The status of anatomy teaching in the medical schools of the Gulf Cooperation Council countries: an exploratory study

Mohamed AL Mushaiqri

This thesis is presented for the degree of

Doctor of Philosophy

The University of Western Australia
School of Anatomy, Physiology, and Human Biology
2015

THE UNIVERSITY OF WESTERN AUSTRALIA
THE ABSTRACT

With the progressively changing anatomy teaching in medical curricula worldwide and the increasing number of medical schools in the Gulf Cooperation Council (GCC) Countries, the status of anatomy teaching in the GCC Medical Schools (GCCMSs) requires investigation.

This study aims to explore anatomy teaching in GCCMSs through focusing on three main aspects; the current status of anatomy teaching, the practice of dissection, and the extent of collaboration between anatomy departments in GCCMSs for the purpose of anatomy teaching and learning.

The study combined quantitative and qualitative methods in three phases. The first phase used a comprehensive survey questionnaire directed to the Anatomy Heads of Departments (HODs) in GCCMSs. In the second phase, semi-structured interviews were conducted with HODs of eleven of the GCCMSs included in the first phase. In the third phase, focus groups were conducted with anatomy teachers of three of the eleven schools included in the second phase.

The study has found that anatomy teaching in GCCMSs is in line with international trends and changes with respect to the type of curriculum, teaching time, teaching methods, and teaching tools. However, dissection was rarely used for gross anatomy teaching due to challenges mainly related to time and cadaver unavailability. HODs and anatomy teachers raised concerns about teaching anatomy in the typically integrated medical curricula of GCCMSs, especially with regards to teaching time, the use of self-directed learning, focusing on relevant applied anatomy, and assessment. The study has revealed a limited level of collaboration between the anatomy departments of GCCMSs. HODs and teachers highly appreciated the role of collaboration in improving the teaching of anatomy in their schools. They also identified some factors behind the limited collaboration and suggested some strategies to encourage future collaboration.

This study has, for the first time, produced a rich description of anatomy teaching in GCCMSs, which is hoped to provide guidance for anatomists and medical educationalists in those schools to better integrate anatomy in future reforms of medical curricula. The study has also generated reference data that form the basis for more detailed future studies on many aspects of anatomy teaching in GCCMSs.
ACKNOWLEDGMENT

Firstly, I would like to express my thanks to my supervision team formed by Professor Luis Filgueira (currently working at The University of Fribourg, Switzerland), Professor David Kandiah, and Dr. Jan Meyer from the School of Anatomy, Physiology, and Human Biology at the University of Western Australia, and Associate Professor Ibrahim Inuwa from the Department of Human and Clinical Anatomy at the Sultan Qaboos University in Oman.

I am very grateful to the research participants for their willingness to take part in this research. My thanks also extend to the deans of the participating medical schools who supported the inclusion of their schools in this study.

I would also like to acknowledge Professor Helen Wildy and Dr. Krystina Haq for their kindness through providing constructive comments and feedback on some parts of this thesis.

My gratitude goes to Professor Abdulmoneim AL-Hayani, the Secretary General of the Saudi Medical Deans Committee for the valuable information he provided in the early stages of this study, which helped me in establishing contact with many deans of medical schools in the Kingdom of Saudi Arabia.

Great thanks go to the staff and postgraduate students of the School of Anatomy, Physiology, and Human Biology at the University of Western Australia for all the help and support they provided during my candidature.

I would also like to thank the administration and members of the Omani Students Society of Western Australia for support, encouragement, and creating a real family far from home.

I would like to thank the Sultan Qaboos University for sponsoring my PHD study in Australia.

Finally, I would like to express my endless thanks to my extended family, including my parents, brothers, and sisters for their support and encouragement. My thanks go also to my small family, including my wife, Sheikha and my daughters Hiba, Aalaa, and Sarah for their patience and understanding.
# TABLE OF CONTENT

**THE ABSTRACT** .................................................................................................................. II
**ACKNOWLEDGMENT** ........................................................................................................ III
**TABLE OF CONTENT** ....................................................................................................... IV
**LIST OF FIGURES** ............................................................................................................. IX
**LIST OF TABLES** ................................................................................................................. X

**Chapter one: Introduction** .......................................................................................... 1
  1.1 Introduction ........................................................................................................... 1
  1.2 Statement of the problem ..................................................................................... 3
  1.3 Objectives and research questions ...................................................................... 5
  1.4 Research methods ............................................................................................... 6
  1.5 Significance of the study ................................................................................... 6
  1.6 Outline of the thesis ......................................................................................... 7

**Chapter two: The evolution of anatomy in medical education** ............................... 9
  2.1 Introduction ....................................................................................................... 9
  2.2 Anatomy in old times ....................................................................................... 9
    2.2.1 The contribution of Herophilus ................................................................. 9
    2.2.2 The contribution of Galen ...................................................................... 9
    2.2.3 The Renaissance .................................................................................... 10
    2.2.4 Anatomy in Islam ................................................................................ 10
  2.3 Anatomy in modern medical education ........................................................ 12
    2.3.1 Origins of modern medical education ................................................... 12
    2.3.2 Anatomy teaching in Great Britain ....................................................... 13
  2.4 Anatomy in traditional medical curricula ....................................................... 19
  2.5 Anatomy in modern medical curricula ............................................................ 21
    2.5.1 Teaching time ...................................................................................... 22
    2.5.2 Teaching faculty .................................................................................. 22
    2.5.3 Problem-based learning ..................................................................... 23
  2.6 Anatomy curricula available today ................................................................. 24
  2.7 Collaboration for anatomy teaching ................................................................. 26
    2.7.1 The role of anatomical societies in collaboration for anatomy teaching 27

**Chapter three: Gross anatomy teaching tools** ......................................................... 31
  3.1 Introduction ....................................................................................................... 31
  3.2 Dissection ......................................................................................................... 31
  3.3 Prosections ....................................................................................................... 35
  3.4 Plastinated prosections .................................................................................... 36
  3.5 Clinically-Oriented tools ............................................................................... 38
    3.5.1 Medical imaging .................................................................................. 38
    3.5.2 Living anatomy .................................................................................... 40
    3.5.3 Procedural anatomy .......................................................................... 43
  3.6 Computer assisted learning and multimedia ............................................... 45
  3.7 Models .............................................................................................................. 49
Chapter seven: Findings of the HODs interview

7.1 Introduction

7.2 Part one: Anatomy teaching
    7.2.1 Type of curriculum
    7.2.2 Methods of teaching
    7.2.3 Approach to teaching anatomy
    7.2.4 Integration
    7.2.5 Anatomy teaching time
    7.2.6 Assessment

7.3 Part two: The practice of dissection
    7.3.1 Introduction
    7.3.2 HODs’ perception of place of dissection in medical schools
    7.3.3 Reasons for not including dissection
    7.3.4 Strategies to include dissection

7.4 Collaboration between anatomy departments
    7.4.1 Introduction
    7.4.2 Experience of collaboration
    7.4.3 Benefits of collaboration
    7.4.4 Factors discouraging collaboration
    7.4.5 Strategies for increasing collaboration

7.5 Summary
    7.5.1 The anatomy Curriculum
    7.5.2 Dissection
    7.5.3 Collaboration

Chapter eight: Findings of the Focus groups

8.1 Part 1: Teaching anatomy in an integrated medical curriculum: the perception of anatomists in GCC medical schools
    8.1.1 Introduction
    8.1.2 Teaching anatomy in an integrated curriculum

8.2 Part two: Anatomists’ perception of collaboration between GCC anatomy departments
    8.2.1 Introduction
    8.2.2 Experience of collaboration in the GCC
    8.2.3 Experience of collaboration outside the GCC
    8.2.4 Benefits of collaboration
    8.2.5 Factors discouraging collaboration
    8.2.6 Factors encouraging collaboration

8.3 Summary
    8.3.1 Anatomy teaching in the curriculum
    8.3.2 Collaboration
Chapter nine: Discussion .......................................................................................... 244
  9.1 Introduction ........................................................................................................ 244
  9.2 The presence of anatomy in GCC countries .................................................. 244
  9.3 Staff demographics ........................................................................................... 245
    9.3.1 Collaboration in light of staff demographic data ........................................ 248
  9.4 The Curriculum ............................................................................................... 250
    9.4.1 Characteristics of the anatomy curriculum ............................................. 251
    9.4.2 Implementation of integration ................................................................. 253
    9.4.3 Anatomy curriculum in light of collaboration ........................................ 253
  9.5 Anatomy teaching time ................................................................................... 255
    9.5.1 The current status of anatomy teaching time ......................................... 255
    9.5.2 The time dedicated to self-directed learning (SDL) ................................ 258
    9.5.3 Anatomy teaching time: anatomists’ perception ..................................... 259
  9.6 Anatomy teaching tools ................................................................................ 262
    9.6.1 The currently used tools ......................................................................... 263
    9.6.2 The place of dissection ........................................................................... 263
    9.6.3 Dissection and the role of collaboration ................................................. 269
  9.7 Summary ......................................................................................................... 272

Chapter ten: Conclusion and recommendations .................................................... 273
  10.1 Introduction .................................................................................................... 273
  10.2 Reflections of the methodology ................................................................... 273
  10.3 Research questions ....................................................................................... 274
  10.4 Limitations of the research ......................................................................... 281
  10.5 Recommendations ....................................................................................... 282
    10.5.1 Recommendations for administrators of the medical schools ........... 282
    10.5.2 Recommendations for anatomy departments and their staff members 283
    10.5.3 Recommendations for future research ................................................. 284

References .............................................................................................................. 286
LIST OF FIGURES

Figure 4.1: Map of the GCC countries (Global Arab Network, 2012) ......................... 54
Figure 4.2: The distribution of medical schools across the countries of the GCC ............. 64
Figure 4.3: The number of GCC medical schools founded in the past five decades ...... 64
Figure 4.4: Public and private GCC medical schools ..................................................... 65
Figure 6.1: The distribution of full-time staff according to the academic rank .......... 102
Figure 6.2: The percentage of local and expatriate full-time staff in each academic rank .............................................................................................................................................. 103
Figure 6.3: The percentage of schools that teach anatomy in each year of the medical curriculum. ........................................................................................................................................................................ 107
Figure 6.4: Distribution of total anatomy teaching hours. ........................................ 119
Figure 6.5: The period for which a single cadaver is used ........................................ 129
Figure 6.6: How difficult is obtaining cadavers? ...................................................... 130
Figure 6.7: Experiencing shortage of cadavers? ....................................................... 131
Figure 6.8: Is dissection practiced in the department? .......................................... 132
Figure 6.9: The categories of personnel who perform dissection ............................ 132
Figure 6.10: The purpose of dissection conducted .................................................. 133
Figure 6.11: Is collaboration with other GCC anatomy departments present? ......... 134
**LIST OF TABLES**

Table 4.1: Basic statistics of the GCC countries ............................................................... 55
Table 4.2: GCC Medical schools in 2011 and their foundation years. ......................... 62
Table 6.1: The distribution of medical schools across GCC countries. .......................... 96
Table 6.2: The distribution of GCC medical schools according to the type (public & private). .................................................................................................................. 96
Table 6.3: The distribution of GCC medical schools according to the foundation year. 97
Table 6.4: Programs other than medicine taught by anatomy departments in GCC medical schools. .............................................................................................................. 98
Table 6.5: The annual student intake number ................................................................. 99
Table 6.6: The employment status of the anatomy teaching staff .................................. 99
Table 6.7: The distribution of full-time staff according to academic rank. ................. 101
Table 6.8: The availability of medically-qualified staff ............................................... 103
Table 6.9: Student: staff ratio in gross anatomy laboratory sessions .......................... 104
Table 6.10: The length of medical curricula in GCC medical schools ......................... 105
Table 6.11: Length of medical curricula in GCC medical schools .............................. 106
Table 6.12: Types of medical curricula in GCC medical schools .............................. 106
Table 6.13: The number and percentage of schools that teach anatomy in each year of the medical curriculum ................................................................. 107
Table 6.14: The ranking of the anatomy curriculum for the four pairs of characteristics. .................................................................................................................. 110
Table 6.15: The degree of integration of anatomy in the medical curriculum .......... 113
Table 6.16: The level of authority that anatomy departments have over anatomy teaching (frequencies and percentages) ......................................................... 115
Table 6.17: The presence of defined minimum core anatomy knowledge ............... 116
Table 6.18: The adoption of a new medical curriculum in the past 10 years .......... 117
Table 6.19: The impact of curriculum change on aspects of anatomy teaching ....... 117
Table 6.20: The percentages of teaching hours dedicated to anatomy sub-disciplines 120
Table 6.21: Percentages of teaching hours dedicated to different teaching formats.... 120
Table 6.22: The frequencies of the use of resources for teaching gross anatomy. ...... 123
Table 6.23: The frequencies of the use of different assessment tools ....................... 127
Table 6.24: The frequencies of the use of different assessment formats .................. 127
Table 6.25: The number of new cadavers obtained per year ........................................ 128
Table 8.1: Demographic data of focus group participants ............................................. 208
Table 8.2: Detailed demographic data of FG participants ............................................. 209
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>American Association of Anatomists</td>
</tr>
<tr>
<td>AS</td>
<td>Anatomical Society</td>
</tr>
<tr>
<td>CAI</td>
<td>Computer-Assisted Imaging</td>
</tr>
<tr>
<td>CAL</td>
<td>Computer-Assisted Learning</td>
</tr>
<tr>
<td>CT</td>
<td>Computerised Tomography</td>
</tr>
<tr>
<td>CBL</td>
<td>Case-Based Learning</td>
</tr>
<tr>
<td>FGs</td>
<td>Focus Groups</td>
</tr>
<tr>
<td>GB</td>
<td>Great Britain</td>
</tr>
<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
</tr>
<tr>
<td>GCCMSs</td>
<td>Gulf Cooperation Council Medical Schools</td>
</tr>
<tr>
<td>HODs</td>
<td>Heads of Departments</td>
</tr>
<tr>
<td>KSA</td>
<td>Kingdom of Saudi Arabia</td>
</tr>
<tr>
<td>MRI</td>
<td>Magnetic Resonance Imaging</td>
</tr>
<tr>
<td>PBL</td>
<td>Problem-Based Learning</td>
</tr>
<tr>
<td>SDL</td>
<td>Self-Directed Learning</td>
</tr>
<tr>
<td>TBL</td>
<td>Team-Based Learning</td>
</tr>
<tr>
<td>TLL</td>
<td>Tutor-Led Learning</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
</tbody>
</table>
Chapter one: Introduction

1.1 Introduction

Anatomy has been regarded as the “cornerstone” of medical education for centuries (Bagley 2011). It lays down the foundation that other basic and clinical medical sciences build upon throughout the undergraduate, graduate, and professional training years of a doctor’s life. Within the context of medical practice, a sound knowledge of anatomy is needed for conducting clinical examination, reaching a proper diagnosis, and communicating the findings to the patients and other medical personnel (Turney, 2007).

The study of anatomy traditionally dominated medical curricula. Medical students used to spend hundreds of hours dissecting bodies and learning the very fine details of the human body’s structure. However, with the explosion of scientific knowledge, new disciplines in medical education such as molecular biology and immunology were gradually introduced into medical curricula. Medical educators also started to realise that sound factual knowledge, which is the focus of traditional medical curricula is not sufficient to produce competent physicians but other skills such as professionalism, teamwork, life-long learning, and the forging of doctor-patient relationship have become equally important. Accordingly, there were calls for medical education reform. Medical curricula were rearranged in order to include the new disciplines and concepts. Logically, the teaching in more traditional medical disciplines such as anatomy had to be revised in order to fit into modern curricula.

Traditional medical curricula have also been criticised for teaching basic medical sciences in a teacher-centred and discipline-based fashion which lacked horizontal integration between basic sciences, and vertical integration between basic medical sciences and clinical disciplines (Richard L. Drake, 1998; Klement, Paulsen, & Wineski, 2011; Parsell & Bligh, 1995). Consequently, students had to rely on memorising large quantities of unrelated factual knowledge with little or no relevance to future clinical practice (Richard L. Drake, 1998; Turney, 2007). At that time, anatomy teaching in medical schools was negatively perceived due to very long courses that overloaded students with anatomical details that lacked relevance to clinical practice (Monkhouse, 1992). Therefore, there were calls again for more integration of anatomy in medical curricula and for more involvement of students in the teaching and learning
process. This has led to a progressive adoption of today’s integrated medical curricula, which utilise more student-directed learning (SDL) and problem-based learning (PBL).

The change in teaching of anatomy in modern medical curricula has manifested in many ways. Firstly, there has been progressive reduction of anatomy teaching hours, particularly in laboratory hours (Richard L. Drake, McBride, Lachman, & Pawlina, 2009; Gartner, 2003; Pryde & Black, 2005). Secondly, teaching practical anatomy has changed from being dictated by dissection towards including other tools such as prosections, models, computer-assisted imaging (CAI), medical imaging, and surface and clinical anatomy. Some schools have actually abandoned dissection completely (Rizzolo & Stewart, 2006). Dissection has been criticised for being outdated, expensive, and putting students under emotional stress as well as benign challenged by the shortage of cadavers (Aziz et al., 2002). Thirdly, the methods of teaching anatomy have changed from didactic lectures and practicals towards including more PBL, SDL, and computer-assisted learning (CAL) (Cahill, Leonard, & Marks, 2000; Regan de Bere & Mattick, 2010).

The change in the way anatomy is taught in modern medical curricula has fuelled concern about the inadequacy of the anatomical knowledge of medical graduates (Bergman, Van Der Vleuten, & Scherpbier, 2011). Such concerns have been raised by clinicians, anatomists, students and by new doctors (Bergman, Prince, Drukker, van der Vleuten, & Scherpbier, 2008; Cottam, 1999; Fitzgerald, White, Tang, Maxwell-Armstrong, & James, 2008; Prince, Scherpbier, Van Mameren, Drukker, & Van Der Vleuten, 2005; Waterston & Stewart, 2005).

Consequently, a considerable amount of scholarly output on the topic of anatomy teaching in medical curricula started to emerge. Medical schools and anatomy departments published their teaching experience and innovations for the purpose of achieving the best ways of incorporating anatomy into medical curricula, which will contribute towards producing competent graduates (Bergman, et al., 2011; Reinhard Pabst, 2009; Regan de Bere & Mattick, 2010; Vorstenbosch, Bolhuis, van Kuppeveld, Kooloos, & Laan, 2011). There have also been calls and attempts to develop a core anatomy curriculum in many parts of the world in order to define the minimum anatomical knowledge needed to graduate competent physicians (Australian Medical Students' Association, 2013; Chapuis, Fahrer, Eizenberg, Fahrer, & Bokey, 2010; Craig, Tait, Boers, & McAndrew, 2010; Heylings, 2002), and to suggest an ideal anatomy
curriculum that incorporates the strong points of both traditional and innovative curricula (Richard L. Drake, 1998; Louw, Eizenberg, & Carmichael, 2009).

In order to define a regional or national core curriculum or to suggest an ideal anatomy curriculum, one would need to have enough information about the way anatomy is taught in that region in terms of the characteristics of the whole medical curriculum, teaching time, teaching resources, maturity of students, and characteristics of the teaching faculty. Such information would help in taking all the local circumstances into consideration when defining the curriculum. In this regard, many regional and national studies have reported the overall state of anatomy teaching in many parts of the world (Craig, et al., 2010; R. L. Drake, Lowrie, & Prewitt, 2002; Gartner, 2003; Heylings, 2002; Kramer, Pather, & Ihunwo, 2008; Pryde & Black, 2005). Such studies can help anatomists and anatomy departments to gain a comprehensive insight on how anatomy is taught in their region. It can also act as a reference point for future studies and therefore, enable historic documentation and monitoring.

The data published in such regional or national studies have been based on local circumstances. Transferring such data from one region to another without adjusting or pre-testing them locally may cause more harm than good due to differences in teaching and learning environments (Reinhard Pabst, 2009). This warrants the conducting of similar studies in regions and countries in which medical schools are exposed to similar environments. This will help in considering local circumstances for future curriculum change and development.

1.2 Statement of the problem

Gulf Cooperation Council (GCC) is a political, economic, social, and cultural organisation of six member countries that was founded in 1981. The member countries are Bahrain, Kuwait, Oman, Qatar, Kingdom of Saudi Arabia (KSA), and The United Arab Emirates (UAE). Modern higher and medical education in the GCC region is relatively new. The first university in the region was established in the KSA in 1957 and the first medical school was established in 1967 (Hamdy et al., 2010a). The massive economic growth in the region which is supported by a parallel population expansion has increased the demand for doctors. As a result, the number of medical schools has dramatically increased to reach 27 in 2010 (Hamdy, et al., 2010a) and 41 in 2013. By 2005, the annual gross annual intake of all medical schools in GCC countries and
Yemen was 3225 students, and the total number of graduates was 1787 (Bin Abdulrahman, 2008).

Being an essential part of every traditional or modern medical curriculum, anatomy departments are as old as the medical schools in the region. Since most of the controversy over anatomy teaching in medical curricula emerged in the second half of the 20th century and became progressively noticed and reported in the last two decades, anatomy departments in the region were not immune from the controversy. The literature published by anatomists from GCCMSs indicated that the region has been influenced by the international trends of anatomy teaching such as limited dissection (Harris 1994, Cowan 2010, Khan 2010), the use of teaching tools other than dissection including plastinated specimens, dry bones, plastic models, X-rays, atlases, CAI, and surface anatomy (Abu-Hijleh et al., 2010; Abu-Hijleh, Hamdi, Moqattash, Harris, & Heseltine, 1997; Al-Rubaish, Al-Motabagani, AbuHijleh, & Al-Sheikh, 2009; Al Motabagani, Al Rubaish, AbuHijleh, & Al Sheikh, 2009; Cowan et al., 2010; Pallab K. Ganguly, Chakravarty, Latif, Osman, & Abu-Hijleh, 2003; Ibrahim Inuwa, Taranikanti, Al-Rawahy, & Habbal, 2011; Jaffar, 2012; Khan, 2010), and the increasing adoption of integrated curricula, especially PBL (AlSaggaf, Ali, Ayuob, Eldeek, & El-haggagy, 2010; Cowan, et al., 2010; Pallab K. Ganguly, et al., 2003; Jaffar, 2012; Khan, 2010; Yaqinuddin, Zafar, Ikram, & Ganguly, 2012).

Each of the studies referred to above reported on specific aspects of the anatomy curriculum in a particular school or a country. Their number is not large enough to give a comprehensive insight into the overall state of anatomy teaching in the region’s medical schools. This warrants a need for a comprehensive regional study to explore the topic of anatomy teaching in GCCMSs. The aspects of interest include the characteristics of the teaching faculty, the types and characteristics of anatomy curricula, teaching time, teaching methods, teaching tools and resources, and assessment methods.

There are also some issues related to anatomy teaching in medical schools, which are of specific interest to the GCC region. First of all, the region suffers from the unavailability of cadavers, which may be a factor behind the limited use of dissection. There are no body donation programs in the GCC region. Anatomy departments have had to rely on importing bodies from abroad at a high cost or to using local unclaimed bodies (O. Habbal, 2009). Anatomists teaching in the region believed that the religious
and cultural considerations lie behind the unavailability of local bodies and this applies to all GCC countries and other Middle East countries (Harris, Abu-Hijleh, & Moqattash, 1994). However, to date, the practice and the use of dissection in GCCMSs have not been empirically investigated. More importantly, the extent of the unavailability of cadavers and its implication on anatomy teaching remains unstudied.

Secondly, there is a noticeable variation in anatomy curricula in the region’s medical schools. Habbal (2009) pointed to the absence of agreement in the GCC region on a common anatomy curriculum, which may have contributed to the variation. The variation in anatomy curricula in a region that shares many cultural, social, and economic similarities on one side and implements similar tools for teaching practical anatomy on the other side, points to the lack of collaboration between the schools in relation to anatomy teaching. Previous attempts in places other than the GCC region to define a regional or national anatomy curriculum were collaborative in nature under the umbrella of professional anatomical bodies or societies (American Association of clinical Anatomists, 1996; McHanwell et al., 2007). However, up to date, such a society does not exist in the GCC region despite the recommendation from the GCC Anatomy Heads of Department Meeting that was held in the KSA in 2000 to establish such a regional anatomical society (O. Habbal, 2009). Moreover, nothing is known about the current state of collaboration between anatomy departments in the region’s medical schools in relation to anatomy teaching. Therefore, there is a need to explore the extent of collaboration between the anatomy departments in GCCMSs and how collaboration may improve the state of anatomy teaching in the region.

1.3 **Objectives and research questions**

This is an exploratory study aimed at exploring the state of anatomy education in the medical schools of the GCC countries. The primary objectives of the study are to:

1. Investigate the characteristics of anatomy curricula in the medical schools of the GCC region, and how anatomy is taught and assessed in those curricula.
2. Investigate the practice of dissection in anatomy departments of the medical schools of the GCC region.
3. Investigate the extent of collaboration between anatomy departments of the GCC medical schools in relation to anatomy teaching, and how collaboration can improve the future of anatomy teaching in those schools.
In order to fulfil those objectives, the study hopes to address the following research questions:

1. What are the characteristics of anatomy curricula taught in GCCMSs?
2. How is anatomy taught and assessed in GCCMSs?
3. How do anatomy curricula in GCCMSs compare to the internationally reported anatomy curricula?
4. What are the perceptions of anatomists in GCCMSs about anatomy teaching in their schools?
5. What are the characteristic of the anatomy teaching faculty in GCCMSs?
6. What is the extent of the use of dissection and what are the factors influencing the adoption of dissection by anatomy departments in GCCMSs?
7. What is the extent of collaboration between anatomy departments and between anatomists in GCCMSs and what are the factors influencing it?

1.4 Research methods

This is an exploratory study that investigates a largely unstudied area. The study was conducted in three phases, each utilising a different data collection method. The first phase used a comprehensive survey questionnaire directed to the Anatomy Heads of Departments (HODs) in GCCMSs to collect data about many aspects of anatomy teaching in their departments. The second phase used face-to-face, semi-structured interviews with a sample of HODs from eleven GCCMSs. The third and last phase used focus groups with staff members involved in anatomy teaching from anatomy departments in three GCCMSs.

1.5 Significance of the study

There have been a substantial number of publications on the place of anatomy in a continuously changing medical curriculum. However, the majority of the publications originated from the developed world such as the United States (US) and Europe. The number of publications from the Middle East including the GCC countries is extremely low, which leaves the topic of anatomy teaching in the regions’ medical schools largely unstudied. Moreover, to date, there has not been any study to explore the overall status of the place of anatomy in medical curricula of the region’s medical schools. This comprehensive study is the first of its kind to focus on anatomy teaching in GCCMSs, which has witnessed a remarkable increase in the number of medical schools in the past
few years. Moreover, to the best of the researcher’s knowledge, this is the first study of its kind to be conducted in the Arab world.

The primary significance of this study is that it presents the first attempt to provide a comprehensive view into the status of anatomy teaching in GCCMSs. The findings of this study will also provide guidance for anatomists and medical educationalists in the region for better incorporation of anatomy in future curriculum design or reform.

Besides its primary significance, this study has the following additional significance points:

- It will update anatomists and anatomy departments in GCCMSs to the range of strategies used for anatomy teaching in the region. This can widen their options when choosing their own strategies.
- It will provide a reference point for future studies on many aspects of anatomy teaching in the region. This reference point will also provide the basis that, with the help of similar studies in the future, will accumulate a record that can be used for historic comparisons.
- It will help anatomists and decision-makers in GCCMSs to collaboratively tackle the challenges that face anatomy teaching in the region.
- It will present the largely unknown experience of GCCMSs in anatomy teaching to the wider scientific and medical education communities. This may be of great interest to countries that have similar circumstances to the GCC region.
- Overall, the study will expand the scholarly publication of the controversial topic of anatomy teaching in medical schools.

1.6 Outline of the thesis

This thesis is composed of ten chapters.

Chapter one is an introduction to the thesis. It presents the statement of the problem, aims, research questions, and the significance of the study.

Chapter two presents the literature review of the evolution of anatomy within the context of medical education from ancient times until today. It focuses on the evolution of anatomy in Great Britain (GB) as an example. It also covers the progressive change in anatomy teaching in medical curricula in recent times.

Chapter three reviews the tools used for teaching gross anatomy in medical schools.
Chapter four provides background information about the GCC countries. It expands on the history and current status of medical education and anatomy teaching in GCCMSs.

Chapter five describes the research methodology used by this study. It provides a step-by-step record of the way the study was conducted. It also provides a literature review of the research methods used.

Chapter six presents the findings of the survey questionnaire.

Chapter seven presents the findings of HODs interviews.

Chapter eight presents the findings of the FGs of the staff members of anatomy departments in three medical schools from three different GCC countries.

Chapter nine discusses the findings of the whole study in light of GCC circumstances and of internationally published literature.

Chapter ten presents the concluding remarks from this study. It also provides recommendations for schools’ administrators, anatomy departments and their staff members, and for future research.
Chapter two: The evolution of anatomy in medical education

2.1 Introduction

The study of anatomy and dissection has been linked to the study of medicine throughout history. This chapter reviews the evolution of anatomy within the context of medical education up to the current time.

2.2 Anatomy in old times

Historic studies have defined three periods that were regarded as milestones for the development and evolvement of human anatomy teaching.

2.2.1 The contribution of Herophilus

The first period dates back to 300 B.C. and was dominated by the Greek physician Herophilus. He was the first person known to dissect human cadavers in Alexandria in Egypt. Before him, there was only the dissection of animals in Greece because dissecting the human body was against the Greek traditional beliefs. Herophilus made original anatomical discoveries such as the difference between arteries and veins, the difference between motor and sensory nerves, the difference between spinal and cranial nerves, and the anatomical description of the liver and pancreas. His contributions to the study of anatomy qualified him to be named the “father of anatomy”. Interestingly, the dissection of human cadavers in that period was short-lived, lasting for only 30-40 years and stopping after the death of Herophilus for 18 centuries (Pearce, 2013; Wiltse & Pait, 1998).

2.2.2 The contribution of Galen

The second period dates back to 100-200 B.C. and it was dominated by another Greek physician, Galen whose name was given to the great cerebral vein (of Galen). Unlike Herophilus, Galen dissected animals such as apes and pigs and studied human remains in Alexandria. He was able to make important anatomical discoveries, especially about the nervous system and locomotor system. He was the first to describe the lymphatic system, and differences between origin and insertion of muscles. However, because his study of anatomy was based on animal dissection, some of his discoveries were inaccurate in relation to human anatomy. Nevertheless, Galen remained the greatest
authority of medicine and anatomy for more than 10 centuries after his death. His
treaties and texts were highly respected and unquestionable until the renaissance in the
15th and 16th century (Dunn, 2003; Joutsivuo, 1997; Ustun, 2004).

2.2.3 The Renaissance

The third period dates back to the renaissance in Europe and was dominated by Andreas
Vesalius (1514-1564). In the 15th century and before Vesalius, dissection of human
cadavers was increasingly practiced and there were many dissectors. However,
dissection followed the traditional texts of Galen to the extent that any new discovery
that contradicted Galen was regarded as being due to decadence or representing
degeneration of the human body since the time of Galen. The dissection session was led
by a lecturer who sat on an elevated chair and described the structures according to the
traditional text. The actual dissection was done by a barber surgeon and there was an
ostensor to point to the structures with a rod. Vesalius believed that accurate anatomical
knowledge could only be gained by dissecting the human body by the physician or
student himself, rather than through study of the traditional texts. He dissected and
allowed students to dissect, bringing anatomy into the realm of an empirical science that
depended on research rather than traditional texts. Vesalius wrote his famous book *De
Humani Corporis Fabrica* (On the Fabric of the Human Body) in 1543, which is
regarded as a significant landmark in the development of anatomy and anatomical
illustration. In this book, Vesalius corrected some of Galen’s remarks (Andrioli &

2.2.4 Anatomy in Islam

The literature on the history of medicine reveals substantial contributions of Muslim
physicians towards the evolution of medical practice. The best known contribution was
reported from the middle ages between the 9th and 12th centuries. During those days, the
study of anatomy in the Islamic lands, like the Christian lands was based on the Galenic
treatises, which were translated into Arabic in the 9th century under the request and
supervision of the physician Yuhanna Ibn Masawayh (died in 857).

Muslim physicians emphasised the importance of anatomy for the practice of medicine
as Al-Zahrawi, the famous Muslim physician stated:

“The art of medicine is long and it is necessary for its exponent, before he
exercises it, to be trained in the science of anatomy/dissection (ilm al-tashrilh), as

10
Galen has described it, so that he may be fully acquainted with the uses, forms and constitutions of the parts; also how they are related and in what way they are independent; that he should understand fully also bones, nerves, and muscles, their numbers and origins; and also the blood vessels, body arteries and veins, with the locations of their sources. . . . For he who is not skilled in as much anatomy as we have mentioned is bound to fall into error that is destructive to life” (Savage-Smith 1995).

Muslim physicians made significant anatomical discoveries, which corrected some of Galen’s descriptions. The common example was the description of the pulmonary circulation by Ibn Al-Nafis, who had the courage to contradict Galen’s description of the unseen openings between the two ventricles of the heart. Another example was the discovery by Al-Baghdadi that the human lower jaw bone was composed of one bone rather than two separate bones as it was described in Galen’s treaties. However, there is no strong evidence that those two or other Islamic scholars dissected humans (Ebrahimnejad, 2011; Proireschi, 2006; Savage-Smith, 1995).

While the study of anatomy by Muslim scholars was asserted and recognised, the question of whether they dissected the human body remains controversial, ambiguous, and not easily answered. The ambiguity around the study of the practice of dissection by Muslim scholars originated firstly from the use of one Arabic term “Tashrih” to refer to the study of anatomy and to the act of dissection. Therefore, when the term Tashrih is used in any of the Arabic books it is hard to know which of the two meanings is used (Savage-Smith, 1995).

The lack of dissection by Muslims has been attributed to religious prohibition. However, this factor remains questionable because none of the sources of Islamic law such as the Holy Quran and the sayings of Prophet Muhammad mentioned dissection at all, let alone contained clear statements to suggest prohibiting the dissection of the human body. The strongest saying by Prophet Muhammad, which could be interpreted to discourage dissection states: “Breaking the bone of the dead is like breaking the bone of the living”. However, some Muslim scholars suggested that this saying applied only to Muslims, which may keep the dissection of non-Muslims permissible. Overall, Islamic law would have left the door open if any Muslim physician wanted to conduct human dissection (Savage-Smith, 1995).

Other than the dissection of humans, there is some evidence to suggest that dissection of animals such as apes and the study of human remains were practiced by Muslim
scholars. The detailed description of the heart and its septum by Ibn Al-Nafis suggested that he has practiced at least animal dissection. Although some have suggested that he also practiced human dissection (Proireschi, 2006), others pointed to the lack of clear evidence to suggest that he did so (Savage-Smith 1995). He himself was quoted to admit that the Islamic law prevented him and his colleagues from practicing human dissection: “The vote of the religious law and the sentiments of charity innate in ourselves alike prevent us from the practice of dissection. This is why we are willing to be limited to base our knowledge of the internal organs on the sayings of those who had gone before us” (Ebrahimnejad, 2011).

2.3 Anatomy in modern medical education

2.3.1 Origins of modern medical education

Modern medical education had its origins from three main types of education systems that were prevalent in the 19th century. The first was the university type of education, which originated in Germany but later spread to neighbouring countries such as the Netherlands and Scandinavia. Medical schools were academic units of well-established universities. In addition to their clinical affiliation, physicians held academic positions and were involved in research, which contributed to their academic promotion. Professors not only knew and taught the current advances in medical practice, but were also required to be investigators in the science they taught (Calman, 2007). This allowed those medical schools to combine laboratory-based and hospital-based teaching. In this regard, medical schools were autonomous research institutes within the University (Bloom, 1989). This association of German medical schools with universities was one of the reasons behind the domination of Germany in the medical world in the 19th century.

The second type was the proprietary type of medical education in the United States (US). It was commonly described as a “private for profit” type of medical education that was delivered in an apprenticeship manner. Medical courses were very short and teaching was done by undertrained physicians who claimed faculty positions, and were paid directly by students. Laboratory-based sciences were abandoned and schools were under-resourced to deliver teaching of those sciences. Most science disciplines were taught without laboratories. Anatomy was the exception (Ludmerer, 1985).
The third type was the clinical or hospital-based type in Great Britain (GB) and France. In this type, teaching was done by physicians and surgeons in hospitals, who were independent providers of medical education. Students followed their masters in hospital wards during bedside teaching. Although physicians were only paid for the teaching but not for practice, they used the opportunity to promote their reputation, which benefited their private practice.

This chapter takes the example of the evolution of anatomy teaching in GB as a representative example of how anatomy started and continued its role in medical education until today. The example of GB is emphasised because anatomy teaching started there much before other English-speaking countries such as the US and Australia. However, it is appropriate to briefly describe medical practice in GB before advancing into the study of anatomy there because they were closely related.

2.3.2 Anatomy teaching in Great Britain

2.3.2.1 Medical practice in Great Britain

Until the early 15th century, medicine was practiced in GB by all-purpose physicians. Their practice of medicine was of a dogma that combined religion, medicine, and magic (Clarke, 1966). Afterwards, three categories of medical practitioners started to appear; physicians, surgeons, and apothecaries.

Physicians were university educated in internal medicine but their educational background was theoretical with little practical training. However, they were highly respected in the society and seen as the most professional of the three categories. Surgeons were seen as craftsmen more than medical professionals. They performed operations and treated broken bones, accident cases, and skin disorders. Apothecaries started their profession as trade druggists by prescribing medicines over the counter. They gained popularity in the 17th century due to the failure of physicians to provide medical care to a large portion of the population. As a result, they became the most popular of the three professions (Newman, 1957; Youngson, 1979).

The division of the medical profession in GB was maximised by the establishment of independent professional bodies for each of the three groups of practitioners. This was clearly seen in the city of London where the Royal College of Physicians was established in 1518, the Society of Apothecaries in 1617, and the Royal College of Surgeons of London in 1800 (Peterson, 1978). By the 18th century, the three categories
of medical practitioners in GB had their profession well-defined and had their own systems of medical education (Clarke, 1966). The division continued until the 19th century, although the actual work that the three categories were doing actually overlapped, especially when the position of general practitioner was introduced. It will be explained in the course of this chapter that the division of the medical profession in GB was reflected in the practice and evolution of anatomy teaching.

### 2.3.2.2 Milestones of anatomy teaching in Great Britain

Despite differing in their systems of medical education, physicians, surgeons, and apothecaries realised the importance of the study of anatomy for the training of medical practitioners many centuries ago. Physicians and surgeons did so first in the 16th century. Apothecaries followed later in the 19th century but they were behind the first move to make the study of anatomy mandatory for medical training, when the apothecaries act was passed in 1815 (Calman, 2007).

In Britain, the first authorized source of obtaining bodies for the study of anatomy dates back to 1505 when the Town council of Edinburgh granted provision for the supply of bodies to the Barbers and Surgeons of the City (Russell, 1970). Therefore, Edinburgh became the leader in the study of anatomy in Britain. Physicians and surgeons of London were granted similar provisions later in that century. The United Company of Barbers-Surgeons was granted the right, after it was established in 1540 by uniting surgeons and barbers, to use the bodies of four hanged criminals for dissection (Richardson, 1987; Russell, 1970). Similarly, the Royal College of Physicians succeeded in obtaining a similar grant in 1565 giving the College the privilege to dissect the bodies of one to six criminals who have been sentenced for death. The grant was renewed later in the 17th century (Hay, 1975). However, physicians did not often exercise the privilege because of the low interest in dissection, as anatomy not being seen as essential for the training of physicians. Therefore, the Barber-Surgeon Company, and later the Royal College of Surgeons exercised the sole monopoly of obtaining bodies of criminals and took control over teaching of anatomy for the next 200 years or more. Beadles were appointed by the company to collect bodies of hanged criminals from Tyburn.

The Barber-Surgeon Company kept that privilege until 1745 when it split again forming the Surgeon Company of London, which later became the Royal College of Surgeons of London in 1800. Before 1745, dissection could only be carried out at the Barber-
Surgeon’s Hall and at the Royal College of Physicians. The teaching of anatomy at the Barber-Surgeon Company was very limited. It was made up of four lectures a year. Each lecture lasted for three days and was supported by the dissection of a single body (Hay, 1975). Despite that, the number of bodies of hanged criminals was not enough for teaching.

Anatomy teaching in British universities was not formally practiced until the 17th century. For example, formal anatomy teaching started at the University of Oxford in 1624 (Russell 1970). The Universities were not able to obtain enough bodies for dissection, according to the old grants of the 16th century. They succeeded, for example, in obtaining a charter from King Charles in 1636 to use the bodies of hanged criminals from within twelve miles of Oxford (P. D. Mitchell et al., 2011). However, that was still not enough to meet the increasing demand for cadavers.

2.3.2.2.1 The Murder Act of 1752

A murder act was passed by the parliament of GB in 1752 as a measure to prevent the horrid crime of murder. It implied that a murderer’s body should be obtained by a surgeon for dissection after hanging. According to the act, dissection was regarded as a form of punishment for the murderer’s body. As a result, more bodies were made available to surgeons. Dissection at the Surgeon Hall was public and in some cases superficial. Some bodies were not carefully dissected or used for the surgeon’s training. They were dissected only in fulfilment of the murder act. They were symbolically dissected by performing an incision through the sternum and then the body was given to a member surgeon, students in a teaching hospital, or a private anatomy school (MacDonald, 2003).

2.3.2.2 The need for more structured anatomy teaching

With the development of scientific knowledge around diseases and their diagnosis, and in the subjects of anatomy and physiology, it was apparent that apprentices had a knowledge gap arising from the limited knowledge that their masters could provide in their private practice. The increased amount of scientific knowledge arising from research was not paralleled with a change in the education system. Moreover, the practice of medicine encountered a shift that diverted the basis of diagnosis away from what patients felt and reported to a stress on what doctors saw and observed through physical examination (Poynter, 1966). The new shift implied that treatment should be directed to the diseased organs instead of the patient’s symptoms. As a result, a new
form of extra education that could integrate the expanding scientific knowledge into the traditional system of apprenticeship-based medical education was needed. Specific knowledge of practical anatomy was required instead of the theoretical anatomy knowledge that was obtained at that time through reading ancient Latin and Greek dissection books. The term “morbid anatomy” was introduced to describe the study of the structure of diseased organs. It was taught in parallel with the ordinary “dead anatomy” but it took until 1820 for this to be established as a separate medical science (Zaini, 2007). However, courses in dissection and morbid anatomy were not mandatory for practising medicine for apothecaries until 1853 (Peterson, 1978). The high demand for courses in anatomy led to the establishment of private anatomy schools near hospitals in the 18th century (Zaini, 2007).

2.3.2.2.3 Private anatomy schools

The establishment of private anatomy schools coincided with the splitting of the Barber-Surgeons Company in 1745. The first private anatomy school was the Great Windmill Street School of Anatomy, which was opened within months of the splitting of the company. It was established by the famous Scottish surgeon William Hunter (Black, 2006). Private schools emerged as competitors against the Surgeons Company and hospital schools for the bodies.

Anatomy teaching in private schools took the form of systemic lectures and practical demonstrations. Although anatomy courses were not required to qualify as a physician or a surgeon, it was accepted that a course in anatomy and dissection in one of those private schools was one of the qualities of a well-trained doctor (Rivett, 1986). This was clearly understood from the advice that William Hunter gave the best candidate for becoming a truly good doctor, when he stressed on choosing a good practical anatomist and putting him in a large hospital to treat the sick and dissect the dead (Calman, 2007). In one of his lectures, Hunter referred to the importance of dissection in anatomical knowledge acquisition, manual skills development, and emotional desensitization. He described the three values as informing the head, giving dexterity to the hand, and familiarizing the heart with a sort of necessary inhumanity, respectively. However, the students’ chance to dissect was rare and it depended on the availability of cadavers (Calman, 2007).

Teaching in private schools was not restricted to anatomy only but also covered surgery, medicine, and midwifery. The anatomical knowledge provided by teachers in those
schools was very detailed in contrast to the lectures offered by the Surgeons Hall or the Royal College of Physicians. Dissection by students, when available, was a new method of teaching anatomy. Overall, students started to spend more time on lectures and anatomical dissection and less time on their masters’ private practice (Peterson, 1978). However, those schools did not have legal rights to obtain cadavers because the Murder Act of 1752 authorizing only the Surgeons Company to conduct dissection of the bodies of executed criminals was still unchanged (P. D. Mitchell, et al., 2011). Private teachers had to look for alternative methods of obtaining bodies in order to keep their flourishing business. They resorted to grave-robbers and body snatchers.

2.3.2.2.4 Grave robbing

Grave-robbing or body-snatching was a widespread business linked to anatomists and their private schools and gave anatomy its worst reputation. Body snatchers were commonly referred to as “resurrectionists”. A black market for bodies existed and bodies became a commodity. Thousands of them were stolen and sold to private schools. A resurrectionist for example, admitted that he and his gang sold the bodies of 1211 adults and 179 children to schools in London alone in the years from 1809 to 1813 (Russell, 1970). Moreover, murders were also committed in order to supply anatomists with bodies of young and healthy people upon their request. Anatomists were eager to receive more cadavers in exchange for cash. They did so to provide enough bodies for dissection to their increasing number of students in order to remain competitive in the booming business. Their practice led to public criticism, outrage, and protest. Relatives of anatomists themself became victims of such practice as on one occasion an anatomist was delivered the body of his sister by a resurrectionist (Black, 2006). Calls to regulate the supply of bodies to surgeons and private schools increased under continuous pressure from the public and the press (MacDonald, 2003; Russell, 1970).

2.3.2.2.5 Apothecaries Act of 1815

Another development that led to even higher demand for bodies was the passage of the Apothecaries Act of 1815. The Act was passed in response to calls for reforms so that the British medical education would be based on a common primary medical qualification instead of the nineteen medical licensing bodies that were present in Britain early in the 19th century. It was driven by surgeons and apothecaries, who were not represented in the councils of the Royal Colleges and universities (Bates, 2008). The Act demanded that practitioners who did not hold university qualifications had to be
examined by the Apothecary Society in addition to completing a traditional apprenticeship. The Act requested students to show evidence of attending a course in anatomy and other sciences such as physiology, chemistry, medicine, and materia medica (Rivett, 1986). Students were also required to attend anatomy lectures and dissection classes in order to be eligible for admission to the examination of the Royal College of Surgeons (Bates, 2008).

Consequently, the demand for anatomy teaching increased. However, many poor students were not able to attend teaching hospitals. They instead attended many of the new flourishing private anatomy schools. Those schools were popular because they offered cheaper teaching than hospital schools. Students could save around one-sixth of the hospital schools’ fees by attending a private school (Peterson, 1978). This manifested in more body snatching, and further deterioration of anatomists’ reputation. Although body snatching was illegal, no actions were taken to find alternative ways to replace it in supplying bodies for dissection. Surgeons and anatomists lobbied and campaigned to convince the public and politicians about the importance of dissection for producing well-trained doctors, who would in return, be more competent in providing medical care to the public. In 1828, the president of the Royal College of Surgeons, Sir Astley Cooper said in a meeting with members of the parliament that “without dissection there can be no anatomy, and that anatomy is our Polar Star, for without anatomy a surgeon can do nothing, certainly nothing well” (Dooley, 1973). He also clearly linked “anatomical knowledge to health, maintenance of life and happiness of the community”.

2.3.2.2.6 The Anatomy Act of 1832

Towards the end of the 1820s, the public outrage concerning anatomists was at its peak following the famous Burke and Hare case in Edinburgh. Burke and Hare murdered a number of people and sold their bodies to the private schools of Doctor Robert Knox (Hughes, 2007; Russell, 1970). A similar case was also revealed in London, where Bishop and Williams murdered at least three of their victims (Hughes, 2007). These two cases were behind the passing of the Anatomy Act of 1832 by the parliament of GB. The purpose of the Act was to regulate the schools of anatomy. It gave surgeons and anatomy schools’ owners access to the unclaimed bodies of people who died in charitable institutions. Consequently, it repealed the Murder Act of 1572 thus ending the public dissection of murderers (MacDonald, 2003). Inspectors were appointed to
insure that the Act was implemented. The Anatomy Act of 1832 has been one of the milestones of medical and anatomical teaching in GB through the legalization of the study of human anatomy and enhancing the acquisition of material for dissection (Dooley, 1973; Hughes, 2007). It also formed the basis for anatomy acts that later regulated the schools of anatomy in English speaking countries such as Australia and the US (Russell, 1970).

The Anatomy Act of 1832 was indirectly behind the closing of many private anatomy schools because unlike hospital anatomy schools, they had limited access to unclaimed bodies. Consequently, all the thirteen private schools of London that existed in 1832 were either closed or merged with hospitals and colleges by 1871. In contrast, the number of hospital schools rose from six to eleven over the same period (Bates, 2008; Richardson, 1987).

Although the study of anatomy had been among the requirements for the training of surgeons and apothecaries since the introduction of the Apothecaries Act of 1815, the teaching was based on lectures only as required by the Society of Apothecaries or lectures and demonstrations as required by the Royal College of Surgeons. The passing of the Anatomy Act of 1832 made bodies legally available for dissection. This in return made it possible to increase the minimum requirements for the study of anatomy. By 1855, the study of anatomy with dissection and study of morbid anatomy were made mandatory by the Society of Apothecaries and the Royal College of Surgeons. Towards the end of the 19th century, the Royal College of Physicians joined these two organisations in including the study of anatomy with dissection and the study of morbid anatomy in its curriculum (Peterson, 1978).

2.4 Anatomy in traditional medical curricula

Towards the end of the 19th century, the expansion of scientific knowledge meant that more systemic medical education was needed. The establishment of the General Medical Council (GMC) in Britain in 1858 (Calman, 2007), was one of the factors behind making moves towards that. Calls for reform of medical education started to rise and medical schools started to be affiliated to universities (Clarke, 1966). As a result, the block system of British medical education emerged. The five year medical curriculum was divided into two blocks. In the first two and a half years, students learned the scientific basis of medicine or the basic medical sciences including anatomy, and in the last two and a half years they advanced into clinical training (Zaini, 2007).
Although anatomy was taught in the first half of the curriculum as a scientific subject, it was still taught by clinicians, mainly surgeons rather than scholars or university professors.

A similar move was taken in the US after the publication of the Flexner Report in 1910 (Abraham Flexner, 1910). Flexner recommended a four year dichotomous medical curriculum divided into two segments; the first two pre-clinical years, in which basic sciences including anatomy were taught and the last two clinical years in which clinical training occurred. Anatomy, including histology and embryology was taught in the first year with physiology and biochemistry. He referred to anatomy as the “oldest laboratory science” and with physiology; it formed the “vestibule of medical education”. His stress was on the new trend since the beginning of the 19th century of dissection performed by students in comparison to the professional demonstration that was the prevalent method of learning anatomy before. However, Flexner pointed to the inability of dissection alone to provide a complete understanding of gross anatomy. Other aids were suggested such as drawing and modelling, charts and cross-sections, and models and special preparations. The correlation of gross anatomy with histology and embryology was also stressed. The question of how much of the medical curriculum time would commonly be spent on anatomy was also addressed.

Flexner pointed to the increasing load that anatomists were starting to take by providing the foundation for medical professionals such as surgeons, clinicians, physiologists, pharmacologists, and pathologists. Anatomists were seen to have two options: to consider the other disciplines when teaching their subjects or to concentrate on providing students with a broad scientific background in anatomy instead. Flexner supported the second option, which was later criticised for the lack of integration with medical disciplines.

Teaching in the pre-clinical years was delivered through lectures, practicals, and dissection. Unlike the British curriculum, Flexner recommended that pre-clinical sciences should be taught by full-time faculty instead of “unscientific practising clinicians”. The report has been behind the most important revolution in medical education in North America and all over the world.

The conventional or the traditional medical curriculum that emerged from the Flexnerian curriculum and the British block curriculum early in the 20th century placed anatomy well into medical education in terms of organisation and teaching time. The
resultant traditional anatomy curriculum still exists today in medical schools around the world. In this curriculum, anatomical regions such as the thorax and the abdomen are taught one after another in weekly blocks. Teaching takes the format of lectures followed by dissection laboratories. Anatomy departments deliver the content in a discipline-based fashion, which fails to integrate the anatomical knowledge with other basic sciences (horizontal integration) and with clinical disciplines (vertical integration). The lack of integration associated with the regional approach forces students to study large amounts of anatomical details and isolated facts, which they have difficulty relating to the other parts of the curriculum and, most importantly, to clinical practice (Richard L. Drake, 1998; Louw, et al., 2009).

The traditional anatomy curriculum was faced with the massive expansion in the scientific knowledge that the medical field has witnessed in the 20th century. Drake (1998) indicated that anatomy departments reacted to this challenge by increasing lecture hours at the expense of most relevant laboratory hours. Consequently, students had to rely on memorization of anatomical facts without much laboratory experience and without paying much attention to clinical relevance. In this way, students were disadvantaged in the sense that over-elaboration of details without clinical relevance made students feel overwhelmed and cause depression (Louw, et al., 2009) and it overlooked basic principles and concepts (G. A. Mitchell, 1959). All in all, the traditional curriculum was criticised for being teacher-centred, discipline-based, and subject-based. It affected student learning because they followed rote learning, relied on memorisation, failed to integrate knowledge, and disregarded life-long learning (Camp, 1996).

### 2.5 Anatomy in modern medical curricula

The criticism of traditional medical curricula triggered calls for reforms in the middle of the 20th century. Since the 1960s, there has been a wave of reform across medical schools in Europe and the US, which later spread over many parts of the world with a major impact on anatomy curricula. This impact manifested in the reduction of anatomy teaching hours, the increased adoption of PBL, and the change of practical anatomy teaching tools. The point regarding the practical teaching tools, which will be dealt with in chapter three, manifested in the reduced reliance on dissection as a primary teaching tool, the use of prosections, models, clinically related tools such as medical imaging and surface and clinical anatomy, and the increased use of CAL (Cahill, et al., 2000).
2.5.1 Teaching time

Historic studies on anatomy teaching in the US and Europe have shown a progressive decline of anatomy teaching hours since the second half of the 20th century. Gartner (2003) reported the total anatomy hours in the US medical schools decreased by 38% between 1967 and 2001. Drake et al (2002) also reported a 55% decrease in gross anatomy teaching hours in the US medical schools between 1955 and 2009. The teaching hours of histology, embryology, and neurosciences were also decreased but to a lesser extent. In Scotland, gross anatomy teaching hours also decreased by 60% between 1984 and 2004 (Pryde & Black, 2005). That is, more than half of gross anatomy teaching hours were given away over a period of 20 years.

The reduction of anatomy teaching time was mainly attributed to the explosion of scientific knowledge in medical education. New basic medical sciences such as genetics, immunology, and medical informatics have forced medical educators and curriculum designers to allocate time slots for them in already overcrowded medical curricula at the expense of established classic medical sciences like anatomy. New disciplines like communication skills, professionalism, ethics, and research methods have also put more demand for re-allocation of teaching time (Sugand, Abrahams, & Khurana, 2010). In response to reduced teaching time, anatomy departments had to modify their teaching in order to make it fit with the new allocated teaching times. Dissection was gradually abandoned as dissection was replaced with prosected specimens. For example, Drake et al (2009) reported that the decrease in anatomy teaching hours in US schools was mainly due to decreasing laboratory hours, which were mainly dissection based. The reduction in lecture hours was less significant. There have been a lot of studies comparing the impact of replacing dissection with prosections and other tools that are used today for teaching practical anatomy. A detailed review of this literature will be presented in chapter three.

2.5.2 Teaching faculty

Anatomy has been traditionally taught by medically qualified anatomists (Raftery, 2006), who are believed to be more able to teach anatomy in context than basic scientists who lack clinical training (Fitzgerald, et al., 2008; Older, 2004). However, with the increasing emphasis on research productivity at the expense of teaching for the funding of academic departments and for academic promotion, there has been a shift in the balance of anatomy teachers towards employing more basic scientists and less
medically qualified anatomists (Monkhouse & Farrell, 1999; Older, 2004; Raftery, 2006; Smith, 2005). The shift was partially brought up by the reluctance of medically qualified doctors to join anatomy departments as full-time faculty because they are less favoured when it comes to promotion, leaving students being taught by non-medically qualified anatomists. Literature shows that for example, medically qualified anatomists formed 38% and as low as 6.7% of the anatomy teaching faculty in medical schools of the Netherlands and of the UK and Ireland, respectively (Heylings, 2002; Van Mameren, 2004). This situation has been regarded among the many factors leading to the commonly cited complaint that medical students and graduates do not know enough anatomy (Bergman, et al., 2011). As a result, there were calls to revive the situation and attract medically qualified anatomists into anatomy teaching through strengthening the link between anatomy and clinical disciplines. There have been suggestions to affiliate anatomy faculty to clinical departments instead of basic sciences departments (Fasel, Morel, & Gailloud, 2005) or at least integrate anatomy departments with surgery departments (Raftery, 2006).

### 2.5.3 Problem-based learning

PBL is an example of one of the most popular trends in medical education. It was introduced by Barrows and Neufeld at McMaster University Medical School in 1969 (Neville & Norman, 2007). Since then, PBL has become “one of the dominant forms of medical education in the world” (Albanese, 2010). PBL and other new types of medical education required changes in the arrangement and delivery of the medical curriculum. Since PBL is the most dominant type of innovation in medical curricula, it has a big share of the published literature on the impact of curriculum change on anatomy. The literature has shown that there is conflicting evidence on the impact of PBL on students’ knowledge of anatomy. PBL curriculum students at the University of Maastricht in the Netherlands felt that their anatomy knowledge in particular was insufficient when entering clerkship and they perceived themselves underprepared for clinical practice (Prince, van de Wiel, Scherbier, can der Vleuten, & Boshuizen, 2000). Follow-up of the graduates of that curriculum revealed that they felt their knowledge of gross anatomy was insufficient. Moreover, clerkship students indicated that they needed more anatomy instruction. Hinduja et al (2005) found that students taught anatomy in a traditional lecture-practical course had a significantly higher level of basic anatomical knowledge compared to the students who were taught anatomy in an integrated PBL course. In another study, although 92.7% of the students expressed their satisfaction
with studying the cardiovascular system anatomy though an integrated PBL course, only 62.7% of them gave a positive response to questions about the anatomical knowledge they acquired from the course (Abu-Hijleh, Kassab, Al-Shboul, & Ganguly, 2004).

On the other hand, other studies have found that PBL does not reduce the amount of anatomical knowledge acquired by students compared to other traditional approaches (Prince et al., 2003). Prince et al (2008) pointed to some factors that may affect students’ anatomical knowledge other than the general characteristics of whether the teaching is problem-based or more traditional. They pointed first to the context in which anatomy is taught. Teaching anatomy in a meaningful clinical context is more important that the approach itself. Other factors are the time that students spend on learning anatomy and the frequency in which learning occurs in reference to the degree of vertical integration of anatomy with clinical sciences (Bergman, et al., 2008). These remarks draw our attention to the importance of understanding the context or the learning environment that the curriculum change brings as a prior step before evaluating the impacts of the change on students’ knowledge or perceptions of the subject. However, Cahill (2000) argues that the results of the studies on the use impact of PBL on anatomical knowledge are vague. According to him, this indicates that either the method of teaching, whether traditional or PBL, is not really important or that the instruments used by most of these studies were not sensitive enough to elicit the differences in anatomical knowledge caused by different methods. Cahill suggests that the second possibility is more likely the case.

2.6 Anatomy curricula available today

Nowadays, anatomy is taught in medical schools around the globe in many versions ranging from traditional to integrated poles (Richard L. Drake, 1998; Louw, et al., 2009; Older, 2004). However, Drake (1998) described three general types of current anatomy curricula; the traditional, the problem-based, and the system-oriented. The traditional curriculum is in fact a continuation of the curriculum that was taught before the middle of the 20th century, which has already been described above (section 2.4).

The systems-oriented curriculum presents the anatomical knowledge in a sequence according to the body systems rather than the body regions. This allows integration the anatomical knowledge with parallel basic medical sciences. However, some courses are presented in a discipline-based fashion, which also has an impact on the level of
integration. The system-oriented curriculum follows the traditional curriculum in terms of teaching format. It relies on didactic lectures and practicals, for which it is criticised for promoting passive teacher-centred learning (Richard L. Drake, 1998).

The PBL curriculum differs from the previous two in the sense that it promotes active student-centred and student-directed learning. It also emphasises problem solving skills, which trains students to be life-long learners. It promotes horizontal and vertical integration by focusing the learning objectives around a clinical problem. Instead of teaching detailed anatomy, PBL focuses on the anatomical knowledge related to the problem. Unlike the previous two curricula, PBL curricula place less emphasis on didactic lectures and practicals, which are replaced by small group tutorials. Drake (1998) raised two concerns about PBL, however. Firstly, since the learning is dependent on students, it cannot be guaranteed that it is appropriate for all students. Secondly, the focusing on anatomical knowledge can leave some gaps in students’ basic anatomical knowledge. Louw et al (2009) described the subject of anatomy in PBL curricula as “fragmented” and lacking order. Students may lack the motivation or the skills to fill these gaps.

In his study on anatomy education in the medical schools of the United Kingdom (UK) and Ireland, Heylings (2002) used the three curriculum types to divide the available curricula into sub-groups. He reported a shift from the traditional curriculum towards greater adoption of the PBL curriculum. Traditional curricula constituted only 24% of all curricula, while PBL curricula occupied 19% of all curricula. However, the majority (57%) of the schools used the system-oriented curriculum, which can be regarded as an intermediate stage between the traditional and the PBL curricula as far as integration is concerned. Across the Atlantic, the shift towards more integrated anatomy curricula was seen less in the US schools. Drake (2009) reported that 71% of US schools were still teaching anatomy in a discipline-based approach and 93% of them were still following the regional approach.

While the general types of anatomy curricula give an overall description about anatomy teaching, they do not provide enough information about the extent to which this description is adopted. For example, a system-oriented curriculum can teach anatomy in a combination of system-based and regional approaches. Moreover, a PBL curriculum can have a combination of PBL and didactic lectures. Therefore, it would be more
accurate to give the detailed information about the combination of each of those approaches rather than the overall curriculum type.

All three anatomy curriculum types have advantages and disadvantages. Therefore, anatomists have attempted to suggest the most appropriate curriculum that brings the advantages of the three general types together. Drake (1998) suggested what he called a “truly integrated curricular model”. In this model, “the traditional program would provide lectures to outline basic concepts and laboratories (when appropriate) to foster student discovery and group interaction. The problem-based learning format would be used in the discussion of weekly clinical cases to reinforce basic concepts. Finally, the systems-oriented model would provide the overall organisational plan for the presentation of material”. He further added that such a model has actually been adopted by some schools in one way or another.

Similarly, Louw et al (2009) suggested what they called the “ideal anatomy program”. The program would be a hybrid incorporating the strong points of the traditional and PBL curricula. In this program, both dissection and PBL tutorials play important roles. On the one hand, dissection, which is focused on areas of clinical importance, presents the regional anatomy. On the other hand, PBL tutorials, which apply the basic anatomical knowledge in explaining the clinical phenomena, present the system-based anatomy. This hybrid program is meant to be an intermediate point between the dissection-based, detailed, and descriptive nature of the traditional curriculum, and the problem-based, dilute, and dispersed PBL curriculum. That is, it is meant to be “principles-based and problem-directed”.

2.7 Collaboration for anatomy teaching

Collaboration is defined as “the action of working with someone to produce something” (Oxford Dictionaries, 2014). With regards to anatomy teaching, collaboration may involve working with someone, e.g. an individual anatomy teacher or an anatomy department, to produce something that can improve anatomy teaching.

While literature on anatomy education is extensive and progressively increasing, the topic of collaboration for the purpose of anatomy teaching remains largely unstudied. To the best of the researcher’s knowledge, there aren’t published reports or empirical studies investigating the extent of collaboration between individual anatomists or anatomy departments from a single country or a group of countries. This observation
does not exclude the existence of such collaboration but points to the need for any experience in collaboration to be reported so that other anatomists and anatomy departments may benefit from it.

Collaboration in the discipline of anatomy in general and anatomy education in particular is well known in practice to anatomists in many parts of the world, although it is not communicated in the form of scientific publications. In many parts of the world where anatomy has been studied and taught for centuries, collaboration is orchestrated by professional bodies such as societies and associations of anatomists. Some of those professional bodies were founded more than a century ago by groups of anatomists (Laurence, 2006). Since then, the professional bodies have been central to the evolution of anatomy and anatomy education in their geographical regions and throughout the world. Today, there are many anatomical societies and association in many parts of the world such as the Anatomical Society (AS) in the UK, the American Association of Anatomists (AAA), the International Federation of Associations of Anatomists (IFAA), and European Federation of Experimental Morphology (EFEM).

The activities conducted by anatomical societies may give an indication about the extent and nature of collaboration between anatomists and anatomy departments in their areas. Information about such activities may easily be obtained from the periodic publications, advertisements, web pages on the internet and, more recently, social network pages. This section will use the examples of AS and AAA to highlight the collaborative activities among anatomists and among anatomy departments that are conducted under these two bodies.

2.7.1 The role of anatomical societies in collaboration for anatomy teaching

Reviewing the websites of the AAA and the AS has revealed three main themes, around which the collaboration between anatomists has been facilitated by the two professional bodies: improving anatomy education, student support, and career development.

2.7.1.1 Improving anatomy education

In the first years following the foundation of AAA and AS, anatomy education was not given the same attention as was given to scientific anatomical research. However, with the progressive change in anatomy education in medical schools, the share of anatomy education in the activities of those bodies has outstandingly increased and manifests
today in many collaborative activities. Such collaborative activities include the following:

1. Defining a core anatomy curriculum. The AS launched a taskforce of senior member anatomists from the medical schools in UK and Ireland for the purpose of defining a core anatomy curriculum or syllabus (McHanwell, et al., 2007). A similar step was taken by the Association of Anatomy, Cell Biology, and Neurobiology Chairpersons (AACBNC) in the US, Puerto Rico, and Canada to suggest the essential content of the anatomical sciences curriculum in medical schools (Association of Anatomy Cell Biology and Neurobiology Chairpersons, 1997). These two attempts aimed to provide the guidance for medical schools and curriculum designers with regards to the essential anatomical knowledge required for undergraduate medical students.

2. Regulation of cadaver use. The availability of cadavers plays an important role on defining the way anatomy is taught. Therefore, this teaching resource needs to be regulated in terms of acquisition, used, and disposal in order to ensure continuous supply. The AS, with collaboration with other anatomical bodies, has produced the “Guidelines for Anatomical Examination” (Anatomical Society, 2009). These guidelines are more specific to anatomy that the general Human Tissue Act. The AAA has also suggested guidelines for the donation of bodies for education and biomedical research (American Association of Anatomists, 2009).

3. Educational meetings and symposia. These meetings and symposia have become parts of the programs of the annual meetings of the AAA and the AS. They provide the platform for anatomists to present and communicate their anatomy educational research and open the doors for future collaborative research in anatomy education.

4. Educational research. This activity manifests in two ways: supporting educational research in anatomical sciences and facilitating publication of such research. The AAA provides educational research scholarship, which provides support for anatomists to work on innovative and creative projects that may lead to improving the quality of teaching and learning in anatomical sciences (American Association of Anatomists, 2013a). The AAA also publishes the Anatomical Sciences Education Journal, which represents a good example of facilitating publication of educational research in anatomy (American Association of
Anatomists, 2013b). This journal is currently the most specialised journal in anatomy education, and attracts submission from all around the globe. The journal is published in cooperation with the American Association of Clinical Anatomists and the Human Anatomy & Physiology Society. It aims at providing an international forum for the exchange of ideas, opinions, innovations and research on topics related to education in the anatomical sciences. The Journal of Anatomy, published by the AS also published educational research.

5. Promoting education of anatomical sciences. This is mainly done through educational outreach programs where workshops, symposia, or demonstrations are organised for the students from schools, high schools, and medical schools in order to expose them to the wonders of anatomy and the academic and career opportunities available in this discipline. Such programs may be of great value in countries that suffer from shortage of anatomists though motivating and attracting young future anatomists and anatomy teachers. Both the AAA (Marquez, 2012) and the AS (Anatomical Society, 2012) provide support to their members who are interested in organising such programs.

2.7.1.2 Career development for anatomists

The AAA and the AS organise collaborative activities and other tools that enhance career opportunities for their members. These activities and tools can be divided into two categories: training and career development activities, and communication tools. The AS collaboratively organises an “Anatomy Training Program” for junior anatomists. Members of the AAA can also join this program. This program allows them to study human anatomy by dissection in modules under the supervision of a faculty member in their home institutions (American Association of Anatomists, 2014b; Anatomical Society, 2014).

The AAA also organises two additional activities and one tool for its members. The first activity is a “Career Mentor Network”, which allows students and junior members to link with a senior member as a mentor to provide him/her with help and advice related to his/her career and professional development (American Association of Anatomists, 2014d). The second activity is the “Short-term Visiting Scholarships” program, which offers “travel support to undergraduate students, graduate students, postdoctoral fellows or faculty to facilitate visiting a laboratory or participating in a course outside their home institution” (American Association of Anatomists, 2014f). The exposure to a
different institution may enhance career development and create windows for future collaboration. The tool is a group of online documents called “How-To-Series”, which covers many aspects of professional development skills from job search to networking (American Association of Anatomists, 2014a).

2.7.1.3 Electronic communication

Besides the physical communication that occurs in meetings and symposia, the AAA and AS provide electronic communication media, mainly through their websites on the internet. The websites work as the main medium through which the AAA and AS communicate with their members and advertise their activities. Members can upload their C.V. when they are looking for jobs and departments can upload their advertisements for new employees.

Moreover, and more importantly, the websites allow the members to communicate among themselves, which may be a major drive for pursuing future collaboration. For example, the AAA has a Career Discussion Forum linked to its website (American Association of Anatomists, 2014c), which allows members to discuss many aspects of anatomy as a discipline, including anatomy education, and their own career. Discussion is not restricted to the official websites but extends to other means of electronic communications such as the social media networks including Facebook and Twitter. The AAA website also includes an online directory for its members and for the anatomy departments in North America and around the globe. Such a directory makes it easy for members and non-members to locate the people and departments of interest when they are considering future collaboration. The websites also include information relevant to junior anatomists and postgraduate students such as the list of graduate degrees in anatomy on the AAA website and the PHD studentships on the AS website.

All in all, the electronic communication opportunities created by the AAA and AS websites create a medium for sharing information among the anatomy departments and among the anatomists. As a result, departments and anatomists stay informed about the status of anatomy teaching in their locale even when there is shortage of research publications on the topic of anatomy teaching in that geographic area.
Chapter three: Gross anatomy teaching tools

3.1 Introduction

Anatomy has been taught and learnt through a variety of different tools. Some are traditional such as dissection, other are clinically oriented such as medical imaging and surface anatomy, and others are new and innovative such computer-assisted imaging (CAI) and body painting. This chapter reviews the tools available today for teaching anatomy in the laboratories.

3.2 Dissection

Dissection is “the systematic exploration of a preserved human cadaver by the sequential division of tissue layers and the liberation of certain structures by removal of the regional fat and connective tissue with the aim of supporting the learning of gross anatomy by visual and tactile experience” (Winkelmann, 2007). Historical records show that dissection has been practised since the second century. Direct observation of the human body through dissection initiated the scientific method for learning medicine that included data collection, hypotheses generation, and further testing of these hypotheses (Aziz, et al., 2002). Compared to other teaching alternatives, dissection has served medical students in different ways, including enriching their knowledge acquisition and integration, manual skills, and attitudes (McLachlan & Patten, 2006).

The anatomical knowledge gained from dissection is unique in many aspects. For example, students discover the details of human body in their natural environment. This allows them to see the three dimensional (3D) relationships of anatomical structures (Granger, 2004). A medical student described the importance of dissection to gain the 3D appreciation of anatomical structures and its relevance to clinical practice by stating: “the only way to truly know the body is to get up close and personal with it, to feel the tendons and nerves, the fascia and the vessels. There are times when I have to do a femoral stick or an a-line or a central line and I remember the anatomy not from some picture but from what I saw during my own dissection” (Granger, 2004). While 3D exposition of anatomical structures can now be gained through the multimedia and the web-based applications (Harry et al., 2007), many argue that dissection remains the essential method for effective 3D learning (Marks, 2000).
Dissection is the best way to expose students to as many variations as possible by dissecting or at least observing as many cadavers as possible (Aziz, et al., 2002). The awareness of these anatomical variations makes a difference when examining patients and trying to reach diagnosis.

Dissection is a multi-sense act. The senses of seeing, touching, and smelling are active during dissection laboratory sessions. This makes the learning experience more intense and later more rewarding. By enhancing the acquisition of anatomical knowledge, dissection also introduces medical students to medical terminology, which is the language of medicine (Granger, 2004).

Besides the pure anatomical knowledge, dissection helps students to learn other aspects of knowledge that are essential for medical practitioners such as, manual skills, professionalism (Escobar-Poni & Poni, 2006), desensitization, and attitudes towards life and death (Winkelmann, 2007). These concepts are important for the doctor-patient humanistic relationship.

Learning gross anatomy through dissection usually takes place in the first two years of the medical course (Turney, 2007). It is at this early time of their long medical career that students need to be introduced to the concept of death and dying and develop the first steps towards desensitization when encountering dying patients. It is also the time when students should start developing their attitudes towards patient care (Marks, Bertman, & Penney, 1997). This is very demanding in the new age of high reliance on technology and machines in providing health care. Therefore, the emotional reaction of students towards cadavers can be viewed as an early opportunity to teach them about the humanistic doctor-patient relationship (Tschernig, Schlaud, & Pabst, 2000). Students see the dead body as a patient and as a teacher at the same time. This appreciation is believed to promote empathy and respect towards the body and towards their future patients and helps in the emotional development of the students (Bohl, Bosch, & Hildebrandt, 2011). However, dissection should not be viewed as the only or the best means to introduce students to the concept of death and dying or to help students to develop their relationship with future patients. There are many other professionals who develop such concepts without doing dissection such as social workers, psychologists, and religious counsellors (Shaffer, 2004).

Despite the many advantages of dissection as a superior tool for teaching anatomy, there are some disadvantages. The disadvantages have been summarised by Aziz et al in a
comprehensive review as reasons for reducing cadaveric dissection in medical education (Aziz, et al., 2002). Here, the disadvantages will be further classified into two main themes; educational and logistics. The educational disadvantages are:

- Dissection is fact-filled and promotes memorizing a huge amount of anatomical information without much relevance to clinical practice.
- Dissection involves out-dated technology, which lags behind the technological revolution experienced the 20th century. It is less attractive to the new generation of medical students, which makes it less acceptable as an educational tool. Some argue that the current decline of anatomy in medical education is due to the failure of anatomy and anatomists to evolve and adapt quickly enough to the expectation of the technological era (Turney, 2007).
- Post-mortem changes that happen to cadavers make anatomical structures different from those in live humans. Consequently, the knowledge obtained from it may be misleading.
- Dissection can be repulsive due to the undesirable smell and look, which might undermine its educational value.

The logistic disadvantages are:

- Learning anatomy through dissection is time consuming, especially in today’s overcrowded medical curricula with shrinking time and many new disciplines competing for time slots.
- Dissection is an expensive teaching tool. High numbers of qualified staff are needed to run dissection rooms. Dissection rooms and cadaver processing, storage, and disposal are financially demanding.
- There is shortage of cadavers experienced by many medical schools around the world especially in countries that lack body donation programs due to cultural and religious reasons.
- There is shortage of qualified anatomists who can obtain the most educational return from the high investment in running cadaver dissection facilities.
- Dissection exposes medical students to potential health hazards such as toxic embalming fluid components and infectious diseases.
- Dissection exposes students to anxiety and psychological stress before, during, and after dissection laboratory sessions (Abu-Hijleh, et al., 1997; Bataineh, Hijazi, & Abu Hijleh, 2006; Finkelstein & Mathers, 1990)
Moreover, dissection has limited value in the study of the anatomy of the skeletal system, central nervous system, and lymphatic system, as well as some small delicate organs such as the parathyroid glands and the adrenal glands (Leung, Lu, Huang, & Hsieh, 2006).

Having said that, it may be argued that most of the disadvantages that are regarded as reasons behind the reduction of dissection in medical education are related to the logistics. They are sometimes referred to as practical problems (Bay & Ling, 2007). Some of those practical problems are directly or indirectly responsible for the creation of the educational disadvantages. For example, the reduced clinical correlation of dissection may be attributed to the shortage of clinically qualified anatomists who are able to make clinical sense of the detailed anatomical knowledge that is gained from dissection. Similarly, those qualified anatomists would best incorporate the opportunities offered by the new technology in their practice. The insecure supply of cadavers may be responsible for the reliance on old stored cadavers which are more susceptible to the undesired post-mortem changes. Moreover, the repulsive smell of cadavers, which undermines the appreciation of dissection as an attractive educational tool, may be reduced by having well ventilated and maintained dissection rooms. Unfortunately, having dissection rooms with such characteristics is hard to achieve in many countries due to the high cost.

Ultimately, the debate over the use of dissection in medical education is largely not on its usefulness as an educational tool but rather on the practicality of keeping it as the preferred anatomy teaching tool. While the supporters - who are largely anatomists - stress its educational value which is far from being replaced by any other tool, opponents stress its impracticality.

The practical problems associated with keeping dissection as a superior anatomy teaching tool has led many medical schools to use a variety of approaches to deal with them. Some anatomists have tried alternating dissection schedules by allowing students to dissect every other laboratory session (McWhorter & Forester, 2004). Follow-up data showed that students’ performance on lower limb anatomy practical tests was equal to those students who dissected every laboratory session. However, test scores on more complicated anatomical regions such as the back and upper limb showed that dissection in every session was superior. Others have tried to allow students to dissect either the upper or the lower extremity and study the opposite extremity that was dissected by
other students. Again, there were no differences in examination results between the
dissected and the studied extremity (Peppler, Hougland, Kwasigroch, & Skalko, 1980).

The levels of anxiety emotional stress of students caused by dissection can be reduced
through exposing the students to introductory programs before their first dissection
laboratory session. Such programs may involve repeated gradual exposure to the
situation through verbal explanation, visits to the dissection room in the absence of
cadavers, and showing the students images or videos of real dissection (Arráez-Aybar,
themselves contribute to relieving the impact of the psychological reactions inside the
dissection room through defence mechanisms such as rationalization (Abu-Hijleh, et
al., 1997). However, tutors, anatomists, and clinicians should be available to offer help
to medical students to cope with these psychological reactions both on personal basis
and through formal introductory courses. Help from senior students can also decrease
the levels of stress that is experienced by junior students in gross anatomy dissection
sessions (Houwink et al., 2004).

3.3 Prosections

The use of prosections as a substitute for dissection in teaching gross anatomy has
stimulated a number of educational research studies. Some have shown that prosections
are as good as dissection. For example, when the traditional lecture-dissection program
was replaced by a program that includes multimedia and prosection tutorials, students’
performance in examinations was equal (Jones, Olafson, & Sutin, 1978). Even when
dissection was aided by demonstration to peers, the advantage over prosection, as
represented by test results, was very small. Therefore, learning from already dissected
cadavers was found to be a satisfactory method to study gross anatomy (Yeager, 1996).
More recently, Al-Motabagani et al (2009) similarly reported no significant differences
between the performances of students who dissected and those who learned gross
anatomy through studying prosections.

Other studies have shown that using prosections in fact had some advantages over
dissection. For example, first year preclinical medical students who studied the lower
limb by prosection were found to perform better than their counterparts who studied it
by dissection in both theory and practical tests (Nnodim, 1990). Students further
commented that they understood the anatomy of the lower limb that they studied by
prosection better than the anatomy of the upper limb that they studied by dissection. In
another study, Nnodim reported that second year medical students who studied anatomy by dissection half of the time and by prosection for the other half performed better in both theory and practical tests than those students who studied by dissection full time (Nnodim, 1997).

Dissection has been reported as advantageous over prosections by the majority of the studies. For example, Jones et al found that first year medical students’ performance in a gross anatomy and embryology exam was better (but not significantly) after actual dissection compared with their learning from peer dissected cadavers. Moreover, dissectors’ performance in practical exams was significantly higher (L. S. Jones, Paulman, Thadani, & Terracio, 2001). In another study, students were allowed to dissect either the upper limb or the lower limb and study the prosections of the limb they did not dissect. Exam scores showed enhanced students’ performance on the limb they dissected (J. H. Johnson, 2002). A more recent study has shown that dissection increases the performance of students in anatomy courses by increasing their ability to pass exams, achieve higher grades, and achieve distinction grades (Anyanwu & Ugochukwu, 2010).

It is apparent that there are studies that have concluded that prosection is inferior, equal, or superior to dissection as a gross anatomy learning tool. Despite the higher number of studies in favour if dissection in literature, it is very difficult to draw a conclusion from those studies. Moreover, most of the studies that addressed the use of alternative methods to dissection such as prosections can be criticised for being biased by the researchers’ and teachers’ interest in developing teaching methods that better suit their circumstances of restricted materials or reduced lab time or both (Winkelmann, 2007).

### 3.4 Plastinated prosections

Plastination is a method that makes cadavers and prosections dry, firm, and odourless but at the same time give a natural appearance. It works by replacing fluids in the tissues of cadavers with reactive plastics such as silicon rubber, epoxy resin, and polyester resin. It was developed by Gunther Von Hagens at the University of Heidelberg and introduced in 1977 (Saeed, Rufai, & Elsayed, 2001; Von Hagens, Tiedemann, & Kriz, 1987). Since then, plastinated specimens have revolutionised the way anatomical structures are introduced to students and the public. While the value of plastination in educating the public about human anatomy is apparent through the
exhibitions that Von Hagens held in many countries (The Body Worlds, 2013), its educational value for medical students remains largely unreported.

One of the few studies in this regard showed plastinated specimens were highly valued by human and veterinary anatomy students and teachers. Students’ anatomical knowledge was also improved (Latorre et al., 2007). More recently, first year medical students valued plastinated specimens as high quality anatomy learning tools. On one hand, features such as spatial relations and resemblance to real life anatomy were praised, but on the other hand, drawbacks such as the limited tactile and emotional experiences were mentioned. It was concluded that plastinated specimens are valuable anatomy learning tools but the students experience and knowledge would be enriched if complemented by the use of wet cadaveric specimens (Fruhstorfer, Palmer, Brydges, & Abrahams, 2011). Another group of medical students preferred the use of plastinated specimens over wet specimens, pots, and models although they claimed that plastinated specimens were less realistic and informative (Mansor, 1996). The author suggested that plastinated specimens are preferred as an anatomy teaching tool when detailed anatomical knowledge is not required. When it was, wet specimens were the preferred tool.

Plastination is also seen as a bridge that closes the gap between anatomists and clinicians in achieving clinically oriented anatomy. The practicality of using the dry and odourless plastinated specimens in clinics and wards can be utilised in stressing the diagnostic and therapeutic aspects of clinically oriented anatomy to medical students and surgery trainees (Fasel, 1988). This consequently aids better integration of clinical and preclinical aspects of undergraduate medical education and a better inclusion of basic anatomical knowledge in postgraduate clinical speciality training (Cook, 1997). The best outcome is achieved when plastinated specimens are used as supplementary to the standard clinical training tools. Moreover, different plastination techniques can produce a wide range of specimens that are sometimes superior to advanced imaging techniques such as MRI in differentiating between anatomical structures (Magiros, Kekic, & Doran, 1997).

Plastination can play a role in medical schools where there is shortage of cadavers and in medical schools with limited financial resources. The longer life span of plastinated specimens makes them a good option for using a single cadaver for teaching purposes for as long as possible. Moreover, plastinated specimens are more cost-effective than
wet specimens in terms of storage and maintenance. In other words, less financial, technical, and human resources are needed to run a collection of plastinated specimens than those needed to run a collection of wet specimens. Although the initial cost of establishing a plastination unit and training staff to run it is high, the long running cost is in favour of this, especially with the availability of low-cost equipment that are affordable by any ordinary anatomy department (O'Sullivan & Mitchell, 1995). Moreover, plastination can easily be technically mastered by people who have basic histology laboratory knowledge and skills (T. P. Dawson, James, & Williams, 1990).

3.5 Clinically-Oriented tools

3.5.1 Medical imaging

Dissection has been the only way to visualise the internal environment of the human body for centuries until the discovery of X-ray by Wilhelm Roentgen in 1895 (Gunderman & Wilson, 2005), which laid the foundation for the role of medical imaging in modern medical practice. Besides its use in diagnosis, X-ray, the first type of radiological imaging, was the first to be used in teaching anatomy, mainly to teach skeletal anatomy. After the discovery of contrast media, X-ray use extended to include the teaching of internal organ anatomy such as the organs of the digestive system, urinary system, and cardiovascular system. Today, new sophisticated types of radiological imaging such as Ultrasound (US), Computerised Tomography (CT), and Magnetic Resonance Imaging (MRI) are used for diagnosis and anatomy teaching purposes.

Radiological anatomy has some advantages over the rest of gross anatomy teaching modalities. The most important advantage is that radiological imaging allows medical students to learn anatomy in the same context and the same medium that they will see their patients throughout their medical career. When patients present to physicians, the nature of their complaints is explored through physical examination and then focused diagnostic radiological imaging. Secondly, radiological imaging techniques display the human body’s internal organs and structures in their dynamic in vivo environment. This is in contrast to dissection which displays them in a static ex vivo abstraction. Thirdly, some radiological imaging techniques have the power to show the structure of internal organs while they are in action. This allows for emphasising the most important aspect of anatomy teaching, which is structure-function relationship. Even metabolic changes of vital organs such as the heart and the brain can be shown through MRI (Gunderman
& Wilson, 2005; Miles, 2005). CT scans visualise the internal structure of the body in multiple sequential planes, which give a better representation of the spatial relationship of these structures (Lufler, Zumwalt, Romney, & Hoagland, 2010).

The use of radiological imaging to teach gross anatomy is a useful alternative for dissection in medical schools that lack cadavers (Cowan, et al., 2010; Harris, et al., 1994; I. Inuwa, Al Rawahy, Taranikanti, & Habbal, 2010). There are reports of the use of radiological imaging to teach gross anatomy to undergraduate medical students with positive outcomes. In a pilot study, portable ultrasound units were used to teach first year medical students ultrasound techniques, procedural skills, and gross anatomy of six organ systems. The majority of students agreed that ultrasound was a valuable anatomy educational tool and they endorsed the continuous use of ultrasound throughout their medical course (Rao et al., 2008). In a similar study, second year medical students were asked to carry out real-time ultrasound examination on their colleagues to visualise internal organs. The vast majority (95.7%) of students regarded the tool as useful for learning anatomy (Heilo, Hansen, Holck, & Laerum, 1997). In a third study, 48.7 of second year students who perform ultrasound on their colleagues said that ultrasound improved their topographical anatomy of the abdomen (Teichgräber, Meyer, Nautrup, & von Rautenfeld, 1996). X-rays, when integrated with other gross anatomy teaching methods such as living anatomy and presentation of patients by clinicians have been shown to increase student’s interest in gross anatomy (Reinhard Pabst, Westermann, & Lippert, 1986). These studies indicate that medical students even in the first year of their medical courses highly value the benefits of radiological imaging in learning gross anatomy.

Besides the use of living subjects for radiological imaging teaching of gross anatomy, radiological imaging of cadavers has also been used. For example, scans of cadavers improved the performance of first year medical students in gross anatomy practical examinations, final course grades, and spatial anatomy examination questions (Lufler, et al., 2010).

Despite the benefits of radiological imaging, radiology remains one of the least commonly used methods to learn anatomy in many medical schools (Insull, Kejriwal, & Blyth, 2006). In North American medical schools, radiological anatomy accounts for only 5% of total teaching time (Ganske, Su, Loukas, & Shaffer, 2006). This could be due to the lack of well-developed and standardised radiological imaging courses or
programs (Teichgräber, et al., 1996). Such programs also need to be delivered by dedicated anatomy staff who have skills in interpreting radiological images, or by staff from radiology departments in affiliated hospitals. Unfortunately, this is difficult to achieve even in the most developed countries. Only half of the English-based Canadian undergraduate medical schools had a radiologist as a faculty member of their anatomy departments (Jack & Burbridge, 2011). Moreover, among 31 anatomy departments in UK and Ireland, only one department had a dedicated full-time radiologist staff member and three departments had them on a part time basis. Seven of 31 departments did not receive any sort of assistance from radiology departments (B. S. Mitchell & Williams, 2002). Questions were raised about the effectiveness of the integration of radiological and anatomical knowledge in the absence of qualified radiological anatomists. Although the Canadian and the UK and Ireland medical schools in the above two studies might represent different medical education systems, there seemed to be a trend towards having more radiologically qualified anatomists in anatomy departments in medical schools between the years 2002 and 2011. This is in line with expectations that digital methods and teaching with radiological anatomy will probably increase in the future (Insull, et al., 2006).

### 3.5.2 Living anatomy

Living anatomy is defined as “the use of the living human body to teach aspects of anatomy” (T. Collett, Kirvell, Nakorn, & McLachlan, 2009). Some have included under this rubric every tool that directly or indirectly uses the living human body such as surface anatomy, medical imaging, surgical procedures, and physical examination (Pallab. K. Ganguly & Chan, 2008). In this chapter, living anatomy is used to refer to surface anatomy and physical examination.

Doctors encounter patients in clinics and hospital wards through two main media; living anatomy and medical imaging (Pallab. K. Ganguly & Chan, 2008; McLachlan, 2004). This has led to the recommendation that medical students should be exposed to these anatomy teaching modalities early in the undergraduate years of medical education (T. Collett, et al., 2009). Living anatomy provides factual knowledge, clinical skills, and professional attitudes (Chinnah, De Bere, & Collett, 2011). The three elements are pillars of achieving the objective of medical education, which is equipping future doctors with the ability to care for patients in an effective and humane manner (Barrows, Patek, & Abrahamson, 1968). There is therefore a role for living anatomy to
emphasise the clinical and professional aspects of anatomy that are in line with the general trends of modern medical education (Aggarwal, Brough, & Ellis, 2006)

The importance of living anatomy as an anatomy teaching tool was realised as early as the 18th century when Winslow, the famous professor of physics, anatomy and surgery at the University of Paris wrote in the context of muscle action: “The cooperation of muscles is easily perceived by touching them when the part they belong to is moved with a considerable force” (Hellebrandt, 1963).

Living anatomy requires the use of life models. The model can be a student volunteer who is willing to fully or partially expose his/her body in order to be examined by his peers under the supervision of a teacher (Metcalf, Prentice, Metcalf, & Stinson, 1982), or a hired professional model (Barrows, et al., 1968; Stillman et al., 1978). The former is the more convenient of the two due to low cost and availability during scheduled and revision sessions. In fact, it is the least costly anatomy teaching tool, less costly than plastic models or simulated patients (Azer, 2011; Patten, 2007). However, anatomists usually face the difficulty of persuading students to volunteer for many reasons such as embarrassment, fear of missing some information while acting as a model, inability to make notes or to clearly focus on what the teachers are explaining while they are the models (Aggarwal, et al., 2006). Specific factors may affect participation in peer examination such as age, gender, and religious background (Patten, 2007). This is evident with students from specific ethnic backgrounds that restrict body exposure. As a consequence, students avoid volunteering.

Participation in living anatomy classes can be improved by using single-sex classes (Aggarwal, et al., 2006). However, in comparison with mixed classes, single-sex classes have a negative impact on students’ appreciation of examination of the opposite sex, professionalism, and patient empathy (Metcalf, et al., 1982).

The use of live models overcomes the shortage of student volunteers, but more importantly, these models have been shown to positively contribute to the quality of living anatomy classes and to the experience of both the teachers and students. Collett (2009) found that models guide students on anatomy content, provide immediate feedback to students about their anatomical knowledge, introduce students to the humane aspects of medicine, share their medical history and experience, and provide feedback to teachers that may improve the delivery of the course. Models with relevant pathologies may be used (Pallab. K. Ganguly & Chan, 2008), but normal living
anatomy should be taught first. The use of hospitalised patients is discouraged as it may be regarded as unethical to use patients for purposes not directly related to their hospitalization (Barrows, et al., 1968).

Living anatomy can also be used in conjunction with other modalities of anatomy teaching tools. Patten (2007) projected a series of 3D and cross-sectional images on the exposed bodies of models. The projections correspond with the deep anatomical structures and students could move between the layers of these structures. The result was interactive and lively anatomy teaching classes that enabled students to conceptualise a 3D mental map of the body with correlation to surface anatomy.

Overall, living anatomy through surface anatomy and physical examination has the following benefits (Azer, 2011; Barrows, et al., 1968; Chinnah, et al., 2011; Pallab. K. Ganguly & Chan, 2008; McLachlan, 2004; Patten, 2007):

1. Students acquire 3D comprehension and develop a mental picture of anatomical structure location and landmarks.
2. Students are introduced to a wide range of anatomical variations by being exposed to models and peers of different characteristics instead of the typical representation of white males in anatomy textbooks and atlases.
3. Students develop correlation between cadavers and living human bodies.
4. Students have their initial transition from theory to clinical practice through physical examination, clinical encounter, and awareness of humane issues of medicine.
5. Student volunteers experience the patients’ perspective.
6. Faculty supervision gives students the confidence in approaching patients in the future.
7. Unlike cadavers that desensitise students, living anatomy trains students to perform effectively while staying sensitive to the humane nature of the medical profession.

Nevertheless, living anatomy cannot stand alone as an anatomy teaching tool. Students should first acquire basic anatomical knowledge through cadaver-based learning and then apply that knowledge to a living human in order to gain maximum benefit (Aggarwal, et al., 2006). Ganguly and Chan (2008) believe that living anatomy cannot replace cadavers in anatomy teaching and they also believe that the 3D knowledge obtained from cadavers is a pre-requisite for understanding living anatomy, as living anatomy cannot be appreciated without a prior knowledge of deep internal anatomy.
Moreover, students believe that living anatomy knowledge obtained from peer examination cannot be substituted by any other tool of teaching living anatomy such as videos, lectures, or computer models (Aggarwal, et al., 2006). In their view, the only tool capable of conveying such knowledge is the use of professional models.

There is also another anatomy teaching method related to living anatomy, which is called “live anatomy”. Here, internal anatomy is not studied from cadavers but from live human subjects during surgery (David S. Hubbell, Byers, & McKeown, 1996), live anesthetised animals such as pigs (D. S. Hubbell, Dwornik, Alway, Eliason, & Norenberg, 2002), or freshly euthanised animals such as rats (Robinson, Metten, Guiton, & Berek, 2004). Live anatomy differs from cadaveric anatomy by presenting internal structures in a condition closer to reality in terms of colour, texture, and smell. It is also different to living anatomy in the sense that it can show active organs such as the lungs and the heart in action. In the three studies cited above, students highly valued such approaches to anatomy teaching and gave them a rating of 5/5 (D. S. Hubbell, et al., 2002) and 4.9/5 (Robinson, et al., 2004). Specific benefits such as 3D conceptualization, regional anatomy appreciation, and deep structures identification were reported by students (David S. Hubbell, et al., 1996). However, when using animals, there should be a successful transfer of knowledge between animals and human.

3.5.3 Procedural anatomy

Procedural anatomy refers to the use of clinical and surgical procedures to teach some aspects of anatomy. Its main objective is teaching undergraduate medical students basic and clinically oriented anatomy to supplement didactic lectures and dissection-based laboratory sessions. In this sense, it should not be confused with the plain teaching of clinical procedural skills or surgical anatomy that is part of the clinical training of senior medical students or residents. Procedures may be done on real patients in real clinical settings (Park et al., 2001) or on cadavers (Fitzpatrick, Kolesari, & Brasel, 2001), depending on availability.

The most frequently reported type of clinical procedures used to teach anatomy is laparoscopy (Fitzpatrick, et al., 2001; Glasgow, Tiemann, Frisella, Conroy, & Klingensmith, 2006; Park, et al., 2001) due to its frequent use in daily practice and to the possibility of connecting the laparoscope to a camera and projection screens, which allows for running classes of large number of students. Sessions may also be recorded.
and videos may be used for many years, although students valued the effectiveness of the live procedure as a learning method more than that of the recorded one (Park, et al., 2001).

Laparoscopy has been used to teach students the internal anatomy of the abdomen including organs, blood vessels, and mesenteries. Manipulation of some of these structures during the procedure allows for appreciation of spatial relations and 3D conceptualization. Students appreciated the benefits of the procedure by reporting as high as 95% agreement that it improves their knowledge of abdominal anatomy (Glasgow, et al., 2006). They also reported 87% agreement that laparoscopy increased their interest in anatomy after appreciating its relevance to clinical practice (Fitzpatrick, et al., 2001). As a consequence, 86% of them recommended that such approach to anatomy teaching should be continued.

In the studies of Fitzpatrick et al (2001), Park et al (2001), and Glasgow et al (2006), procedural anatomy teaching was delivered to medical students as early as the first year of their study. Senior surgeons and surgical residents were involved in demonstrations and discussions. This provided the students with an early exposure to clinical practice through the procedures and through discussions with clinical specialists. Students tend to see these clinicians as role models and this should be utilised by educators to emphasise professionalism. Glasgow et al (2006) reported that laparoscopy increased students’ interest in surgery as a future speciality in comparison to other specialities such as internal medicine. Hence, procedural anatomy may help students in exploring their future interests from the first year, although career decision making is rarely finalised in the early years.

Gogalniceanu et al (2008) argue that clinical integration of anatomy is the solution that anatomists should adopt in order to deal with decline of anatomy in medical curricula. They specifically refer to clinical but minimally invasive approaches to anatomy teaching such as laparoscopy in achieving clinical integration. They summarised the advantages of such approach as the following:

- Increasing spatial anatomy and 3D conceptualization
- Integrating anatomy with clinical sciences
- Introducing students to clinical procedures
- Improving clinical skills such as hand-eye coordination
- Promoting professional skills such as communication skills and teamwork
• Reducing the cost resulting from damage to anatomical specimens associated with other forms of dissection based approaches (Gogalniceanu, Madani, Paraskeva, & Darzi, 2008).

Procedural anatomy remains a new method of anatomy teaching and has been used in many parts of the world, including developed countries. There were no reports describing its use for teaching anatomy to undergraduate medical students in UK or Europe as a whole before 2008 (Gogalniceanu, et al., 2008). Procedural anatomy usually requires fresh unembalmed cadavers with well-preserved tissues and realistic anatomical landmarks (Tabas et al., 2005). If its use in the UK and Europe, where fresh cadavers are more available is rarely reported, then such an approach to anatomy teaching becomes practically not achievable in counties that have shortage of even embalmed cadavers (Prakash, Prabhu, Madhyastha, Kumar, & Singh, 2007). Prakash et al (2007) also argue that the shortage of medically qualified anatomists is a further limitation, as they would be best to conduct such teaching in collaboration with laparoscopic surgeons.

3.6 Computer assisted learning and multimedia

In the 20th century, with the advent of computers and other related products of the technological revolution (Qayumi & Qayumi, 1999), a new teaching modality has been increasingly adopted by educationalists in general and by medical educationalists in particular, which is Computer-assisted Learning (CAL). It makes use of computers, the internet, and other multimedia devices.

Today, there are three categories of commercially available products that assist in CAL for anatomy teaching. These are categorised according to their interactivity which is important for promoting active learning and minimising rote memorisation. The first category is no more than a digital duplication of established anatomy textbooks. Most of anatomy text books such as Moore’s Clinically Oriented Anatomy are accompanied by a CD-ROM that contains digital versions for the images from the textbook. The second category contains more interactive multimedia products which allow students some control such as moving between different layers of the anatomical structure and rotating the images in different angles and views. Such products include the Primal Pictures website (Primal Pictures, 2013) and the Netters Interactive 3D anatomy (InteractElsevier, 2013). More recently, a new generation of products of this category were developed. They allow what is called digital dissection. Here students can do
virtual dissection through removing layers or specific structures of the body in a sequence similar to that occurring in real dissection (American Association of Anatomists, 2014e). However, these products have the limitation of being restricted to basic anatomy with little reflection on clinical anatomy, where a further step is needed by addressing the doctor-patient relationship and diagnostic skills. The third category takes a holistic approach to the medical education process. Products in this category, such as CyberPatient™ (Bolger, 2013) are clinically oriented and they integrate anatomy with other basic and clinical sciences. The anatomy part deals mainly with physical examination and in some products performing surgery where it is required.

Anatomists have also contributed to the development of their own multimedia tools for CAL. Such individual initiatives, which have been reported in the form of published studies used a wide range of approaches and resulted in a wide range of findings. The outcomes of those studies mainly deal with two main themes; the degree of students’ satisfaction towards the tool and the effectiveness of the tool in promoting students’ learning.

In general, students show high levels of satisfaction towards CAL in anatomy in comparison to other traditional methods such as lectures, tutorials, and textbooks. In one study, students learned pelvic anatomy through either a computer-based (CD-ROM) format or a paper-based format. The CD-ROM format students group showed higher satisfaction (Corton, McIntire, Wai, Ling, & Wendel Jr, 2006). Others developed an interactive online learning tool for first year health sciences students, which contained interactive anatomy images obtained from digital photographs of cadavers and textbook-derived illustrations. Students used the tool widely and rated it as relevant and supportive for SDL (O’Byrne, Patry, & Carnegie, 2008). In a third study, students showed positive attitudes towards web-based interactive 3D visualisation and virtual reality modules for the study of anatomy (Petersson, Sinkvist, Wang, & Smedby, 2009). More recently, it was reported that students expressed higher satisfaction rates toward a computer-based 3D animation module for the study of the hepatobiliary anatomy compared with a computer-based text document containing the same images in a 2D presentation without animation (Keedy et al., 2011). Altogether, these studies indicate that students value computers and multimedia as learning tools of anatomy highly compared with other less interactive tools such as textbooks. Nevertheless, the level of students’ satisfaction does not reflect the effectiveness of those tools in promoting students’ learning, which needs to be addressed separately.
While there seems to be a consensus in relation to students’ satisfaction, the learning effectiveness of CAL in anatomy is controversial. Studies have reported CAL to be superior, inferior, or equal to other anatomy learning tools. For example, Hallgren et al. (2001) recruited 107 first year medical students in a study of the effectiveness of an interactive web-based tool for learning anatomic landmarks. The web-based materials included a simple graphic that identified the anatomic landmarks, a drill exercise reinforcing the location of the landmark, and self-evaluator exercise. It was found that students’ who used the web-based exercise scored better than those who did not, in both midterm and final exams (Hallgren, Parkhurst, Monson, & Crewe, 2001).

In another study, a comprehensive web-based program called “Interactive Human Anatomy” was developed to supplement dissection and contained dissection videos, radiological imaging, and cross sectional anatomy images was found by the faculty to prepare students better for the actual dissection laboratories. Faculty needed less time explaining basic concepts and techniques. Overall, such a program improved the quality and the efficiency of anatomy learning in dissection classes (Granger et al., 2006). An additional finding of the Petersson study that was mentioned earlier was that the web-based interactive 3D module significantly improves the anatomical knowledge of the test group students (Petersson 2009).

There are some parts of the human body that are difficult to be studied through dissection due to their small size and the complexity of their structure such as the middle and inner ear. Nicholson et al (2006) investigated the potential of virtual reality to improve anatomy learning of such regions. They constructed a 3D interactive model of the middle and inner ear from MRI scans of a human cadaver ear. A group of students was asked to study the anatomy of the ear by the interactive model and their scores in a 15 question quiz were compared with the scores of the control group of students who were not exposed to the model. The quiz questions cover 3D relationships within the ear. The intervention group students scored significantly higher than the control group (Nicholson, Chalk, Funnell, & Daniel, 2006).

More recent studies have looked into the effectiveness of 3D computer-based models of less complex and larger anatomical structures such as the larynx (Tan et al., 2012) and hepatobiliary systems (Keedy, et al., 2011). Both studies found that the 3D computer-based models to be no more effective than their 2D counterparts, despite the preference of the former by students. Moreover, it was also reported that computer-based
interactive module for the study of pelvic anatomy is not significantly different from the traditional paper-based approach (Corton, et al., 2006).

The trend of equal learning effectiveness of computer-based and traditional approaches was also reported when comparing physical dissection with digital dissection (Hisley, Anderson, Smith, Kavic, & Tracy, 2008). In this interesting study, digital dissection was performed by reconstructing 3D volume modelling of a normal cadaver using CT and MRI image sets and students were allowed to manipulate the 3D model. A control group of students was asked to physically dissect the same cadaver. After 6 weeks, all students were evaluated using a single assessment tool based on photography and animated digital manipulation. Students from both groups performed equally on spatial ordering, viewpoint determination, and special feature identification.

There are also rare studies reporting that CAL has been found inferior to other non-computer-based anatomy learning modalities. For example, Lieberman et al (2002) compared the factual anatomical knowledge of fourth year medical students and radiology residents exposed to a CAL interactive module with their counterparts who were exposed to an interactive tutorial. Both methods were effective but the CAL module showed a statistically significant inferiority in terms of effectiveness (Lieberman, Abramson, Volkan, & McArdle, 2002).

Others have looked into the effectiveness of different degrees of interactivity that the new computer models provide. The issue of spatial ability has been specifically addressed by Garg and colleagues. They used computer models of carpal bones as an example of a spatially complex area and for the importance of knowledge of their structure in the examination and treatment of fractures. A group of students were exposed to the computer model that show the carpal bones in two key views; palmar and dorsal. Another group was exposed to the same model but they were allowed to study it in multiple views by passively or actively rotating the model in 36 different viewing angles. They found that the degree of interactivity improved spatial understanding. However, they emphasise the importance of students’ spatial ability in determining the effectiveness of interactive CAL tools in learning anatomy. In particular, there was the concern that more interactive computer-based models may disadvantage students with low spatial ability (A. Garg, Norman, Spero, & Maheshwari, 1999; Amit X. Garg, Norman, & Sperotable, 2001; A. X. Garg, Norman, Eva, Spero, & Sharan, 2002).
3.7 Models

Anatomical models are “constructs that replicate the structure of the human body and can be used in teaching and learning anatomy” (Chan & Cheng, 2011). The first models appeared early in the 17th century in Europe and they were made of wax in response to the limited success of preservation techniques. Models have continued to evolve since then and new materials such as wood, bronze, and ivory have been used in their construction. Smaller anatomical structures such as the eye and ear have been represented in models capable of being dismantled to expose internal features. The credit for producing anatomical models should not go to anatomists alone, but should extend to artists and modellers who could express the educational needs of anatomists in their artwork (Hopwood, 2007).

Today, there are two main types of physical anatomical models. The high-fidelity commercially available models (GPI Anatomicals, 2013) and low-fidelity models developed by anatomists to explain complex anatomical structures and relationships to their students (Chan & Cheng, 2011; Cloud, Youdas, Hellyer, & Krause, 2010; Motoike, O’Kane, Lenchner, & Haspel, 2009). Although they are criticised for undermining biological variation and the lack of pathological authenticity in comparison to real anatomical specimens, the former type is well-known and available in most anatomy departments due to the high degree of resemblance to normal anatomical structures (Mattingly & Barnes, 1994; Sugand, et al., 2010). Examples of low fidelity models have been sufficiently reported and they have been shown to have some advantages including aiding memory, reducing cognitive overload, facilitating problem solving, arousing students’ enthusiasm and participation, and requiring minimum resources and cost (Chan & Cheng, 2011). Some of them are very creative and innovative despite using simple materials such as clay, cloth, ropes, and paper.

The success and acceptance of any anatomical model is largely influenced by the correspondence between it and the anatomical structure it represents. The factors that determine the degree of correspondence are: dimensionality, number of structures, spatial relationship between structures, absolute and relative sizes of structures, as well as shapes and surface features such as colours and texture (Chan & Cheng, 2011). Nevertheless, complete correspondence is hard to achieve especially when using low-cost simple materials that lack resemblance to normal structures. As a consequence, anatomists may miss or misrepresent some structures or relations that are crucial for
students in order to understand the model, resulting in increased confusion (Nayak, 2010). Here, teachers need to invest more time in explaining the missing correspondence to the students to avoid any confusion.

3.8 Body painting

Body painting is defined as “the painting of internal structures on the surface of the body with high verisimilitude” (Finn, 2010). Historically, it first appeared in the literature of human anatomy teaching to medical students in 2002 when (Op Den Akker, Bohnen, Oudegeest, & Hillen, 2002) published the work that presented this new tool as a promising supplement to other traditional forms of anatomy teaching. Since then, it has attracted the attention of some anatomy teachers, leading to the build-up of a small body of literature around it, though it still remains under-researched (Finn & McLachlan, 2010).

Body painting is different to line drawing that uses marker pens or crayons, which usually result in sketches of complex lines that are difficult to understand, interpret, and remember (McMenamin, 2008). Body painting uses the powerful impact of colour in aiding knowledge retention as supported by psychology literature (Finn & McLachlan, 2010) through making anatomical knowledge more memorable by being an interactive process and through the high sensory stimulus it provides and the ability of colour to aid recall. That is what Finn and McLachlan (2010) concluded depending on a qualitative study that used focus groups of students involved in body painting. Later, Finn et al (2011) did a follow-up quantitative study on the impact of colour on knowledge retention obtained from body painting sessions. They found that body painting improved students’ knowledge of anatomy. Despite the absence of difference in the short term and long term knowledge retention between students who used black outlines and those who used colour, the colour group showed an increase in knowledge retention four weeks after the sessions in comparison to immediately after the sessions, while the black outline group showed a decline (Finn, White, & Abdelbagi, 2011).

Body painting is seen to present an alternative approach to anatomy teaching in times of limited access to cadavers and continuously reduced time devoted to anatomy in medical curricula (Finn, 2010). Moreover, it can reduce the high cost associated with more traditional cadaver-based courses (Op Den Akker, et al., 2002), and other forms of living anatomy such as simulated patients (Azer, 2011). It can also be an alternative to
students who are overwhelmed by the emotional distress associated with dissection and cannot cope with it (Finn, 2010).

The most important advantage of body painting as an anatomy teaching tool is its complete reliance on successful identification of surface landmarks (Finn & McLachlan, 2010; McMenamin, 2008; Op Den Akker, et al., 2002). This way, it enforces the surface anatomy aspects of anatomical structures. It also demands students correlate their basic anatomical knowledge to clinical practice through the application of important clinical skills of inspection, palpation, percussion, and auscultation (McMenamin, 2008; Op Den Akker, et al., 2002). This is important to promote students’ appreciation of the relevance of anatomical knowledge to clinical practice in their early undergraduate years.

The relevance of body painting to clinical practice extends to include the development of other important skills such as critical observation and hand-eye coordination (T. J. Collett & McLachlan, 2005). Professional skills such as communication skills and teamwork may also be improved (Finn, 2010). The undressing associated with body painting helps students being aware of patients’ perspective when they later encounter real patients. It also early introduces nudity to students in a professional way, which in return can desensitise them to the concept and prepares them to face it with a lower level of embarrassment later in clinical practice (Op Den Akker, et al., 2002). However, undressing in this manner is sensitive to the influence of cultural and religious background on anatomy teaching methods. While undressing in body painting sessions is more accepted by students in Western countries and the level of embarrassment associated with it is limited, its acceptance students from more conservative cultures is questionable and warrants further investigation. In this regard, McMenamin (2008) deemphasised the issue of culture and gender influences and did not regard it as significant. He further argued that this issue should not be exaggerated to students. Others have treated this sensitive issue with more caution and demanded that under all circumstances, students’ dignity and comfort should be a priority that must always be ensured (Finn, 2010).

A more extreme form of body painting used to supplement anatomy teaching is life drawing, which involves drawing the superficial features of the body of a life model (Phillips, 2000). Such a method links anatomy to art. Sessions can be run in an informal learning environment in places other than the usual anatomy laboratory such as art
studios (T. J. Collett & McLachlan, 2005). Such sessions were not found to improve students’ knowledge of anatomy or students’ ability to appreciate the relevance to anatomy and clinical practice despite being enjoyed the students, anatomists, and the artists, they (T. J. Collett & McLachlan, 2005; Phillips, 2000).

Overall, body painting remains a new method for teaching anatomy in medical schools. The published literature on body painting is not comparable to that of other forms of teaching such as dissection. More research needs to be done on its practicality and educational value, especially in countries with cultures where body exposure is a sensitive matter, or prohibited.
Chapter four: Anatomy teaching in GCC countries

(Background of the study)

4.1 Introduction

This chapter presents background information related to anatomy teaching in the context of medical education and in Gulf cooperation Council countries, leading to exposing the knowledge gaps that this study aims to fill.

4.2 Basic background information

The Gulf Cooperation Council for the Arab States of the Gulf, referred to as the Gulf Cooperation Council (GCC) is a political, economic, social, and cultural organisation of six member countries that was established in 1981. The member countries are Kingdom of Bahrain, Kingdom of Saudi Arabia (KSA), Kuwait, Oman, Qatar, and the United Arab Emirates (UAE) (See Figure 4.1). The GCC region lies in the furthermost part of South-Western Asia and forms the Eastern borders of the Arab World. It spreads over 2.4 million square kilometres with a total population of 47.4 million (GCC Secretary General, 2012a).

The six member countries share many common characteristics. Firstly, they are all Arabic speaking and Muslim countries. Therefore, Islamic culture prevails in this region. Secondly, their political systems are similar in the sense that they are all monarchical, giving the head of state an absolute power and authority to govern the country. Thirdly, their economies are currently based on oil and gas resources. Fourthly, the modernization of those countries kicked off after the discovery of oil and gas and their increased production in the second half of the 20\textsuperscript{th} century. Therefore, these common characteristics formed the basis for the foundation of the GCC.
In the context that oil and gas resources can not last forever, GCC countries have taken measures to diversify their economic activities in order to decrease their reliance on oil and gas. The contribution of oil and gas and mining to the GDP has decreased from 45% in 2006 to 39% in 2009. In the same period the contribution of other sectors such as agriculture, fishing, manufacturing, and finance services has increased (GCC Secretary General, 2011b).

The basic objectives of the foundation of the GCC were to “effect coordination, integration and inter-connection between Member States in all fields, strengthening ties between their peoples, formulating similar regulations in various fields such as economy, finance, trade, customs, tourism, legislation, administration, as well as fostering scientific and technical progress in industry, mining, agriculture, water and animal resources, establishing scientific research centres, setting up joint ventures, and encouraging cooperation of the private sector” (GCC Secretary General, 2011a).

One of the objectives of forming the GCC as stated in its charter is to achieve integration and to formulate similar regulations in different fields of people’s life including those concerned with education and culture (GCC Secretary General, 2011a).

4.2.1 GCC countries: basic statistics

Since its foundation, the Secretariat General of the GCC has been responsible for collecting data and publishing statistics about economic and demographic parameters of the region. The latest publication has shown many important statistics that can give an insight into the current state of some parameters of GCC countries individually and collectively (GCC Secretary General, 2014). Table 14.1 illustrates a summary of the basic statistics for each country and for the whole GCC region.
Table 4.1: Basic statistics of the GCC countries.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>0.8</td>
<td>1.2</td>
<td>30.4</td>
<td>25.4</td>
</tr>
<tr>
<td>KSA</td>
<td>2000</td>
<td>29.2</td>
<td>711.0</td>
<td>24.3</td>
</tr>
<tr>
<td>Kuwait</td>
<td>17.8</td>
<td>3.3</td>
<td>183.2</td>
<td>56.0</td>
</tr>
<tr>
<td>Oman</td>
<td>309.5</td>
<td>3.6</td>
<td>78.1</td>
<td>21.6</td>
</tr>
<tr>
<td>Qatar</td>
<td>11.6</td>
<td>1.8</td>
<td>192.4</td>
<td>105.0</td>
</tr>
<tr>
<td>UAE</td>
<td>83.6</td>
<td>8.3</td>
<td>383.8</td>
<td>46.4</td>
</tr>
<tr>
<td>Total</td>
<td>2,423.3</td>
<td>47.4</td>
<td>1,578.9</td>
<td>33.3</td>
</tr>
</tbody>
</table>

One of the remarkable observations in that report was the increase in the population of the region in the past decade. Between 2000 and 2014, the total population increased from 29.9 to 47.4 million. That is 58.5% increase over a 14 year period. The increase in the total population was mainly driven by the increasing rate of migration of workers to the region, which was required to support the economic boom brought about by the oil, gas, and mining revenues.

The high rate of workers’ migration to the GCC countries was reflected in the percentage of expatriates in the overall population of the GCC countries. In 2010 the expatriates formed 43% of the total population (GCC Secretary General, 2012b). However, the percentage of expatriates varies from one country to another, the highest percentage of expatriates being in the UAE, where they form about 88% of the population.

4.3 Education in GCC countries

4.3.1 Basic education in GCC countries

Modern systemic education is relatively new in the GCC countries. Like all other signs of modern civilisation, it came up with the first discovery of oil in Saudi Arabia in 1936 and its commercial production during and after World War II (Zaini, 2007). Before that, education in GCC countries was mainly practiced in the traditional way. Pupils were taught by a local teacher under a tree or in a mosque. He mainly taught them the Holy Quran and the basics of Islam besides the Arabic language and basic mathematics (Ministry of Education in Oman, 2013). After the oil revolution, GCC countries invested heavily in infrastructure building that fulfilled the basic needs of the region’s
people such as education and health. In fact, development of the educational systems in the member countries was one of the first priorities of the GCC countries’ leaders. It was stressed in their early meetings after the foundation of the council (GCC Secretary General, 2002). Since then, the number of schools has dramatically increased. By 2009, the total number of schools at all levels in the GCC region reached 37,650 (GCC Secretary General, 2011b).

4.3.2 Higher education in GCC countries

The next step towards the development of education in the GCC countries was addressed higher education. The GCC region had to wait until 1957 to witness the foundation of its first university, the King Saud University in the KSA (Al-Qahtani, 1999). Other GCC countries had their own universities later during the second half of the 20th century. Kuwait founded Kuwait University in 1966 (Kuwait University, 2013), Qatar founded Qatar University (Qatar University, 2013) and the UAE founded the UAE University in 1977 (Al-Qahtani, 1999), The Arabian Gulf University was founded in Bahrain in 1980 (Al-Qahtani, 1999), and Finally Oman founded the Sultan Qaboos University in 1986 (Sultan Qaboos University, 2013).

The foundation of the Arabian Gulf University in Bahrain reflected the cooperation between the GCC countries in the area of higher education. It was not established as a national university of Bahrain but rather as an institution that was meant to reflect the unique economic, social, and cultural attributes of the Gulf communities and their environments (Hamdy & Anderson, 2006). The university is financially funded by contribution from all GCC countries and therefore, it accepts students from every GCC country. Bahrain also founded its own national university, the University of Bahrain in 1986 (University of Bahrain, 2013).

GCC countries have continued to investing in the establishment of new universities providing both undergraduate and postgraduate education. By the year 2009, the number of universities in the region reached 111 enrolling just below 750 thousand students (GCC Secretary General, 2011b). Meanwhile, GCC countries send some of their students on scholarships to study in universities of the developed world to partake highly specialised and postgraduate courses not available in local universities.
4.4 The culture of GCC countries

4.4.1 The consequences of the culture of the GCC countries on educational system

Hofstede (2001, p.9), a prominent social psychologist defined the culture of a country or a nation as “the collective programming of the mind that distinguishes the members of one group or category of people from another”. He conducted a famous study on the cultures across modern nations. As a result of that study, he developed a four dimensional model of cultural differences (Hofstede, 1986, 1994, 2001). The four dimensions are:

1. Collectivism versus Individualism. This dimension refers to the relationship between the individual and the collectivity of the society. That is, whether the prevailing interest is that of the individuals or of the society. In a collective society, the individuals are part of strong groups from birth throughout life, resulting in a highly integrated society. On the other hand, in an individualistic culture, the ties between the individuals are loose and every individual follows his personal interests and the interests of his immediate family, resulting in a loosely integrated society.

This dimension of the culture has its reflection on schools and educational systems. In a collective culture, education is regarded as a way of gaining social prestige and joining higher groups. Therefore, obtaining a qualification by any means is more important than gaining competence. Students speak in classes only when the teachers request them to speak. Students split into small groups according to predefined social criteria such as ethnicity.

In an individualistic culture, education is regarded as a way to improve economic status and self respect though gaining competence. Therefore, gaining competence is more important than the certificate as such. The purpose of education is to learn how to learn, which makes it a life-long process. Students speak in the class without the need for a personal request from the teacher, and students split into small groups according to practical criteria such as the nature of the task.

Hofstede placed the Arab countries including the GCC countries in the collective type of culture.
2. Power distance. This refers to the “extent to which the less powerful persons in the society accept inequality in power and consider it as normal” (Hofstede 1986). In other words, it refers to tolerance of inequality by the society. Large power distance cultures expect and accept inequality. In those cultures, education is largely teacher-centred. The teacher transfers un-contradicted and respected wisdom to his students. The teacher is expected to initiate communication with the students and to outline the path for the students to follow. The effectiveness of teaching is attributed to the excellence of the teachers.

On the other hand, in low power distance cultures, education is student-centred. The students can seek the truth from any competent person other than the teacher. They can also contradict and criticise the teacher. In response, the teachers should respect the independence of the students and allow them to find their own path for learning. In the class, students can simultaneously initiate communication. The effectiveness of learning is attributed to the prevalence of two-way communication in the class.

Hofstede placed the Arab countries including the GCC countries in the cultures of large power distance.

3. Uncertainty avoidance. This defines “the extent to which people in a culture are made nervous by situations which they perceive as unstructured, unclear, or unpredictable, situations which they therefore try to avoid by maintaining a strict code of behaviour and a belief in absolute truth” (Hofstede 1986). The level of a society’s uncertainty avoidance, whether strong or weak, reflects on the educational system. In weak uncertainty avoidance societies, students are rewarded for being innovative in problem solving. They feel comfortable with unstructured learning environment including elements such as ambiguous objectives, open assignments, more than one correct answer, and when there are no strict timetables. In such societies, teachers can say “I don’t know” and they are stimulated by students’ disagreements.

On the other hand, students in strong uncertainty avoidance societies are rewarded for being accurate in problem solving. They feel more comfortable with structured learning environments. For example, they like precise objectives, in depth assignments, one correct answer, and strict timetables. The teachers are expected to be the experts in the subject and have all the answers. Therefore, they regard students’ disagreement with them as disloyalty.
Hofstede placed the GCC countries in the strong uncertainty avoidance culture.

4. Femininity versus masculinity. The two poles of this dimension are defined as follows: “Masculinity stands for a society in which social gender roles are clearly distinct: Men are supposed to be assertive, tough, and focused on material success; women are supposed to be modest, tender, and concerned with the quality of life. Femininity stands for a society in which social gender roles overlap: Both men and women are supposed to be modest, tender, and concerned with the quality of life” (Hofstede 2011).

In the education systems of the feminine societies, the focus is on teacher’s friendliness and social skills and on students’ social adaptations. Therefore, teachers do not openly praise good students but they may do so to weak students as encouragement. They use average students as the norm. Students practice mutual solidarity and they regard failure in school is a minor incident. They also choose a subject to study following their personal interests.

In masculine societies on the other hand, the focus is on teachers’ brilliance and academic reputation and on students’ academic performance. Therefore, teachers openly praise good students and use them as the norm. Students compete with each other in classes and they regard failure in school as disaster. They also choose studying a particular subject according to career opportunities.

Hofstede place the GCC countries among the masculine cultures.

4.4.2 Language

Arabic language is the language of all GCC countries. It is the language of instruction in all levels of pre-university education although some private schools use English as the language of instruction for science subjects such as biology and mathematics. Arabic is also the language of instruction for humanities subjects in the universities. However, science subjects such as medicine and engineering are taught in English (Al-Qahtani, 1999). When they join medical schools, students have to face the challenge of learning medicine in a totally new language. This challenge may influence the learning environment in GCCMSs. Therefore, most of the medical schools in the GCC region do not admit new students directly into the medical program. Instead they enrol students with inadequate English language skills into intensive English courses to develop their skills. Some schools also enrol the students to a pre-medical phase where they expand
their knowledge of science subjects such as biology and chemistry (Hamdy, et al., 2010a; Hamdy et al., 2010b). Interestingly, GCC medical students acknowledged the importance of studying medicine in this era. When they were asked if they preferred to learn medicine in Arabic, they all answered “No” (Kassimi, 1983).

### 4.4.3 Religion

The GCC countries adopt Islam as their religion. Islamic traditions, which originate from the Holy Quran, the revelation from GOD, and the teachings, sayings, and actions of Prophet Mohammed form the core on which all aspects of an individual’s and society’s lives are centred. In his book on the Arab mind, Patai (Patai, 1973), described the role that Islam plays in Muslims’ lives:

“Islam permeates life, all of which came under its aegis. Religion was not one aspect of life, but the hub from which all else radiates. All custom and tradition was religious and religious do’s and don’ts extended throughout all activity, thought, and feeling. Most importantly, all the people in the Arab world were religious in the double sense of unquestionably believing what traditions commanded them to believe, and obeying the ritual rules with which religion circumscribes their lives. Religion was- and for the traditional majority in all Arab countries has remained- the central normative force in life”.

Higher education in GCC countries would be expected to be set in a way that does not contradict the Islamic rules and regulations. Some more conservative GCC countries, for example, do not allow students from both sexes to learn together. They have separate male and female institutions. Students from one of each sex are taught by teachers of the same sex (Al-Qahtani, 1999). Within the scope of this study, the study of anatomy by dissection has also been influenced by the Islamic traditions. Dissection of a Muslim’s body is not permitted as such unless it is done for one of three purposes: the study of medicine, forensic investigation, and pathologic investigation (General Presidency of Scholarly Research and Ifta' in Saudi Arabia, 2012). Although there is a consensus by religious scholars on the permissibility of dissection for those purposes, there are still some scholars who prefer a total ban of dissection of the body of a Muslim.

### 4.5 Medical service in GCC countries

The increase in the population of the GCC region increased the demand for health services. By 1997, the total number of hospitals in all GCC countries was 456 (GCC Secretary General, 2011b). Fifteen years later, the number of hospitals had increased to
656 and these hospitals were equipped with 89.2 thousand beds (GCC Secretary General, 2014). More than 112 thousand doctors work in these hospitals. Because there were not enough local citizen doctors to fill the positions in the increasing number of hospitals, the GCC countries resorted to recruiting expatriate doctors. In 2009, about 54% of doctors working in public hospitals of the GCC countries were expatriates (GCC Secretary General, 2011b). At the same time, GCC countries started to establish their own medical schools to ensure a continuous supply of locally trained future doctors. In fact, medical education kicked off in the GCC countries earlier than the foundation of the GCC itself.

4.6 Medical education in GCC countries

King Saud University was the first GCC university to start a medical school in 1967 (Hamdy, et al., 2010a). This medical school remained the only one in the region until 1973, when the second GCC medical school was opened at Kuwait University. The Arabian Gulf University (AGU) in Bahrain had its medical school receiving its first class of preclinical medical students in 1982. Oman and the UAE had their first national medical schools opened in 1986 at the Sultan Qaboos University and the UAE University, respectively. Qatar, which is currently regarded as one of the richest countries in the world had established its first medical school in 2001 (Weill Cornell Medical College in Qatar, 2012).

The massive economic growth in the region which has been supported by a parallel population expansion has increased the demand for health services, and consequently for health service personnel like doctors. As a result, the number of medical schools has increased dramatically. Bin Abdulrahman (2008) was able to include 21 medical schools in his study on the status of medical education in the GCC countries. Moreover, Hamdy et al (2010a, b) included 27 medical schools in his study on undergraduate medical education in the GCC countries. However, our most updated research has identified a total of 41 medical schools in the region. Table 4.2 and Figure 4.2 set out medical schools in each GCC country.
Table 4.2: GCC Medical schools in 2011 and their foundation years.

<table>
<thead>
<tr>
<th>Country</th>
<th>Public medical schools</th>
<th>Private medical schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSA (28)</td>
<td>King Saud University 1967</td>
<td>Ibn Sina College 2004</td>
</tr>
<tr>
<td></td>
<td>King Abdulaziz University 1975</td>
<td>Batterjee Medical College 2006</td>
</tr>
<tr>
<td></td>
<td>University of Dammam 1975</td>
<td>Alfaaisal University 2008</td>
</tr>
<tr>
<td></td>
<td>King Khalid University 1981</td>
<td>Almamarefa College for Science and Technology 2008</td>
</tr>
<tr>
<td></td>
<td>Umm Al-Qura University 1995</td>
<td>Global Colleges 2008 (Closed in 2012)</td>
</tr>
<tr>
<td></td>
<td>Qassim University 2000</td>
<td>Sulaiman AlRajhi Colleges 2009</td>
</tr>
<tr>
<td></td>
<td>Taibah University 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>King Faisal University 2002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>King Saud Bin Abdulaziz University of HealthSciences 2005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taif University 2005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jazan University 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Najran University 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Al Jouf University 2007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alhudood Alshamaliya University 2007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Al Imam Mohamed Ibn Saud Islamic University 2007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>University of Tabuk 2007</td>
<td></td>
</tr>
<tr>
<td></td>
<td>University of Hail 2008</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AlBaha University 2009</td>
<td></td>
</tr>
<tr>
<td></td>
<td>King Abdulaziz University- Rabegh 2009</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salman Bin Abdulaziz University 2009 (Name changed to King Saud University 2009)</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Public medical schools</td>
<td>Private medical schools</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td>to Prince Sattam University in 2015)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>King Saud Bin Abdulaziz University of Health Sciences-Jeddah 2010</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Majma’ah University 2010</td>
<td></td>
</tr>
<tr>
<td>UAE (5)</td>
<td>The United Arab Emirates University 1986</td>
<td>Dubai Medical College for Girls 1986</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gulf Medical University 1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University of Sharjah 2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RAK Medical and Health Sciences University 2006</td>
</tr>
<tr>
<td>Bahrain (3)</td>
<td>Arabian Gulf University 1982</td>
<td>AMA International University-Bahrain 2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Royal College of Surgeons in Ireland- Medical University Bahrain 2004</td>
</tr>
<tr>
<td>Oman (2)</td>
<td>Sultan Qaboos University 1986</td>
<td>Oman Medical College 2004</td>
</tr>
<tr>
<td>Kuwait (1)</td>
<td>Kuwait University 1973</td>
<td></td>
</tr>
<tr>
<td>Qatar (1)</td>
<td></td>
<td>Weill Cornell Medical College in Qatar 2002</td>
</tr>
</tbody>
</table>

Note: Four new medical schools were founded after the year 2011. These are:

1. Umm Al QUra University at AL Qunfuda
2. Shaqra University College of Medicine at Shaqra
3. Shaqra University College of Medicine at Dawadmi
4. Bisha University College of Medicine
Figure 4.2: The distribution of medical schools across the countries of the GCC.

Figure 4.3 illustrates the increase of medical schools’ number in the GCC region since the first school was founded in 1967. By the year 2000, all GCC countries had their own medical schools except Qatar. There were a total of 13 medical schools. The first decade of the 21st century witnessed a massive increase in the number of schools from 13 to 40. That is a 207% increase in just under 10 years.

Figure 4.3: The number of GCC medical schools founded in the past five decades

4.6.1 Private medical education

Private medical education has also taken part of the responsibility of supplying most of GCC countries with medical graduates. As illustrated Table 4.2, Dubai medical College for Girls was the first private medical school in the region, which started in 1986. In a highly conservative culture like that of GCC countries, girls only medical schools were
needed to encourage more conservative families to enrol their daughters in single sex medical schools. A window of opportunity was seen and a private medical school for girls was established to fulfil that need. Moreover, the high of expatriate population in the region (17.4 million in 2009) (GCC Secretary General, 2011b) increased the requirement for the provision of private medical education for these expatriates. As a result, more private medical schools followed and by 2013, the total number of private medical schools in the GCC region reached 13, forming just below a third of total medical schools in the region (Figure 4.4).

The massive increase in the numbers of medical schools in the GCC region has increased the gross annual intake of students. By 2005, the annual gross annual intake of all medical schools in GCC countries and Yemen was 3225 students, and the total number of graduates was 1787 (Bin Abdulrahman, 2008).

4.6.2 GCC medical schools in the new millennium

To gain an idea of the number of medical schools in any region or country in the world, the number of medical schools in relation to the population size is estimated. The number of medical schools per million inhabitants is commonly used. In 2012, the number of medical schools per million inhabitants is 0.97 in the GCC region. That is well above the global average number of 0.30 and it is also above the numbers in Africa, Asia, Europe, and North and South America, which were 0.15, 0.22, 0.54, and 0.60 respectively for the year 2007 (Boulet, Bede, McKinley, & Norcini, 2007). This fact indicates that GCC countries have collectively surpassed the rest of the world.
including the developed countries, in terms of the number of medical schools in relation to population size. This is a massive accomplishment, especially given that the region did not have a single medical school less than five decades ago. This growth is an indication of the amount of funding and resources that were directed towards the establishment and the development of medical education systems that are up to world standards. It is also an indication of the high demand for doctors and health service facilities to keep up with the expansion of population and the momentum of modernisation.

4.6.3 Accreditation standards

The massive increase in the number of medical schools, especially the private medical schools, in the GCC in the last decade raises questions about the quality of the medical education provided. In this regard, medical schools in the GCC countries have recently been subject to certain accreditation criteria.

Medical schools in the GCC region have obtained accreditation from international accrediting organisations or agencies such as the General Medical Council (GMC) in the UK, World Health Organisation (WHO), World Federation for Medical Education (WFME), and the Liaison Committee on Medical Education of the Association of American Medical Colleges, and the American Medical Association (Hamdy, et al., 2010a; Hamdy, et al., 2010b). Moreover, in the past decade, Ministries of Higher Education in GCC countries have taken further steps to establish their own local assessment and accreditation committees such as the National Commission for Academic Assessment and Accreditation (NCAAA) in the KSA, which was established in 2005 (Hamdy, et al., 2010a; Zaini, 2007). Similar committees have either been established in countries such as Bahrain, Oman, and the UAE or steps have been taken towards their establishment in the remaining GCC countries (GCC Secretary General, 2008). In 2010, the Quality Assurance Authority for Education and Training (QAAET) in Bahrain banned a private medical school in the country from taking new students after a review that found major deficiencies in its resources (Imam, 2012).

Most of the accreditation agencies and committees in the GCC countries are general in nature and not specialised in medical education. Therefore, there was a need for establishing specific accreditation standards for the accreditation of medical schools in the GCC region. In 2001, the GCC Medical Deans Committee decided to launch a taskforce for this mission and the accreditation standards for establishing medical
schools in the GCC region were approved in 2003 and the guidelines were published in 2005 (Zaini, 2007). The standards cover all the aspects of medical education from the curriculum to facilities and schools’ management. This was a remarkable step in the evolution of medical education in the GCC region, incorporating accreditation standards that were in line with international standards but taking the specific environment of the GCC countries’ into account. It was also a step towards emphasizing the cooperation between those countries in the field of medical education.

4.6.4 The curriculum of GCC medical schools

Until recently, the vast majority of GCCMSs followed a traditional medical curriculum adopted from the North American medical education system, which follows the famous Abraham Flexner’s report of 1910 (Bin Abdulrahman, 2008). That curriculum was characterised by the division of the program into two consecutive phases; a pre-clinical phase dominated by teaching the basic medical sciences such as anatomy, physiology, and biochemistry, and a clinical phase dominated by teaching the clinical disciplines in the hospital environment (A Flexner, 1910). However, over the years and with the expansion of the scientific knowledge in medical education, the traditional curriculum has been criticised for being teacher-centred, discipline-base, and subject-based. This had negative impacts on students learning because they followed rote learning, relied on memorisation, failed to integrate knowledge, and disregard life-long learning (Camp, 1996). As a result, medical educationalists called for reforms in medical education in the hope of adopting curricula that are more student-centred, problem-based, and integrated. GCCMSs responded to those calls.

In the past few years, older GCCMSs conducted curricular reforms in order to introduce more of the characteristics of modern medical education such as integration, PBL, SDL, and student-centred learning (Hamdy, et al., 2010a; Hamdy, et al., 2010b). Newer schools were also established from the beginning with curricula that incorporate these modern characteristics. In 2005, innovative learning strategies such as PBL were adopted by many of the region’s medical schools (Bin Abdulrahman, 2008). However, the adoption of PBL was not absolute but partial, as 53% of the schools had a hybrid form of curriculum between traditional and PBL teaching. There were schools on both sides. That is, some schools were still following the traditional curriculum, while others adopted a largely PBL curriculum. Hamdy et al (2010a, b) reported that the wave of modern integrated and problem-based curricula has spread further in the six GCC
countries, with a prevalence of the hybrid from. Moreover, they reported the opening of the first medical school to offer a graduate medical program, which is the National Guard King Saud Bin Abdulaziz College of Medicine in the KSA.

Hamdy et al (2010a, b) pointed to one positive aspect of the overall nature of curricula in GCCMSs, which manifested in the similarities among the schools in terms of the vocabularies that described the organisation of the curricula in relation to the program, assessment, and overall evaluation. Moreover, there were even greater similarities in relation to vision and mission statements of the curricula. However, they stressed that those descriptions were provided by administrators of the schools and may not represent the way the curricula were delivered in practice, which at that stage had not been explored.

4.7 Anatomy education in GCC medical schools

Being essential parts of every medical school, anatomy departments are as old as the medical schools in the GCC region. Since most of the controversy over anatomy teaching in medical curricula emerged in the second half of the 20th century and became progressively noticed and reported in the last two decades, anatomy departments in the region were not immune from the global controversy. On the contrary, they became part of it and the issue of anatomy teaching and learning in the region may add valuable insight into the current global discussion of the topic.

There is shortage of literature on anatomy education in GCCMSs. To the best of this researcher’s knowledge, the first article on this topic was published in 1994 by Harris et al from the Sultan Qaboos University in Oman. Since then, many studies, reports, and literature reviews have followed from different GCCMSs (Abu-Hijleh, et al., 1997; Al-Rubaish, et al., 2009; Al Motabagani, et al., 2009; Cowan, et al., 2010; OA Habbal & Harris, 1995; Harris, et al., 1994; I. Inuwa, 2009; I. Inuwa, et al., 2010; Khan, 2010; Moqattash, Harris, Abu-Hijleh, & Gumaa, 1995). However, all those studies were specific in nature in the sense that they investigated one aspect of anatomy teaching in specific schools such as teaching tools including dissection, types of curriculum, and assessment. Through reviewing the published literature, it was possible to identify some key points regarding anatomy teaching in GCCMSs.
4.7.1 Cadaver unavailability

The GCC region suffers from unavailability of cadavers. Anatomy departments in the GCC region are challenged by the difficulty of obtaining enough cadavers for teaching purposes. National or regional registered body donation programmes do not exist and therefore, the departments depend on importing cadavers from other countries, together with the use of some unclaimed local bodies (O. Habbal, 2009). Anatomists teaching in the region believed that the religious and cultural considerations were behind the unavailability of local bodies in GCC countries and other Middle East countries (Harris, et al., 1994). Therefore, GCCMSs had to import cadavers from other countries. Inuwa et al (2011) believed that the situation worsened over the past decade due to the reluctance of the exporting countries to send cadavers because they are also struggling to find enough of them. The insecure nature of new cadaver supplies left medical students in the region disadvantaged by not having the chance to dissect and to be largely dependent on prospected and plastinated specimens.

Reports from a few schools have described some forms of limited dissection opportunities available to students. Harris et al (1994) reported allowing interested and highly motivated senior students to perform dissection under staff supervision during students’ free time (Harris, et al., 1994). Khan (2010) also reported offering their students dissection as part of elective anatomy courses. Students could dissect either the upper or the lower limb. The experience was highly appreciated by the students. Cowan et al (2010) also reported offering weekly selective dissection of the body parts that are related to the week’s theme of a hybrid PBL curriculum. Every week, 10 students performed dissection for one hour under staff supervision. Afterwards those 10 students offered peer teaching to the other students.

In order to investigate the impact of abandoning dissection on GCC students’ learning of anatomy, AL Mutabagani et al (2009) allowed students from the KSA to study anatomy through either dissection or prossections. Both groups were given the same supplementary tools such as plastinated specimens, dry bones, plastic models, X-rays, and atlases. They did not find any significant difference between the disectors and non-dissectors in written and practical exam performance. They concluded that students learned anatomy by dissection or through prossections equally especially when supplemented with other resources. However, students from the same school ranked the
dissection conducted by themselves as the most preferred method and the one that helped them in learning structural and functional anatomy (Al-Rubaish, et al., 2009).

Emotional disturbance has been identified as one of the disadvantages of dissection (Bataineh, et al., 2006). While dissection is largely unavailable in GCCMSs, the emotional and psychological reactions of GCC students to the dissecting room (DR) have been investigated by Abu Hijleh et al (1997). They found that 46% of the students experienced fear when they first entered the DR and many of them experience reactions such as visual images of cadavers (38%) and temporary loss of appetite (22.5%). Such reactions were responses to just being in the DR and studying prosected whole cadavers, parts of cadavers, and organs without doing any dissection. No studies have reported the reactions to actual dissection. However, it would be expected to be worse than the above reported figures.

The limited availability of cadavers can be an advantage in the GCC, as it stimulates the use of more clinically oriented teaching tools like medical imaging and surface and living anatomy (Harris, et al., 1994). Inuwa et al (2011) believed that anatomists, especially in the Middle East in general, need to be innovative in teaching and assessing anatomy to adapt to the reality of cadaver unavailability (Ibrahim Inuwa, et al., 2011). To date, the overall state of the availability of cadavers and the consequently the use of dissection for teaching anatomy in the whole GCC region remains unstudied. This situation warrants further investigation in a regional approach.

4.7.2 The use of tools other than dissection

The use of dissection as a tool for teaching practical anatomy is minimal in the GCC region, possibly due to the unavailability of sufficient cadavers. Instead, GCCMSs used a wide range of other tools. For example, King Faisal University in the KSA uses plastinated specimens, dry bones, plastic models, X-rays, atlases, and surface anatomy (Al-Rubaish, et al., 2009; Al Motabagani, et al., 2009). Alfaisal University in the KSA also uses prosections, models, diagrams, radiographs, and videos (Cowan, et al., 2010). Kuwait University uses prosected material, plastinated specimens, 3-D models and radiological images such as X-rays, CT scans, and MRIs (Khan, 2010). Sultan Qaboos University in Oman uses prosected cadaveric specimens, plastic models, and radiological images (Abu-Hijleh, et al., 1997; Ibrahim Inuwa, et al., 2011). The AGU in Bahrain uses computer programs, museum specimens, models, anatomical images and photographs, videos, anatomical charts, radiological images, and living and surface
anatomy (Abu-Hijleh, et al., 2010; Pallab K. Ganguly, et al., 2003). The University of Sharjah in the UAE uses cadaveric wet prosections, plastinated specimens and sections, plastic models, and radiographs (Jaffar, 2012).

It is apparent from the previous paragraph that GCCMSs use a variety of anatomy teaching tools. Moreover, cadaveric prosections, models and radiologic images have all been used in the GCC schools whose teaching tools have been reported. AL-Rubaish et al (2009) believed that providing such a variety of teaching tools and resources is desirable and enhances student-centred learning. There is nothing in the literature about the extent to which those tools are used in GCCMSs, however.

The use of radiological images in particular highlights the attention paid by the schools to vertical integration of anatomical knowledge. It also corresponds with the finding that by the year 2005, 57% of medical schools in the GCC region have Hybrid PBL curricula (Bin Abdulrahman, 2008). Unfortunately, the literature search did not return any studies on the extent of integration of anatomy into these hybrid curricula.

The second observation from the literature regarding teaching tools relates to the adoption of CAL. Several GCCMSs have reported the use of different modalities of CAL. For example, the SQU in Oman used computer-animated tutorials, which were positively rated by the students for teaching normal and abnormal functional anatomy, in the mid 1990s (OA Habbal & Harris, 1995). More recently, the same school used a computer-based version of the anatomy spotter practical examination (Ibrahim Inuwa, et al., 2011). It was also preferred by the students over the wet spotter exam because of image quality, time management, and seating arrangements. From the staff perspective, it required less preparation time and less effort for retrieval and administration (I. Inuwa, et al., 2010). Oman Medical College also used video recordings of laparoscopic cholecystectomy to supplement pre-clinical students’ study of gross anatomy (Kumar, Norrish, & Heming, 2011). More recently, the University of Sharjah used YouTube videos of gross anatomy demonstrations as a SDL task for second year medical students (Jaffar, 2012). The majority (92%) of students indicated that the task helped them to learn anatomy. Habbal (2009) admired the benefit of CAL in facilitating problem solving skills and vertical integration but he warned that over-dependence on CAL may de-humanise medical education in general.
4.7.3 Types of anatomy curricula

There seems to be a noticeable variation in anatomy curricula in the region’s medical schools. Habbal (2009) pointed to the absence of regional agreement in the GCC region on a common anatomy curriculum, which may have contributed to the variation. There seems, however, to be an increasing adoption of integrated curricula for teaching anatomy in the region’s medical schools, especially PBL curricula. PBL was introduced to the GCC region in 1982 by the Arabian Gulf University in Bahrain, which started from the beginning with this type of curriculum (Pallab K. Ganguly, et al., 2003). Afterwards, new schools started with hybrid PBL curricula while older schools changed their curricula to adopt the PBL strategy (Alsaggaf, et al., 2010; Cowan, et al., 2010; Khan, 2010; Yaqinuddin, et al., 2012). Anatomy teaching was affected by the curriculum change. For example, the curriculum change at Kuwait University resulted in a 70% decrease in anatomy lecture time and a total abolition of dissection. This loss was accepted with reluctance by the anatomy department (Khan, 2010). However, the extent to which the innovative integrated curricula are adopted by the schools in the GCC region for anatomy teaching remains unknown. The studies of Bin Abdulrahman (2008) and Hamdy et al (2010a, b) on medical education in the GCC countries, reported on the medical curricula in general without any data specific to particular disciplines.

4.7.4 Collaboration for anatomy teaching

It was presented in chapter two that there is shortage of literature on the topic of collaboration between anatomy departments and between anatomists apart from what is published on the websites of anatomical societies. This state of affair applies to the situation in the GCC. Moreover, the situation is worsened by the absence of national and regional anatomical societies, a situation that has triggered suggestions to “establish a regional anatomical society or body that holds regular scientific meetings, and discusses and publishes anatomical research” (O. Habbal, 2009). Therefore, it was not possible to review the existence or extent of collaboration for anatomy teaching in the region.

Literature has shown a few venues for general collaboration between GCCMSs and for collaboration with regards to anatomy teaching. The first of them is the GCC Medical Colleges Dean’s Committee, founded in 1995 for the aim of improving medical education in the region and setting minimum standards in undergraduate medical
education (Al-Shehri et al., 2013; Zaini et al., 2011). The second venue is provided by
the GCC Medical Colleges’ Conference, which started in 1999 in Kuwait (Al-Muhanna
& Sobbaroa, 2003). The last of these conferences was held in Bahrain in November
2013 under the name of 9th GCC Medical Education Conference. While these
conferences are general in nature, anatomists from GCCMSs attend them to meet and
present their research including educational research (Al-Rubaish, et al., 2009; Al
Motabagani, et al., 2009; I. Inuwa, 2009). The third venue, which is purely related to
anatomy, was the GCC Heads of Anatomy Meetings, the first of which was held in
KSA in 2000 (O. Habbal, 2009). That meeting has been the only reported one to the
best of our knowledge. This was confirmed through personal communication with the
author of (O. Habbal, 2009), who attended that meeting and remained the HOD of his
department for eight years afterwards but never attended another HODs meeting.

In his review of anatomy teaching in GCCMSs, Habbal (2009) expressed the need for
collaboration between GCCMSs to improve anatomy teaching across the region. He
recommended some steps including a common anatomy core curriculum, common
strategies to deal with shortage of cadavers, sharing expertise for training, exchange
visits, and an anatomical journal. Up to date, it is still not known if any of these steps
exist.

4.8 Knowledge gap

It has been noted earlier that the studies and reports on the topic of anatomy education
in GCCMSs were specific in the sense that they reported on particular aspect from
single schools. However, many important aspects of teaching anatomy in medical
schools in the region have not been studied yet. Moreover, the number of the previous
studies from the region on specific aspects is not large enough to reveal the overall
status of the topic. Up to date, there are no general regional studies exploring anatomy
teaching in the medical schools of the GCC region.

Regional and national studies have been made on anatomy education in medical schools
from a single country and from a group of countries. Examples of those studies came
from the US and Canada (Blevins 1973), the UK and Ireland (Heylings, 2002), the US
(Cottam, 1999; R. L. Drake, et al., 2002; Richard L. Drake, et al., 2009; Gartner, 2003),
Scotland (Pryde & Black, 2005), Africa (Kramer, et al., 2008), and Australia and New
Zealand (Craig, et al., 2010). These studies have explored many aspects related to
anatomy teaching in medical schools including:
• The types of anatomy curriculum
• Teaching hours and their distribution among teaching methods and between anatomy sub-disciplines
• Gross anatomy teaching tools and resources, including the role of dissection
• Teaching faculty and the student: staff ratio and the prevalence of medically qualified faculty
• Assessment

Besides exploring the current state of anatomy teaching, some of these studies (Cottam, 1999; R. L. Drake, et al., 2002; Gartner, 2003; Pryde & Black, 2005) have provided historic data that allow historic documentation of the changes in anatomy teaching over the years.

With the progressive increase in the number of medical schools in the GCC region over the past two decades and changes in curricula, such a study is needed to give a comprehensive insight over the status of anatomy teaching in the region. Such a study could also provide the first set of data from the region suitable for use as a baseline for similar studies in the future. This work attempts to address these issues.

Apart from the three types of possible venues for collaboration GCCMSs and between anatomy departments mentioned in section 4.7.4, the extent of collaboration remains unknown. It is also unknown whether there is a need for collaboration between anatomy departments in GCCMSs in the first place. This study also attempts to address this topic through aiming to investigate the extent of collaboration between anatomy departments in GCCMSs and the factors influencing it.
Chapter five: Methodology

5.1 Introduction

This is an exploratory study aimed at investigating the status of anatomy teaching in the medical schools of the GCC region. To fulfill its objectives, the study has adopted a methodology that combines quantitative and qualitative methods. The quantitative method takes the form of a comprehensive survey questionnaire directed to the HODs of anatomy departments in GCCMSs. The purpose of the questionnaire was to provide essential data about many aspects of anatomy teaching in their departments. The qualitative methods took two forms. The first was face-to-face interviews with a sample of eleven HODs of anatomy departments in GCCMSs, and the second was FGs with staff members of anatomy departments in three GCCMSs. The purpose of the qualitative phase was to expand and enrich the quantitative findings in general and to explain some of the interesting quantitative findings in particular.

This chapter presents a record of the research methodology used by this study. It provides information about the review of the methods and justification for the selection of methods, sampling procedures, and data analysis.

5.2 Ethics approval

The research has been approved by the Human Research Ethics Committee at the University of Western Australia (Appendix X), where the researcher was enrolled as a PhD student.

5.3 Questionnaire

Questionnaires are the most frequently used research instrument for the acquisition of information (Baruch & Holtom, 2008). They are also a commonly used research method to determine the current status of a given phenomenon. Questionnaires can provide information about organisational policies and practice as well as individuals’ perceptions and attitudes. They are specifically used in organisational research for their advantages in addressing aspects of organisations, among which is observing trends and evaluating progress (Baruch & Holtom, 2008).

The current literature shows that questionnaires have been used to investigate anatomy education in medical schools from countries in specific geographic areas since 1965.
(Craig, et al., 2010; R. L. Drake, et al., 2002; Richard L. Drake, et al., 2009; Gartner, 2003; Heylings, 2002; Kramer, et al., 2008; Pryde & Black, 2005). Countries and regions, where such studies have been conducted include Africa, Australia and New Zealand, Scotland, the US, and the UK and Ireland. All these studies were interested in the actual collective practice of anatomy teaching in the participating departments rather than in the individual practice of every faculty member in those departments. Factual information such as teaching hours, staff and students’ numbers, types of curricula, teaching resources, and availability of medically qualified anatomists was gathered. These initial surveys were essential to assess the nature of anatomy education in medical schools of a specific region and to compare this with the situation in other regions. Similar follow up surveys after a few years monitored the changes in trends of anatomy teaching in that region and correlated this with other regions.

Beside its use by previous studies listed above, a survey questionnaire was chosen for this study for other additional reasons. Firstly, it is an efficient tool to gather basic factual information about anatomy education in anatomy departments at GCCMSs. Most of the research questions about the numbers of teaching hours, staff, and students, and the frequency of use of different teaching resources, and assessment tools are properly addressed by a quantitative research tool such as a questionnaire. Secondly, a questionnaire allows for exploration of the relationships between variables such as the country in which the medical school is located and the type of medical school whether public or private. Thirdly, questionnaire would provide general preliminary data about the topics that may be addressed later through qualitative methods. Fourthly, there are a total of 41 medical schools in GCC countries, which makes a posted or an electronically distributed questionnaire a more convenient option for reaching the maximum number of medical schools than preliminary face-to-face interviews.

In previous similar studies, one questionnaire was filled in by a faculty member in every department. This participant was usually the department’s HOD, course or program director, or a pre-identified individual active in anatomy teaching within the department. Course directors and department HODs are classified as analogous to organisational representatives in top management positions (Richard L. Drake, et al., 2009). The literature shows that surveys directed to these people generally have low response rates of around 35.7% compared with 52.7% when directed to other types of individuals (Baruch, 1999; Baruch & Holtom, 2008). The reasons for this low response rate to surveys at higher organisational levels included: being too busy, not considered relevant
to their needs, an address unavailable to return the questionnaire, and a company or the organisational policy not to complete questionnaires (Fenton-O’Creevy, 1996), while being too busy was by far the most common reason (28%).

5.3.1 Recruitment process

In this study, the first three reasons behind low response rate to surveys directed to high position managers were carefully addressed in order to maximise the response rate. Firstly, busy department HODs were given the option to nominate a senior faculty whom they thought was capable of providing the required information. Secondly, the questionnaire and the aims of the research were undoubtedly relevant to anatomy departments’ HODs in GCCMSs. Thirdly, the questionnaire was distributed electronically by E-mail and the participants were asked to E-mail the completed questionnaire back to the researcher’s E-mail address. E-mail was chosen as the distribution method because the literature indicates that it returns the highest response rate among other practically possible methods such as mail, and the web (Baruch & Holtom, 2008). To minimise non-responses, a recruitment advertisement letter (Appendix IV) was sent by E-mail to the Deans of all GCCMSs to alert them to the study and ask them to provide the contact details of their schools’ anatomy department HOD. The advertisement was accompanied by a document that explained the study rationale and background. The recruitment letter was welcomed and highly appreciated by some deans. For example, one of them replied:

“The subject matter of your thesis is very relevant to curriculum design and delivery for our Region, in the sense that with a mushrooming of medical schools (both public and private), and a plethora of technologies from plastinated models to virtual anatomy there is a danger of making seriously expensive educational blunders. There are already signs of that, with consequences for the skills and attitudes of graduates from the Region”.

Furthermore, anatomy department HODs from schools whose deans did not respond to the recruitment advertisement were sent a separate recruitment advertisement letter (Appendix V) to alert and pre-notify them about the questionnaire a few weeks before the questionnaire was sent. This was done in order to secure the maximum number of participating departments, as pre-notification has been suggested a strategies to improve the response rates (Rogelberg & Stanton, 2007).

The recruitment advertisement letters that were sent to the deans and the prior notification letters that were sent to the anatomy departments’ HODs were also
particularly useful for this study. One dean from the KSA replied to the E-mail by stating that his medical school was new and they have not started teaching anatomy yet. This letter alerted the researcher to the appropriateness of including such schools in the study. Further research discovered that all the newest medical schools in the region were located in the KSA, as the newest school outside the KSA was founded in 2006. Consequently, the Secretary-General of the Saudi Medical Deans Committee was contacted in order to consult with him about the current status of the newest Saudi schools in terms of their curricula. He confirmed that 14 medical schools were new and had not yet graduated any medical students. Seven of them had their first batch of students in the clinical phase of the curriculum and the other seven had their first batch of students still in the basic medical sciences (pre-clinical) phase.

Since anatomy teaching mainly occurs in the pre-clinical phase with other basic medical sciences in Saudi medical schools (Zaini, 2007), it was decided to exclude the seven schools that had not completed the basic medical sciences phase from the study. The decision was taken because those schools had not completed the anatomy curriculum for a single batch of students. In addition, they may not have had well established and finalised anatomy curricula, which may have distorted the findings of the study. Moreover, since medical schools in the other five GCC countries did have well established curricula and graduates, it was seen as better to exclude the Saudi schools that did not share the same characteristics.

Out of the 34 remaining medical schools, the researcher was able to obtain E-mail addresses of participants from 29 anatomy departments. Reminder letters were sent to the deans of the remaining four schools but no responses were received.

### 5.3.2 Questionnaire Design

Questionnaire design is a very critical step in questionnaire-based research as a badly designed questionnaire can affect participants’ interests in completing it, resulting in a low response rate. An extensive literature review was conducted in order to produce a questionnaire that addressed the research questions of the study in the light of current advances in medical education in general and anatomy teaching specifically. Similar studies conducted in other parts of the world were reviewed in order to include the aspects of anatomy education which are of global interest. Literature on anatomy education in GCCMSs was reviewed in order to address aspects of anatomy education which would be of specific interest to GCC anatomists and medical students, such as the
availability of cadavers. The experience of the researcher as an anatomy lecturer in a GCC medical school was also utilised during the questionnaire design process.

The questionnaire was divided into five parts; each one investigated one aspect of anatomy education in GCCMSs. Part A asked questions on general background information about the medical school and specific background information about the anatomy department. Part B asked questions on general information about the curriculum of the medical school and specific information about the anatomy curriculum that the department delivers. Part C asked questions on the teaching and assessment of the anatomy course. Part D asked questions about the practice of dissection and the use of cadavers in the department. Part E briefly asked questions on the presence of collaboration between GCC anatomy department and the factors influencing the extent of collaboration.

5.3.3 Pilot questionnaire

Once the final version of the questionnaire was developed the questionnaire was piloted. Ideally, a pilot questionnaire should have been sent to participants who were from the target respondent group (C. Dawson, 2009). However, the participation in this study was limited to the HODs of anatomy departments in GCCMSs. Based on the research design, it was decided not to include those participants in the piloting phase of the study because there was a concern that these respondents would not be willing to fill in the actual questionnaire again later, as they could be too busy. Instead, the pilot questionnaire was sent to six pre-identified academics from four anatomy departments in GCCMSs. They were chosen on the basis of the following characteristics:

1. Academic rank: the sample included two professors, two assistant professors, and two lecturers. This was important to include faculty at different academic levels. One of those participants holds a degree in medical education.

2. Nationality: the sample included three GCC citizens and three expatriates. This is important to include faculty whom their first language is Arabic.

3. From old and new medical schools: the sample included faculty from schools that were established in the 1970s, 1980s, and 2000s.

Participants were asked to fill in the questionnaire to the best of their knowledge and search for information when needed. They were specifically asked to provide feedback on the following points:
1. The length of the questionnaire and how long it took them to complete it.
2. Overall structure of the questionnaire and the flow of questions.
3. Clarity of wording of questions.
4. Any complex or ambiguous questions.
5. Any redundant or repeated questions.

Participants were also given enough space to write comments that may improve the questionnaire. Five of the distributed pilot questionnaires were returned. Some feedback from participants was received and considered and the questionnaire was amended accordingly. Particular comments made on the need for such a study of anatomy education in the region were noted.

5.3.4 Main questionnaire

The main questionnaire (Appendix I) was electronically mailed to the participants from 29 schools by the 1st of April 2012. Anonymity was assured when E-mailing the questionnaire by sending the E-mail message as a blinded carbon copy (Bcc) so the recipients did not know the E-mail address or the identity of the other recipients. The period of questionnaire distribution was carefully chosen. The month of April is in the middle of the second semester of the academic year in all GCCMSs. It is neither at the beginning of the semester, when faculty members are busy in the preparation for the semester ahead, nor at the end of the semester when faculty members are busy with exam preparation or with administrative wrap-up prior to the long summer break.

The questionnaire was sent in a modified user-friendly Microsoft word format. To facilitate quick response and to save participants’ time, it was designed to allow participants to tick boxes and fill in small spaces only. The questionnaire was protected in order to deny any further modifications by the participants, which may have changed the standard layout or distort it during completion. The questionnaire was also accompanied by the consent form (Appendix VIII). Participants were requested to download the questionnaire and the consent form, complete the questionnaire, electronically sign the consent form, and E-mail this back to the researcher.

After two weeks, eleven completed questionnaires were returned. A reminder letter was E-mailed to the non-respondents to request and encourage them to complete the questionnaire and return this electronically. After a further two weeks, four more completed questionnaires were returned, raising the total to 15. A second reminder letter
was also sent to the remaining non-respondents encouraging them to complete the questionnaire and explaining to them the importance of this study for medical schools of the GCC region. After two more weeks, five more completed questionnaires were returned raising the total number to 20. The researcher made phone calls to participants whose telephone numbers could be obtained. Some phone numbers were obtained from participants’ schools websites. The researcher also performed a wide online search for participants’ latest publications in the hope of finding their contact phone numbers in their correspondence details. It was later decided to extend the period of questionnaire return until the end of June 2012 and start data entry and analysis. However, no more completed questionnaires were returned. Ultimately, the final number of the returned questionnaires remained 20, giving a response rate was 69%.

5.3.5 Questionnaire data analysis

The data analysis of the returned questionnaires started by creating a codebook that included all the variables. The codes were entered into and analysed using the Statistical Package for Social Sciences (SPSS) program, version 20 (IMB Corporation, NY, USA). Due to the exploratory nature of the study in general, and the questionnaire in particular, descriptive analysis was primarily used. Data was presented as frequency and percentage distributions of variables and mean and median scores. However, inferential statistical analysis was also used to test for significant differences of certain variables between school types (public versus private), curriculum types (integrated versus sequential), and school operational age (old versus new). Due to the small sample size, non-parametric analysis techniques were used. The following techniques were used:

- Chi square test for independence to explore the relationship between two categorical variables.
- Mann-Whitney U test, the non-parametric equivalent of the Independent sample t-Test to test for differences between two independent groups on a continuous measure.
- Kruskal-Wallis test, the non-parametric equivalent of One Way Analysis of Variance (ANOVA) to compare the scores on continuous variables for three groups or more.
- Test Wilcoxon Signed Rank Test, non-parametric equivalent of Paired-sample t-Test to compare the scores of one group in two occasions or under two conditions.
Friedman Test, the non-parametric equivalent of One Way repeated Measure (ANOVA) to compare the scores of the group at three or more time points or at three different conditions.

The minimum level of significance that was applied throughout this study was 0.05.

5.4 Interviews

An interview is a well-known method for collecting qualitative data. It is in fact “the most prominent data collection for qualitative research” (Punch, 2009). It involves a two-way discussion between the interviewer and the interviewee. During the interview, the researcher gathers information about the interviewee’s experiences, knowledge, opinions, beliefs, and feelings. Moreover, that information can relate to the past, present time, and future predictions (Best & Kahn, 1998).

Interviews can serve researchers independently or in combination with other quantitative data collection methods. When used independently, Interviews can stand-alone as the single and principle means of gathering information. However, they can also be used as an exploratory tool to identify possible variables and relationships which can be further verified with a subsequent quantitative data collection method. Interviews can also be used to further expand on the findings that were reached by a preceding quantitative data collection method. Here, interviews can help the researcher to validate the method, follow unexpected results, or explain reasons for participants’ responses (Cohen, Manion, & Morrison, 2011).

5.4.1 Types of interviews

This study used interviews to expand and enrich the findings of the preceding questionnaire. It was also used to explain some of the interesting findings of that questionnaire.

Interviews have been categorised in the literature into many classifications according to criteria such as the number of interviewees involved at a time and the flexibility of the interview guide or structure (Newby, 2010). The main difference lies in the structure of the interview, relating to how much the interviewer deviates from pre-designed questions and asks additional probing questions. Accordingly, Dawson (2009) identified three types of interviews:
• **Structured interviews:** The interview is highly structured and standardised in the sense that the interviewer asks pre-determined questions and does not include any additional questions.

• **Unstructured in-depth interviews:** The interviewer conducts the interview without pre-determined questions except a few general questions that cover a few issues but in great detail and depth. Follow-up questions continue to unfold as the interview proceeds in response to the interviewee’s answers.

• **Semi-structured interviews:** This type of interview is midway between the extremes of the two previous types. The interviewer uses a flexible pre-determined interview guide that contains open-ended questions covering the topics and the issues of interest. However, the interviewer has the freedom to include additional questions that allow him/her to explore the interviewees’ responses in more detail.

In this study, the semi-structured interview was chosen to ensure that all the interviewees were asked the same set of general open ended questions, which covered the main topics of interest. However, at the same time the interviewees are given the flexibility to steer the discussion towards some points or issues that are of personal interest to them during the interview.

### 5.4.2 Schedule of semi-structured interviews

Every interview needs a schedule, which converts the research aims and objectives into clear questions. This schedule is usually a reflection of how structured the interview will be, ranging from a fixed list of pre-determined questions for structured interviews; to the general questions of the unstructured ones. While semi-structured interviews have a degree of flexibility, they should have a schedule to help the interviewer to obtain the information of interest. According to Cohen et al (2011), that schedule might include the topics to be discussed and the possible questions under each topic, the issues to be discussed under each topic and the possible questions under each issue. It may also include a series of prompts and probes to expand on each topic, issue and question. Prompts and probes help the interviewer to clarify questions to the interviewee and to help the interviewer to ask the interviewee to clarify or expand on his/her response, respectively.

The interview schedule for this study (Appendix II) was prepared after full analysis of the questionnaire data. This assisted in identifying aspects of anatomy teaching that
needed to be further expanded or explained qualitatively. The results, especially the main findings of the questionnaire (summarised in section 6.9) were used to inform and construct the interview schedule. Like the questionnaire, the interview schedule focused on the three themes or objectives of the study which were:

1. The curriculum: the interview schedule included questions aimed at obtaining qualitative information about the implementation of some aspects of the anatomy curriculum such as integration, teaching hours, assessment, and teaching methods. Moreover, the schedule included questions exploring the HODs evaluation of their schools’ anatomy curriculum and the points of strengths and weaknesses of the way they teach anatomy.

2. The practice of dissection: the interview schedule had questions to explain the rarity of cadavers and the rare use of dissection for anatomy teaching in GCCMSs as shown by the questionnaire results. There was a specific interest in knowing whether abandoning dissection was the choice of the schools or something that was imposed on them, and why?

3. Collaboration: although this theme was superficially explored quantitatively, the questionnaire results were interesting, especially the rarity of collaboration. The interview schedule aimed at obtaining additional qualitative data about the extent of collaboration among anatomists and anatomy departments of GCCMSs. Questions were designed to expand the knowledge on this issue and explain the quantitative data that yielded a very low level of collaboration.

The interview questions were also piloted with two academic staff members from an anatomy department in one GCC medical school. Those pilot interviews were useful in testing the clarity and sequence of the questions and the time needed to cover them. The interviewees gave feedback for further improvement.

5.4.3 Recording interviews

Interview data needs to be recorded in order to be used for analysis later. This can be done by many means including note-taking, tape recording, and video recording (Punch, 2009). Each method has its own advantages and disadvantages. Tape recording has been called as the preferred method for recording interviews (Best & Kahn, 1998). It has the advantage of yielding a comprehensive record of the interview including the interaction between the interviewer and the interviewee. Moreover, it gives the interviewer the time to concentrate on listening to what is said and at the same time maintain eye contact.
with the interviewee. On the other hand, the interviewer may risk losing the recording if the equipment fails, and some interviewees may not speak freely when the conversation is recorded (C. Dawson, 2009).

In the end, the selection of the recording method needs to be addressed and planned in advance, after considering all the circumstances such as practical constraints, interviewer’s adaptation to the method, and interviewee’s cooperation and approval (Punch, 2009). The researchers used the Voice Memos application on his smart phone (iphone) devise to record all interviews.

5.4.4 Selecting interviewees

Sampling, that is, selection of interviewees, is an important issue for interviews. Two main points are important in this regard: the characteristics of the interviewees and their number. Cohen et al (2011) argue that there is no straightforward rule to reach a decision, but advises interviewing as many people as required to get the needed information and fulfil the objectives of the research. The purpose of the interview can give some clues. For example, a researcher who is interested in gathering in-depth individual data would require fewer interviews than the one interested in gaining a range of responses. Moreover, the golden rule is to select the right group of interviewees who will be able to provide the information that the interviewer seeks.

For this particular study, the process of selecting interviewees started early with the distribution of the survey. Every questionnaire included in the last page a question to ask the participant if he/she was interested in participating in the second phase of the study, a face-to-face interview. All of the twenty returned questionnaires provided positive responses to this question. It was decided to interview them all if possible, but there was a greater emphasis placed on interviewing the HODs whose departments exhibited unique characteristics. For example, the departments that used dissection as a primary anatomy teaching tool and the departments that never used dissection; the departments that had collaboration with other departments and the departments that did not have collaboration; the departments that used didactic teaching and the departments that depended on PBL.

Six months after distribution of the survey questionnaire, all twenty participants were contacted though E-mail (Appendix VI) to confirm their availability for interview and to fix a time for it. After two weeks, eight HODs confirmed their interest and
availability to participate in the interview. An E-mail reminder was sent to the rest of
the HODs requesting them to confirm their interest and availability. After one more
month, six more HODs responded and confirmed their interest and availability. The
door for receiving more confirmations from each GCC country was left open until it
was actually visited. Despite that, no more confirmations were received.

All the fourteen HODs willing to be interviewed were contacted through E-mails and/or
phone calls to arrange for the most convenient time for them to be interviewed, but only
eleven HODs responded to those E-mails and/or phone calls. Finally, it was possible to
interview those eleven HODs. HODs were notified that the interview would take about
one hour but, they were requested to recommend a day where they had two consecutive
hours of teaching-free time. Extensive correspondence was made to ensure that HODs
from each city were interviewed in the same week.

5.4.5 Conducting the interviews

Two days prior to the pre-arranged interview day, each interviewee was contacted
though E-mail or phone call to remind him/her about the interview and to fix the most
convenient time and place for him/her. All except one of the interviewees chose to be
interviewed in their school campuses offices. The single exception preferred to be
interviewed in the library of another medical school, where he was attending a
workshop. The researcher paid special attention to arriving on time and sometimes
ahead of schedule to locate the interviewees’ office rooms in advance.

Before the interview, the researcher started the conversation by thanking the
interviewees for accepting the first invitation to participate in the survey questionnaire
and the second invitation to participate in the interview. The researcher also reminded
every interviewee about the aims and the significance of the study and about its
importance in evaluating the current status and the future prospects for anatomy
education in GCCMSs. They were asked to provide information about anatomy
teaching in their departments and personal opinions that reflect their departments’
formal position. The interviewees were also provided with the consent form for this
phase of the study and given the time to read and sign it

The Arabic speaking interviewees were allowed to choose Arabic or English as the
language in which the interview was to be conducted. It was made clear to them that the
researcher had no preference as he could equally conduct the interview in either
language. They all chose English because they felt more comfortable with it, especially in relation to the technical and anatomical terminology.

All interviews were conducted by the researcher during the period from November 2012 to March 2013, interrupted by the mid-year break in January 2013. The average interview time was 90 minutes, ranging from 70 minutes to two hours. All interviews were tape-recorded following the interviewees’ consent. This allowed the researcher to focus on the discussion and maintain eye contact with the interviewees. All interviews were later transcribed verbatim by the researcher using Express Scribe Pro software (NCH Softwares, Inc., CO, USA).

5.4.6 Interview analysis

Qualitative data analysis, including interview analysis, is the process through which the researcher transfers raw data into publishable evidence-based interpretations. It generally involves preparing the data for analysis, developing themes and sub-themes through the process of coding, and finally presenting the emerging themes. There are many methods that researchers can choose for analysing qualitative data. Thematic analysis remains the most commonly used method in this regard, however, because it is believed to be the most useful in capturing the complexities of meanings embedded in texts (Guest, MacQueen, & Namey, 2012). Moreover, thematic analysis allows a great level of flexibility, which makes it useful in providing rich, detailed, and complex account of data.

Braun and Clarke (2006) pointed to a number of important decisions that need to be taken when doing thematic analysis. The first one is whether the analysis intends to give a rich description of the whole data set or to give a detailed account of one particular aspect of the data. This study used the first option as Braun and Clarke believed that it is particularly useful when investigating an under-researched topic as in this study. The second decision is whether to use inductive thematic analysis, which is based on the data without a pre-existing coding frame, or to use a theoretical thematic analysis, which is based on researchers’ theoretical or analytical interest in the area. This study used the second option because the interviews were used to expand on and explain some of the findings of the preceding questionnaire (Braun & Clarke, 2006).

The researcher followed the six stages of the thematic analysis method which are: (1) familiarisation with data through listening to the recording, transcribing, reading, and
noting interesting ideas, (2) generation of initial codes from the entire data set and pooling data relevant to each code, (3) finding themes through pooling codes into potential themes, (4) reviewing themes through checking if the themes work in relation to the codes and the entire data set, (5) defining and labelling themes through refining the specifics of the themes and overall story told by the analysis, and (6) writing up the findings that are supported by example extracts from the data set (Braun & Clarke, 2006).

The Nvivo program (QRS International, MA, USA) was used for analysis. Transcripts of interviews were uploaded into the program. Then a set of initial theoretical themes was created and each theme became a node. All the transcripts were then coded and every code was put under the appropriate theme (see Appendix XI for examples of codes and generation of themes). Moreover, additional themes and sub-themes were identified as the coding process continued and new nodes were created for them. After going through the whole data set, a final set of themes was reached and each theme included coded data from all the transcripts that contain the appropriate data.

5.5 Focus groups

This study used Focus Groups (FGs) as a second data collection method for the qualitative phase. Staff members from anatomy departments in three GCCMSs were involved in this part of the study. The main purpose was to ensure triangulation by including a new data collection tool to collect data from a different group of participants.

5.5.1 The use of focus groups

A focus group is “a type of group interview in which a moderator leads a discussion with a small group of individuals to examine in depth how the group members think and feel about a topic” (b. Johnson & Christensen, 2008). FGs rely on the interaction between the participants to get a collective group view rather than individual views (Cohen, et al., 2011). (Krueger, 1988) argued that the purpose of the FG is to explore the participants’ views and beliefs on an action or topic rather than to produce consensus, to arrive to an agreeable plan, or to make decisions.

FGs can be independently used as a stand-alone data collection method to gather general information about a topic. However, they are also used to complement other data collection methods such as interviews and surveys for the purpose of triangulation.
(Cohen, et al., 2011). For example, they can be used to generate hypotheses, which can be tested later with a quantitative approach, or can be used to interpret earlier quantitative results (b. Johnson & Christensen, 2008).

FGs have the advantage, over individual interviews, of providing qualitative data over a short period of time at a reduced cost. However, the gathered data is not as deep and rich as the data that can be obtained if all the FG participants were to be individually interviewed (Cohen, et al., 2011).

5.5.2 The role of moderator

The moderator of the FG differs from the interviewer in an interview in the sense that he/she does not get involved in the conversation with the participants but just acts as a facilitator to keep the participants’ discussion focused on the point of interest. Therefore, he/she is required to possess some personal skills that allow him/her to properly facilitate the discussion. He/she specifically should know how to get all participants involved in the discussion, contain dominating participants, resolve conflicts and strong arguments, and know when to smoothly move from one topic to another.

5.5.3 The number and the size of focus groups

To ensure the success of FG studies, attention should be paid to some points, mainly the number of FGs, the size of each group, and characteristics of the participants. Cohen et al (2011) warned of relying on a single FG in one study because it would be hard to tell whether the outcome is representative or it is just due to the behaviour of that specific single group. Moreover, Johnson and Christensen (2008) pointed to the “quite common” practice of using two to four FGs in a single study. Literature has shown that the size of a FG can be from as low as four to as high as twelve participants (Cohen, et al., 2011; b. Johnson & Christensen, 2008).

5.5.4 Questions in focus groups

The FG moderator uses an interview guide which contains up to ten open-ended questions. He/she is required to cover the questions within the available time. Those questions are given to the participants in a specific order to maintain flow of the discussion. Johnson and Christensen (2008) suggested that the more general questions are asked early in the discussion and the more specific ones are kept to be asked later.
5.5.5 The participants

Two points should be considered regarding the characteristics of the participants. Firstly and most importantly, they should have knowledge and information about the topic of discussion. That is, to select participants who are directly related to the selected topic which is relevant to their everyday lives (Merriam, 2009). Secondly, the participants should be relatively homogeneous. It is believed that homogeneity enriches the discussion and reduces the possibility of conflicts and strong arguments (b. Johnson & Christensen, 2008). Special attention is paid to eliminating participants who have authoritative or administrative power over other participants to ensure they talk freely without any inhibitions.

For this study, the participants were the staff members in anatomy departments at GCCMSs who were involved in teaching gross anatomy to undergraduate medical students. It was decided to conduct four FGs with staff members in four departments, according to the commonly used range of two to four FGs based on the literature. Each department’s staff members had their own FG. The participating departments were purposely selected according to the following criteria:

- The departments must have at least four staff members in order to comply with the accepted size of the FG in the literature.
- The department should have a combination of local and expatriate staff members in order to represent the views of both groups of staff members. Including local anatomists was necessary as all the previously interviewed HODs were expatriates.
- The anatomy curriculum taught by the department is an integrated curriculum that used PBL and didactic teaching. This represents the typical anatomy curriculum in GCCMSs, depending on the questionnaire and HODs interview findings.
- The departments must be those that were included in the HODs interviews because these were the more likely HODs to approve the research, and would agree for their departments’ staff members to participate in FGs. The researcher could obtain verbal approvals from the potential HODs of the departments that fulfilled the first two criteria, on the day when he interviewed them.
5.5.6 Conducting the focus groups

According to the previous verbal approval, the researcher contacted the HODs of potential departments through E-mails and phone calls to confirm their approval, the availability of staff members, and to fix a time for the FG. Three HODs from three different GCC countries responded to the request. No further requests or reminders were sent to the non-respondent HODs due to the adequate number of departments.

The HODs were requested to recommend a day when all their staff members did not have teaching duties for at least two consecutive hours. They were also requested to provide the contact details and phone numbers of their staff members so that the researcher would contact them individually to confirm their interest and availability for participation and also to provide them with a recruitment letter (Appendix VII) containing information about the purpose and significance of the study in general and the FGs in particular. The HODs later showed interest and enthusiasm to act as liaison between the researcher and their staff members to find the appropriate time and venue for the FGs.

The FGs were conducted in June and July 2013. The HODs and participating staff members were reminded about the FGs two days before the pre-defined date of the FG. The HODs were also notified that the FGs were only for the staff members and the HODs were not required to participate. The researcher provided the HODs with the justification for this requirement, which was to allow the staff members to speak freely. They all agreed. Being aware that the FGs were conducted in rooms the researcher had not seen before, he made sure that he reached the department at least 30 minutes before the FGs were due to start in order to arrange the seating. Every participant was assigned a seat and provided with copies of the demographic data survey (Appendix IX), the consent form, and study background. All the FGs were conducted in the seminar rooms of the respective anatomy departments.

Before starting the discussion, the researcher thanked the participants for accepting the invitation to participate in the study and for finding the time to attend. He also explained to them the ground rules for conducting FGs. All FGs were conducted in English. Two of them had a mixture of Arabic and English speaking participants. The third one had only Arab participants. The researcher gave them the choice to have the discussion in Arabic or English. They all chose English for the same reasons as those of HOD interviews. The three FGs took 64, 76, and 81 minutes. The discussions were tape-
recorded after obtaining consent from the participants. Afterwards, the recorded data was transcribed and analysed in a manner similar to that described in relation to the HODs interviews.

5.6 Research standards

5.6.1 Questionnaire validity and reliability

In quantitative research, the criteria of validity and reliability are regarded as the main criteria for evaluating the research process and conclusions. Validity of a questionnaire refers to “whether or not it is measuring what we want it to measure” (Brace, 2008). Therefore, it is important that the validity of a questionnaire is considered during early stages of quantitative research. The validity of the survey questionnaire used by this study was ensured through taking the following measures:

1. Constructing the questionnaire items by combining inputs from the existing literature on anatomy teaching in general and on anatomy teaching in GCCMSs in addition to the researcher’s experience as an anatomy teacher in one GCCMS for around ten years.
2. Enhancing the comprehensiveness of the questionnaire in order to collect all the information needed to achieve the goals of the study, especially considering the exploratory nature of the study.
3. Targeting the most appropriate participants (HODs) who have the best knowledge of anatomy teaching in their medical schools.
4. Piloting the survey questionnaire before distributing it to the participants and using the feedback for improving the questionnaire.

Reliability is another concept used when validating quantitative data, which simply is a reflection of the consistency. It “means that received from participants are consistent and stable over time” (Creswell & Plano Clark, 2011). While the reliability of an established questionnaire can be determined from its past reliability score, the reliability of new questionnaires can be estimated by two ways; comparing test-retest results or statistically calculating its internal consistency. This study used the second method due to the impracticality of retesting the questionnaire with same participants. Internal consistency can be estimated using the Cronbach's alpha coefficient, which should have a value of 0.7 or above (Pallant, 2013). The calculated Cronbach's alpha coefficient of the scales on the questionnaire used by this study varied ranged from 0.4 to 0.9. The
scales that had the lowest Cronbach's alpha coefficient were the ones that contain less than 10 items, which are expected to have lower Cronbach's alpha coefficient due to the sensitivity of this indicator to the number of items in each scale. All in all, most of the questionnaire scales showed high internal consistency, which reflects high validity. This high reliability also adds to the validity of the questionnaire as (Lincoln & Guba, 1985) argued that a measure cannot be regarded valid if it is unreliable in the first place.

5.6.2 Trustworthiness of qualitative data

When talking about qualitative research, the concepts of reliability and validity are not as straightforwardly applicable as in quantitative research. Literature in fact shows some sort of a debate over the application of these terms in the context of qualitative research. On the one hand, some scholars, such as (Stenbacka, 2001) argue that reliability and validity have no relevance to qualitative research because they simply deal with measurements. Therefore, they can be misleading, and therefore their use in judging the quality of qualitative research process is unfair. On the other hand, others suggest that qualitative researchers should pay equal attention to reliability and validity as check points for the quality of their research process (Patton, 2002). A third group of scholars suggested that a new set of criteria can be applied to qualitative research. In this regard, Lincoln and Guba (1985) introduced the concept of trustworthiness, which includes four criteria to judge the quality of qualitative research. Trustworthiness has criteria;

1. Credibility: refers to the internal consistency, which ensures the truth of the research process and findings
2. Transferability: refers to the extent to which the research findings are applicable to other similar situations
3. Dependability: refers to the extent to which the way the research process is repeatable across time, researchers, and analysis techniques.
4. Conformability: refers to the extent to which the research findings are based on the data rather than the researcher’s preconceptions or biases.

The trustworthiness of the qualitative phases of this study was considered from the early stages of the research process. It started with developing familiarity with research topic by conducting an extensive literature review on anatomy teaching in general and anatomy teaching in GCCMSs in particular. The literature review in conjunction with the researcher’s experience in anatomy teaching in the GCC region enhanced the familiarity with the aspects of the region’s culture that may have an influence on
anatomy teaching. The literature review also gives the thesis readers background information necessary for establishing understanding of the topic of the study and the context in which it is conducted.

With regards to the methodology, the study used the well-recognized research methods of semi-structured interviews and focus groups. Moreover, the qualitative phase of the study used two levels of triangulation; the use of two research methods which were the semi-structured interviews and focus groups, and the use of two groups of participants, who were the HODs and staff members. Triangulation is believed to have reduced the investigator bias and provided a thick description of the study topic. In addition, the thesis includes a detailed methodological description in the hope of enhancing the repeatability and of the research process and scrutiny of the research findings.

The honesty of the participants is central to the trustworthiness of qualitative research. Therefore, it was maximised by taking measures such as assuring them of the anonymity and confidentiality of their participation and avoiding the participation of the HODs in the FGs so the staff members could speak freely. Finally, the limitations of the study were acknowledged in the last chapter of the thesis.
Chapter six: Findings of the survey questionnaire

6.1 Introduction

In this chapter, the results of the survey questionnaire will be presented in the same order as in the questionnaire. The main aim of the questionnaire was to provide, for the first time, an understanding of the current state of anatomy education in medical schools of the GCC countries.

As indicated previously in the methods chapter, 34 established medical schools were included in the study. It was possible to get the E-mail contacts of the anatomy HODs of 29 schools. The questionnaire was E-mailed to the 29 participants. A total of 20 questionnaires were completed and returned, giving a response rate of 69%.

6.2 Representativeness of respondents

The response rate is an important factor that determines whether the respondents are representative of the total population. However, in this study there are some other characteristics of the respondent medical schools that need to be looked at carefully in order to evaluate representativeness. These are as follows:

- The country of the medical school
- The type of medical school (public versus private)
- The operational age of the medical school

6.2.1 Country of the medical school

Table 6.1 presents the numbers of medical schools in each GCC country and the numbers of respondent schools from each country.
Table 6.1: The distribution of medical schools across GCC countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total medical schools</th>
<th>Respondent medical schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSA</td>
<td>29 (70%)</td>
<td>12 (60%)</td>
</tr>
<tr>
<td>UAE</td>
<td>5 (12.5%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>Bahrain</td>
<td>3 (7.3%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Oman</td>
<td>2 (5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Kuwait</td>
<td>1 (2.5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Qatar</td>
<td>1 (2.5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Total</td>
<td>41 (100%)</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>

The KSA has by far the majority of medical schools in the GCC region with 70% (n=28) of the school, followed by the UAE 12.5% (n=5), Bahrain 7.5% (n=3), Oman 5% (n=2), Kuwait 2.5% (n=1), and Qatar 2.5% (n=1) respectively. Likewise, the majority of the respondent medical schools are from the KSA 60% (n=12), followed by the UAE 15% (n=2), Bahrain 10% (n=2), Oman, Kuwait, and Qatar 5% each (n=1). It is clear that the distribution of total and respondent medical schools follow a similar pattern according to the country of origin. That is, medical schools in all GCC countries are found to be proportionately represented in the sample of respondent medical schools.

6.2.2 Type of medical schools

Table 6.2 illustrates the distribution of total and respondent medical schools in GCC countries according to the type of schools, whether public or private.

Table 6.2: The distribution of GCC medical schools according to the type (public & private).

<table>
<thead>
<tr>
<th>Type of medical school</th>
<th>Total medical schools</th>
<th>Respondent medical schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>28 (68%)</td>
<td>14 (70%)</td>
</tr>
<tr>
<td>Private</td>
<td>13 (32%)</td>
<td>6 (30%)</td>
</tr>
<tr>
<td>Total</td>
<td>41 (100%)</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>

Out of the 41 medical schools in GCC countries, 68% (n=27) are public and 32% (n=13) are private. More or less likewise, out of the 20 respondent medical schools, 70% (n=14) are public and 30% (n=6) are private. By comparing the two types of
medical schools, it is found that the distribution follows a similar pattern in the population of medical schools in the GCC region and in the sample.

### 6.2.3 Year of foundation

Table 6.3 depicts the distribution of total medical schools in GCC countries and the respondent schools to the questionnaire according to the year of foundation.

Table 6.3: The distribution of GCC medical schools according to the foundation year.

<table>
<thead>
<tr>
<th>Year of foundation</th>
<th>Total medical schools</th>
<th>Respondent medical schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1969</td>
<td>1 (2.5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>1970-1979</td>
<td>3 (7%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>1980-1989</td>
<td>5 (12.5%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>1990-1999</td>
<td>4 (10%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>2000-2009</td>
<td>28 (68%)</td>
<td>13 (65%)</td>
</tr>
<tr>
<td>Total</td>
<td>41 (100%)</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>

The table shows that the medical schools founded in the last five decades are proportionally represented in the sample of respondent medical schools. For the sake of simplicity in the later parts of this chapter, the schools that were founded before the year 2000 will be referred to as “old schools” and the schools that were founded after the year 2000 will be referred to as “new schools”.

In summary, the sample of the respondent medical schools is found to be representative of the total population of medical schools in GCC countries in terms of the country of origin, type of medical school, and the operational age of the medical school.

### 6.3 Background information

#### 6.3.1 Type of department

Participants were asked about the administrative nature of their anatomy department whether it is a stand-alone independent anatomy department or a section of an integrated basic medical sciences department. Analysis showed that the majority (75%, n=15) of anatomy departments in GCCMSs are independent and only 25% (n=5) are part of an integrated basic sciences departments. Knowing the administrative type of the department is important for understanding the context in which the subsequent
questions regarding the authority that anatomists have over the delivery of anatomy teaching such as the content, amount, and integration of anatomy with other basic and clinical medical sciences. The finding that the majority of anatomy departments were independent administrative units raise questions about the level of the integration of anatomy with other basic sciences disciplines and the authority that anatomists have over the delivery of the anatomy curriculum. This issue will be further explored later in this chapter.

6.3.2 Programs taught besides medicine

This question was included in order to know the range of undergraduate academic programs that anatomy departments in GCCMSs are involved in. In other words, the study was interested in knowing if those departments exist to serve medical students only or are there other students of other courses who receive anatomy teaching. Analysis showed that the majority (70%, n=14) of the departments teach other students besides medical students. The other 30% (n=6) of the departments were founded solely to teach medical students.

Table 6.4: Programs other than medicine taught by anatomy departments in GCC medical schools.

<table>
<thead>
<tr>
<th>The program</th>
<th>Departments teaching it Number (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentistry</td>
<td>8 (57.1%)</td>
</tr>
<tr>
<td>Nursing</td>
<td>7 (50%)</td>
</tr>
<tr>
<td>Medical laboratory sciences</td>
<td>6 (42.9%)</td>
</tr>
<tr>
<td>Physiotherapy</td>
<td>5 (35.7%)</td>
</tr>
<tr>
<td>Others</td>
<td>9 (64.3%)</td>
</tr>
</tbody>
</table>

It is apparent that anatomy departments in GCCMSs are not restricted to teaching medical students only but the majority of them also serve a wide range of program. All of those programs are related to medicine. This may indicate that anatomy is taught in GCC countries for the study of medicine and its allied sciences only, as no department reported any programs outside this category.
6.3.3 Annual student intake

Table 6.5: The annual student intake number

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sum</th>
<th>Mean±SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual students intake number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>350</td>
<td>2630</td>
<td>138.4±77.3</td>
<td>130.0</td>
</tr>
</tbody>
</table>

Table 6.5 illustrates the details of the annual medical student intake number from 19 GCCCMSs which responded to this particular question. It shows that the gross number of student intake is 2630 students, ranging from 30 students per year in small schools to 350 students per year in larger schools. The average student intake number was 138.4±77.3 (Median= 130.0) per year. Mann-Whitney U test revealed no statistical differences in student intake numbers between old (median= 150.0) and new (median= 130.0) schools (p=0.11), or between public (median= 160.0) and private (median= 60.0) schools (p=0.08).

6.3.4 Faculty demographic data

The study aimed also to provide demographic data about the teaching faculty in anatomy departments of GCCCMSs. It was particularly interested in the following questions:

1. What is the actual number of anatomists in GCCCMSs?
2. What is the proportion of GCC citizen anatomists?
3. What is the proportion of medically qualified anatomists?

Table 6.6: The employment status of the anatomy teaching staff

<table>
<thead>
<tr>
<th>Employment status</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sum (% of total)</th>
<th>Mean± SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time staff</td>
<td>2</td>
<td>30</td>
<td>205 (94.5%)</td>
<td>10.2±8.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Part-time staff</td>
<td>0</td>
<td>10</td>
<td>12 (5.5%)</td>
<td>0.6±0.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Total staff</td>
<td>3</td>
<td>30</td>
<td>217 (100%)</td>
<td>10.8±7.9</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Table 6.6 illustrates the details of anatomists in GCCCMSs. While all the medical schools have full-time faculty, there are only two medical schools that have part-time anatomy teaching staff. The total number of anatomy teachers in the 20 participating GCCCMSs is 217 (mean= 10.8±7.9, median= 9). The vast majority (94.5%, n=205) of staff are
employed full-time. There is a 15-fold difference between the minimum number (n=2) and the maximum number (n=30) of full-time faculty per medical school. However, the particular medical school that has the lowest number of full-time anatomy faculty happened to be one of the two medical schools that employ part-time teaching staff. That particular school employs two clinical staff from an affiliated hospital. Moreover, the other school that has part-time anatomy teaching staff was found to have the second lowest number of full-time anatomy faculty (n=3). This particular school employs three clinical staff from affiliated hospitals and 7 postgraduate students.

In general, the number of full-time faculty depends on the size of the medical school. The annual student intake is one of the indicators of schools’ size. A Spearman’s rho correlation analysis revealed that there was a significant positive correlation ($r=0.66$, $p=0.002$) between the annual student intake and the number of full-time anatomy faculty. The coupling of the numbers of students and staff will be addressed later when presenting the data of the student :staff ration.

Table 6.7 illustrates the distribution of full-time anatomy faculty in GCCMSs according to the academic rank. It also shows the proportions of GCC citizen and expatriate anatomists in teaching anatomy in those schools. The table includes the sum, percentage, mean ±SD, and median for GCC citizens, expatriates, and all staff at each academic rank.
Table 6.7: The distribution of full-time staff according to academic rank.

<table>
<thead>
<tr>
<th>Academic rank</th>
<th>GCC citizens</th>
<th></th>
<th>Expatriates</th>
<th></th>
<th>All staff</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sum (% of rank)</td>
<td>Mean ± SD</td>
<td>Median</td>
<td>Sum (% of rank)</td>
<td>Mean ± SD</td>
<td>Median</td>
</tr>
<tr>
<td>Professor</td>
<td>6 (14%)</td>
<td>0.30 ± 0.80</td>
<td>0.0</td>
<td>37 (86%)</td>
<td>1.85 ± 1.90</td>
<td>1.0</td>
</tr>
<tr>
<td>Associate professor</td>
<td>4 (9%)</td>
<td>0.20 ± 0.62</td>
<td>0.0</td>
<td>41 (91%)</td>
<td>2.05 ± 2.18</td>
<td>1.0</td>
</tr>
<tr>
<td>Assistant professor</td>
<td>8 (14.8%)</td>
<td>0.40 ± 0.68</td>
<td>0.0</td>
<td>46 (85.2%)</td>
<td>2.30 ± 2.00</td>
<td>2.0</td>
</tr>
<tr>
<td>Lecturer</td>
<td>10 (34.5%)</td>
<td>0.50 ± 1.40</td>
<td>0.0</td>
<td>19 (65.5%)</td>
<td>0.95 ± 1.57</td>
<td>0.0</td>
</tr>
<tr>
<td>Demonstrator (fresh BSc graduate)</td>
<td>14 (42.4%)</td>
<td>0.70 ± 1.22</td>
<td>0.0</td>
<td>19 (57.6%)</td>
<td>0.95 ± 2.78</td>
<td>0.0</td>
</tr>
<tr>
<td>Clinical specialist</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0.0</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>43 (21%)</td>
<td>2.15 ± 3.13</td>
<td>1.0</td>
<td>162 (79%)</td>
<td>8.10 ± 6.28</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Analysis revealed that there are 205 full-time anatomy academics in the 20 medical schools. The majority (69.3%, n=142) of the anatomy faculty occupy the highest 3 ranks with 21% (n=43) professors, 22% (n=45) associate professors, and 26.3% (n=54) assistant professors. The remaining 30.7% (n=58) occupy the lowest three ranks with 14.1% (n=29) lecturers, 16.1% (n=33) demonstrators, and 0.5% (n=1) clinical specialist (Figure 6.1).

The vast majority (79%, n=161, median= 5.0) of faculty are expatriates. A Wilcoxon Signed Rank Test revealed a statistically significant difference between the total number of expatriate and GCC citizen anatomy faculty, $z = -3.38$, $p = 0.001$. The distribution of GCC citizens and expatriate anatomists is further illustrated in Figure 6.1.
From Table 6.8 and Figure 6.1, it is clear that GCC citizen anatomists constitute lower percentages and expatriate anatomists constitute the higher percentages in all the academic ranks. Wilcoxon Signed Rank Tests revealed significantly higher numbers of expatriate professors, associate professors, and assistant professors (p <0.05). There were also higher numbers of expatriate lecturers and demonstrators but the difference was not statistically significant (p > 0.05).

However, it is worth noting, as illustrated in Figure 6.2, that there is an increasing contribution from local GCC anatomists as we go down the hierarchy of the academic positions. The academic position that has the lowest percentage of GCC anatomists is the position of associate professor (9%), followed by the positions of professor (14%) and assistant professor (14.8%).
Moreover, it is also worth noting that the academic position that has the highest percentage of GCC anatomists is the junior position of demonstrator (42.4%), followed by the position of lecturer (34.4%). This reflects an increase in the numbers of GCC graduates to pursue an academic career in anatomy teaching.

Another point of interest in relation to the demographics of anatomy faculty is the availability of medically qualified anatomists.

Table 6.8: The availability of medically-qualified staff.

<table>
<thead>
<tr>
<th></th>
<th>GCC citizens</th>
<th>Expatriates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (%)</td>
<td>Number (%)</td>
<td>Number (%)</td>
</tr>
<tr>
<td></td>
<td>median</td>
<td>median</td>
<td>median</td>
</tr>
<tr>
<td>Medically qualified</td>
<td>29 (67.4%)</td>
<td>134 (82.7%)</td>
<td>163 (81.5%)</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>5.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Non-medically qualified</td>
<td>14 (32.6%)</td>
<td>28 (17.3%)</td>
<td>42 (18.5%)</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total (100%)</td>
<td>43 (100%)</td>
<td>162 (100%)</td>
<td>205(100%)</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>5.0</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Table 6.8 shows that the majority 81.5% (n=163) of anatomy faculty in GCCMSs are medically qualified. This applies to both local and expatriates, as 67.4% (n=29) of locals and 82.7% (n=134) of expatriates are medically qualified. A Wilcoxon Signed Rank Test revealed that the numbers of total medically qualified academics (median = 6.0) was significantly higher than the number of total non-medically qualified academic (median = 0.0), (p= 0.001). This reflects a preference of GCCMSs towards recruiting...
local and expatriate medically qualified anatomists. However, Wilcoxon Signed Rank Tests revealed that the difference between expatriate medically qualified and non-medically qualified anatomists was significant ($p=0.001$) but the difference between GCC citizen medically qualified and non-medically qualified anatomists was not significant ($p=0.17$).

### 6.3.5 Student: staff ratio

Since anatomy is mainly a laboratory medical science, students’ learning largely depends on the number of teaching staff available during laboratory sessions.

Table 6.9: Student: staff ratio in gross anatomy laboratory sessions

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean± SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of staff</td>
<td>1</td>
<td>12</td>
<td>3.05±2.50</td>
<td>2</td>
</tr>
<tr>
<td>Number of students</td>
<td>15</td>
<td>120</td>
<td>53.58±27.77</td>
<td>50</td>
</tr>
<tr>
<td>Student/staff ratio</td>
<td>10</td>
<td>50</td>
<td>21.73±13.02</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 6.9 shows that the number of students in gross anatomy laboratory sessions ranges from 15 to 120 with an average of 53.58±27.77 and a median of 50. Likewise, the number of staff ranges from 1 to 12 with an average of 3.05±2.50 and a median of 2. Overall, the average student/staff ratio in gross anatomy laboratory sessions is 21.73±13.02 and ranging from 10 to 50. The median student: staff ratio is 15. Interestingly, the school that has the highest number of students in sessions (n=120) also has the highest number of tutors (n=12), and the schools that has the lowest number of students (n=15) shares the lowest number of tutors (n=1). A Spearman’s rho analysis also revealed a significant positive correlation ($r=0.54, p=0.019$) between the number of students and the number of staff across the schools.

Further inferential analysis showed that there is a difference between groups of medical schools in terms of student: staff ratio. Mann-Whitney U Test revealed that private schools (n=6) have a statistically significant lower median student: staff ration of 13.4 compared to 17.0, the median student: staff ratio of public schools (n=13) ($p=0.042$). Old schools (n=7) also tended to have lower median student: staff ratios, 15 on average compared to 18.5 in the 12 newer schools. However, the difference was not statistically significant ($p=0.134$).

Since 83.3% (n=5/6) of private medical schools are actually new, it would be more appropriate to restrict the inferential statistics for differences between private and public
schools to new medical schools only. Consequently, Man Whitney U test revealed that the seven public schools had a higher median student: staff ratio, a median of 30, compared to 14 in the five private schools founded in the same period \((p=0.023)\). Moreover, newer public medical schools had a higher median student: staff ratio \((\text{median}= 30)\) than older public medical school \((n=6)\) \((\text{median}= 15)\) \((p=0.024)\). This indicated that the increase (by 207.7\%) in the number of medical schools during the first decade of the 21st century from 13 to 41 was not accompanied by an increase in the number of full-time anatomy faculty. The deficit was more obvious in public schools.

### 6.3.6 Characteristics of medical curricula

This section presents brief background information about the medical curricula in GCCMSs and detailed information about the anatomy curricula in particular. It aims at providing answers for the following questions:

1. When is anatomy taught?
2. What are the characteristics of anatomy curricula?
3. How much authority do anatomy departments have over the delivery of anatomy teaching?
4. What was the impact of recent curriculum changes, if any, on the delivery of anatomy teaching?

#### 6.3.6.1 Length of medical curriculum

Table 6.10: The length of medical curricula in GCC medical schools

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean± SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of curriculum (years)</td>
<td>4</td>
<td>7</td>
<td>5.8±0.6</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Table 6.10 illustrates the details of length of medical curricula in the 18 GCCMSs, which responded to this question. The mean length is 5.78±0.65 years, ranging from 4 to 7 years. The median was 6.0 years. More details about the distribution of medical curricula lengths are depicted further in Table 6.11.
Table 6.11: Length of medical curricula in GCC medical schools

<table>
<thead>
<tr>
<th>Curriculum length</th>
<th>Number of schools</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td>1</td>
<td>5.6</td>
</tr>
<tr>
<td>5 years</td>
<td>3</td>
<td>16.7</td>
</tr>
<tr>
<td>6 years</td>
<td>13</td>
<td>72.2</td>
</tr>
<tr>
<td>7 years</td>
<td>1</td>
<td>5.6</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The majority (72.2%, n=13) of the schools have a 6 year curriculum. There are 3 schools (16.7%) with a 5 year curriculum. One (5.6%) of the remaining two schools has a 4 year curriculum and the other one (5.6%) has a 7 years curriculum.

### 6.3.6.2 Type of curriculum

Table 6.12: Types of medical curricula in GCC medical schools

<table>
<thead>
<tr>
<th>Curriculum type</th>
<th>Number of schools</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple phase sequential curriculum</td>
<td>15</td>
<td>75.0</td>
</tr>
<tr>
<td>Single phase integrated curriculum</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Participants were asked to classify their schools’ medical curriculum as to whether it is a multiple phase sequential curriculum that is divided into separate consecutive phases such as pre-medical, pre-clinical (pre-clerkship), and clinical (clerkship); or a single phase integrated curriculum in which basic and clinical sciences are taught in parallel without dichotomy. They were also given the chance to specify any other type of curricula that do not belong to any of the two categories above. The description of “sequential” and “integrated” will be used refer to these two types of curricula in relation to GCCMSs. Table 6.12 shows that the majority (75%, n=15) of the schools have a sequential curriculum. No participants described any other curriculum type or arrangement. This indicates that the majority of curricula in GCCMSs have basic medical sciences and clinical disciplines separated and students have to pass the basic medical sciences, including anatomy, before advancing to the clerkship phase of the curriculum.

The next step after knowing the lengths and the types of medical curricula in GCCMSs is to explore when in the curriculum anatomy is taught. While 18 respondents answered
the question regarding the length of the curriculum in their schools, the entire 20 respondents answered the question regarding the years of the curriculum in which anatomy is taught. Therefore, for the ease of analysis, those 2 respondents were theoretically assigned the median curriculum length, which was 6 years. Accordingly, the details of when anatomy is taught are illustrated in Table 6.13 and Figure 6.3.

Table 6.13: The number and percentage of schools that teach anatomy in each year of the medical curriculum.

<table>
<thead>
<tr>
<th>Years of the curriculum</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of schools that teach anatomy</td>
<td>11 (55%)</td>
<td>18 (90%)</td>
<td>16 (80%)</td>
<td>6 (30%)</td>
<td>3 (15.8%)</td>
<td>3 (18.8%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Number of schools that do not teach anatomy</td>
<td>9 (45%)</td>
<td>2 (10%)</td>
<td>4 (20%)</td>
<td>14 (70%)</td>
<td>16 (84.2%)</td>
<td>13 (81.3%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total number of schools</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
<td>20 (100%)</td>
<td>19 (100%)</td>
<td>16 (100%)</td>
<td>1 (100%)</td>
</tr>
</tbody>
</table>

The table shows the numbers and percentages of medical schools that teach anatomy in each year of the curriculum. Since only three schools have curricula that extend beyond the fourth year, the number and the percentage of the schools that teach anatomy in years 5, 6 and 7 are calculated from the total number of schools whose curriculum extends to each of those years.

![Figure 6.3: The percentage of schools that teach anatomy in each year of the medical curriculum.](image)
Figure 6.3 further illustrates the distribution of the percentage of medical schools that teach anatomy in each year of the curriculum. Anatomy is taught in the second by the majority (90%, n=18) medical schools, followed by the third year (80% of schools), first year (55% of schools), fourth year (30% of schools), sixth year (18.8%), and lastly fifth year (15.8%). The one school that has a 7 years curriculum continues teaching anatomy into the seventh year. This indicates that the majority of GCCMSs teach anatomy in the first three years of the curriculum. However, as students advance towards the second half of the curriculum, they gradually receive less anatomy instruction. Anatomy is not totally abolished from the later stages of the curriculum in some schools, as they continue teaching anatomy in years 5, 6, and seven. Moreover, more than half of the schools teach anatomy early the first year of the curriculum.

Participants were also specifically asked if their anatomy department delivers anatomy teaching to clinical or clerkship students. They were also asked to specify the nature of that teaching if present. Sixty percent (n=12) of the departments deliver formal anatomy instruction to clinical students. Eleven of them specified the nature of that instruction. Practical revision sessions were the most common format of instruction as it was reported by 45.5% (n=5) of departments. Online revision materials were provided by 18.2% (n=2) of departments. More structured anatomy courses, either compulsory or elective, were very rare. Each type existed in only 18.2% (n=2) of departments. Other formats were also reported by some participants. One department conducts small group sessions and another department conducts one on one sessions. However, they did not specify whether those sessions are compulsory or elective. While earlier data (Table 6.13 and Figure 6.3) showed a few medical schools teach anatomy in each single year of the second half of the curriculum, these latest data add more dimensions to the picture by revealing that the anatomy delivered to clinical students is mainly unstructured revision sessions with rare structured anatomy courses.

6.4 The anatomy curriculum

6.4.1 Characteristics of anatomy curriculum

Participants were asked to scale their anatomy curriculum for some characteristics that are of major importance for the understanding of its nature. These characteristics are:

- Discipline-based versus integrated
- Subject-based versus problem-based
• Regional versus system-based
• Tutor-led versus self-directed learning

Table 6.14 illustrates the summary of the data obtained from participants.
Table 6.14: The ranking of the anatomy curriculum for the four pairs of characteristics.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>The rank</th>
<th>Total</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 0 0 2</td>
<td>11</td>
<td>61.1%</td>
<td>22.2%</td>
</tr>
<tr>
<td></td>
<td>5.6% 0% 0% 0%</td>
<td>4 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System-based</td>
<td>2 0 2 0</td>
<td>7</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td>10% 0% 10% 0%</td>
<td>9 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem-based</td>
<td>3 2 0 2</td>
<td>3</td>
<td>29.4%</td>
<td>17.6%</td>
</tr>
<tr>
<td></td>
<td>17.6% 5.9% 0% 11.8%</td>
<td>3 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-directed</td>
<td>1 3 6 2</td>
<td>3</td>
<td>17.6%</td>
<td>11.8%</td>
</tr>
<tr>
<td></td>
<td>5.9% 0% 17.6% 35.3%</td>
<td>2 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutor-led</td>
<td>2 3 2 6</td>
<td>0</td>
<td>0%</td>
<td>5.9%</td>
</tr>
<tr>
<td></td>
<td>11.8% 17.6% 11.8% 35.3%</td>
<td>1 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject-based</td>
<td>3 5 3 2</td>
<td>0</td>
<td>0%</td>
<td>5.9%</td>
</tr>
<tr>
<td></td>
<td>17.6% 29.4% 11.8% 10%</td>
<td>3 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td>10 6 0 2</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>50% 30% 0% 10%</td>
<td>2 100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discipline-based</td>
<td>4 2 0 2</td>
<td>0</td>
<td>0%</td>
<td>5.6%</td>
</tr>
<tr>
<td></td>
<td>22.2% 61.1% 0% 11.1%</td>
<td>1 100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The first pair of characteristics aimed to describe the anatomy curriculum in terms of integration. By looking at the mean column in Table 6.14, it is clear that the most common characteristic of anatomy curricula is integration with a mean score of 5.72 out of 7. This was further indicated by the observation that 83.3% (n=15) of participants rated the integration of anatomy in their schools curricula either 6 or 7 out of 7. On the other hand, only 5.6% (n=1) gave the same rating for the contrary discipline-based approach. Moreover, there were only 4 (22.2%) medical schools that teach anatomy in a purely integrated fashion and only one (5.6%) school that teaches anatomy in a purely discipline-based fashion, which indicates that in most of the schools combine the integrated and discipline-based approaches of teaching anatomy. A Wilcoxon Signed Rank Test revealed a significant difference between the ratings of anatomy curricula as integrated (median= 6) and as discipline-based (median= 2), \( p = 0.004 \).

The second most common characteristic of anatomy curricula was that they are system-based instead of regional. They were rated higher for being system-based (mean= 5.6, median= 6.0) than for being regional (mean= 2.3, median= 1.5). This was also supported by the observation that 80% (n=16) of participants scored their schools anatomy curriculum either 6 or 7 out of 7 for being system-based in comparison to only 20% (n=2) who gave the same score (6 or 7) to their schools’ anatomy curriculum for being regional. A pure system-based approach to anatomy teaching was practiced in 45% (n=9) of the schools, while a pure regional approach was practiced in only 10% (n=1) of the schools. A Wilcoxon Signed Rank Test revealed a significant difference between the ratings of anatomy curricula as system-based and as regional, \( p = 0.006 \).

The high rating of the system-based or oriented approach to anatomy teaching in GCCMSs fits very well with the first finding that those curricula were also highly rated for being integrated rather than discipline-based. The system-based approach implies that body systems are taught in an integrated fashion, where anatomy is presented in parallel with other basic sciences and maybe clinical disciplines. However, both findings do not fit with the earlier finding that the majority (75%) of medical curricula in the GCC schools were found to be dichotomous and divided into multiple sequential phases, which may discourage integration. It seems that despite the division of most curricula into multiple phases, anatomy was still taught in an integrated and system-based approach.
Anatomy curricula were also rated as being problem-based more than being subject-based. The mean score given to the problem-based approach was 4.65 (median= 5.0), while the mean score given to the subject-base approach was 3.35 (median= 3.0). Moreover, 47% (n=8) of the participants gave a score of either 6 or 7 to their schools’ anatomy curricula for being problem-based compared to 23.5% (n=4) who gave the same score for being subject-based. In addition, problem-based and subject-based approaches to anatomy teaching were each practiced in its pure form in only 17.6% (n=3) of the schools. A Wilcoxon Signed Rank Test revealed no significant difference between the ratings of anatomy curricula for being problem-based and for being subject-based, \( p = 0.36 \).

Lastly, the learning of anatomy in GCCMSs was described as being more self-directed and less tutor-led. These two characteristics were the least contrasting pair among the four pairs of characteristics described so far. The mean score given to the SDL was 4.47/5, compared to 3.53/7, the mean score given to tutor-led learning. About 29% (n=5) of participants gave a score of either 6 or 7 to SDL in comparison to only 5.9% (n=1) participant gave the same score to tutor-led learning. More than a third of participants 35% (n=6) rated anatomy learning in their curricula as being equally self-directed and tutor-led. Interestingly, two schools (11.8%) solely adopted SL for anatomy teaching while one school (5.9%) solely adopted tutor-led learning. Moreover, a Wilcoxon Signed Rank Test revealed no significant difference between the ratings of anatomy learning for being self-directed and for being tutor-led, \( p = 0.21 \).

These findings indicate that GCCMSs adopt the above mentioned characteristics of anatomy curricula in varying combinations. There are few schools that solely adopt each characteristic – part from a systems-based approach - in its pure form. The balance between each pair of characteristics may be estimated from the difference between the mean scores and the median given to each of them. Anatomy curricula in GCCMSs may collectively be described as:

- Integrated more than discipline-based (statistical significance achieved).
- System-based more than regional (statistical significance achieved).
- Have tendency towards being problem-based than being subject-based (statistical significance achieved).
- Have tendency towards the adoption of SDL than the adoption of TLL (statistical significance not achieved).
It is worth mentioning that as we go down the list, the contrast between the pair of characteristics gets smaller.

6.4.2 Integration

The question about integration reported in Table 6.14 did not differentiate between integration of anatomy with basic medical sciences (horizontal integration) and integration with clinical disciplines (vertical integration). Therefore, participants were further asked to rate the degree of horizontal and vertical integration of their schools' anatomy curricula. They were required to rate the degree of integration in a Likert scale from 1 = no integration to 5 = full integration. The distribution of responses to these questions are presented in Table 6.15.

Table 6.15: The degree of integration of anatomy in the medical curriculum.

<table>
<thead>
<tr>
<th></th>
<th>1 (5%)</th>
<th>2 (5%)</th>
<th>3 (15%)</th>
<th>4 (35%)</th>
<th>5 (40%)</th>
<th>Total</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>integration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>integration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Wilcoxon Signed Rank Test revealed no significant difference between the degrees of horizontal and vertical integrations (\( p = 0.16 \)). While all the participants gave a score to horizontal integration, only 15 of them gave a score to vertical integration. This could be due to the fact that some of the new medical schools have just started the clinical (clerkship) phase of their curricula and therefore the participants could not give a definite score.

Mann-Whitney U Test was performed to test for significant differences between the degrees of integration of anatomy between the two types of curricula (sequential vs. Integrated) revealed that schools that had integrated curricula had a significantly higher rating for their anatomy curricula as integrated (median = 7.0) than schools that had sequential curricula (Median = 6.0), \( p = 0.034 \). Until now, differences between horizontal and vertical integration have not been looked at.

Mann-Whitney U Test also revealed that schools with integrated curricula had significantly higher degrees of vertical integration (median = 5.0) than the schools with sequential curricula (median = 3.0), \( p = 0.041 \). Integrated curriculum schools also tended
to have higher degrees of horizontal integration (median = 5.0) sequential curriculum schools (median = 4.0) but the difference was not statistically significant ($p = 0.219$).

Interestingly, medical schools that have integrated curricula had similar mean and median scores for horizontal and vertical integration of their anatomy curricula (mean = 4.6, median = 5.0). On the other hand, schools with sequential curricula tended to have seemed to have higher mean and median scores for horizontal integration (mean = 3.8, median = 4.0) than for vertical integration (mean = 2.8, median = 3.0). However, the differences were not significant (Wilcoxon Signed Rank Test, $p = 0.125$).

### 6.4.3 Authority over anatomy teaching

The authority or the control that anatomy departments have over anatomy curriculum is of major interest, especially in the past few decades where anatomy teaching in medical curricula has been progressively reduced. The issues which participants were asked to address were:

1. The methods of anatomy teaching
2. The range of topics taught (content)
3. The anatomy teaching hours
4. When anatomy is first taught to medical students
5. Integration of anatomy to other components of the curriculum

Participants were asked to rate the level of authority that their departments have over those issues in a Likert scale from 1 = no authority to 5 = absolute authority. The findings are summarised in Table 6.16.
Table 6.16: The level of authority that anatomy departments have over anatomy teaching (frequencies and percentages)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>The method of teaching</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>20</td>
<td>3.65</td>
<td>4</td>
</tr>
<tr>
<td>The range of topic taught (content)</td>
<td>2</td>
<td>0</td>
<td>9</td>
<td>4</td>
<td>5</td>
<td>20</td>
<td>3.50</td>
<td>3</td>
</tr>
<tr>
<td>The anatomy teaching hours</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>20</td>
<td>3.35</td>
<td>3</td>
</tr>
<tr>
<td>When anatomy is first taught</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>20</td>
<td>3.35</td>
<td>3</td>
</tr>
<tr>
<td>Integration</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>20</td>
<td>2.85</td>
<td>3</td>
</tr>
</tbody>
</table>

According to the mean and median scores, the highest level of authority was over the method of teaching (mean= 3.65, median= 4.0) and the lowest level was over integration (mean= 2.85, median= 3.0). The level of authority over the range of topics was scored the second highest (mean= 3.5, median= 3.0). Finally, the levels of authority over the number of teaching hours and when anatomy is first taught were equally scored (mean= 3.3, median= 3.0).

While the commonest situation was that anatomy departments had absolute authority over choosing the method of teaching and over when anatomy is first introduced, this still amounted to just over one third (35%) of all departments surveyed. Slightly more had authority over decisions concerning the range of topics (45%), the teaching hours (35%), and the degree of integration (40%).

Kruskal-Wallis Test analysis did not reveal significant differences between the levels of authority across school types (public versus private or new versus old), department types (anatomy versus basic medical sciences), or curriculum types (sequential versus integrated).
6.4.4 Minimum core anatomy knowledge

Participants were also asked about the presence of a statement for the minimum core anatomy knowledge in their schools’ medical curriculum. Findings are presented in Table 6.17.

Table 6.17: The presence of defined minimum core anatomy knowledge

<table>
<thead>
<tr>
<th>Is a minimum core anatomy knowledge statement present?</th>
<th>Number of schools</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>14</td>
<td>70.0</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The majority (70%, n=14) of the schools had the minimum core anatomy knowledge stated in their medical curricula. This indicates that anatomy has been considered during the development of those curricula. Data were further analysed to investigate the characteristics of those schools that did not have a core knowledge statement. Fisher’s Exact Test for independence was performed to test for association between the presence of a core knowledge statement and school type, schools age, department type, and curriculum type. The only interesting association was found with the schools’ operational age ($p=0.051$). All of the old schools (n=7) had a minimum core anatomy knowledge. On the other hand, just above half (53.3%, n=7) of the thirteen new schools reported such a statement.

This indicates that older medical schools have well established and developed medical curricula, in which the core anatomy knowledge, and maybe other medical sciences, was clearly stated. However, many newer medical schools have not reached this stage yet.

6.4.5 Anatomy and curriculum change

One of the questions of this study related to the changes in anatomy teaching in GCCMSs in the past decade and its impact on aspects of anatomy teaching. Participants were asked whether their schools had changed their existing curricula in the past 10 years. Table 6.18 illustrates that more than half (55%, n=11) of the schools had
curriculum change in that period. This is a reflection of the progressive change that medical curricula have gone through in the last decade.

Table 6.18: The adoption of a new medical curriculum in the past 10 years

<table>
<thead>
<tr>
<th>New curriculum adopted?</th>
<th>Number of schools</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>11</td>
<td>55.0</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>45.0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Fisher’s Exact Test for independence was performed to test for association between curriculum change adoption and school type, schools age, department type, and curriculum type. Again, the only interesting association was found with the schools’ operational age, \( p=0.07 \). Descriptive analysis revealed that out of the 11 schools that had curriculum change, 55.5% (n=6) were old. Moreover, out of the 7 old schools included in this study, 85.7% (n=6) had a curriculum change compared to only 38% (n=5) of the 13 new schools. The observation indicates that older GCCMSs had to change their curricula in order to parallel the global trends and innovations in medical education. Those participants, whose schools had a curriculum change, were further asked about the specific impacts it had on the aspects of anatomy teaching. The details of the responses from the schools experiencing curriculum change are summarised in Table 6.19 below.

Table 6.19: The impact of curriculum change on aspects of anatomy teaching.

<table>
<thead>
<tr>
<th>The aspect of anatomy</th>
<th>Not changed</th>
<th>Changed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>More traditional 0 (0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>More innovative 8 (72.7%)</td>
<td>11 (100%)</td>
</tr>
<tr>
<td>The method of teaching</td>
<td>3 (27.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 (18.2%)</td>
<td>Increased 2 (18.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased 7 (63.6%)</td>
<td></td>
</tr>
<tr>
<td>The range of topic taught</td>
<td>2 (18.2%)</td>
<td>Increased 1 (9.1%)</td>
<td></td>
</tr>
<tr>
<td>(content)</td>
<td></td>
<td>Decreased 8 (72.7%)</td>
<td></td>
</tr>
<tr>
<td>The anatomy teaching hours</td>
<td>2 (18.2%)</td>
<td></td>
<td>11 (100%)</td>
</tr>
<tr>
<td></td>
<td>9 81.8%</td>
<td>Brought forward 0 (0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deferred 2 (18.2%)</td>
<td></td>
</tr>
<tr>
<td>When anatomy is first taught</td>
<td>9 (81.8%)</td>
<td></td>
<td>11 (100%)</td>
</tr>
<tr>
<td></td>
<td>1 (9.1%)</td>
<td>Increased 10 (90.9%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased 0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Integration</td>
<td></td>
<td></td>
<td>11 (100%)</td>
</tr>
</tbody>
</table>
The most changed aspect of anatomy teaching was integration. The vast majority (90.9%, n=10) of the schools increased the integration of anatomy teaching with other disciplines. The second most changed aspects were the range of topics (content) and the anatomy teaching hours, each was changed in 81.8% (n=9) of the schools. Both the range of topics and the teaching hours were decreased in 63.6% and 72.7% of the schools, respectively.

The method of anatomy teaching was the third on the list with 72.7% (n=8) of the anatomy departments changed the way they teach anatomy in parallel with the curriculum change process. The change was towards more innovative methods of anatomy teaching in all of them. The least changed aspect of anatomy teaching was the time when students start learning anatomy. It was changed in only two schools (18.2%); both of them deferred the time when they first teach anatomy. The deferral of the start of anatomy teaching fits well into a move towards more vertical integration of anatomy, with anatomy teaching reserved for a stage of the curriculum where it can be taught in close time proximity with clinical disciplines.

In sum, recent curriculum changes in GCCMSs have manifested, in the majority of schools, in teaching less anatomy in terms of both hours and content. They have also manifested in increased integration and more adoption of innovative methods of anatomy teaching.

6.5 Teaching and assessment of gross anatomy

This section presents the findings on the practice of teaching and assessment of anatomy in GCCMSs. The aims of this section were to provide answers for the following questions:

1. How many teaching hours are dedicated to anatomy?
2. What are the proportions dedicated to different anatomy sub-disciplines and different teaching formats?
3. What are the methods used for teaching gross anatomy?
4. How students’ knowledge of gross anatomy is assessed?
6.5.1 Teaching of gross anatomy

6.5.1.1 Teaching hours

Figure 6.4 depicts the distribution of the total teaching hours dedicated to anatomy across the 18 medical schools that responded to this particular question. This includes hours dedicated to the three anatomy sub-disciplines of; gross anatomy, histology, and embryology.

![Distribution of total anatomy teaching hours](image)

There was diversity in the number of hours devoted to anatomy teaching across the schools. Most commonly (n=7, 38.9%) schools teach 201-300 hours of anatomy. Three schools (16.7%) teach 100 hours or less, and three other schools (16.7%) teach more than 400 hours of anatomy. Mann-Whitney U Test revealed no significant differences between the total anatomy teaching hours between schools’ types, schools’ ages, departments’ types, and curriculum types, p> 0.05.

Moreover, the relationship between the total anatomy teaching hours and the rating of anatomy curricula for the four pairs of opposed characteristics was investigated using the non-parametric Spearman’s Rank Order Correlation (rho) analysis. The only significant relationship was found with the rating of anatomy curricula for being problem versus subject-based. There was a strong positive correlation between total anatomy hours and the rating for being subject-based (r=-0.61 p= 0.015). That is, medical schools that have adopted more problem-based curricula have less scheduled anatomy teaching hours.
Next, participants were asked to provide the percentages of teaching hours dedicated to each sub-discipline of anatomy.

Next, participants were asked to provide the percentages of teaching hours dedicated to each sub-discipline of anatomy.

Table 6.20: The percentages of teaching hours dedicated to anatomy sub-disciplines

<table>
<thead>
<tr>
<th>Sub-discipline</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean ± SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross anatomy</td>
<td>40%</td>
<td>80%</td>
<td>65.35±12.49</td>
<td>67.5</td>
</tr>
<tr>
<td>Histology</td>
<td>10%</td>
<td>40%</td>
<td>22.10±10.05</td>
<td>20.0</td>
</tr>
<tr>
<td>Embryology</td>
<td>10%</td>
<td>40%</td>
<td>22.10±10.05</td>
<td>20.0</td>
</tr>
</tbody>
</table>

Table 6.20 shows that the highest percentage of teaching hours (mean= 65.35±12.49%, median= 67.5) was dedicated to gross anatomy, ranging from as low as 40% to as high as 80%. Histology occupied about a fifth (mean= 22.10±10.05%, median= 20%) of anatomy teaching hours, with a range of 10% to 40%. The lowest percentage was dedicated to embryology (mean= 12.55±4.30%, median= 10%), ranging from 8% to 20%.

The results of the Friedman Test, the non-parametric alternative to the one way repeated measures ANOVA, indicated that there was a statistically significant difference in the percentage of teaching hours dedicated to the three anatomy sub-disciplines ($p= 0.000$). Post-hoc analysis using the Wilcoxon Signed Rank Test and Bonferroni adjusted p-value revealed significant differences in the percentages of teaching hours dedicated to each of the three sub-disciplines ($p= 0.000$).

Participants were also asked to provide information about the contribution of different teaching formats (lecture, laboratory, and small group sessions) to the total anatomy teaching hours.

Table 6.21: Percentages of teaching hours dedicated to different teaching formats

<table>
<thead>
<tr>
<th>Teaching format</th>
<th>Number of schools using it</th>
<th>Minimum %</th>
<th>Maximum %</th>
<th>Mean± SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>20</td>
<td>20</td>
<td>70</td>
<td>40.8±14.4</td>
<td>40.0</td>
</tr>
<tr>
<td>Laboratories</td>
<td>20</td>
<td>10</td>
<td>70</td>
<td>42.9±15.9</td>
<td>40.0</td>
</tr>
<tr>
<td>Small group sessions</td>
<td>15</td>
<td>5</td>
<td>60</td>
<td>16.1±15.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Other formats</td>
<td>10</td>
<td>5</td>
<td>17</td>
<td>7.9±3.9</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Table 6.21 shows that lectures and laboratory sessions were used for anatomy teaching in all the schools. I sum they contributed to almost a similar extent to the total teaching hours. The mean and median percentage of lectures contribution was 40.80±14.42% and 40% respectively, ranging from 20% to 70%, while the mean and median percentage of laboratory session’s contribution was 42.90±15.95% and 40% respectively, with a range of 10% to 70%.

Small group sessions were used in 75% (n=15) of the schools. In those schools, their mean and median percentages were only 16.13±15.05% and 10% respectively. However, the range of the percentage of the contribution of small group sessions to anatomy teaching was large (5%-60%), as it is also indicated by the large standard deviation. Moreover, the particular school that had the highest use of small group sessions (60%) devoted the least time to both lectures (20%) and laboratories (10%).

Half of the schools (n=10) used formats other than the previously mentioned three, among which were three of the five schools that did not use small group sessions. The mean and median percentages of the use of those other formats collectively were only 7.90±3.93% and 2.5% respectively, ranging from 5% to 17%. Those other formats included

The results of the Friedman Test indicated that there was a statistically significant difference in the percentage of teaching hours dedicated to the three teaching formats ($p= 0.000$). Post-hoc analysis using the Wilcoxon Signed Rank Test and Bonferonni adjusted p-value revealed significant differences in the percentages of teaching hours dedicated to the three formats ($p= 0.000$), except between the percentages of lectures and laboratory hours ($p= 0.65$).

Since the format of teaching depends largely on the type of medical curriculum, Mann-Whitney U Test was performed to look for significant differences in the use of different teaching formats for anatomy teaching across schools with different types of curricula. Schools with sequential curricula were found to used more laboratories (mean= 46.67±16.00%, median= 50.0%) than schools with integrated curricula (mean= 31.60±10.01%, median= 35.0%), ($p= 0.036$). On the other hand, sequential curriculum schools tended to devote fewer hours to lectures (mean= 37.40±11.77%, median=
40.0% compared with mean= 51.00±18.17%, median= 45.0%). However, the difference did not achieve statistical significance ($p=0.14$).

Tendencies were found in the use of small group sessions and “other formats” between schools with different types of curricula. The majority (80%, $n=12$) of the fifteen schools with sequential curricula used small group sessions, compared to 60% ($n=3$) of the five schools with integrated curricula. As a compensation, more of the latter type of schools (60%, $n=3$ compared with 46.7%, $n=7$) tend to use “other formats” of teaching though. These observations are not statistically different according to Fisher’s Exact Test for independence ($p>0.05$).

The non-parametric Spearman’s Rank Order Correlation ($\rho$) analysis was also performed to test for relationships between the rating of characteristics of anatomy curricula and the percentage of hours dedicated to different teaching formats. No significant correlation was revealed. The only noticeable relationship was between the percentage of lecture hours and the rating of anatomy curricula for being either subject-based or problem-based. The percentage of lecture hours correlated negatively with the rating of the anatomy curriculum for being problem-based ($r= -0.452 \, p= 0.069$), and vice versa.

### 6.5.1.2 Gross anatomy teaching resources

Since anatomy is a largely laboratory-based basic medical science, the question about the methods of teaching anatomy in laboratory sessions is central to this study. Participants were asked about the frequency of the use of different teaching resources in laboratory sessions. They were asked to rate how frequently they used them on a Likert scale ranging from never to always. The other options on the scale were rarely, sometimes, and usually. The findings are summarised in Table 6.22 below.
Table 6.22: The frequencies of the use of resources for teaching gross anatomy.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Never 1</th>
<th>Rarely 2</th>
<th>Sometimes 3</th>
<th>Usually 4</th>
<th>Always 5</th>
<th>Total 100%</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet prossections</td>
<td>2 (10%)</td>
<td>1 (5%)</td>
<td>2 (10%)</td>
<td>6 (30%)</td>
<td>9 (45%)</td>
<td>20 (100%)</td>
<td>3.95</td>
<td>4.0</td>
</tr>
<tr>
<td>Plastic Models</td>
<td>0 (0%)</td>
<td>6 (33.3%)</td>
<td>1 (5.6%)</td>
<td>3 (16.7%)</td>
<td>8 (44.4%)</td>
<td>18 (100%)</td>
<td>3.72</td>
<td>4.0</td>
</tr>
<tr>
<td>Plastinated prossections</td>
<td>1 (5%)</td>
<td>3 (15%)</td>
<td>4 (20%)</td>
<td>5 (25%)</td>
<td>7 (35%)</td>
<td>20 (100%)</td>
<td>3.70</td>
<td>4.0</td>
</tr>
<tr>
<td>Medical imaging</td>
<td>2 (10%)</td>
<td>6 (31.6%)</td>
<td>5 (26.3%)</td>
<td>3 (15.8%)</td>
<td>3 (15.8%)</td>
<td>19 (100%)</td>
<td>2.95</td>
<td>3.0</td>
</tr>
<tr>
<td>Computer assisted imaging</td>
<td>4 (20%)</td>
<td>6 (30%)</td>
<td>6 (30%)</td>
<td>1 (5%)</td>
<td>3 (15%)</td>
<td>20 (100%)</td>
<td>2.65</td>
<td>2.5</td>
</tr>
<tr>
<td>Surface and living anatomy</td>
<td>5 (25%)</td>
<td>6 (30%)</td>
<td>4 (20%)</td>
<td>4 (20%)</td>
<td>1 (5%)</td>
<td>20 (100%)</td>
<td>2.50</td>
<td>2.0</td>
</tr>
<tr>
<td>Procedural anatomy and clinical skills</td>
<td>6 (30%)</td>
<td>9 (45%)</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>3 (15%)</td>
<td>20 (100%)</td>
<td>2.30</td>
<td>2.0</td>
</tr>
<tr>
<td>Simulation softwares</td>
<td>10 (50%)</td>
<td>4 (20%)</td>
<td>3 (15%)</td>
<td>1 (5%)</td>
<td>2 (10%)</td>
<td>20 (100%)</td>
<td>2.05</td>
<td>1.5</td>
</tr>
<tr>
<td>Drawing and colouring</td>
<td>10 (50%)</td>
<td>5 (25%)</td>
<td>3 (15%)</td>
<td>2 (10%)</td>
<td>0 (0%)</td>
<td>20 (100%)</td>
<td>1.85</td>
<td>1.5</td>
</tr>
<tr>
<td>Optional dissection</td>
<td>10 (50%)</td>
<td>6 (30%)</td>
<td>3 (15%)</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
<td>20 (100%)</td>
<td>1.75</td>
<td>1.5</td>
</tr>
<tr>
<td>Compulsory dissection</td>
<td>17 (85%)</td>
<td>0 (0%)</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>20 (100%)</td>
<td>1.45</td>
<td>1.0</td>
</tr>
<tr>
<td>Body painting</td>
<td>15 (75%)</td>
<td>2 (10%)</td>
<td>2 (10%)</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
<td>20 (100%)</td>
<td>1.45</td>
<td>1.0</td>
</tr>
</tbody>
</table>
In Table 6.22, anatomy teaching resources are listed in a descending order according to the mean and median scores, starting with the most frequently used resource in GCCMSs collectively. For the ease of presentation, the responses to questions about teaching resources will be categorised into three main groups; cadaveric materials, clinically oriented materials, and modern materials.

6.5.1.2.1 Cadaveric material

Cadaveric materials were divided into dissection and prosections. The most interesting finding in Table 6.22 is that dissection in its two forms (compulsory and optional) came in the bottom of the list with mean scores of only 1.45 and 1.75 respectively. Dissection was rare to the extent that the vast majority (85%, n=17) of the schools never used compulsory dissection and half of the schools (n=10) never used dissection as an optional resource for anatomy teaching. There was only one single school that always used dissection. While dissection was largely unavailable, prosections were among the most frequently used resources. Wet prosections were in fact the most frequently used resource, scoring a mean of 3.95/5. A majority (75%, n=15) of the schools used wet prosections either “usually” or “always” in gross anatomy laboratory sessions. Only two schools did not use wet prosection. Plastinated prosections were the third most frequently used resource, with a mean score of 3.72/5. More than half (60%, n=12) of the schools used them either “usually” or “always” in laboratory sessions. Only a single school “never” used them.

6.5.1.2.2 Clinically oriented resources

Medical imaging was the fourth most frequently used gross anatomy teaching resource, after prosections and plastic models. It had a mean score of 2.59. There were only two schools that “never” used it although nearly one third (31.6%, n=6) “rarely” used it. Participants were also asked about two more clinically oriented resources; surface and living anatomy, procedural anatomy and clinical skills. Both came in the middle of the list. The former had a mean score of 2.50/5 and the latter had a mean score of 2.30/5. Again, the most frequent response (30% and 45%, respectively) indicated that they were “rarely” used in gross anatomy laboratory session.
Modern resources

Three main resources may be described as modern or innovative resources for gross anatomy teaching. They are plastic models, computer-based resources, and art-related resources such as drawing, colouring, and body painting.

Plastic models were the second most frequently used resource in GCCMSs (mean score= 3.72/5), after wet prosections. They were the only resource which was used in every school. Moreover, the highest percentage (44.4%, n=8) of the schools used them in every gross anatomy laboratory session.

Computer assisted imaging was not uncommonly used for gross anatomy teaching (mean score= 2.65). While only three schools (15%) used it in every laboratory sessions, more than the half of the schools (60%, n=12) used it “sometimes”or “rarely” and only four schools (20%) “never” used it. When participants were asked specifically about simulation softwares, the reported frequency of use was much less (mean score=2.05/5). Half of the schools (n=10) had “never” used such programs before. Only two schools (10%) used simulation software in every gross anatomy laboratory session.

Artistic ways of gross anatomy teaching were not often used in GCCMSs. Drawing and coloring, and body painting were among the four least frequently used resources, with a mean score of 1.85/5 and 1.45/5 respectively. Drawing and coloring had “never” been practiced in half (n=10) of the schools, and body painting in 75% (n=15) of them.

In summary, while dissection was largely unavailable to GCC medical students, prosections were the most frequently used resource for gross anatomy teaching. Artistic ways of teaching anatomy such as drawing and body painting were not often utilised. The use of clinically oriented and computer-based resources lay between the two extremes.

The results of the Friedman Test, the non-parametric alternative to the one way repeated measures ANOVA, confirmed that there were statistically significant differences in the frequencies of use of the 12 gross anatomy laboratory teaching resources surveyed (p = 0.001). Post-hoc analysis to elucidate which differed from which other was not performed because 66 tests would have been needed, which could affect the adjusted p-value.
6.5.2 Assessment

This study aimed at exploring the different assessment tools and formats used to assess gross anatomy knowledge in GCCMSs. Analysis showed that more than half (53%, n=10/19) of the departments did not have a minimum achievement level for anatomy in the assessment. This implies that in those schools, students can pass the course without the need to have a minimum score in anatomy. Formative assessment of anatomy was not commonly used by the departments. More than half (55%, n=11) of the departments either never used it or used it very rarely. It was used in every course by only 10% (n=2) of the departments.

Participants also asked to rate the frequency of the use of different assessment tools by anatomy departments. They were asked to rate how frequently they used them on a Likert scale ranging from “never” to “always”. The other options on the scale were “rarely”, “sometimes”, and “usually”. The findings are summarised in Table 6.23 below.

Paper-based written exams were used in all of the schools, lab-based practical exams (spotter or OSPE) in 95% (n=19), research-based assignments in 42.1% (n=8), computer-based exams and oral vivas in 31.6% (n=6), logbooks in 21.1% (n=4), and portfolios in 11.8% (n=2). Paper-based written exams and laboratory-based practical exams were the most frequently used, with mean scores of 4.45 and 4.40 respectively. The other tools were far less frequently used, with mean scores ranging from 1.29 to 1.79.

Participants were also asked to rate how frequently they used different assessment formats (types of questions) on a Likert scale ranging from “never” to “always”. The other options on the scale were “rarely”, “sometimes”, and “usually”. The findings are summarised in Table 6.24 below. Multiple choice questions (MCQs) were used in 95% (n=19) of schools surveyed, short answers in 88.2% (n=15), diagram labeling in 61.1% (n=11), matching questions in 55.6% (n=10), diagram drawing in 22.2% (n=4), and essays in 16.6% (n=3).

MCQs were also the most frequently used assessment format, with an average score of 4.45/5, and essays the least frequently used, with an average score of only 1.33/5.
Table 6.23: The frequencies of the use of different assessment tools.

<table>
<thead>
<tr>
<th>Assessment tools</th>
<th>Never 1</th>
<th>Rarely 2</th>
<th>Sometimes 3</th>
<th>Usually 4</th>
<th>Always 5</th>
<th>Total</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-based written exams</td>
<td>0 (0%)</td>
<td>1 (5%)</td>
<td>2 (10%)</td>
<td>4 (20%)</td>
<td>13 (65%)</td>
<td>20 (100%)</td>
<td>4.45</td>
<td>5.0</td>
</tr>
<tr>
<td>Lab-based practical exams</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
<td>4 (20%)</td>
<td>13 (65%)</td>
<td>20 (100%)</td>
<td>4.40</td>
<td>5.0</td>
</tr>
<tr>
<td>Computer-based exams</td>
<td>13 (68.4%)</td>
<td>0 (0%)</td>
<td>4 (21.1%)</td>
<td>1 (5.3%)</td>
<td>1 (5.3%)</td>
<td>19 (100%)</td>
<td>1.79</td>
<td>1.0</td>
</tr>
<tr>
<td>Research-based assignment</td>
<td>11 (57.9%)</td>
<td>4 (21.1%)</td>
<td>3 (15.8%)</td>
<td>1 (5.3%)</td>
<td>0 (0%)</td>
<td>19 (100%)</td>
<td>1.68</td>
<td>1.0</td>
</tr>
<tr>
<td>Oral viva</td>
<td>13 (68.4%)</td>
<td>4 (21.1%)</td>
<td>0 (0%)</td>
<td>2 (10.5%)</td>
<td>19 (100%)</td>
<td>1.63</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Logbook</td>
<td>15 (78.9%)</td>
<td>2 (10.5%)</td>
<td>1 (5.3%)</td>
<td>1 (5.3%)</td>
<td>0 (0%)</td>
<td>19 (100%)</td>
<td>1.37</td>
<td>1.0</td>
</tr>
<tr>
<td>Portfolio</td>
<td>15 (88.2%)</td>
<td>1 (5.9%)</td>
<td>0 (0%)</td>
<td>1 (5.9%)</td>
<td>17 (100%)</td>
<td>1.29</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.24: The frequencies of the use of different assessment formats.

<table>
<thead>
<tr>
<th>Assessment formats</th>
<th>Never 1</th>
<th>Rarely 2</th>
<th>Sometimes 3</th>
<th>Usually 4</th>
<th>Always 5</th>
<th>Total</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple choice questions</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>7 (35%)</td>
<td>12 (60%)</td>
<td>20 (100%)</td>
<td>4.45</td>
<td>5.0</td>
</tr>
<tr>
<td>Short answers</td>
<td>2 (11.8%)</td>
<td>6 (35.3%)</td>
<td>3 (17.6%)</td>
<td>1 (5.9%)</td>
<td>5 (29.4%)</td>
<td>17 (100%)</td>
<td>3.06</td>
<td>3.0</td>
</tr>
<tr>
<td>Matching questions</td>
<td>8 (44.4%)</td>
<td>3 (16.7%)</td>
<td>5 (27.8%)</td>
<td>2 (11.1%)</td>
<td>0 (0%)</td>
<td>18 (100%)</td>
<td>2.06</td>
<td>2.0</td>
</tr>
<tr>
<td>Diagram labelling</td>
<td>7 (38.9%)</td>
<td>6 (33.3%)</td>
<td>3 (16.7%)</td>
<td>2 (11.1%)</td>
<td>0 (0%)</td>
<td>18 (100%)</td>
<td>2.00</td>
<td>2.0</td>
</tr>
<tr>
<td>Diagram drawing</td>
<td>14 (77.8%)</td>
<td>1 (5.6%)</td>
<td>2 (11.1%)</td>
<td>1 (5.6%)</td>
<td>0 (0%)</td>
<td>18 (100%)</td>
<td>1.44</td>
<td>1.0</td>
</tr>
<tr>
<td>Essays</td>
<td>15 (83.3%)</td>
<td>1 (5.6%)</td>
<td>1 (5.6%)</td>
<td>1 (5.3%)</td>
<td>0 (0%)</td>
<td>18 (100%)</td>
<td>1.33</td>
<td>1.0</td>
</tr>
</tbody>
</table>
6.6 Dissection

This section presents the findings of the survey questionnaire about the practice of dissection in anatomy departments of GCCMSs.

Cadavers were used in 18 (90%) of the departments. Only two departments did not use them; one was in a public medical school and the other was in a private medical school. Both schools were new, one founded in 2004 and the other in 2008. A binomial test indicates there was a statistically significant difference in the proportions of schools that used cadavers as compared with the proportion of schools that do not use cadavers \( (p = 0.001) \).

When participants from those two departments were asked about the reasons behind abandoning the use of cadavers, they both pointed to the lack of appropriate facilities, which may be attributed to their short operational ages. Only one of them pointed to the lack of cadaver sources. The other participant from a school which did not use cadavers referred to the excessive amount of time consumed by using them and the concern about health hazards associated with importing them. That particular department has never used dissection or prosections for gross anatomy laboratory teaching. Instead, models have been used in every session. Interestingly, neither of the two participants referred to cultural or religious considerations as being factors behind their decisions to abandon the use of cadavers.

For the department that use cadavers, the total number of cadavers obtained per year by the 18 schools was 81 (mean= 4.5±3.2, median= 4.25), (Table 6.25). The highest number of cadavers obtained by single school was ten. Four schools obtained no more than a single cadaver for the whole year.

Table 6.25: The number of new cadavers obtained per year

<table>
<thead>
<tr>
<th>Number of cadavers obtained per year</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Sum</th>
<th>Mean±SD</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>10</td>
<td>81</td>
<td>4.50±3.19</td>
<td>4.25</td>
</tr>
</tbody>
</table>

The two schools that obtained the highest number of cadavers (10) were among the most frequent users of dissection in gross anatomy laboratory sessions. One of them “always” used compulsory dissection, and the other “usually” used both compulsory and optional dissection. That is, the inclusion of dissection in gross anatomy laboratory
sessions may depend on the availability of cadavers. The first of these high-use schools has a strong affiliation with a medical school in the West, where body donation programs are available.

Mann-Whitney U Test was also performed to look for differences in the number of cadavers obtained per year across schools’ types, schools’ operational age, and curriculum types. No significant differences were revealed (p > 0.05). Moreover, Spearman’s Rank Order Correlation (rho) analysis did not reveal any significant relationships between the number of cadavers obtained per year and the rating of the characteristics of anatomy curricula (p > 0.05).

With the limited supply of cadavers in general, the next question asked was for how long those cadavers are used?

![Figure 6.5: The period for which a single cadaver is used](image)

Figure 6.5 shows that the minimum period for the use of cadavers was one year. No schools discarded cadavers after just one semester. The majority of schools (61.1%, n=11) used cadavers for 2-5 years. Three schools kept using cadavers for up to 10 years. One school used cadavers for more than 10 years. These findings indicate to the possibility that anatomy departments in some GCCMSs have reacted to the low supply of cadavers by using cadavers for many years.

Participants were also asked about the sources from which they obtained cadavers. Analysis revealed that all cadavers used in GCCMSs were imported from abroad. While all departments import intact cadavers, four of them also import dissected cadavers (prosections). That is, most of the prosections that were earlier shown to be frequently
used in laboratory sessions must have been prepared in-house. Interestingly, not a single school used cadavers obtained from a local body donation program or used local unclaimed bodies. Participants were also asked to list any sources of cadavers apart from the ones listed on the questionnaire. One participant mentioned that the cadavers they obtained were gifts from another school. This particular school is a new branch of an old school within the same country. The mother school imports all its cadavers and prosections. No other sources of cadavers were specified.

Participants were asked to describe the process of obtaining new cadavers in terms of difficulty. They were asked to rate it in a Likert scale as 1= “very easy”, 2= “easy”, 3= “neutral”, 4= “difficult”, and 5= “very difficult”.

![Figure 6.6: How difficult is obtaining cadavers?](image)

Figure 6.6 demonstrates that the majority (61.1%, n=11) of participants described obtaining new cadavers as “difficult”. There was one participant who described it as “very difficult”. No one described it as “very easy”. It is apparent that GCC anatomy departments not only receiving a low number of cadavers, but the majority of them face difficulty in securing that low supply.

Putting the low number of cadavers obtained per year and the difficulty facing the departments to secure it, it was of interest to determine if anatomy departments in GCCMSs face a shortage of cadavers; i.e., were the cadavers they obtained enough for their educational needs?
Figure 6.7: Experiencing shortage of cadavers?

Figure 6.7 illustrates that a third (n=6) of the anatomy departments in GCCMSs feel they suffer from a shortage of cadavers. The other two thirds (n=12) do not feel they face such a problem. Moreover, a binomial test indicates there was no statistically significant difference in the proportions of schools that reported a shortage of cadavers as compared with the proportion of schools that do not (p=0.238).

Putting all the previous findings concerning cadavers together, it seems that despite the difficulty facing most departments in obtaining cadavers, they managed to secure the number of cadavers that serves their educational needs.

The questionnaire explored further the measures that were specifically taken by the six departments which face shortage of cadavers to compensate for the shortage. All of them used cadavers for as long as possible. They also abandoned dissection and used cadavers for demonstration only. The majority (83.3%, n=5) plastinated their prosections in order to prolong their shelf life. A similar number resorted to using more medical imaging. Two thirds (n=4) used more surface and living anatomy in their laboratory sessions. Participants were also asked to list any measures resorted to other than those listed in the questionnaire. Only one of them did so, mentioning the incorporation of more computer-based dissection. Overall, GCC anatomy departments that suffer from a shortage of cadavers managed to reduce their reliance on cadavers by two ways; minimising dissection and incorporating more non-cadaver based methods of teaching such as clinically oriented and computer-based resources.

The study was also interested in exploring the practice of dissection in GCC anatomy departments that use cadavers in terms of who performs the actual dissection and for what purposes.
Figure 6.8 shows that sixteen (88.9%) of the 18 anatomy departments that use cadavers perform dissection. Further, a binomial test indicates there was a statistically significant difference in the proportions of schools that practice dissection as compared with the proportion of schools that do not practice it ($p = 0.001$).

Figure 6.9 shows the number of schools in which different categories of people perform dissection.

Faculty perform dissection in the majority (88.3%, n=13) of schools, followed by students in (43.8%, n=7) of schools, and technical staff and demonstrators in (31.1%, n=5) of schools each. Only one school employs prosectors. After considering the total number of schools included in this study (n=20), students conduct dissection in only 35% (n=7) of the schools. However, this observation does not match with the earlier finding that 50% (n=10) used optional dissection - in a varying frequencies - for gross anatomy laboratory teaching. This discrepancy may be because participants did not
count the rare occasions when students dissected in laboratory sessions. It may also be because participants counted only the occasions when students dissected the structured teaching hours. Lastly, it is possible the some participants counted only the dissection conducted by postgraduate students, as dissection was performed for the purpose of postgraduate teaching in 33.3% (6/18) of those schools (Figure 6.10). Figure 6.10 also demonstrates the purposes of dissection performed in GCC anatomy departments.

![Figure 6.10: The purpose of dissection conducted.](image)

Figure 6.10 also demonstrates the purposes of dissection performed in GCC anatomy departments. The most common purpose of dissection was undergraduate teaching. All schools used dissection for this purpose that can include either or both the preparation of prosections or actual dissection by the students. The second most common purposes reported were clinical specialty training and research, each used for in 43.8% (n=7) schools. Dissection was used for postgraduate teaching in only 33.3% (n=6) schools. Participants were given the opportunity to describe other purposes for dissection used in their schools, but no other purposes were described.

Figures 6.9 and 6.10 together demonstrate that dissection in GCC anatomy departments was most commonly performed by faculty for the purpose of undergraduate teaching.

### 6.7 Collaboration

The last aim of the study was to explore the extent to which collaboration between anatomy departments in GCCMSs exists for the purpose of anatomy teaching. The first asked whether their departments have collaboration or communication with other
anatomy departments in the GCC region. Figure 6.11 demonstrates that only 5 (25%) of the departments had such collaboration.

![Figure 6.11: Is collaboration with other GCC anatomy departments present?](image)

A binomial test indicates there was a statistically significant difference in the proportions of GCC anatomy departments that have collaboration with other anatomy departments in GCCMSs as compared with the proportion of departments that do not have such collaboration (observed proportion= 0.75), \((p= 0.041)\).

### 6.8 Reasons for non-collaboration

Participants from departments which indicated that they had no collaborations were asked for the reasons for this state of affairs. The most common reason given for preventing collaboration was the absence of a professional body, as it was indicated by the vast majority (85.7%, \(n=12\)) of respondents (binomial test \(p= 0.013\)). The second most commonly cited reason (78.6%, \(n=11\)) was the occupation by responsibilities within participants’ own departments (binomial test \(p= 0.057\)). Lack of initiative and lack of encouragement from other anatomy departments in the region was the third most common reason given (50% \((n=7)\) of participants). Bureaucracy was claimed as an obstacle by four anatomy departments. Interestingly, only three (14.3%) of the HODs of the 15 non-collaborating anatomy departments cited lack of interest among the reasons for not collaborating (binomial test \(p= 0.013\)). That is, the majority of GCC anatomy departments’ HODs appreciated the interest in establishing collaboration between other anatomy departments in the region. Participants were also given enough space on the questionnaire to mention other reasons that were relevant to their departments for the lack of collaboration with other departments. Only one participant added another reason. He mentioned that his medical school was still new.
6.8.1 Characteristics of departments that do collaborate

All five departments that had collaboration were collaborating with anatomy departments in the same country. Only two of them extended their collaboration across the borders to reach departments in other GCC countries. Four of the five collaborating departments were from new medical schools and only one from an old school. Moreover, four of them were also stand-alone anatomy departments and only one a basic medical sciences department. These observations point to the possibility that newer and independent anatomy departments were more interested in establishing collaboration with other GCC anatomy departments. These associations between the presence of collaboration and the type of department or the operational age of the medical school were not statistically significant according to Fisher’s Exact Test for independence (p> 0.05), however.

6.8.2 Types of collaboration

Participants were also asked about the type of collaboration that their departments have with other anatomy departments in the GCC region. Faculty exchange was the most common form of collaboration, as it was reported by four departments. Three were collaborating in matters related to educational and curriculum policies. Collaboration in regard to student exchange, teaching resources exchange, and conferences was practised by two departments each. Collaborations in regard to staff recruitment policies and collaborative research were the least common, as they were practiced by a single department each. No participants described any form of collaboration other than the ones listed on the questionnaire.

6.9 Summary

The findings indicated that anatomy departments in GCCMSs were established to teach students of Health sciences including medicine. None of them taught students of basic degrees in anatomy. The vast majority of the teaching staff were expatriates, medically qualified, and employed full-time. There was concentration of local anatomists in junior academic posts. Although there was large variation in the number of students and of teachers in anatomy practical sessions, there was a direct correlation between the numbers of each. Private schools had lower student: staff ratios than public schools, and older public schools had lower student: staff ratio than their older counterparts.
The questionnaire findings indicated that the length of medical curricula in GCCMSs ranged from four to seven years. The majority of the schools had a six year medical curriculum and the majority of the curricula were divided into consecutive pre-clinical and clinical phases. Anatomy teaching started in the first year in more than half of the schools. The majority of the schools teach anatomy in the first three years of the curriculum, with fewer schools continued teaching anatomy in the second half of the curriculum. The rare anatomy teaching that occurred in the second half mainly took the form of laboratory and online revisions.

The typical anatomy curriculum in GCCMSs was described as integrated more than discipline-based (p<0.05), systems-based more than regional (p<0.05), tend to be problem-based more than subject-based (p>0.05), and tend to use self-directed learning more than tutor-led learning. There was more emphasis on horizontal integration than vertical integration. One phase Integrated medical curricula were described to have more integration of anatomy in general (p<0.05) and more vertical integration in particular (p<0.05) than sequential medical curricula.

The findings also indicated that GCC anatomy departments possess middling degrees of authority over many aspects of the teaching of anatomy in their schools. The highest authority possessed was over the methods of teaching.

More than half of the schools, mainly older schools had experienced curriculum change in the past ten years. In the majority of those schools, there was a decrease in anatomy content and the time for anatomy teaching with the change, but increased levels of integration. The majority of anatomy departments changed the teaching methods from being traditional to more innovative.

The majority of GCCMSs had a minimum core anatomy curriculum defined in their schools curriculum. However, many of the new schools did not have such a core curriculum.

Questionnaire findings showed a big variation in the anatomy teaching hours between GCCMSs. That applied to the total anatomy teaching hours, the distribution of teaching hours according to the sub-disciplines and the teaching methods. The highest percentage (39%) of the schools taught between 200 and 300 hours. About 28% taught more than 300 hours and 34% taught less than 200 hours of anatomy. The total anatomy teaching hours correlated negatively with the rating of the anatomy curriculum as problem-based.
The Highest average percentage (65%) of the teaching hours was allotted to gross anatomy, leaving an average of 22% and 13% for histology and embryology, respectively. Lectures and practical were the most frequently used teaching methods. They each occupied an average of more than 40% of the total teaching hours, leaving an average of 16% of the time for small group teaching. Schools with sequential curricula used more laboratory hours than the ones with one phase integrated curricula (p<0.05). Moreover, the percentage of laboratory hours negatively correlated with the rating of the anatomy curriculum as being problem-based (p=0.07).

The findings indicated that GCCMSs used a wide range of the tools and resources for teaching gross anatomy in practical sessions. Prosections and plastic models were the most frequently used tools. Clinically oriented tools such as surface and clinical anatomy and medical imaging, and computer assisted imaging and simulation softwares were used sometimes. Dissection in its compulsory and optional forms and body painting were very rarely used.

The findings also showed that anatomical knowledge was mainly assessed though paper-based written exams and lab-based practical exams. The use of computers for the assessment of anatomy was not common, and the use of continuous assessment such as logbooks and portfolios was very rare, the majority of schools never using them. MCQs and short answers were the most frequently used assessment formats in assessment of anatomy. Matching questions and diagram labeling were also used but less frequently. Diagram drawing and essays were the least frequently used assessment formats, the majority of schools never using them.

The great majority of departments obtained cadavers. However, the average number of the number of cadavers obtained annually varied from one to 10, with an average of less than five. Among many variables, the number of cadavers obtained per year was found to be significantly related only to the frequency of use of compulsory dissection for teaching anatomy. The two departments that did not obtain cadavers related it to the lack of appropriate facilities, lack of cadaver sources, the excessive time needed for dissection, and health hazards. Neither of them related it to cultural or religious reasons.

All the cadavers used by the GCC schools were imported from other countries. None of them obtained local donated or unclaimed bodies. The majority (66.6%) of the HODs indicated that their departments face difficulties when importing cadavers. However, only 33.3% of them indicated that their departments suffer from the shortage of
cadavers. All the departments that reported suffering from a shortage of cadavers compensated for the shortage by using their cadavers for long time, and by using cadavers for demonstration only. The majority of them (83%) plastinated their prosections. Many of them also used more clinically-oriented tools and one used more CAL.

GCC anatomy departments overall kept using the cadavers they obtained for years. The majority used them for 2-5 years and some for up to 10 years and one school used its cadavers from more than 10 years. No departments used cadavers for a single semester.

Dissection was practised in all but two of the departments that obtained cadavers. They all performed dissection to support teaching anatomy to undergraduate medical students. Dissection was also performed for other purposes such as postgraduate specialty training, research, and postgraduate teaching. Dissection was performed by the faculty in the majority of the departments. In some departments it was performed by technical staff and demonstrators. Students were allowed to dissect in 44% of the departments.

A significant majority (75%) of anatomy departments in GCCMSs did not have any communication or collaboration with other departments in the region. The absence of a professional body was cited by the HODs of those departments most frequently to lie behind the lack of collaboration. Other important reasons were the over-occupation with internal responsibilities, and less importantly a lack of encouragement and bureaucracy.

Collaboration was mainly with departments from the same country. Collaboration was mainly (80% of collaborating schools) seen in stand-alone anatomy departments and departments from new medical schools.

Collaboration mainly took the form of staff exchange (80%), and exchange of educational and curriculum policies (60%). Collaboration as student exchange, resources exchange, and conferences were less frequently practised (40%).
Chapter seven: Findings of the HODs interview

7.1 Introduction

Interviews were conducted with eleven HODs of anatomy departments in GCCMSs. This chapter presents the findings from those interviews. The findings will be presented in three parts. Part one presents findings about anatomy teaching, part two presents findings about the practice of dissection, and part three presents findings about collaboration between the departments.

7.2 Part one: Anatomy teaching

7.2.1 Type of curriculum

All the eleven HODs indicated that their schools have integrated curricula. None of them described their school’s anatomy curriculum as being discipline-based with anatomy taught as a stand-alone subject. Some described the integration explicitly:

“It is fully integrated, community-based and oriented and there is a lot of emphasis on self-study and self-learning” (P1).

“It is a fully integrated curriculum in the sense that the subjects are divided into modules and each module contains elements of anatomy, physiology and pharmacology as its main content. They can also include some elements of psychology and molecular medicine” (P2).

Others expressed the concept of integration implicitly through describing the way they conduct the actual teaching:

“When students are dissecting [the] thorax they are actually studying [the] cardiovascular system and [the] respiratory system. Similarly when they dissect [the] abdomen they study [the] gastrointestinal system” (P3).

“Second and third years have a system based curriculum where there are 10 modules of all the systems where there is integration of anatomy with basic sciences and some clinical subjects” (P4).

Both types of integration; horizontal and vertical, were emphasised by the HODs in their descriptions of the delivery of the anatomy curriculum, but some participants referred only to horizontal integration.

“We have assembled anatomy, physiology, biochemistry, pharmacology, and microbiology and we have got integration in a modular fashion” (P6).
“Every week students get a clinical problem and we discuss basic science issues with them. They discuss all the basic sciences of anatomy, physiology, biochemistry, pharmacology, and even immunology” (P8).

On the other hand, other participants emphasised vertical integration when they described their school’s anatomy curriculum. For example, one participant indicated:

“We give clinical vignettes to students to train them on clinical appraisal using anatomical knowledge in solving problems and to give them the skills that make good clinical examination. So it is integrated with the clinical examination classes” (P5).

A second participant described how vertical integration has spread anatomy teaching over most of the years of the curriculum up to the last (7th) year, where clinical year students revisit the anatomy laboratory to support their learning:

“Now we have technically five years of anatomy because we teach anatomy in the second, third and fourth years. Surgery students come and rotate in pathology and anatomy labs maybe three or four times a semester. So we are participating in fifth year’s general surgery and sixth year’s gynaecology and seventh year’s general surgery” (P8).

At this stage, it is apparent that the integrated curriculum is the prevalent type of curriculum in GCCMSs.

### 7.2.2 Methods of teaching

HODs revealed different types of anatomy curricula in terms of the methods of teaching. The hybrid type was indicated by eight of the eleven participants. PBL was the commonest form of teaching that was used in combination with the traditional forms of teaching in these hybrid curricula. Almost all these hybrid curricula combined didactic teaching with PBL. One HOD indicated:

“We have a hybrid curriculum. Every week we have PBL. So we conduct two stations for PBL as well as lecture-based and practical-based sessions” (P6).

Very few schools have PBL as the main teaching method but use it supported by didactic lectures in situations where PBL cannot achieve the level of learning of anatomical knowledge needed:

“We have a problem-based curriculum here. If we have a lecture on a particular organ then it covers gross anatomy and histology. Sometimes we cover
development. If development is not covered there will be a separate lecture on development” (P8).

Pure PBL curricula were not found in any of the schools. Although the description “pure” was mentioned by one of the HODs, it later appeared that the curriculum contains some sort of lecturing. The HOD first described his school’s curriculum as “purely PBL, not traditional” (P5). However, he later indicated that they also used lectures but different from the traditional lecture in the sense that their lectures “are not for submission of knowledge to students but more for guiding students” (P5). He further added that the “the aim of the lecture is to focus on important points but not to explain everything” (P5).

Forms of innovative teaching other than PBL were very rarely mentioned. HODs who have hybrid forms of curricula mentioned only two of them. One school used case-based learning (CBL) and the other one used team-based learning (TBL).

“We also included case-based learning and problem-based learning along with the systems” (P4).

“We run our lectures in what we called Team-based learning. We conduct traditional lectures at the beginning of the module or for summarisation at the end” (P5).

The pure traditional lecture-practical based curricula were also very rare in GCCMSs. Only two of the interviewed HODs indicated that they have this type of curriculum, free of any form of non-traditional teaching. One of them, despite indicating that the curriculum is “fully integrated”, then stated that they “do not use PBL here. It is formal lecture, tutorial, practical” (P2). The other one similarly indicated they have “an integrated system but not PBL” (P11).

Many HODs emphasised the use of self-study and self-directed learning as methods of learning anatomy by their students. Self-study was not used as a primary method of teaching but, rather, was used as a complement to support students’ learning. Since most of the schools have hybrid curricula that include some PBL, self-study was used to prepare the students for the classes. This gave them the chance to study and review the factual anatomical knowledge before the class and to prepare for presentations.

“You will find most of the students already make use of the pre-class preparation. So they are coming in the session not to receive new information but to ask about doubts they have and we clarify the differences in opinions” (P5).
“Students make their presentations on various surgical aspects. Then in their presentations, they give demonstrations that they have understood the area that they are looking at” (P8).

Self-study was also emphasised by those HODs whose schools rely a lot on PBL. Here, self-study was used to teach the students the skills of actively looking for information rather than it being passively spoon-fed. Those skills are among the most important lifelong skills that are required for the medical profession, and self-study creates a suitable opportunity to train students on them. One of those HODs describes this benefit:

“This is the beauty of PBL. You encourage students to do self-learning because this is a lifelong learning that does not stop after graduation. So you need to have the skills and the way how to look for information” (P1).

“One of the core characteristics for this system [PBL] is to let students fish for information. As long as you give the student these skills you should not worry about when he becomes a specialist because he will be able to get the required information” (P5).

SDL mainly happened in the dissection rooms and anatomy museums where students were encouraged to come and make use of the available resources:

“There is the anatomy museum, which is arranged in a way that allows students to self-study” (P1).

“Students usually do not cover everything. So in that situation they then go to the technician who is in charge of the lab and they book a time and he will open the lab for them and get all the models that they need to study and we encourage them to do that” (P5).

“For example, we do self-directed learning. So in a week we have 8 to 10 hours. We ask the students voluntarily if you can come for three hours, our dissection hall is open. So come to study” (P6).

Some HODs emphasised the importance of providing guidance and other resources for students when they use SDL. Study guides were provided in the form of learning objectives that students became aware of at the beginning of the course. Resources, besides the physical resources in the dissection rooms and museums, were provided in the form of libraries and online programs.

“It is again going to core objectives. Each learning or teaching activity has very clear objectives. At the end of this activity students need to know 1, 2, 3, 4, and 5.
That is very important and it must be very clear in the mind of the teacher and the student” (P1).

“All classes should have learning objectives or outcomes and these outcomes are given to students before the class plus websites, atlases, and books” (P5)

“Our library is very grand and very good so all resources are there. We have got CDs, softwares, and media” (P6).

“We have audiovisual materials like DVDs and radiographic anatomy. They are in the medical library, and students can go there and have access to them” (P10).

“The library contains books and atlases of anatomy and videos of dissection in order to be within the reach of the students” (P11).

### 7.2.3 Approach to teaching anatomy

It was found that the majority of the interviewed HODs indicated that their departments teach anatomy in a system-based fashion. However, some of them include some sort of regional anatomy. Accordingly, two versions of systemic anatomy curricula were identified. In the first one, anatomy departments teach introductory courses of general anatomy for one or two semesters and then the students move to specific organ system integrated modules. Good examples of this approach were described by three HODs:

“In year one, we teach tissues and organs with introduction to organ systems and basic tissues. From the second year, all the systems start like cardiovascular system, respiratory system and other systems. There we teach anatomy of that system” (P4).

“In semester one, we have basic concepts which include general anatomy and histology and embryology. Then we teach respiratory system, cardiovascular system and digestive system” (P6).

“We start talking about general anatomy in the first semester and second semester. That is still systems but it is general. Then in the second year we start the blocks that are related to the body systems” (P10).

In the second version of the systemic anatomy curricula reported, anatomy was taught as system modules from the beginning without any general introductory courses. This version was less common and was more commonly adopted by schools with mainly PBL curricula, reflecting the lack of a place for discipline-based basic introductory courses in PBL curricula. An HOD from one of such schools indicated that “in the PBL system you do not give them all the basic anatomy but you exclude the topics which are not required” (P5), referring to the anatomical knowledge that does not serve any of the
PBL problems. Another HOD described the knowledge that they give to students in the PBL system as “focused” on “the core or the basics, the clinical applications, and correlations between structure and function” (P1). Such knowledge is again related to the PBL problems. In a third school, the HOD indicated that they have “stopped teaching anatomy as such” (P8). He further justified his department’s position towards stopping teaching pure anatomy courses by stating that “the detailed anatomy is not required by a medical student but the applied aspect is important, which they get in the PBL”.

The regional approach to teaching anatomy was also found to be present in GCCMSs, but was far less common. In fact, it was only described by two of the interviewed HODs. Ironically, both schools have integrated curricula and the whole curriculum for both of them was taught in a systemic approach in the sense that the curriculum was divided into body system modules. That is, regional anatomy was taught in parallel with the systems modules rather than in a subject-based fashion. For example, one HOD described this arrangement as follows:

“We dissect region by region but it is integrated. So when students are dissecting [the] thorax they are actually studying [the] cardiovascular system and [the] respiratory system. Similarly when they dissect [the] abdomen they study [the] gastrointestinal system” (P3).

The other school followed more or less the same arrangement.

“In the second semester we finish the detailed anatomy of the pelvis in the genitourinary and endocrine module. We do the anatomy of the thorax and upper limb as part of the CVS and RS modules” (P2).

Interestingly, it was found that the two schools which taught regional anatomy were not actually native GCCMSs but were rather branches of Western medical schools. Both schools follow exactly the same curriculum of the parent school, the HODs having little authority to modify the way they teach anatomy in the GCC branch.

“Unfortunately our curriculum is dictated by ..., our parent college, which is a pity. Unfortunately it is not systems-based because of [parent school’s] strategy in this. It is regional” (P2).

“We have little freedom at present in deciding what we teach and how much we teach. It comes from the course design group. It is based in the [mother school]. We actually try not to deviate from that.” (P3).
In summary, the HOD interviews revealed the prevalence of systemic approach of teaching anatomy in GCCMSs. The regional approach to anatomy was rare and, where practised, always taught in parallel with a systemic integrated curriculum. The regional approach was not developed within the GCC, but adopted from the parent western medical schools. The anatomy departments concerned did not have the authority to shift to the systemic approach and had to stick to the curricula of the parent schools.

7.2.4 Integration

This section explores further how integration was delivered by GCC anatomy departments in their anatomy curricula. Findings concerning the two levels of integration (horizontal and vertical) will be presented separately.

7.2.4.1 Implementing integration

7.2.4.1.1 Horizontal integration

Horizontal integration was mainly implemented during the teaching of system-based modules. The classical arrangement of a horizontally integrated curriculum is that basic medical sciences departments deliver their individual lectures in a parallel fashion that is “agreed by various departments” (P7) within the context of a systems-based module.

“Almost in the same day when I am teaching something in the structure, there may be a neurologist or a physiologist giving a lecture on the same topic” (P3).

“We teach the anatomy of the eye and others teach the physiology of the eye and pharmacology teaches the drugs used for the eyes” (P11).

Although it was always described as integrated, a number of HODs acknowledged that it was not as integrated as the term implied. One HOD indicated that what is called “integrated” teaching nowadays is in fact not much different from what was taught in a traditional curriculum in the old days when “the individual departments taught anatomy or physiology. And we had lectures by anatomists and by physiologists and we integrated the material they taught us in our own minds” (P2). In his view, what is happening now is more or less the same, where “although we call it an integrated curriculum, the individual lectures are still given by anatomists or physiologists or biochemists”. He even added that for the sake of integration, at least the lecture which is given by anatomists should “contain fully integrated material but it does not”. In his view, he thought that the increasing attention given to integration in medical curricula is “just playing around with the curriculum for the sake of change”.

145
Other HODs had a less extreme view towards the horizontal integration of anatomy. One of them described what was happening in his school as having “the lectures of anatomy are separated from those of physiology and other sciences”. Consequently, this did not fulfill his personal view of the meaning of integration but instead “it is just concomitant teaching not true integration. It is synchronised teaching”.

A more integrated version of the stand-alone anatomy lectures was described by some HODs. In one school, during their lectures, anatomists reflect briefly on some points which are related to the material that will be presented in the lectures from other basic sciences departments: “We integrate anatomy with physiology and biochemistry but we do not go deep. We tell them that this part will be covered by physiology or biochemistry” (P5). However they concentrate more on the anatomy content because the HOD stated that the “role in anatomy is to know these important points”, referring to anatomy objectives.

In the same school, integration of anatomy was taken one step further by calling teaching faculty from other basic sciences departments to participate with the anatomy teacher in an integrated lecture:

“An example is adrenal and thyroid glands. I start with anatomy for 20 minutes then followed by physiology and biochemistry in one session for about one or two hours. So students have integration in one session” (P5).

Since most of the anatomy curricula in GCCMSs are delivered in hybrid form comprising traditional lecture-practical and PBL teaching, horizontal integration is also achieved through the PBL sessions. The classical arrangement of the PBL teaching is that the teaching is divided into weeks. In one week one problem is studied.

“PBL students study a problem in small groups of between 8 and 10 [students]. They have a tutor or a facilitator. They have one session at the beginning of the week and another session at the end of the week, each 3 hours long. And between these 2 sessions, they have certain time-tabled activities like 3 lectures in the week. They also have certain practical labs like microbiology and certain basic sciences labs” (P1).

“Every week we have PBL. So we conduct two sessions for PBL as well as lecture based and practical based sessions” (P6).

The problem is the core of PBL sessions where “there is a PBL problem every week and according to this problem, all the lectures are insinuated” (P5). This HOD stressed that PBL cases should ideally be designed in a way that insures the implementation of
horizontal integration by being “designed in such a manner that makes the students think and put anatomy and physiology and other basic sciences together” (P8).

The type of anatomical knowledge that is delivered in PBL cases is different from that which is delivered in traditional lectures in the sense that it should serve the purpose of integration. Anything which does not serve that purpose is excluded.

“In the PBL system you do not give them all the basic anatomy but you exclude the topics which are not required for GPs but for specialists” (P5).

“Through the problem we cover most of the common clinical problems, through which anatomical sciences are applied” (P5)

“The detailed anatomy is not required by a medical student but the applied aspect is important, which they get in the PBL” (P8).

It seems that horizontal integration was mainly linked PBL cases. Departments of those HODs who earlier described horizontal integration as “playing with the curriculum” or “concomitant teaching” were found to depend on traditional lecture-practical method of teaching anatomy. The first one indicated that they “do not use PBL” (P2), and the second one described his school’s curriculum as an “integrated system, not PBL” (P11).

7.2.4.1.2 Vertical integration

While the horizontal integration was achieved through classical arrangements of application in the contexts of traditional lectures and PBL cases, vertical integration occurred in more diverse ways.

Anatomy was first vertically integrated while students were still in the pre-clinical phase of their medical study through didactic lectures and PBL. As one HOD indicated, PBL cases were used by anatomists to link the applied anatomical knowledge to the clinical side: “We make sure that the anatomical knowledge is linked with the clinical knowledge” (P5). That link will eventually be used by the students to solve the problems “to train them on clinical appraisal using anatomical knowledge in solving problems”.

That link was also emphasised in didactic lectures. However, it occurred in relation to individual attempts by the anatomy teachers themselves, depending on their interests. One HOD indicated that they include points of clinical significance in addition to the pure anatomy related objectives that they had to cover during the lectures. For example, in a lecture that covered the kidneys, they also include clinical aspects such as “kidney stones, hydronephrosis, bladder stones, renal colic, and lasers” (P2). In another lecture
that covered the ventricular system of the brain, they included “hydrocephalus, lumbar puncture holing, and clinical features of raised intracranial pressure”. However, such lectures were uncommon as this HOD added: “If you were to ask me for another example, it would be hard to find another good example in all of the lectures that we give”. Because of the limited anatomy teaching time they have, the priority was to cover basic anatomical learning objectives: “Whatever else I include in the lecture, I have to include kidneys and the calyces, the renal papillae, and others”.

Vertical integration was not restricted to the scheduled PBL sessions and didactic lectures but was also emphasised during scheduled anatomy practical sessions and as part of SDL through the inclusion of clinically applied anatomy material.

> “Sometimes we have one station left [in the practical sessions] for questions or for clinical correlation to show the importance of clinically applied anatomy of the problem” (P1).

> “If the problem is diabetes, students make appointments with anatomists to show them the pancreas gross anatomy and histology and to relate that to the problem” (P1).

> “Sometimes we give them a station about a small problem to be solved or something like a clinical problem. The clue to the problem is anatomical so they study the problem and try to solve it” (P5)

### 7.2.4.1.2.1 Methods for implementing vertical integration

HODs identified many ways through which they insured that the anatomy content that their departments taught during laboratory sessions was vertically integrated. Surface and living anatomy and imaging anatomy were the commonest approaches.

#### 7.2.4.1.2.1.1 Living and surface anatomy

Living and surface anatomy was given a high degree of importance due its direct link to clinical examination.

> “Living anatomy forms the basis of physical examination of patients which clinicians do and students will do after that. This all depends on good and sound knowledge of living and surface anatomy and surface markings. So that is the rationale why it is important and we emphasise it” (P1).

> “We have certain classes in living and applied anatomy in every system course. It is very important for the students to know this. Superficial or surface anatomy is one of the important things that every doctor should be able to demonstrate” (P7).
In the majority of departments, surface and living anatomy sessions were delivered by the anatomy faculty in the practicals through asking the students to perform physical examination tasks such as “palpate the radial artery, pass a finger into the external anal sphincter, palpate the anterior border of the axilla, do the breast examination, and keep your stethoscope on the mitral area and listen to the pulmonary valve” (P6).

However, a few departments restricted their involvement in such teaching. The actual practical training was taken care of by clinicians from the hospitals in the clinical skills labs. Three HODs described this sort of restricted involvement in teaching surface and living anatomy. Two of them indicated that their departments did not teach living and surface anatomy because it was taught in a separate course dealing with clinical skills

“They get some of this [living anatomy] in the clinical competency module, which is not related to anatomy. The material is not covered by anatomy [department] and it is taught in parallel with anatomy at the same time” (P2).

“We do not do surface anatomy but it is covered by the clinical skills lab. They are done by clinical instructors working in the departments of surgery or medicine” (P8).

Interestingly, in some schools living and surface anatomy was not used to its full potential by the anatomy departments due to the reluctance by the students to volunteer as models during the sessions. According to those HODs, the local culture of the GCC region applies some restrictions that make students unwilling to undress or to expose some parts of their bodies.

“I would like us to teach surface anatomy in some of the practicals but it is against the local culture. I cannot get a male student to strip off and volunteer. I tried it on several occasions but none of them will do it. They would not even take their shoes or socks” (P2).

HODs from other departments described how they encouraged the reluctant students to volunteer for surface and living anatomy. One HOD asked the students to make the volunteering process in rotation so by the end of the course “each group should take it in turns so everybody should be volunteering to demonstrate for their colleagues. If you do it in a rotation fashion then it is fair and each one will participate” (P7). Another HOD had to personally tackle the problem to secure volunteers for each session: “I will select one of the students. Ok, come on. This is your time to come here and show me the structures on the dorsum of your foot” (P6).
7.2.4.1.2.1.2 Medical imaging

Medical imaging was also described by HODs as a way to implement vertical integration of anatomy. Like surface and living anatomy, medical imaging was praised for its direct link to the students’ future careers:

“Bear in mind what the students are going to experience as clinicians, clinical students, and clinical practitioners. They are going to come across a lot of radiology. So we have radiological anatomy” (P2).

According to the HODs, medical imaging for undergraduate teaching served two main purposes; firstly it allows students to correlate the structures they study on cadavers and models to their appearance in living subjects:

“We teach them the correlation and the correspondence to CT scans and MRIs to build in their mind the three dimensional concepts of the cadavers” (P1).

“At this stage it is a question of correlating radiological images with their study on the plastic models” (P2).

Secondly, it introduces students to the normal and abnormal appearances of anatomical structures on images and the principles of the techniques used:

“We give them an X-ray of a fractured clavicle or humerus. We do not ask them what is the diagnosis but we tell them what is the abnormality in this joint or bone or what is the likely problem that might cause that?” (P5).

“Imaging is part of our teaching and in each system we show them every type of normal radiological imaging and various techniques” (P7).

While most of the identified uses of medical imaging were done by anatomy staff in the anatomy departments, HODs described some teaching of imaging that was carried out by people from other departments such as radiologists.

“We are fortunate to have two very good radiologists at [...] Hospital next door. They teach a detailed course, a very detailed course in radiological anatomy” (P2).

“Students were not only exposed to imaging anatomy but they will attend classes in the radiology department in the hospital” (P5).

“Students also have sessions with radiology staff to go into the details of analysis of the images for different systems” (P8).
7.2.4.1.2.1.3 Other forms of vertical integration

Vertical integration of anatomy was also implemented after medical students finished the anatomy course and entered the clinical phase of their study. HODs described two forms of arrangements that their departments applied to ensure that anatomy teaching does not stop at the pre-clinical level. The first form was the offering of elective courses to students, among whom were clinical medical students.

“The department of anatomy has organised electives for fourth and fifth year [students]. During the fourth year there is a 4 week window and during the fifth year, all students have a 4 week window for electives. So anatomy department offers an elective course” (P8).

“Elective courses are for students in the pre-clerkship and clerkship years. So any student can take the dissection course, in addition to postgraduates, and residents in surgery” (P10).

The second type of teaching anatomy to clinical students took the form of revisit of advanced or clinical students to the anatomy department to revise the anatomical knowledge related to the corresponding clinical discipline’s rotation. This arrangement was described by one HOD as a “spiral” curriculum. He further added that those revisits allowed them to teach anatomy “in all years from year one to year six” (P10).

Another HOD whose department allowed this type of revisits to anatomy labs indicated that students from many clinical rotations such as “surgery students come and rotate in pathology and anatomy labs may be three or four times a semester. So we are participating in the fifth year’s general surgery, sixth year's gynecology, and seventh year’s general surgery” (P8).

In another department, revisits were made according to the individual interests of clinical instructors and the contribution from anatomy department was restricted to providing the space and material. The HOD indicated that they “have a person who does obstetrics and gynecology round clerkship. She brings the students back into the dissecting room and they study structures” (P3). This in fact was the only opportunity for the students to revisit the anatomy department because the HOD indicated earlier that “after second year they do not come back”. She further expressed her support for such revisits to enhance clinical students’ learning of anatomy: “I believe the students would benefit if we have a little bit of anatomy in the clinical years where they can come back and see some of the structures”.

151
Those revisits, besides refreshing the anatomical knowledge that the students had in their pre-clinical years, allowed anatomists to increase the level of that knowledge when it was delivered to more advanced students in parallel with the clinical rotations as one HOD explained that “anatomy is also given as part of surgical round in the clinical phase when they take what we call surgical anatomy, which is a higher level from the basic and applied anatomy taken in the pre-clinical phase” (P5). Therefore, according to another HOD, these revisits “ensure gradual assimilation of anatomy knowledge” (P10).

7.2.4.2 Advantages of integration

HODs identified some advantages of integration of anatomy in medical curricula. However, most of the advantages were not directly related to student’s knowledge of anatomy as a subject, but to contributions to maximising the clinical experience of students in integrated curricula.

Teaching relevant anatomy was the point around which the advantages were focused. HODs believed that integrated medical curricula make anatomy departments focus on applied rather than basic anatomy, which is more relevant to studying medicine: “We offer in relation to anatomy what we call applied anatomy more than basic one. Of course basic is important. However we focus more on the applied critical thinking and clinical examination of the patient” (P5). Therefore, anatomy departments were encouraged to introduce students to early patient exposure and clinical examination before reaching hospitals: “We ask the students to keep their stethoscopes on the mitral area or listen to the pulmonary valve. Students will be examined on history taking and examination of cardiovascular system, for example” (P6). Students also get exposed to real medical practice because they become exposed early to the hospital environment and introduced to different clinical specialties:

“Students will be visualising the MRI machine there and the infrastructure. They are exposed to the precautions and the steps of processing of the imaging. They also see how the radiologist uses his anatomical knowledge in interpreting the findings” (P5).

The relevance of anatomy taught in integrated curricula was believed to increase students’ motivation to study anatomy when they realise the rationale of knowing anatomy early in their study: “Everything is running together and they see the reason of why they have to study the structure A or the structure B. This is one advantage that I
see” (P9). Moreover, it also makes students more motivated because it makes them feel like doctors at an early stage in their study: “The good thing is that the student feels that he is exposed early to the clinical experience. He feels that he is a doctor from the beginning” (P11).

Besides making students more motivated, teaching anatomy in integrated curricula was thought to enhance students’ knowledge of anatomy. Firstly, integration spreads anatomy teaching over more years instead of finishing the anatomy course in the first one or two years of the curriculum: “Now we have technically five years of anatomy” (P8). This allowed time for revision and gradual introduction of the anatomy content. Secondly, Integration makes the anatomical knowledge easy to remember for a longer time: “Students from the first time already integrate anatomy with clinical, basic, and applied sciences and it becomes difficult to forget” (P5).

Integration also had some positive effects on anatomy teachers, encouraging them to interact more with faculty from other departments: “There is one big advantage of an integrated curriculum and that is it brings the individual disciplines together, so in a very real sense the physiologists and all the rest are immediate colleagues of mine” (P2). This interaction was highly admired: “Here at an academic level we are fully integrated with other staff and I think that is important” (P2). It also opens new opportunities for integration at the level of staff “now we are thinking of having multidisciplinary research” (P9).

**7.2.4.3 Disadvantages of integration**

HODs, on the other hand identified some disadvantages of teaching anatomy in an integrated curriculum. Unlike the advantages, the disadvantages were mainly directly related to anatomical knowledge.

First of all, Integration makes anatomical knowledge presented to students fragmented in comparison to the continuous flow of the traditional discipline-based curriculum: “When I came here I thought maybe this is not the thing that I want to teach. Anatomy is bits and pieces, not a continuous thing” (P4). While it helps the integration of different medical sciences, it affects the integrity of anatomy as a subject because in an integrated curriculum, “you should learn that much related anatomy and not the body as a whole” (P4). Secondly, the fragmented nature of anatomical knowledge fails to cover the anatomy of all body regions and organs. As a result, gaps in the anatomical knowledge
were created. This becomes more obvious when using PBL as the main method of teaching: “We find some areas in the human body not included directly in any problem” (P5). Thirdly, integrated curricula concentrate on teaching mainly applied anatomy: “They are more into clinical and para-clinical subjects than basic sciences” (P4). This makes students miss “very fundamental knowledge in anatomy and other basic sciences” (P11). As a consequence, the anatomical knowledge that students get usually lacks depth. Moreover, students may know applied anatomy but they miss the basic anatomy behind it: “We find the students to do good physical examination however they lack the anatomical rationale behind these examinations” (P5).

From other perspectives, students in integrated curricula learn too many disciplines by many staff members at the same time, which can be confusing if not well aligned: “The reason why the students are not remembering the moment they finish the anatomy is that they have other loads like pathology, microbiology, pharmacology, community medicine” (P6). While anatomy forms the foundation for other basic and clinical medical sciences, the sequence of the lectures in the integrated curriculum can cause some confusion to the students if they are not well aligned:

“The sequence of the lectures used to be one of the complaints of the student, to give somebody clinical part first and at the end of the week you give the physiology or anatomy. So what is the use of it?” (P9).

From a teacher’s point of view, Integration also requires more effort and time to ensure that it happens smoothly without affecting student learning:

“It needs time and collaboration between faculty and disciplines” (P1).

“Teaching anatomy in integration requires faculty integration. I should make contact with physiologist; what is your class this week? To avoid overlap” (P5).

### 7.2.5 Anatomy teaching time

This section presents the views of HODs of anatomy departments in GCC on the time given to anatomy teaching in their schools and how it affects the delivery of the anatomy curriculum. Four main themes will be presented: perception towards anatomy teaching time, reasons for needing more time, impact of inadequate time, and strategies to minimise the impacts of time inadequacy.
7.2.5.1 HODs perception of anatomy teaching time

First of all, HODs acknowledged that, unlike traditional curricula, the new “innovative” medical curricula contain many more disciplines that students need to study. Those new disciplines needed to be allotted part of the curriculum time, which had to be at the expense of the old disciplines like anatomy.

“No new innovative medical curricula in the past 20 or 25 years, there is a lot of revolution in the way of teaching. And new courses need to be sort of included, you know, like molecular biology, genetics and other sciences and so on. So it was on the expense of those areas like anatomy” (P1).

“They say there are not enough hours given to anatomy. Anatomy has been downgraded and anatomy is being treated very badly. I don’t think any of that is true. I think the traditional subjects have to make way for new subjects” (P2).

“It was a necessity to cut down the anatomy time” (P7).

Despite the justified view of many HODs on the need to cut the anatomy teaching time, all except two, felt that the time devoted to anatomy teaching in their schools was inadequate.

“I feel the time has been cut much. It needs to be at least part with other disciplines if not more” (P7).

“The time frame for anatomy is very short for the knowledge to be passed” (P11).

The sense of insufficient anatomy being taught to students was not confined to the HODs themselves, but it was shared by their departments’ staff members, external examiners, and even students.

“There was a demand from the students. There was a demand from the faculty also. The time allotted to anatomy is not sufficient” (P6)

“Time has been cut down so much and that is a complaint I hear from both students and staff” (P7).

“We got feedback from external examiners and they said that anatomy is not adequate” (P7)

Satisfaction with the time allotted to anatomy teaching was expressed by only two HODs. Despite stating first that their “time is limited”, one HOD later commented that she was “largely satisfied with the time”. However, with that degree of satisfaction, she indicated that there was actually some need for more time to improve the delivery of the
anatomy curriculum: “with additional time we could do better” (P3). The second HOD expressed a stronger degree of satisfaction with the time available for anatomy time by confidently indicating that it was “perfect” (P2).

7.2.5.2 Reasons for the need for more time

HODs described a number of reasons behind their perceptions of the inadequacy of the time allotted to anatomy teaching in their schools’ curricula. They were related to the nature of anatomy as a subject, the nature of the curriculum and the way anatomy was being taught in it, and the feedback received from those who were involved in the learning process.

According to one HOD, the anatomical knowledge that is required by medical students is large in the sense that they “have to cover very important and large volume of anatomical information” (P11). However, the anatomy time in his school’s curriculum did not allow his department to do so: “more time was needed by the department to pass that knowledge to the students”. Another HOD added that his department is not able to pass on the amount of knowledge that they feel medical students should have. “Students are not getting the full dose that they should get from the anatomy department”, and consequently, “it is bound to affect the students and their comprehension of the material” (P7).

The second feature of anatomy as a subject, which was seen to require more teaching time is the fact that it “requires repetition” (P3) or revision, therefore students need to spend more time on it. This comment was made by an HOD who was “largely satisfied” with the anatomy time they have. Therefore, she commented that “for that [repetition] alone I think they need more time”.

HODs indicated that, unlike other basic medical sciences, teaching anatomy in a PBL curriculum particularly requires more time. It is related mainly to the visual nature of anatomical knowledge, which makes it require more student contact. One HOD whose department faced this problem commented that because of “the visual nature of anatomy, a lot of appointments were required” (P1). Moreover, students “used to take appointments with different faculty from the same department”. With the increasing student numbers every year, “it was not really a good teaching or learning practice for the department of anatomy”. Therefore, there was a need for more scheduled time.
The way anatomy was taught in the integrated curriculum was also behind the need for more anatomy teaching time. The nature of the integrated systems modules results in anatomy being presented in “bits and pieces, not a continuous thing”, according to one HOD (P4). As a result, the anatomical knowledge that was presented in those modules was “not in depth like what we teach in a traditional curriculum”. Moreover, the scattered nature of the anatomical knowledge in the system modules was made worse by the insufficient time allotted to it, according to another HOD who stated that “the module makes students exposed for short time to the issue. This short time impacts the information” (P11).

### 7.2.5.3 Impact of insufficient time for teaching anatomy

HODs identified some negative impacts of the limited time available for teaching anatomy on the way they taught. It also had impacts on the way their students learned anatomy. Moreover, these negative impacts put the departments under pressure to deliver the needed anatomy content within a limited time.

One HOD indicated that the reduction of anatomy time that was brought about by a recent curriculum change has affected “both lectures and practicals” (P7). Even those HODs who have expressed their satisfaction with the available anatomy time admitted that “the practicals are very short” (P2). The limited time for practicals forced the departments to abandon dissection. For example, one HOD stated that “the time constraints in an integrated curriculum will not give you time to dissect” (P4). Another HOD added that dissection “requires more time and that is why they started to sacrifice dissection” (P5).

Lack of depth of the anatomical knowledge taught was also identified as one of the consequences of having less time for anatomy teaching:

“For the basic sciences the students should learn more than what we can give because it is not coming as continuous thing, not in depth like what we teach in a traditional curriculum” (P4).

Another HOD implicitly referred to the lack of depth as weak understanding, memorizing information and regurgitating it, which can be improved by having more time. He stated that “the time input needs to increase and we must make sure that our students do understand anatomy, not just to regurgitate it or just memorise it” (P7). Even memorization becomes helpless when there is limited time to study according to
another HOD because “this short time impacts the information. It makes the information volatile” (P11).

Integration was also found to be compromised by the limited anatomy teaching time. One HOD indicated first that the available teaching time did not match the amount of knowledge that students should receive: “We have 30 lectures in core course of anatomy. We have to cover very important and large volume of anatomical information in 30 lectures. It is very short time to do this” (P11). Even though the curriculum is integrated, the HOD could actually pass less “clinical anatomy, surgical anatomy and applied anatomy” to the students than what he used to in the traditional curriculum that he taught before joining his current medical school. He further stressed that it occurred “because of the time shortage”. Another HOD described how students spend the limited available time on understanding the basic concepts of anatomy first, which they obtained from lectures. This does not leave them with much time to be invested on applying that knowledge in an integrated approach.

“The students will have less time to focus on doing the horizontal integrated approach and they will just focus on lectures and utilise the same lectures into integration and I think this will minimise their potentials” (P9).

HODs also complained about the negative impact of the shortage of scheduled anatomy time on the assessment of anatomical knowledge which followed the distribution of teaching time, especially in integrated curricula.

“Anatomy becomes like very minor subject in assessment” (P4).

“Assessment is weighted according to the time input. They weigh the questions according to the time of input” (P7).

“If [students] have six lectures, this means that six questions will come” (P9).

Finally, the shortage of anatomy teaching time and its negative impacts on student understanding of anatomy has caused some personal discomfort to the teaching faculty. It was mainly related to the feedback that they received from other people in the school that they were not teaching enough anatomy. One HOD stated that “students are not getting the full dose that they should get from the anatomy department. That is why it is a perception by others that anatomy is not adequately taught in this new curriculum” (P7), and therefore “we are under pressure”.

158
7.2.5.4 Adaptation of Anatomy teaching to the inadequate time

Delivering a large amount of anatomical knowledge in the limited time available in the integrated curricula can be a very challenging task to anatomy departments and their faculty. In this section, HODs presented their departments’ experiences of how they adapted their anatomy curriculum to time inadequacy.

Focused teaching was the most common way that anatomy departments had followed in order to deal with the limited time. They focused on teaching clinically relevant anatomy instead of a lot of detailed anatomy.

“There is no luxury of one hour to just talk about all details” (P1).

“We have reduced the details. We do not cover much in the way of the scientific background of anatomy” (P2).

“The aim of the lecture is to focus on important points but not to explain everything” (P5),

Since the curricula are mostly integrated, the teaching was focused on the anatomical knowledge that served the integration of anatomy into the medical curriculum instead of the factual anatomical knowledge itself. Therefore, the clinical and applied aspects of anatomy were mainly emphasised.

“You have to talk about the core or the basics, the clinical applications, and correlations between structure and function” (P1)

“With anatomy, the gross anatomy lectures if you like, we dwell on things of clinical significance” (P2).

“In the PBL system you do not give them all the basic anatomy but you exclude the topics which are not required for general practitioners but may be for specialists” (P5).

Interestingly, some HODs indicated this sort of focused learning was beneficial to medical students. One of them stated that this gives them “more time and at least they know the use of basic and clinical anatomy in the clinics later” (P5). Consequently, he described the short anatomy teaching time available in his school’s curriculum as being “more productive” than that of the traditional curriculum because the teaching was “more applied for the students”. P2 agreed with the suitability of the resultant “trimmed” and “focused” anatomy curriculum for medical students through stating that what they “got here is better for medical students".
The second strategy that GCC anatomy departments used to face the challenge of teaching time inadequacy was SDL. One HOD indicated when asked about his suggestions to improve the delivery of anatomy curriculum in his school: “To allow more time for the students to learn by themselves” (P10). He suggested the resort to self study, because he could do nothing to include more structured anatomy teaching in a typical week because students were almost fully occupied by other departments:

“Allocating more hours in a typical week could be sometimes difficult because you do not want to take [time] from somewhere and put [it] somewhere else or in another discipline like to take from physiology or microbiology and allocate it to anatomy”. (P10)

One department managed to triple the weekly practical time by encouraging the students to do two hours of SDL following the weekly single hour of structured practicals: “The practicals are very short. Our kids here have one structured hour a week and they do up to two hours in their own time” (P2). Another department gave one-to-one or group appointments to students when they need to clarify issues that they could not understand in the scheduled anatomy teaching time: “If students have any difficulty, they go and make an appointment with a resource person from the faculty who has been assigned to them for that week” (P1). However, due to the high demand for those appointments and the lack of focus in that sort of SDL, the appointments were replaced by a course of more structured teaching. Here, SDL was used as a bridge to include more structured anatomy teaching.

A third department was planning to use student dissection as a form of SDL. Because “the time is not enough”, the HOD “introduced the new idea to use what is called student directed learning for the dissection”. Students will be divided into small groups and each group was assigned a cadaver and a supervising faculty member at the beginning of the academic year. Students had to return the dissected cadaver by the end of the academic year. That was all done “out of the schedule” and described as “student directed learning, or self-directed learning” (P11). The HOD emphasised that the need for more students’ exposure to anatomy was the main reason behind that new idea. He introduced it as “an assignment in order to just expand the time of exposure to anatomical knowledge”.

Optional courses were the third strategy to increase students’ exposure to anatomy. As it was previously presented, the limited anatomy time has forced many GCC anatomy departments to cut dissection as part of the set curriculum. Some departments have
managed to bring dissection back into the curriculum but in a limited format as supplementary studies by students during their anatomy course or as revision after they have finished the anatomy course.

“Anatomy department offers elective courses which involve dissection. For example, fourth year students can dissect the upper limb or the lower limb, the thorax or the neck, or the abdomen. The fifth year students can dissect the orbit, the back, the applied anatomy of the upper or lower limb, or the detailed dissection of the abdomen.” (P8).

“Elective courses are for students in the pre clerkship and clerkship years. So any student can take the dissection course” (P10).

There was high demand for those elective dissection courses from students, which indicated a real appreciation of their value by students.

“I would say that about 25 to 30% [of] students take it every year” (P8).

“The minute I offer the course it is fully booked” (P10).

HODs also expressed the feeling that the problem of not enough time being allotted to anatomy needs to be addressed at a higher level in the organisation of the whole medical curriculum. One HOD indicated that as a department, they “do review the situation and as far as what I have seen the time is not adequate” (P7). Therefore, he described that need for review through stating: “I think the time is not adequate and we should review that” (P7). He also realised after a recent curriculum change that they “do not have enough time” and indicated that the new curriculum required an urgent review to lift the injustice done to anatomy time: “the matter needs review now” (P7). He further added that to deal with the perception by other people involved in the anatomy teaching process that “anatomy is inadequately taught”, “a review should take place”.

7.2.6 Assessment

This section presents the main reflections of the HODs of anatomy departments in GCCMSs on the assessment of anatomy in their schools’ curricula.

Integration was the main issue in relation to the assessment of anatomy in an integrated curriculum that was identified and discussed by HODs. One HOD described the link between teaching and assessment in the integrated curriculum as: “We teach in [an] integrated manner and we assess in an integrated manner” (P1). However, that link was
not present in all the eleven medical schools whose HODs were interviewed, despite all of them indicating earlier that their schools had integrated medical curricula.

In most schools, anatomy assessment was integrated in written and practical exams. A good example of integration of anatomy assessment was applied in the medical school of P1 and P5. P1 described how anatomy assessment was integrated in the written exams of an integrated PBL curriculum:

“The written exam is composed of two components; MCQs and short essays in form of what we call patient problem management. Now these short essays are around a scenario similar to the cases or problems they studied and it unfolds as students go down” (P1).

Here, the PBL case was the centre of teaching and it was also the centre of assessment, where “there are questions which are integrated. They cover all the basic sciences and clinical sciences related to that problem”.

P5 similarly described the way they integrated anatomy assessment in the practical exams where they included “a station of anatomy, a station of imaging radiology, a clinical station, station of physiology, or microbiology”. Even clinical scenarios were included in the practical exams.

“Sometimes we have a station of what we call [an] integrated station where students can find an x-ray vignette and they can find near it a model of the lung and microbiology in the form of a jar of an organism. It is integrated”.

In minority (n=3) of schools anatomy was assessed in a discipline-based fashion, with written and practical anatomy exams separate from those of other discipline areas. The HOD form one such school stated that “the written exams are module based. So we have anatomy questions and physiology questions but you want integrated questions” (P2). This school does not use PBL but they sometimes included case scenarios in their written exams. However, even in the case scenarios the questions “would be still purely anatomical or physiological or biochemical questions. It is either a pharmacology question or an anatomy question”. They “do not integrate the content”. The link between the limited integration of anatomy assessments and the limited use of PBL was also emphasised by another HOD who described the use of PBL in his school as “minimal”. He indicated that “about 90% of the assessment is subdivided” (P11).

Practical exams, which took the form of oral vivas in the school of P1 were also unintegrated. During those practical exams students were asked pure anatomy questions
by the examiners on anatomical specimens. The HOD described how those exams were run: “What happens is that students come to the practical lab and we have a full range of plastic specimens laid out and it is the same as a spotter exam. We chat.” In the third school of this group, practical anatomy exams took the form of Objective Structured Practical Exams (OSPE). The HOD described this exam as “pure anatomy” (P6), where students were asked to identify structures related to gross anatomy, histology, and embryology.

None of the HODs whose departments had not integrated anatomy assessments, expressed any concern about the assessment of anatomy, but HODs of schools which had integrated anatomy assessments identified some concerns. Those concerns were related to the elimination of the assessment of basic anatomical knowledge and the reduced contribution of anatomy to the overall assessment of the integrated medical curricula.

The first concern was related to the perception that assessment in integrated curricula in general is oriented towards applied and clinically-oriented knowledge rather than basic knowledge. One of those HODs who first indicated that the assessment “is not separately anatomy” indicated this concern by saying that exams “are more into clinical and para-clinical subjects than basic sciences” (P4). This type of assessment made other HODs feel that knowledge of basic anatomy as a subject was not assessed because there were no anatomy exams as such. Two of the HODs stated:

“We do not have exams of anatomy per se. It is integrated. Anatomy questions or items are part of the overall MQCs type A” (P5).

“We have totally eliminated the assessment of anatomy because there is no anatomy exam as such. There is no separate anatomy exam. So we are not assessing their knowledge of anatomy at all” (P8).

“We have stopped teaching anatomy as such and totally stopped assessing their understanding of anatomy”. (P8)

The second concern about the assessment of anatomy in integrated curricula was related to the proportion of anatomy questions in integrated exams. HODs indicated that the limited teaching time resulted in reducing the contribution of anatomy in assessment because the distribution of questions between the disciplines followed the distribution of lectures by those disciplines.
“Anatomy becomes like a very minor subject in assessment. With all other subjects, the space for anatomy is very little. So may be the assessment pattern is doing some injustice to anatomy” (P4).

“Usually the course coordinator sits down with various representatives from departments who taught in that course, on each course. And they weigh the questions according to the time of input” (P7).

“If [students] have six lectures this means that 6 questions will come” (P9).

Moreover, in an integrated exam, what matters for pass or fail is the overall score rather than the score in every individual discipline. Therefore, students may pass the exam even if they failed to answer anatomy questions correctly.

“The problem that we have with the current system is that we are not assessing their knowledge of anatomy, whether they know anatomy or not, they move on. And the majority of them have inadequate understanding but they hide it because the contribution of assessment is very small” (P8).

Even the practical exam, which was mainly anatomy and pathology, made only a minor contribution to the final score and therefore, students could pass the integrated course even if they actually failed the exam:

“Students’ performance in the practical exams is extremely unsatisfactory, very unsatisfactory. Hardly anybody gets an A and there are a lot of failures and they are not requested to pass the practical exam separately. That practical exam contributes a very small percentage to the overall final grade” (P8).

As a result, “students are moving up with inadequate knowledge of anatomy and inadequate understanding of the human body”, he added.

One HOD indicated that this link between the teaching time and the contribution in assessment has affected students’ motivation to study anatomy. Due to the time needed to study anatomy in comparison to other disciplines, students skipped studying anatomy in preparation for exams because they could calculate in advance how many anatomy questions would come in the exams. The HOD explained:

“The students when they find that the number of lectures for anatomy is minimal and you are following a blueprint, what they will prefer? They will prefer instead of spending two hours or two and a half hours to study the blood vessels of the lower limb, it is easier to study 15 or 10 minutes of any other lecture and at the end the number of questions will be the same” (P9).

As a consequence, the student “may not study anatomy at all and he passes” (P9).
7.3  **Part two: The practice of dissection**

7.3.1  **Introduction**

This section presents the findings of the HODs interviews about the practice of dissection in the medical schools of the GCC countries. The findings will be presented into three themes; HODs’ perception of the importance of dissection, reasons for not including dissection, and strategies to include dissection.

7.3.2  **HODs’ perception of place of dissection in medical schools**

7.3.2.1  **The need for dissection**

This section will explore the perceptions of the HODs towards the need for students’ dissection as an anatomy teaching resource in medical schools.

HODs were classified into three groups according to their views of the importance of dissection: the first group indicated that dissection was needed in medical schools, the second group indicated that it was not while the third group took a middle stand by acknowledging the importance of dissection for teaching anatomy to medical students but at the same time admitting that is was not essential.

One of the HODs from the first group stated that dissection is “extremely essential” (P3), and it is a “very valuable tool” and “Skill”. Therefore, she believed that “it is essential for medical students to dissect” and dissection is “a worthwhile investment”. It is worth mentioning that this HOD’s was in the only GCC medical school that used dissection as the primary anatomy teaching resource.

Another HOD described dissection as an “integral part of teaching anatomy” (P4). He further expressed his admiration for the role that dissection plays in learning anatomy when stated that “most of the things that you learn in anatomy [is] while dissecting”. Therefore he recommended that “dissection should be part of the curriculum”. However, the dissection that he recommended was “not full body dissection but some dissection should be there”.

A third HOD in this group described dissection as an “indispensable” resource for teaching anatomy to medical students (P9). His expressed preference was that “all medical students need to conduct dissection by themselves”. He further added that medical educators “need to emphasise dissection”.

165
One of the HODs from the second group, which did not think that dissection was necessary, raised a legitimate question related to the link between teaching and assessment. He questioned the value of allowing students to dissect without being examined on it:

“You ask a student to dissect for 200 hours and dissect [a] full cadaver, and at the end you [only] examine him or her on the end result of dissection. You ask him to identify structures on a prosection. So why not show him this structure from the beginning and examine him” (P1).

He further added that if dissection was to be included, then “some sort of assessment of the actual dissection technique and task” should be also included.

Another HOD from this group indicated that dissection is “unnecessary” for undergraduate medical students (P2). He admitted that this is an “unpopular statement” for an anatomist who had spent the majority of his career teaching anatomy by dissection in a traditional curriculum. He justified his position through indicating that medical students need to learn the applied anatomy rather than the detailed anatomy that dissection provides:

“Most medical graduates are not going to be surgeons. The majority will be non-surgeons. So what they need to know is how to examine the skin of a patient and how to feel a patient for lumps. They are never to go beneath the skin”. Therefore, students at the undergraduate level “do not need it” (P2)

The third HOD from this group indicated that dissection is not a skill that needs to be mastered by undergraduate medical students: “Are we aiming to provide the students with the skills of dissection? This is not our aim” (P11). He further added that “you can achieve this goal away from the cadaver, in cadaver-free teaching”, and therefore, “there is no need for dissection”. Moreover, with the increasing use of endoscopy in surgery, the value of dissection is decreased, he thinks:

“In the next few years, anatomy will be changed so much because about 95% of operations will be done through endoscopy. Anatomy through endoscopy is completely different from anatomy through dissection, it is completely different” (P11).

HODs from the third group, who took a practical stand towards the need for medical students to dissect endorsed the importance of dissection for teaching anatomy but admitted later that it is not essential. For example, one of them indicated first that dissection is “the best way to learning anatomy” (P7). However, he later stated that
“everybody should look at a cadaver, whether it is plastinated or preserved, as long as they see the material in its proper and appropriate dimensions”. With this available, he thought that students “do not have to dissect”.

Similarly, another HOD described dissection as “intrinsic and most important part of learning anatomy” (P6). However, because dissection is “time consuming”, he thought that dissection could be replaced with “one or two demonstrations [of] dissection”. A third HOD also described the cadaver as “the best teacher of anatomy” (P5) but because “within the philosophy of PBL the learning objective for students is not to be dissectors, not to be surgeons, and not even anatomists”, he later added that “demonstration is enough”.

### 7.3.2.2 Advantages of dissection

Despite having differing views towards the need for dissection for teaching anatomy to medical students, HODs identified both advantages and disadvantages of dissection.

Most of the advantages were centred on the improvement of the way students acquire and retain anatomical knowledge and on improving their career skills. Dissection was seen to enable students to acquire a 3D view of the human body structure: “When the students get a chance to do the dissection, it is the best way of seeing the 3D aspects of the body” (P8). It also allows them to trace finely detailed differences between closely related anatomical structures:

> “When they are gone through 20 or 30 labs of dissection, they are very sure about the superficial fascia and deep fascia. They are sure about which is tendon and which muscle is. These differences are easy to learn in the dissection room” (P3).

Dissection was also seen as enhancing the holistic approach to the structure of the human body because “when they do full body dissection, they study the whole body” (P8). Such an approach may be lost when there is no dissection as another HOD stated that “because of the [absence of] dissection, the holistic approach to the body even in the integrated curriculum is missing” (P6). Moreover, dissection introduces students to the presence of anatomical variation among humans such as “identifying the appendix for example, and then seeing the variation between cadavers in position, which may vary” (P3).
HODs also believed that dissection improves the retention of the anatomical knowledge, as “the more you dissect, the more the information will be unforgettable for you” (P9). This HOD also mentioned his own experience in this regard:

“Up to now I remember exactly the courses of arteries and nerves because I have seen them and I dissected them”. It can do so because “when you dissect by yourself you are utilising more than one sense and this is important for memory” (P9).

Dissection was also believed to equip the students with the skills needed by future doctors. Firstly, dissection helps the students to develop their manual skills, which they may need later in the clinical practice: “Manual skills of graduates [who dissect] become better than those who did not dissect” (P5). Moreover, a skill such as “hands-on experience is not possible in 3D softwares” (P6). Dissection can also train students psychologically through introducing them to death early in their medical career:

“Remember that this will be the first encounter of the students with death. So it is different than when you have the student who never saw a dead body and suddenly in the internship a patient passes away. That will be a shock for him or her” (P10).

Lastly, during dissection classes students learn other important professional skills such as “the way they interact with each other around the cadaver, the way they learn to respect the cadaver, [how] to work together as a team, learn together as a team, and other sorts of professional behaviour such as being on time, keeping the work area neat, and taking responsibility” (P3).

7.3.2.3 Disadvantages of dissection

The disadvantages of dissection identified by the HODs were centred around two main issues; the logistic challenges facing dissection in medical schools and the doubts about its actual benefits on students’ career skills.

Dissection was seen by some HODs as time-consuming when anatomy departments already do not have enough time in the integrated curriculum: “If they dissect the recurrent laryngeal nerve for example, it will take time” (P3). Reflection from personal experience was also mentioned:

“I remember when I did my undergraduate studies in medical school, we used to spend hours and hours in the dissecting room and even that time was not enough and we used to come over weekends” (P7).
Added to that, dissection is “expensive because you have to get and maintain cadavers” (P3). Therefore, “It costs the university reasonable amount of money” (P8). Moreover, dissection is an unsustainable resource that could be stopped at any time because “in our environment, it is almost impossible to get human bodies for dissection” (P8). Even those schools that currently have cadavers are uncertain about the future supply because “we do not know how long it [importing cadavers] will work” (P3).

While improving students’ manual skills was one of the advantages of dissection, some HODs raised doubts about its benefits in practice. From one perspective, preserved cadavers do not represent the human body in its real form because “what you see in the operating theatre is totally different from the fixed cadaver, very different. Even the nerve, the appearance of the nerve in the fixed cadaver differs so much from the one you see in life” (P11). From another perspective, the manual skills that are acquired through dissection may only benefit some students because “not all medical students will become surgeons and not everyone will require full details of anatomy and surgical techniques” (P8). For students who do not go on to surgical specialties, it is a waste of time and resources. Many students do not actively participate in dissection practical sessions because they do not see the value of it, especially if they do not plan a surgical specialty in the future:

“Even in the UK where dissection was part of students’ duties, you only find four or five students dissect and the rest are just standing and looking. Although the material was available for them to dissect, you find only few students wanted to dissect” (P7).

It is worth mentioning here that the HODs from the group that supported the need for medical students to dissect did not just espouse the advantages of dissection any more than HODs from the group that saw no need for medical students to dissect just identified the disadvantages of dissection. Nevertheless, it was predominantly the HODs from the third group that identified both advantages and disadvantages who differed. On balance they contributed less towards the identification of advantages than disadvantages, which may indicate that their pragmatic stand towards the use of dissection in medical schools was influenced by the realisation of its disadvantages.

It was also found that the actual use of dissection in anatomy departments of GCCMSs was not always a reflection of the perception of the HODs towards the need for medical students to dissect. For example, out of the four HODs who stated that dissection was essential, only one came from a department that used full body dissection as the primary
anatomy teaching resource: “The students do dissect. They have a good experience with dissecting the body” (P3). One of the remaining three departments offered elective dissection courses: “We do have dissection and this [is] part of elective courses” (P10), and the other two did not use dissection at all: “There is only demonstration, prosected specimens and models” (P4).

On the other hand, only one of the departments of three HODs in the second group did not use dissection or even prosected specimens at all: “We have a practical laboratory and the students come in and examine some plastic models” (P2). One of the remaining two departments offered elective dissection courses: “Students have elective courses in years five and six and some of them like to do it in dissection” (P1), while the other one used prosected specimens: “Here, there is no dissection by the students. It is prosections. It is only demonstrations of pre-dissected samples” (P11). Moreover, the third department was actually planning to offer dissection in the form of a yearlong SDL: “The time is not enough. So, I introduced the new idea to use what is called student-directed learning for the dissection” (P11).

7.3.3 Reasons for not including dissection

7.3.3.1 Limited scheduled anatomy time

Almost all HODs whose departments did not use dissection as the primary teaching resource blamed the limited scheduled anatomy teaching time. There were many comments that referred to this point.

“Here in this school, students do not do dissection for too many reasons. I mentioned one which is time constraints” (P1).

“In our curriculum, the timetable is such that it will be very difficult to find long sessions for dissection during the week” (P2)

“The time constraints in [an] integrated curriculum will not give you time to dissect” (P4).

“Because of the limitation of the time allocated to anatomy in the curriculum, we cannot afford the time [to dissect]” (P7).

Time shortage was not the only reason for not including dissection but many HODs indicated that it remained the main and the most telling factor. Even if the other problems were solved, dissection would remain impossible to implement because the problem of time shortages. HODs made clear statements referring to this point such as
“all logistics are available. But there is no time” (P11) and “actually the major one is [the] timetable” (P5). Other HODs also indicated that they could solve the other problems discouraging them from including dissection such as the unavailability of cadavers and funding but the problem of time shortage will remain.

“We could get the money, we could go to Africa and North Africa for bodies, but again we will be stuck with the last thing, which is the timetable” (P2).

“We have a complete dissection hall and everything: tanks, rooms, and everything. Facilities are there but we do not have the time to include dissection. We can get cadavers but there is no time for them” (P4).

“We have got the cadavers. We have got reserve of cadavers. There are fourteen or eighteen cadavers but we do not have the time” (P6).

7.3.3.2 Unavailability of cadavers

Unavailability of cadavers was the second most commonly cited reason for the rarity of dissection in GCCMSs. One HOD indicated that “students do not do dissection for too many reasons. I mentioned one which is time constraints and the second is we do not have cadavers” (P1). Another HOD also indicated that they had to resort to demonstrations because “with the rarity of cadavers, they [students] do not dissect anymore and dissection was left to the faculty and instructors” (P5). A third HOD similarly stated that “the department cannot afford giving cadavers for dissection by students because the supply of cadavers is very limited” (P7).

The unavailability of cadavers has become a common issue among GCCMSs, as an HOD who has spent more than 20 years in the region indicated that “availability of cadavers is [a] very important topic here in this university and most universities in the region” (P1).

HODs indicated that the unavailability of cadavers is not a problem unique to the GCC region.

“[Obtaining] cadavers is a major problem here. It is really not only here but has become a worldwide problem to gain enough cadavers for dissection and even for demonstrations in our days” (P5).

“Even in Egypt now many colleges have no dissection but prosections because of the shortage of the cadavers” (P11).
7.3.3.2.1 Factors contributing to unavailability of cadavers

The HODs identified some factors that contributed towards cadaver unavailability in their schools. First of all, cadavers were not available at a reasonable cost because there was no body donation program available in any of the GCC countries. One HOD indicated that “in our environment, it is almost impossible to get human bodies for dissection” because “we do not have a donation system in the country so we have to purchase from outside” (P8). Another HOD pointed to the importance of having such a donation program in order to ensure a reliable source of bodies for dissection. He stated that “we would need to have a regular source of bodies. The obvious way to do it is to set up a bank of donors here” (P2). However, he further indicated that such a program is not easy to set up in the region: “You will not get them [the donors]. You know, it is against the local culture. It is not good, it is not bad, it is just against the local culture”.

Another expatriate HOD who spent more than 20 years teaching anatomy in the region explained how the local culture may interfere with setting up a body donation program by stating that “in Islam, the dead body should be buried as soon as possible. To move away from that, I think it will be very difficult to convince people to move away from this belief” (P7).

The sensitivity of body donation for dissection in the culture of the GCC was realised by the medical schools’ administrations. Those administrations preferred not to touch this issue although some HODs showed some interest in establishing body donation programs.

“We wanted to start a body donation program here in our university. I discussed it with our higher-ups and they said: do not talk about body donation programs. It is very difficult to get permission from various departments in this country” (P6).

Being unable to obtain local bodies, anatomy departments resorted to importing cadavers from abroad. However, importing cadavers is not an easy task and is faced with many problems. One of them was the high cost of importing and maintaining the bodies. One HOD commented that “the availability of cadavers is the main constraint because of the cost” (P9). He further added that it was difficult to provide a continuous supply of cadavers at that high cost as “each one costs about 55 thousand Saudi Rials (US$ 14,600) and if you start to dissect them this means that you need a high turnover”. Moreover, with the increasing number of students, the increasing cost of providing cadavers for dissection will become more unaffordable:
“The University started with about 40 students per batch. Now they are 90 and next year it should be 120. They are [ultimately] aiming for 300. This will be another problem [against dissection]” (P9).

Two HODs indicated that while they import cadavers from Germany, this came at a high cost. One of them indicated that they “get them from outside, from a German lab there. They offered the bodies and we buy them. They are very expensive” (P5). The second HOD from a private medical school gave a very high cost for importing just two bodies from the same country: “The first time we got them from one agent, he imported it from Germany and he took a huge amount, 80 thousand dollars for two bodies” and he added: “it is very expensive” (P6). This was compared to less than a third of the annual budget to run a model based lab in another school, whose HOD stated: “I have a limited budget for buying the models. I get 25000 US dollars a year, which is not much. But over 8 years it bought a big collection” (P2).

The problem of providing the funds to import cadavers did not affect all GCCMSs. Some schools could actually provide the required funds when the need for more cadavers arose. One HOD stated that “when there is a need they do provide funding. The university is aware that this is a very important teaching material and we should have it. And when it is required, the supply is there” (P7). Another HOD also indicated that if they need cadavers they “can order more” because “the school can afford it” (P8). However, a third HOD expressed his worry about the future availability of such funds: “so far we are not having a problem with the money. I do not know about the future” (P10).

If the schools could find the time for students’ dissection and could provide the money to import the cadavers they would be faced with another problem, which is the long and complicated process of getting those cadavers delivered. The process usually starts within the schools when trying to secure the funding from the administration, which can be a lengthy process as “the issue has to go to the finance and purchasing office at the central administration of the university and then they have to go into bidding through private companies. That takes some time” (P11). Another HOD admitted that his department had problems in securing the required funding and he described the task as “very hectic” (P9). According to him, the negative attitudes of higher authorities in the universities and the medical schools towards the necessity of dissection can sometimes make getting the required funding more difficult: “If being a basic scientist is not one of
the concepts or at the back of [the] minds of the strategic [decision] makers, they will not pay this money for you”.

The second stage of the process as indicated by the HODs was getting the cadavers into the country, which also raised some difficulties as one HOD indicated that it is “very difficult to get the dead bodies and the rules are very strict” (P4). Another HOD stated that “getting cadavers is not an easy task and now there are international rules and regulations” (P10). Therefore the process of importing cadavers takes a lot of effort and time, which includes “a lot of paper work to get licensing and passport passage in the airport” (P5), and would have been avoided if there was a supply of local bodies. P10 also indicated that importing cadavers is a process that takes time because of the bureaucracy. They had to get politics involved in it to ensure its success in the form of “getting the help through the cultural attaché of the [country] and various embassies overseas”, which is “sometimes a lengthy procedure”.

7.3.3.3 Other reasons for not including dissection

Besides time and cadavers, HODs also identified the disposal of dissected human remains as one of the major problems that made their departments limit the use of dissection. One HOD stated that “dead body disposal is a big problem here” (P6). He further added that it also suffers from bureaucracy through extensive paper work and permissions from many departments in the country and from absence of common guidelines:

“We have dissected pieces and other things and they had to be disposed. We collected them in bins but we could not find how to dispose them. Luckily, we have to contact the Human Resources department, they contacted awqaf [religious department] and some people came from there after so many letters and other things they took them and buried them somewhere” (P6).

“If we want to bury them, we face a lot of technical problems. We need to go to Amara [governor’s office] to [obtain] permission and then we need to contact the security and it takes more than 3 months to bury them” (P9).

One HOD whose school is relatively new indicated that one of the reasons behind his school abandoning dissection was to avoid the competition with other schools in the country and in the region for the already short supply of cadavers. Such a competition can harm the schools that already have dissection through limiting their access to cadavers to run their established dissection facilities.
“Now we cannot import. The reason for this is there is an inadequate supply worldwide and the [neighbour] University does have a limited dissection facility. They were here first and we will be in direct competition with them and they cannot get enough bodies. So if we went into competition with them, we would make their position worse” (P2).

The type of the curriculum was identified as one of the challenges against the inclusion of dissection. Dissection provides detailed basic anatomy, which is different from the clinically applied anatomy that is required by an integrated PBL curriculum as one HOD indicated that “to have dissection for every student to be part of the curriculum is very difficult because students study every week problems and they need the knowledge of anatomy related to the problem” (P1). Therefore, the HOD added that “in PBL there is no room for students to dissect”. Another HOD commented that dissection would probably lose if it was put against applied sessions in an integrated curriculum: “the time that can be allocated for dissection can be allocated at least for some applied sessions which might be more productive to the students than dissection” (P5).

Moreover, most of the anatomy of the integrated curriculum is taught is a systems-based approach. According to one HOD, making dissection fit into a systems-based curriculum can be problematic.

“Integrated curriculum will not give you time to dissect because dissection is region wise and in [an] integrated curriculum you cannot fit dissection because it is usually done in a regional approach. Then it may create a problem” (P4).

Consequently, he added that the integrated curriculum has limited their reliance on dissection: “Now we do not need to get [cadavers] every year because it is an integrated curriculum”.

7.3.4 Strategies to include dissection

Despite the different problems that faced anatomy departments of GCCMSs when they wanted to include dissection, the departments did not abandon it completely. This section presents the strategies that some departments used to make dissection available to their students.

7.3.4.1 Dealing with the time problem

Since departments could not find the time for full body dissection for all students within the set curriculum, they resorted to offering dissection outside the mainstream scheduled time. For that purpose, a few departments offered optional dissection courses
for interested students. One HOD whose department offered such elective dissection courses indicated that they were offered to advanced students: “Students have elective courses in years five and six and some of them like to do it in dissection” (P1). He added that those courses included specific dissection tasks which were aligned with the PBL objectives. He described them as “two or three weeks of very specific short courses under supervision of one faculty”. In another department, those interested advanced students were given the chance to choose one body region to dissect according to their interests and the clinical rotation they were doing:

“For example for 4th year we have electives where the students can dissect the upper limb, lower limb, thorax, neck or, the abdomen. Then for 5th year students we have dissection of the orbit, back, applied anatomy of the joints of the lower limb or upper limb, or detailed dissection of the abdomen” (P8).

Two department offered dissection in the form of SDL. One of them offered it to all described in section (7.2.5.4). The second department used SDL dissection in a different way. The HOD invited interested students in their spare time to attend the dissections performed by the staff members to act as observers and helpers. They were also given the chance to participate in the dissection process. The HOD explained

“I made what we call students’ dissection groups, which are optional. Those students who are interested I group them in non-curricular hours and I inform them I am going to dissect this region and if you are interested you may come. So they come and I give them the chance to help me and dissect in order to fulfil their interest” (P5).

Another HOD indicated that they also invited the interested students to attend dissections in the past and he would support restarting it

“Actually we did that in the past. We gave them the chance [to dissect]” and “If they want to dissect, provided they are really keen and they want it in their extra time, I would encourage them” (P7).

7.3.4.2 Dealing with the problem of unavailability of cadavers

P3 provided the best example of how a GCC anatomy department can obtain enough cadavers to offer compulsory full body dissection to all students. Being a branch of a Western medical school that used full body dissection as the primary anatomy teaching resource was the most important advantage. The HOD indicated that their success in obtaining cadavers “relates to the fact that we are so closely linked to our parent institution in” (P3). The link obliged her students to “have the same [dissection]
experience of [the parent schools’] students” and most importantly, this link allowed the department to “get the cadavers through the cadaver donation program in [the parent school]”.

Moreover, the link between the GCC School and the parent school made importing cadavers an easy task because the parent school took the role of dealing with the regulations in the Western country.

“In [the parent school] the cadavers belong to the organisation and again it is regulated by the government, by the legal office, [including] how the cadavers are procured, how they are dissected, how they are returned to the family. In that process we have made a presentation that we have a branch campus in here so we would have to send the bodies [from] there” (P3).

The second action taken by the departments that could not provide full body dissection was to reduce the demand for cadavers by limiting the use of dissection. Almost all those departments offered interested students optional dissection courses or dissection as SDL instead of offering all students full body dissection. Optional dissection courses and dissection as SDL have been described in the previous section.

HODs also acknowledged the help that they received from politicians in making importing cadavers an easier task. In this regard, the HOD of the GCC medical school which had had the most success in importing cadavers pointed first to the fact that the school is under management headed by a member of the Royal family: “When the college was set-up it was set-up under the auspices of [a royal figure], who is the minister of education” (P3). Moreover, the HOD indicated that for importing cadavers to be successful, “it required the support of both governments”. Another HOD indicated that his department involved his GCC country’s embassies overseas in the process of importing cadavers. He indicated that so far they “are able "to get some cadavers through the cultural attaché office of the [country] overseas”, although it “is sometimes a lengthy procedure” (P10).

Help from anatomy departments within the GCC was also mentioned as an action taken by one department to obtain cadavers. The HOD described how they did that: “We got it from our sister college. We have got one in [a neighboring city]. They ordered more bodies and they asked us: we have got plenty of bodies, do you need them? We accepted and purchased the bodies” (P6). Moreover, that help from the sister college allowed them to obtain cadavers at a much reduced cost compared to what they used to pay
when they ordered cadavers from overseas: “We gave them 40 thousand dirham ($US 10,800) for one body. So, 40 thousand dollars [when importing alone] compared to 40 thousand dirham. There is a lot of difference”.

Another HOD mentioned a different action to deal with the high cost of importing cadavers. His department provided space and technical support for dissection done as part of the residency programs organised by the Ministry of Health: “Now, new residency programs are being introduced in the country. So we are involved in teaching anatomy and provide material to those courses like surgery and dentistry residents” (P8). The collaboration between the department and the Ministry of Health helped in increasing the number of imported cadavers at a reduced cost by making the ministry of health pay their share of the cost:

“We can get some money from the Ministry of Health. That would help us in compensating the university. So the total cost of the cadavers will not be coming from the university budget but also from the Ministry of Health budget” (P8).

Initiatives from anatomy departments and specifically from the HOD to make dissection available in any form were also identified as a factor that encouraged the use of dissection. One HOD who introduced elective dissection courses to his school indicated in this regard that he “wanted to start [dissection]. The main issue is to start. You do not wait for things to happen. You make it happen by yourself” (P10). He started by putting a plan for providing the facilities to run the dissection classes:

“When I joined here they did not have [a] dissection hall. So I put on the paper a plan for establishing a modern dissection hall with video cameras” (P10).

Another HOD also introduced elective dissection courses to his school after joining the department also stated: “When I came here I introduced the elective system here also. During summer I organised these dissection courses” (P8). He also took the initiative to offer dissection courses to residency programs trainees:

“I have suggested to these programs’ coordinators that when the residents come in they should spend three or four weeks, may be few hours in the week to do dissection and refresh their anatomy”.

A third HOD, who admired dissection as “indispensable” but whose department was yet to introduce it indicated that he took the initiative to expand the facilities for storing cadavers and running dissection classes.
“We have the facilities to store up to four cadavers. But we are aiming for twenty cadavers, and I have already issued the memo about it” (P9).

7.4 Collaboration between anatomy departments

7.4.1 Introduction

This section presents the findings about the current status for collaboration between anatomy departments of GCCMSs, based on the experience of the departments’ HODs. The section is divided into four sub-sections that present four themes. The themes are experience of collaboration, benefits of collaboration, factors discouraging collaboration, and strategies for increasing collaboration.

7.4.2 Experience of collaboration

Three out of the eleven interviewed HODs indicated that their departments did not have any sort of collaboration or contact with any other departments. For example, one of them indicated: “we do not have any sort of collaboration with other anatomy departments in the GCC region” (P3). Moreover, her department has not been approached by any other department to initiate collaboration as she indicated that they “have never been invited to collaborate by any department”.

The rest of the HODs described some forms of collaboration between their departments and other anatomy departments in the region. Three levels of collaboration were identified; regional collaboration, departmental collaboration and personal or individual collaboration.

7.4.2.1 Regional collaboration

Regional collaboration involving all or a group of anatomy departments from GCCMSs was mentioned by two HODs, both of whom had been teaching anatomy in the region for more than 20 years. It took the form of meetings between several anatomy department HODs.

“We had a meeting in the UAE in Al-Ain University a few years back. There was a conference and we had the opportunity to sit in the anatomy department, several heads of departments. The idea was to have some sort of collaboration. We were exchanging ideas first” (P1).

“We have met as heads of departments before in the GCC. It was in Dammam in 1999 probably. I think that was the only meeting that took place at the level of
the heads of departments. I was representing [this country]. There was a spirit of cooperation” (P7).

In those two meetings, the HODs discussed many issues regarding the teaching of anatomy in the medical schools of the region, paying some attention to the need for initiating collaboration between the departments. Among the issues that were discussed were “cadavers and their sources and to share” (P1) and “making a journal of anatomy for all GCC countries, exchange of teachers between the countries, collaborative research, exchange of external examiners, and establishing an anatomical society for the GCC countries” (P7).

The other form of regional collaboration mentioned was forming an anatomy sub-committee under the GCC Medical Deans committee “because on the [deans’] agenda there was the issue of cadaveric study of anatomy” (P1). Anatomy HODs were requested to gather information about anatomy teaching in GCCMSs. Subsequently, a meeting was planned but due to reasons which will be presented in a subsequent section, it “was cancelled” (P1) and the idea “just gradually faded away” (P7).

7.4.2.2 Departmental collaboration

Departmental collaboration is that involving two departments in a one-to-one relationship. This type of collaboration was the most commonly mentioned by the HODs. Eight of the interviewed HODs described at least one example of such collaboration. They described the exchange of short visits of staff members, exchange of external examiners, and exchange of anatomy study aids and materials.

Short exchange visits of staff members were the most common form of departmental collaboration, experienced by six departments. The visits were just to observe the teaching methods and the facilities of the other department. Many HODs described the purpose of those visits as “exchange of experience”.

“..... University department of anatomy, five, six, or seven years ago, wanted to come and visit our department here. They did [so] and they were very welcomed. We had a nice meeting. They looked at what and how we teach and at our facilities” (P1).

“I would not have any hesitation of seeing [a neighbouring school’s] anatomy facilities and I have seen the approach of how they teach anatomy and they have come here and seen ours” (P2).
“The interaction comes in the way of just visits to exchange experience here and there in the UAE” (P5).

Such visits were also requested by newer medical schools in order to have an idea about how older schools deliver their anatomy curriculum.

“When we came here in 2006, we were not having a single slide, a single bone, or a single book. We started from the scratch. We visited nearby colleges and studied their things and we took their cooperation and help” (P6).

“[A new medical school] visited us and colleagues from other colleges visited us and saw how we deliver the curriculum and they now try to set up similar systems in their schools” (P11).

Exchange of external examiners was mentioned by five HODs, three of them from the same country. One of them indicated that the exchange of external examiners was the only type of collaboration his department had so far: “Only in [this country] we have exchange during the exams. External examiners come in from [city 1] or from [city 2]” (P4). The second HOD described those external examiners as “observers” and his department received them from within the country as well from other countries:

“Two years back, people came from outside the country; from Bahrain and Qatar, so many places. They came here as observers. People [also] came from Dubai College two times” (P6).

The other two departments invited external examiners from two other different GCC countries.

Exchange of study aids and materials was only practised by two departments, and for both of them this was as a one-off occasion. The exchange took the form of sending a dissector with a cadaver for plastination, receiving dissected prosections, and purchasing a cadaver from another department.

“I remember that [our university] sent a cadaver there to be plastinated and a dissector went from here to dissect it there and leave the cadaver to be plastinated. We used it at that time for teaching” (P1).

“The first three months [after starting the school], students joined without any cadaver, bones, or slides. We ran the college like that. Then we got dissected lower limb and upper limb from [a neighbour school]” (P6).

“They ordered more bodies and they asked us: we have got plenty of bodies, do you need them? We accepted and purchased the bodies” (P6)
7.4.2.3 Personal collaboration

The personal level involves collaboration between two or more staff members of anatomy departments in the GCC region for academic purposes. It was found that such collaboration was extremely rare. It was found to be mainly personal rather than professional contact. Only one HOD acknowledged the existence of personal professional collaboration with staff members of another anatomy department in the GCC and it was “collaboration in the sense of research where I can write personally to individuals is there” (P8).

Other HODs identified some degrees of interaction with staff members from other departments, which did not reach the level of collaboration. It was more towards friendships and informal personal contacts and meetings in international conferences.

“I am friendly with the anatomy staff in Arabian Gulf University and in King Abdulaziz University, Jeddah in Saudi Arabia. So our collaboration here is more of a social and personal nature” (P2).

“I met a few anatomists in one of the conferences overseas. They were working at various medical schools in the GCC” (P8).

“Staff members have personal interactions. Some of them were working in King Saud University” (P9).

7.4.3 Benefits of collaboration

This section presents the perceptions of HODs of anatomy departments in GCCMSs on the benefits of collaboration between their departments. Analysis revealed that collaboration would benefit the departments in four main ways namely, unifying anatomy teaching in GCCMSs, benefits for faculty, benefits for teaching resources, and benefits for students.

7.4.3.1 Collaboration unifies anatomy teaching the in the region

Developing a core curriculum for anatomy among GCCMSs came on top of the list of benefits of collaboration cited by the HODs. One HOD indicated that collaboration can benefit them because they “can have certain agreement about an important topic, which is core curriculum. To have a unified core curriculum of anatomy for all GCC schools” (P1). According to him, the need for a core curriculum came in response to the current situation in GCCMSs in which “every college or department or university have their
own style or curriculum. Curricula are different and teaching methods are different” (P1).

Another HOD believed that “it would be ideal if we can have one anatomy curriculum” (P7). He and another HOD raised a number of questions directly related to the need for a regional core anatomy curriculum.

“Should every one teach according to his facilities or system? Should it be unified? Should anatomy be taught the same way or it differs? This question should be asked” (P5).

“What is the core anatomy curriculum for all GCC countries that is acceptable to all? Why do we have different curricula? Are we seeing things differently? Why do not we have a core anatomy curriculum?” (P7).

Those HODs believed that such questions regarding the core anatomy curriculum and how it can be reached can be discussed in a collaborative regional way as “if we have a common platform, we can discuss a common or basic core curriculum for anatomy for all the GCC.” (P4).

It was perceived that a core curriculum could improve the teaching of anatomy in the region in a number of ways. First of all, it would standardise the teaching of anatomy in the region through regulating all aspects of teaching from delivery to examination as it would “look after the examination, the teaching methodology, and portions or topics to be taught” (P6). Consequently, the position of anatomy in medical curricula of the region would be regulated to ensure that the core curriculum was implemented: “[The core curriculum] will govern the anatomy contribution to the medical curricula across all the universities of the GCC” (P10).

The core curriculum was also seen as a way to reduce the gap between the well-funded public medical schools and their less-funded private counterparts through ensuring that students across the GCC region got the same anatomy teaching, regardless of the country or the type of their schools:

“As I said, the majority of medical schools have enough or adequate anatomy facilities but some of them do not, they are poor, especially the newly sprouting private medical schools” and therefore “we should look into that and make sure that the core curriculum not only applied to public schools but also applied to those [private schools]” (P7).
Having a common core anatomy curriculum for the GCC region can also benefit current students when they graduate and sit for regional licensing exams or look for jobs in the region.

“If I am teaching something and others are teaching something else, then at the final licensing exam the students might feel some difficulties there. So if you have collaboration with each other at least the anatomy part can be brought into the same level” (P4).

“[having a core anatomy curriculum] means that graduates who graduate from any school will be at the same level. So they can work in any of the GCC countries” (P6).

7.4.3.2 Collaboration benefits staff members

Collaboration between staff members of anatomy departments in GCCMSs was seen to improve the way in which they teach. First of all, through collaboration, they are exposed to how anatomy is delivered across the region. Many HODs referred to this benefit as “exchange of experience”. This exchange of experience can help them in many ways as described by the HODs.

Such exposure was thought to help anatomy teachers to reach consensus on the best methods for delivering the anatomy curriculum in the region. Collaboration was seen to enable anatomists to “exchange the experience regarding methods of teaching” (P9). Ultimately, the “exchange of experience helps the departments to reach the best way for teaching or learning the discipline according to the available curriculum and resources” (P5).

For others, the exposure to how anatomy is taught in other medical schools was seen as an opportunity for anatomists to catch-up on new ideas about teaching anatomy. According to one HOD, collaboration is needed “to get the idea of how anatomy is taught in every college. I can improve on my teaching and I can get some new ideas of implementing anatomy. That is my idea of collaboration” (P4).

Collaboration was also seen to help in the exchange of information about different teaching methods and resources and their suitability for implementation within the context of the GCC environment in a manner which would help in improving the advantages and avoiding the disadvantages of operating in the region.
“If some departments are having some facilities we can get their experience of how useful they are. Is it worth to spend all that amount of money on them?” (P5)

“If you exchange, you have more experience, you will have more exposure on the advantages and disadvantages. You may have things in your institution that are not here and I will bring them here to raise the level of my students” (P9).

Getting to know how anatomy is taught in other departments with similar circumstances is also important when any department wants to introduce curriculum change. Visiting another department with a good experience can be very helpful in this regard, as one HOD described such an occasion when he was working outside the GCC:

“I went to Galway, which had a very good anatomy department, to see what their course was like because I wanted to change the programme in Cork and I did not want to change it without reference to another anatomy department that had a strong tradition of histology” (P2).

“The help I got from there was wonderful and it did focus my mind very much on the kinds of change that were achievable” (P2).

Anatomists can also benefit from collaboration through getting feedback from other anatomists in other schools on the way they deliver their anatomy curriculum. The need for such feedback was expressed by many HODs.

“I need feedback about the way I teach from my colleagues, which will be definitely an addition” (P9).

Assessment can also benefit from collaboration when anatomists discuss assessment standards applicable to the GCC circumstances.

“If they [students] are for example answering wrong or the spelling is not good, at what stage we say ok we will accept anything or we will not accept? It will be good to know if other GCC students also do these mistakes or they have very bad handwriting or they cannot express themselves” (P3).

Besides the occasional exchange of experience, collaboration can benefit the way anatomists teach anatomy through the collaborative educational research. Doing educational research is important for verifying the outcomes of current and new methods of anatomy teaching. Such activities raise the level of collaboration from when “the exchange of experience and trial of new techniques for teaching is based on documented research” (P5).
“We are looking at the dissection experience and what are the responses of students towards dissection and that might be of interest to you and other departments” (P3).

“It [collaboration] will help try new methods of teaching and make some education research among the different strategies of teaching anatomy” (P5).

“If we want to compare the traditional colleges with PBL colleges, we can collaborate in a paper useful for your students and also useful for my students. It will detect the drawbacks and advantages in each system” (P5).

7.4.3.3 Collaboration improves teaching resources and facilities

Collaboration can also benefit anatomy teaching in GCCMSs through the exchange of resources. One HOD stated that through collaboration, “we can share the resources that we have” (P8) and he further described sharing the resources as “important”. Moreover, it becomes a necessity for smaller departments that have limited resources and facilities to collaborate in this regard in order to have access to a wider range of them: “If we have collaboration, smaller departments can join forces and share the facilities” (P8).

Sharing resources is needed because there are some schools that do not have appropriate anatomy teaching facilities and resources as one HOD indicated that “the majority of the medical schools have enough or adequate anatomy facilities but some of them do not. They are poor especially the newly sprouting private medical schools. These have to be taken into consideration” (P7). He further added that being unable to provide adequate facilities and resources forces the schools to abandon common resources and resort to other “less beneficial alternatives” as he thinks:

“Some countries are pushed to do that [adopting software] because of the lack of cadaveric material to compensate. That is fine but it should not be there to replace it completely. And that is where collaboration comes in” (P7).

Moreover, access to similar types of teaching resources and facilities would be required for the implementation of a core anatomy curriculum in order to make sure that the curriculum is equally delivered across the schools. Through collaboration, schools with limited resources can receive help from other better positioned ones:

“We should make sure that the core curriculum not only applied to public schools but also applied to those [private schools]. And if they do not have the facilities, then they should be helped out” (P7).

Exchange of cadaveric material was on the top of the list of resources that require exchange. Schools that suffer from shortage can obtain some from other schools with
extra cadaveric material. Moreover, schools that produce a lot of reusable dissection leftovers can process it and exchange it with other schools that are in need for such resources:

“Every year we are harvesting ten brains. We could set up a plastination unit and then help sell [them] at cost price” (P3).

“Let us suppose there is a country that is deficient in teaching material, they do not have enough cadavers while another country or countries have enough material. Then collaboration will be very beneficial here. We could make arrangements to exchange materials on lending basis” (P6).

GCCMSs could collaboratively provide a stable supply of cadavers at a reduced cost through establishing a central anatomical facility.

“You need to have a body and this body I think can import directly from different countries, do the embalming, and provide these cadavers to the GCC at a lower cost. I am sure that this will bring the cost down to almost half” (P9).

By doing so, the body will ensure the “quality” of materials, “provision on demand”, and “increase the region’s expertise in the field” (P9).

7.4.3.4 Collaboration improves students’ learning

The fourth aspect, through which collaboration can benefit anatomy teaching in the medical schools of the GCC countries, as identified by the HODs, was through supporting students’ learning. The most frequently identified benefit was that collaboration can allow students to move between the schools as part of student exchanges and get exposed to what is available outside of their own schools:

“If some resources are there in some colleges then our students can go and benefit from that” (P4).

“Other students can make use of our resources. We have a very good collection of plastinated parts. Students from other colleges can make use of the resources” (P5).

“We can accept people from outside if there is collaboration” (P8).

Dissection was identified as the most important reason for exchanging students’ visits between the departments. HODs acknowledged the opportunity that collaboration in the form of student exchange provides students from schools that lack dissection experience to have it in other schools. HODs expressed willingness to send their students to other schools or accept students from other schools to do dissection.
“Suppose there are no facilities or cadavers and faculty is also not there, so I recommend students to go to another college to visit and have training for about one, two, or three month module, acquire the knowledge and come back” (P6).

“If Oman does not have any dissection at all and [our university] has a four week dissection session, we may take students from outside. So we own the resources and we benefit from them” (P8).

“If a medical school does not have dissection unit and the other one has dissection unit, they can send some of their students. They can exchange students” (P10).

Students exchanges benefits the students by enriching their learning through being exposed to different learning environments and teaching resources. One HOD describes his experience with American students where such exchange is available:

“If the American system has this elective period [that we have] during the fourth year of their medical school, no student stays in one place. They go to five different places and get enriched by the environment because each and every institution has a different way” (P8).

Students exchange also benefits students’ learning of anatomy indirectly in their own schools through providing feedback about their visits to other schools. This feedback can help their schools and specifically anatomy departments, to implement some of the resources or facilities that they tried during those visits. One HOD pointed to this benefit by stating that “students can go and give feedback to you about what is happening there which might be good for them” (P4). For example, “if some resources are there in some colleges then our students can go and benefit from that or even if the methodology is good, we can implement it here and our students can benefit from it” (P4).

7.4.4 Factors discouraging collaboration

This section presents the challenges that face collaboration between anatomy departments in GCCMSs. HODs identified three main types of factors discouraging collaboration: the lack of need for collaboration, administrative factors, and factors related to anatomists themselves.

7.4.4.1 Lack of feeling the need for collaboration

Some HODs raised legitimate questions about the actual need for collaboration between the departments for teaching purposes. Some HODs indicated that their schools provide
enough funding for all their department’s need for teaching and, therefore, there is nothing extra that collaboration can offer them.

“I think it is just because we can all cover what we are supposed to cover in each university without the need to collaborate with others. We have the facilities here for doing what we do” (P2).

“We have good facilities, we have enough material, we have good expertise in certain techniques and we have motivated staff” (P7).

“Anything we need we apply inside our university and they give us what we need” (P11).

While the exchange of resources may be needed by new schools lacking appropriate facilities, when such schools stand on their own feet, collaboration may not be required. For example, a new department asked for cadaveric material from an older school to start their first gross anatomy practicals and that proved very helpful. However, after some time the HOD commented: “Then slowly our contact grew up and the response from the agent who supplies the bodies was quick. So from that time onwards we are independent. We got the slides, cadavers, and we started dissecting” (P6). In this case, gaining independence lay behind the reduced need for collaboration.

Similarly, while the exchange of visits to obtain exposure to what is available in the other departments may be needed as a one-off occasion, recurrent revisits may not be needed because nothing more can be achieved from them and there is no need for long term collaboration:

“I would not have any hesitation in seeing AGU’s anatomy facilities and I have seen the approach of how they teach anatomy and they have come here and seen our approach. So there is no reason for them to come back and no reason for me to go back except for social contact” (P2).

While HODs from some schools needed to visit other well-equipped schools in order to improve their teaching, their counterparts from the visited schools did not express a similar need. On the contrary, they believed that other less-equipped schools had little to offer them and were less enthusiastic about collaboration

“[A new medical school] visited us and colleagues from other colleges visited us and saw how we deliver the curriculum and they now try to set up similar systems in their schools. I think they have nothing to provide until now” (P11).

The difference in types of curriculum was identified as another factor reducing the need for collaboration. Knowing that a particular school has a different curriculum made the
HODs reluctant to initiate collaboration as one HOD commented that their “system is pure PBL and maybe other systems are hybrid or traditional. So the academic point of interaction is little” (P5). This particular reason was also a discouragement to staff exchange for examination and teaching purposes. One HOD preferred to replace the external examiner from the GCC with an external examiner from a school outside the GCC, which he knew had a similar curriculum.

“We then decided we could share [the non-GCC school’s] external examiners and one of their examiners will come each year, just to have a presence from the west because we teach the same program and it was felt useful if the same external examiner could be here” (P2).

It was also seen as more convenient for the staff member to go on an exchange mission to a school with a similar curriculum because he/she would be more likely to teach the same material: “If somebody is to come here we cannot just tell them to teach physiology or anatomy that you have been teaching because it might not be similar to our course” (P2).

The feeling of the lack of need for collaboration within the GCC region may also arise from purely personal reasons. Most of the anatomists in GCCMSs are senior expatriates. They have already accumulated a vast experience of anatomy teaching before coming to the region. One of them indicated when he was asked about the need for local collaboration: “I have my own experience in Libya, Yemen, and Egypt” (P11). He taught anatomy for 28 years before coming to the GCC. Some of the HODs still maintained the overseas collaborations that they had accumulated over the years, which made them feel fulfilled and in no need of new collaborations.

“In my own little area I collaborate a lot with Cardiff and Galway and with Cork and that is enough and fills all the need that I have. So there is no need for me to become involved with others” (P2).

“I still have links with Europe but not here” (P9).

7.4.4.2 Administrative factors

HODs identified some administrative factors that discourage collaboration between anatomy departments in the region. The chief of these were bureaucracy, lack of follow-up, and lack of recognition.
7.4.4.2.1 Bureaucracy

Bureaucracy when dealing with higher authorities in the schools was one of the reasons behind limited collaboration. It was blamed for the failure to implement real regional collaboration following the previous HODs’ meetings. One of the HODs indicated that it was the insistence of the deans of certain schools that they host the meetings which lay behind the cancellation of further meetings.

“There was some E-mail correspondence and we decided to have a meeting in [one school]. They insisted to have it there. The dean there was also insistent. I suggested having the meeting in [our school] because it is easier and it did not happen. They wanted it to be there” (P1).

“Deans want to have meeting in certain areas. They do not want to have the meetings outside their schools. Some want to be taking the credit. That is my feeling. It is unfortunate” (P1).

Bureaucracy was also experienced by other HODs in the form of the need to request permission or fill out many papers in order to participate in activities as simple as giving a talk or obtaining an appointment to use a microscope in other departments.

“The problems are administrative and I tried this myself. I was part of research to be done in [a school in the same country] and I found it very difficult because I had to through tons of papers to be signed in order to get an appointment to make some microscopic specimens” (P5).

“Suppose I want to go to the [a schools in the same country] and talk about a subject or related anything, it is not allowed. We have to get permission” (P6).

One of the reasons behind this was that the administrations of other schools were concerned that their staff members may be persuaded to move to other schools as a result of collaboration: “They [administrators] think that their staff will leave. And it actually happened. Two or three staff has joined here after leaving there and they are working with us. It is migration of the staff” (P6). That is, medical school administrators may try to limit collaboration to avoid losing valuable staff members.

7.4.4.2.2 Lack of follow-up

The two HODs meetings held were perfect opportunities to initiate collaboration, but both of the HODs interviewed who had participated in those meetings believed that nothing among the points that were discussed was achieved. For example, following one of the meetings, “they presented some document to the deans after one year from
the formation of the committee and it ended there and nothing happened [afterwards]” (P1).

Despite having a plan to start a collaborative initiative in those meetings, one of the HODs confirmed that “none of these happened” because “they were not followed up. As far as I [the HOD] know no other meeting took place” (P7). The other HOD involved in those meetings also indicated that the initiative “faded away and there was no follow up. Follow-up to see it coming to collaboration and continue was not that efficient and that good” (P1).

Follow-up did not occur due to the absence of leadership in ensuring that the recommendations of the meetings were administratively realised. One of the HODs explained that “it lacked a convener or a leader to organise it again. Although it took place in [one GCC medical school], it did not follow up from there” (P7).

7.4.4.2.3 Lack of recognition

Collaboration with departments or people from the GCC region may not be as recognised or accepted as collaboration with departments or people from outside the region, especially from the West.

“There is a perception in the Gulf countries. My perception is that they do not accept people of other Gulf countries. We got excellent examiners in this part of the world but if you are trying to run an exam in Abu Dhabi and you fly in a Bahraini, the candidates there do not want a Bahraini to examine them. But they do not mind an Irish guy even though the Bahraini might be better” (P2).

“The idea of having gone outside the region being better than staying within the region is a very strong one and that would be against it [local collaboration]” (P2).

“We have still the concept that we are tiny or small. We think that if things are coming from a Western country it will be ideal” (P9).

Establishing a GCC anatomy journal was among the possibilities raised in the previous regional HOD meetings, but the lack of local recognition was seen as an obstacle to the achievement of such an initiative. Publishing in local journals is under-recognised in comparison with publishing in international ones when it comes to promotion.

“We are discouraging our people to publish in our journals because we do not give it the importance that it deserves” (P8).
“If faculty members published in Medical Principles and Practice [a local journal] and applied for promotion, they will say that all the papers are in local journal? Only two are allowed” (P8)

7.4.4.3 Factors related to anatomists

The limited collaboration between the anatomy departments in GCCMSs was not merely due to administrative factors but also to personal factors related to the anatomists themselves. HODs identified some of those factors as lack of initiative, lack of communication, lack of information, and time constraint. There are also factors specific to expatriate anatomists.

7.4.4.3.1 Lack of initiative

The importance of initiative for initiating collaboration, regardless of its source, was acknowledged by the HODs. One HOD indicated that “it [collaboration] needs somebody to drive it and make the initiative. It is just the initiative. As long as the initiative is there, it can work” (P7).

However, in the case of collaboration between the GCC anatomy departments, this initial step was seen to be lacking. The rare HODs’ meetings themselves did not come through an initiative of the HODs themselves, but were in response to requests from the deans. For example, one HOD indicated that “there is the GCC Medical Deans Committee and in one of the meetings, they asked to form a subcommittee. Because on the agenda there was the issue of cadavers and cadaveric study of anatomy” (P1).

HODs referred to the impact of the absence of initiative on establishing forms of collaboration such as a GCC anatomical journal, a general meeting of anatomists, and visits for exchange of experience.

“The other missing thing for me is the initiative to go and see and learn” (P3).

“GCC anatomical journal will also help but somebody has to take the initiative” (P4).

“Somebody has to take the initiative and make a gathering of anatomists in a time point but who will organise that? Who will initiate that? It is a big thing” (P8).

HODs identified some factors that could be responsible for the lack of initiative such as the HOD’s personal characteristics, the uncertainty about attracting the interest or the support of others, and the unstable nature of expatriate anatomists.
“On my own, I would not initiate contact even if I have the name and contact of the head of department in Saudi, I would not initiate contact or discussion with that person. Partly due to my own reluctance or shyness you may call it. I think there is some sort of reluctance” (P3)

“The initiative is missing because most of the people are expats. The basic thing is that nobody is continuously here. All these things can happen if somebody is stable. This faculty is gipsy in the sense that somebody will come and somebody will go” (P4).

“I thought maybe to write to various anatomy department heads thinking about starting an organisation of anatomists within the region. But then I gave up on that idea because again thinking there may not be a positive response. So I could spend my time and then nothing would happen” (P8).

7.4.4.3.2 Lack of communication

HODs described the lack of communication between them as one of the factors behind the limited collaboration between them and their departments.

“I think it is the lack of communication” (P3).

“There are so many medical colleges in Saudi Arabia and Oman and Qatar. There is no link. Nobody ever invited or contacted us and neither we contacted anybody else” (P8).

“I met few anatomists in one of the conferences overseas. They were working at various medical schools in the GCC. And nobody knows what the others are doing. There was no communication whatsoever” (P10).

The lack of communication between the anatomists and between the departments has led to a situation in which there is lack of information about the overall status of anatomy teaching in the region. This includes for example, information about the available staff members: “In other colleges we do not know how many anatomy faculties are there; we are unaware” (P4), the available facilities: “I do not know [of] any GCC country that has an electron microscope in their anatomy department” (P7), the types of research conducted: “They have very nice research projects but we do not know what research [and] in what field they are doing [this]. We do not know, we are not aware” (P6), and the types of curricula: “Now I do not know what colleges are applying it [PBL] and to which level” (P5).

This state of “no information at all about what is going on in other anatomy departments around” (P8) was described by one HOD to be as if there is “secrecy”
around anatomy teaching in the regions’ medical schools because “what is going on in one university is not known by other universities” (P6).

The lack of communication between anatomists in GCCMSs was attributed by the HODs to the lack of opportunities, in the absence of a professional organisation, meetings, conferences, and journals. One of them indicated that he and his department do not have the information about other departments because “there is no professional body” (P6). Another HOD admitted that he is able communicate his department’s activities in the international arena because opportunities are available, but he could not do so locally

“I can go and make my presentation there [internationally], but nobody in the local area knows what is going on in our department of anatomy because there is no forum for local presentations” (P8).

Some HODs contrasted their experience in the GCC with the opportunities to communicate with locals arose when they were working outside the region. They described their experiences in the countries before they came to the GCC region such as in the US, India, and Egypt:

“We also had our own anatomy bodies in the state I was in. They used to have a state meeting and there were national conferences. They also have a journal; the anatomic society of India had a journal of anatomy” (P3).

“We have our separate body of anatomy. Every year there is a national conference where we meet” (P4).

“In the US it was totally different. There was the American Association of Anatomists and every year we used to meet in the conferences. So you know who is up and who is where but in GCC you do not” (P8).

“We have anatomy society, very active society in Egypt but here we have no contact” (P11).

7.4.4.3.3 Time constraints

HODs identified time constraint as one of the factors that limited the collaborative activities of their departments.

“I think the explanation [for not having collaboration] is the free time that I have to devote to other things. I can do more in producing self-teaching powerpoints. So it really has been a question of not having the time” (P2).
“We have no other sort of collaboration. I think because again it is time constraints, but we should have some collaboration at least in the [this country]” (P4).

“There was an intention to have another meeting to follow but it did not take place. It just gradually faded away. People busy with their work. I think people are just too busy, too busy” (P7).

One HOD expressed the worry that risking valuable time on unproductive collaborative activities could make him lose the time that he could have invested on other more productive tasks. He explained:

“I thought maybe to write to various anatomy departments heads thinking about starting an organisation of anatomists within the region. But then I gave up on that idea because again thinking there may not be a positive response. So I could spend my time and then nothing would happen” (P8).

This attitude points to the importance of time towards making decisions in regards to collaborative activities.

7.4.4.3.4 Factors specific to expatriate anatomists

Expatriate anatomists pointed to their temporary employment in the GCC region as one of the issues discouraging them from initiating collaboration. That is, they felt uncertain about how long they would be staying due to their short term contracts.

“That is the difficult part of it because to have a continuous faculty in a GCC country I do not think it is possible” (P4).

“Obviously collaboration will be done on the long term basis. You can only do that if you have long term contracts. Our maximum contracts for expatriates here is 3 years” (P7).

From one HOD’s experience, even when an expatriate starts collaboration with others from other departments, that collaboration ends when the expatriate leaves after a few years:

“We invited a professor from the UAE. This gentleman came. He is a British man. He came three times. Now there is no local there. Everybody else is a foreigner. So even inviting that person as an external examiner did not cause any collaboration of any sort” (P8).

Moreover, the temporary status of expatriate anatomists was seen to affect their devotion, interest, and commitment towards collaboration.
“Those who are short term participants will not be devoted for this process [collaboration]” (P5)

“Because all expats will be leaving after five years, so they may not be interested in that” (P5).

“The thing which makes me angry although I am an expatriate, when an expatriate colleague of mine says: I am here for few years and it is their country” (P8).

Some HODs felt that collaboration was more likely to prosper if there were many local anatomists to adopt it. Unlike expatriates, local anatomists have the advantage of staying in their schools for longer and therefore have interest in collaboration.

“If you have somebody who is a local involved in this basic medical sciences society they will be permanent and interested in moving the wheel” (P5).

“When you have local people there is continuity. So that makes a big difference. The lack of local people causes this discontinuity and lack of long term planning” (P8).

The other issue which one HOD saw as a discouragement to expatriate anatomists initiating collaboration was the lack of power or authority to do so.:  

“One of the issues here is that for most of them, their minds change instead of being motivated, because they do not have authority, they will become like a service job. Everything here comes to authority. We do not have that” (P9).

“Most of the people are expatriates and they do not have the power to establish the society that will help them communicate properly” (P10).

Expatriates acknowledged the need for interested locals, who they thought had more power or authority, to start and maintain collaboration.

“I am sure in every department there is at least one national. So request or ask this national to represent that department and to meet. So you will have all GCC nationals” (P1).

“One of the reasons that I have not done any collaboration for the past two years basically I was looking for the nationals to see them and to work with them, not in Saudi Arabia but also in the remaining GCC countries” (P10).

The temporary status of expatriates was not seen by some HODs as an obstacle to collaboration as long as the interest was there. They were of the opinion that anatomists will collaborate regardless of their nationality or the length of their stay: “I do not see it as an obstacle. As I said you can make collaboration if intention is there even with short
Some believed that collaboration is institutional rather than personal, so that expatriate or local status was not an issue.

“You are not making it [collaboration] at the level of individuals but at the level of departments and departments are there whether you leave or not. The institutions are there and individuals move around” (P7).

“You may be a local or a foreigner but at the end, the collaboration is for this institution” (P9).

Moreover, short-term expatriates may stay for a long time in the GCC region but move between schools, as one HOD indicated:

“Even if they are staying for 15 or 20 years they will be moving between colleges but not staying in the same college or the same institution” (P4).

“Even when they [expatriates] stay in the GCC they will be moving around from one college to another” (P7).

P7 saw such movement as an advantage that could promote collaboration between the departments as those making the moves could establish the needed communication between their current and previous departments and colleagues. He thinks that “a member of staff who may come here for 6 months might have contacts in another anatomy department in the gulf and may have more friends and contacts” (P7).

### 7.4.5 Strategies for increasing collaboration

This study investigated the strategies that can help in facilitating collaboration between the anatomy departments in GCCMSs and between their staff members.

#### 7.4.5.1 Establishing an anatomical professional body

During the interviews, HODs expressed the need for establishing the professional anatomical body suggested at the previous HODs meeting. Nine of the eleven HODs made reference to this body, describing it as the best and most urgent requirement.

“The first strategy is that we should form an anatomy body for all the GCC countries” (P4).

“A professional body should be there” (P6).

“What is needed first there should be an organisation like association of anatomists of the GCC” (P8).

“Anatomy departments need a body or association; you can establish a GCC association of anatomists” (P9).
Some HODs had actually considered establishing such a body either for the whole GCC region or for the country where their schools were located.

“We were thinking of establishing an association for anatomists like the association for microbiologists under the umbrella of the ministry of health” (P5).

“I thought may be to write to various anatomy department heads thinking about starting an organisation of anatomists within the region” (P8).

“I have been dreaming about it for two years now, is to really establish this GCC society for anatomy” (P10).

Establishing this anatomical body was seen to enhance collaboration between anatomy departments in the region’s medical schools in a number of ways. Such a body would enhance communication between the anatomists by organising conferences and meetings, uniting efforts while dealing with the challenges that face anatomy teaching in the region, and ensuring systematic rather than individual collaboration.

“If there is one platform you can unite. If there is not common platform then everybody is different” (P4).

“It [the body] will be systematic collaboration rather than just meeting each other” (P4).

“If there is a GCC association of anatomists which can hold a conference every two years” (P8).

Moreover the body could organise, control, and regulate all aspects of anatomical science teaching in the region: “Professional body should be there, that body can look after the examination, the teaching methodology, and portions or topics to be taught” (P6). According to another HOD, such a body would “set strategies” (P9), which will govern and plan for the future of anatomy teaching in the region.

In an anticipation of what could face the establishment of this body if it was based on the individual efforts of anatomists, HODs indicated that the body needs to recognised by GCCMSs and other related government departments.

“It should be adopted by the schools” (P5).

“I think it should be a formal one an association or a society of [anatomists] or it can be done as a part of higher education in the GCC” (P9).
The HODs brought up some ideas to minimise administrative obstacles to the formation of a regional body for anatomists, such as having representatives from all countries and rotation of presidency.

“If it is a common platform then one representative from each country may represent [to have a common body]” (P4).

“The presidency of the society they can rotate it. One year it will be from Oman and second year it will be from Saudi Arabia and so on” (P10).

HODs also raised the concern of whether there were enough anatomists in the GCC region to qualify for establishment of a professional body. One of them thought that “if you want to make a society, anatomical society, I do not know if the numbers qualify for it... but it can” (P1). On the other hand, another HOD thought there was no need for a large number of anatomists in order to establish a professional body. He confidently stated that “you can start with two members by the way” (P10). A third HOD took a middle stand as he pointed that the body could have additional members by attracting participants from outside the region, as it is the case with many national and international professional bodies.

“If there is a GCC association of anatomists which is holding a conference every two years, then people from the local area will come there and people from outside the area will also come and participate” (P8).

7.4.5.2 Sporadic meeting opportunities

While a professional body has been described as the “optimum” (P9) way for facilitating collaboration between anatomy departments in the region, it may not be feasible in the near future. In this case, HODs identified other ways for providing opportunities for communication and interaction, among which were meetings of different types and purposes. HODs suggested types or varieties of meeting opportunities such as commonplace meetings of HODs or other faculty, seminars, workshops, and conferences.

“Meeting at the level of heads of departments or all faculty I am sure they are very useful” (P1).

“Collaboration can be done at smaller levels like organising seminars for anatomy” (P4).

“If we have more meetings like that and exchange ideas and suggest solutions and put these solutions into practice, then we can reach some kind of collaboration” (P7).
"To hold a workshop in Jeddah, Emirates, or Muscat in a turning form and each workshop has a title and all of them will speak about this title" (P11).

Those meetings can facilitate collaboration in different ways. First of all, they give anatomists the chance to know the people who share the same profession in the same region because they “get anatomists from different medical schools in one building sitting side by side and ideally have interactive sessions where they would get to know one another” (P2) and specifically to “know that these are the people who teach anatomy in various schools” (P8). Secondly, during those meetings, opportunities would arise for anatomists to “present their work” (P8). Presentations and discussions that usually accompany such meetings are the essence of exploring opportunities for collaboration because “research abstracts, experience, new trends, and things like that can be shared” (P5). In brief, one HOD summarised the advantages of such meetings in collaboratively planning for the future of anatomy teaching in the regions’ medical schools by stating:

“The point is to have a gathering and sharing and exchanging ideas and looking at the future of anatomy. What are the challenges? What are the opportunities? How to improve? It is these kinds of things” (P1).

7.4.5.3 Electronic communication

Organisation of a professional anatomical body and opportunities for physical meetings require planning and logistics that may not be within the immediate reach of GCC anatomy departments or their staff members. HODs identified an easier means of communication that does not require travel and is available to individuals, namely electronic communication.

The first step towards establishing electronic communication was seen to be the construction of a “database” of all the information relevant to the medical schools of the GCC region such as “number of students, type of curriculum, teaching methods, use of cadavers, assessment methods, and problems facing them” (P1). This database could help anatomists to easily find possible target departments for future collaboration. It was suggested that this database contain the details about the teaching faculty in the region’s anatomy departments, to help identify precisely target colleagues, as another HOD commented that there is a need “to establish a database about who are the nationals who had the opportunity to do at least a Master’s degree in anatomy?” (P10).
Electronic communication can take “*simple and achievable*” (P10) forms such as a special website, discussion forums, and modern social networking websites such as Facebook.

“To have some sort of a list on in internet or Facebook or a group. There I can say that one student has written this spelling for an anatomical term, would you give credit or marks for such an answer? So it will be interesting to see what they say” (P3).

“The web page of course can be useful; we can make a special page” (P5).

“We can have a forum among ourselves. Every day we can say good morning, how are you? And you start talking about interesting stuff” (P10).

### 7.5 Summary

#### 7.5.1 The anatomy Curriculum

HOD interviews revealed that their schools’ anatomy curricula were integrated, most being hybrids of traditional didactic teaching methods of lectures and practicals and PBL. Pure traditional curricula that did not include PBL were rare and pure PBL without traditional teaching methods did not exist. SDL was given emphasis in most of the schools, but greater emphasis was given to it by those that relied largely on PBL. HODs emphasised the need for clear objectives and the provision of suitable study resources for successful SDL.

The systemic approach to teaching anatomy was prevalent in GCCMSs surveyed. Those schools that followed the regional approach had their anatomy teaching aligned with overall systems-oriented curricula and were branches of Western medical schools without the authority to deviate from the mother schools’ curricula.

Horizontal integration was implemented in didactic lectures and in PBL sessions. In lectures integration took three forms; anatomists and teachers of other basic medical sciences delivering their separate lectures in the same day, teaching in the same lecture, or anatomists briefly covering topics related to other basic medical sciences. The first form was the commonest. Horizontal integration also occurred in PBL sessions but the focus for anatomical knowledge in those sessions was clinical application. HODs whose schools did not use PBL had negative perceptions about horizontal integration describing it as concomitant teaching rather than real integration.
Vertical integration took various forms. It occurred in PBL sessions, SDL, and in individual attempts by anatomists in didactic lectures. Most commonly it occurred in laboratory sessions, where special stations were dedicated to emphasise it. Surface and living anatomy and medical imaging were the tools used in laboratories to implement vertical integration. Vertical integration was also approached through the contribution of clinicians to the teaching of surface and living anatomy and medical imaging.

Vertical integration was also implemented through allowing clerkship students to refresh their anatomical knowledge by offering them elective anatomy courses including dissection and short time revisits to the anatomy laboratories. HODs believed that such courses and revisits ensured gradual assimilation of the anatomical knowledge and the opportunity to immediately apply that knowledge in their clinical practice.

The advantages of integration identified by HODs were fuelled by their positive perceptions of the impact of integration on enrichment of the clinical experience of the students. The combination of the teaching of relevant anatomy and early exposure to patients in the hospital environment was seen to increase students’ motivation to study anatomy and spreads anatomy teaching over more years, which allows revisits. It also benefits anatomy teachers by allowing them to interact more with teachers from other departments.

On the other hand, the disadvantages mentioned were fuelled by negative perceptions of the impact of integration on the depth of students’ anatomical knowledge. Integrated curricula were seen to focus on applied anatomy at the expense of basic anatomy which creates gaps in the students’ anatomical knowledge. Moreover, anatomical knowledge is presented as fragmented pieces, which may lack sequence and cause confusion to the students. Teaching anatomy in an integrated curriculum was also seen to require more time and effort from the anatomists.

Most HODs were dissatisfied with the time allocated to anatomy teaching in their schools. Only two of them expressed satisfaction with the time; one of them used dissection as a primary teaching tool and the department of the other had significantly reduced anatomy content. However, HODs understood that the reduction of anatomy time in medical curricula in general was justified in order to give time for new subjects.

The feeling of time inadequacy by the HODs was triggered by some factors related in part to the nature of anatomy as a subject, such as the high factual content, the need for
revisits and repetitions, and the visual nature of practical anatomy. Other factors were related to the way anatomy is taught in integrated medical curricula, such as the fragmented nature of the anatomical knowledge which could be presented and the lack of depth causing students to need more time to assimilate the knowledge. The feedback received by the HODs from staff members, students, and external examiners about time inadequacy was an additional factor influencing their perceptions.

HODs revealed that the inadequate teaching time has affected the ways they teach anatomy. Firstly, anatomy practical time has been reduced, causing departments to sacrifice dissection. Secondly, the depth of the anatomical knowledge that students receive has been impacted because they needed to cover a high content in limited time. Thirdly, students did not properly utilise SDL, but restricted themselves to the material given in lectures. Fourthly, anatomists used the limited scheduled time to deliver basic anatomical knowledge first, which left less time to implement integration. Finally, anatomists were put under pressure by teachers from other departments due to the perceived inadequacy of students’ anatomical knowledge.

HODs revealed some strategies that their departments followed in order to reduce the impacts of time inadequacy. Firstly, they focused on teaching applied or clinically relevant anatomical knowledge and paid less attention to basic knowledge. Secondly, they increased their reliance on SDL to cover the anatomical content. Thirdly, they offered elective anatomy courses including dissection to pre-clerkship students in parallel with the mainstream anatomy course and to clerkship students after they finished the mainstream anatomy course. Fourthly, some departments tried to instigate a review of the whole medical curriculum to resolve the perceived injustice done to anatomy teaching in their schools.

Assessment of anatomy in the majority of the schools was integrated to varying degrees. The departments that integrated anatomical assessments were from the schools that used PBL. The few schools that did not use PBL had a discipline-based non-integrated assessment. The HODs of the departments with integrated curricula perceived an impact of integration on anatomy assessment. Firstly, the assessment was focused more on applied anatomy with little emphasis on basic anatomical knowledge. Secondly, the contribution of anatomy in assessment was limited due to the limited contribution of anatomy in teaching hours. Thirdly, because there was no minimum achievement level
required in anatomy to pass the overall course, students’ motivation to study anatomy has been affected.

7.5.2 Dissection

HODs took three positions towards the need for dissection; some thought it was not needed, others thought it was not needed, and the third group took a pragmatic position by acknowledging the value of dissection but at the same time admitting that it is not feasible, mainly due to the logistic challenges. Their perceptions of the need for dissection for teaching anatomy in GCCMSs were reflections of ongoing debate over the topic. They identified advantages of dissection related to improving the acquisition and retention of anatomical knowledge and the development of manual and professional skills. On the other hand, they identified disadvantages, which were not related to anatomical knowledge but to the logistic challenges, such as time consumption and the unavailability and cost of cadavers. Some of them questioned the need for manual surgical skills for all medical graduates.

The reasons identified by HODs for the limited use of dissection in their medical schools included time unavailability and cadaver unavailability due to lack of local supply and the high cost and the complicated process of importation. The importation process was complicated by the difficult and long process of obtaining funding, strict local and international rules, and bureaucracy in the form of the time and paperwork it took, and the involvement of higher government authorities. The integrated anatomy curriculum also made it difficult to fit dissection because it focused on relevant applied anatomy and teaching systemic, rather than regional anatomy.

HODs revealed some strategies followed by their departments in order to avoid completely abandoning dissection. To deal with the problem of time unavailability some departments offered their students only modified limited dissection experience in the form of optional dissection courses, dissection as SDL, and invitations to attend and help in dissections performed by faculty. To deal with the problem of cadaver unavailability some departments managed to obtain cadavers at a reduced cost by collaborating with Western medical schools, other GCCMSs, and government departments that use cadavers, such as the Ministry of Health and postgraduate medical specialty programs. The enthusiasm of the HODs towards dissection was identified as a factor that allowed them to maintain a limited dissection experience. Enthusiastic HODs took actions such as introducing optional dissection, starting a dissection facility,
expanding existing dissection facilities, and collaborating to provide dissection experience.

7.5.3 **Collaboration**

The extent of collaboration between anatomy departments of GCCMSs, as revealed by the HODs, was limited. Despite a few previous attempts to initiate regional collaboration, such level of collaboration still does not exist. However, many departments had one-to-one collaborations, mainly in the form of faculty exchange for short visits and external examiners. Exchange of teaching resources was extremely rare. Anatomists did not have individual professional collaborations and rarely met in international anatomy conferences.

HODs acknowledged the benefits that teaching anatomy in the region’s medical schools could get from local collaboration. These included discussing and developing the idea of a core anatomy curriculum for the whole region and, hence, the regulation of the teaching of anatomy, reduction in variation in teaching, and reduction in variation in the quality of the region’s medical graduates. Collaboration was also seen to offer the possibility to enrich the experience of the teaching faculty through exposure to a variety of methods of anatomy teaching in the region and to new trends. It could also enable them to receive feedback about their teaching, participate in educational research, and exchange experiences of the outcomes of teaching methods.

Collaboration can also help new and under-resourced departments to get access to a wider range of teaching resources and facilities, especially in relation to cadaveric materials. Students can benefit by being able to access resources available in other schools and indirectly benefit their own schools by providing feedback, which may be used for improvement.

The many benefits of collaboration identified by the HODs do not correspond with the limited collaboration revealed by them. The HODs identified a number of factors that have played or can play a role in discouraging collaboration. Firstly, some departments, especially from old schools, did not see a need for collaboration because they were well-funded and did not see benefits they could gain from the new departments. Departments with totally different anatomy curricula may not see the need to collaborate due to the use of different teaching methods and resources. Senior faculty
may not feel the need to collaborate due to the rich experience that they have accumulated over the years.

Secondly, there are some administrative factors that were seen to discourage collaboration, such as bureaucracy that involved senior administrators in the process, required anatomists and departments to obtain permission from higher up and to complete a lot of paperwork. There was a failure to follow up previous collaborative initiatives. HODs also complained of the lack of recognition from administrators for local collaboration, which was less recognised than collaboration with institutions from outside the GCC region.

Thirdly, there are some factors related to the anatomists themselves which were seen to discourage collaboration, such as a lack of initiative, a lack of communication, and time constraint due to heavy academic workloads. HODs revealed two factors that may particularly affect expatriate anatomists’ devotion, interest, and commitment towards long-term local collaboration. Firstly, there is uncertainty brought about by the temporary stay in the region arising from short-term contracts. Secondly, they do not see themselves having the same authority or power to initiate collaboration as their local colleagues.

HODs also identified strategies which can encourage collaboration between their departments and staff members. Those strategies were aimed at increasing communication and contact between anatomists in the region, a necessary first step towards initiating collaboration. The first strategy was to establish a regional anatomical body. Besides facilitating communication between the anatomists though organising meetings, conferences, and seminars, this body could set strategies to organise anatomy teaching in the region. The second strategy was to have recurrent meetings and gatherings of anatomists where they can get to know one another and present their work. The third strategy was to use electronic means of communication such as websites, forums, and databases to encourage continuous communication and discussion between the anatomists in GCCMSs.
Chapter eight: Findings of the Focus groups

8.1 Part 1: Teaching anatomy in an integrated medical curriculum: the perception of anatomists in GCC medical schools

8.1.1 Introduction

This chapter presents the findings of the three FGs that were conducted with anatomists from three GCCMSs. The demographic data of the participants in those three FGs is illustrated in Tables 8.1 and 8.2.

Table 8.1: Demographic data of focus group participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>GCC citizens</th>
<th>Expatriates</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>4 (31%)</td>
<td>9 (69%)</td>
<td>13 (100%)</td>
</tr>
<tr>
<td>Gender</td>
<td>1 M, 3 F</td>
<td>6 M, 3 F</td>
<td>7 M, 6 F</td>
</tr>
<tr>
<td>Academic position</td>
<td>2 Assistant Prof.</td>
<td>6 Associate Prof.</td>
<td>6 Associate Prof.</td>
</tr>
<tr>
<td></td>
<td>1 lecture</td>
<td>3 Assistant Prof.</td>
<td>5 Assistant Prof.</td>
</tr>
<tr>
<td></td>
<td>1 Instructor</td>
<td>1 Lecturer</td>
<td>1 Instructor</td>
</tr>
<tr>
<td>MD qualified</td>
<td>3 (75%)</td>
<td>6 (66.6%)</td>
<td>9 (69.2%)</td>
</tr>
<tr>
<td>Total teaching experience (years)</td>
<td>3 less than 5 yrs</td>
<td>All more than 15 yrs</td>
<td>3 less than 5 yrs</td>
</tr>
<tr>
<td></td>
<td>1 more than 15 yrs</td>
<td></td>
<td>10 more than 15 yrs</td>
</tr>
<tr>
<td>GCC teaching experience (years)</td>
<td>3 less than 5 yrs</td>
<td>7 less than 5 years</td>
<td>10 less than 5 yrs</td>
</tr>
<tr>
<td></td>
<td>1 more than 15 yrs</td>
<td>2 more than 15 years</td>
<td>3 more than 15 yrs</td>
</tr>
<tr>
<td>The place they worked before GCC</td>
<td>None</td>
<td>4 in India</td>
<td>4 in India</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 in Egypt</td>
<td>4 in Egypt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 in Sudan</td>
<td>1 in Sudan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 in USA</td>
<td>1 in USA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 none</td>
<td>4 none</td>
</tr>
<tr>
<td>Characteristic</td>
<td>FG1</td>
<td>FG2</td>
<td>FG3</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GCC</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Expatriate</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Academic position</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prof</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Assoc Prof.</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Assist Prof.</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lecturer</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Instructor</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Qualifications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MD/ MBBS</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PhD</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>MSc</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>BSc</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Anatomy teaching experience (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5-10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11-15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&gt;20</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><strong>Anatomy teaching experience in GCC (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5-10</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>11-15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16-20</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;20</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>The place they worked before GCC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Egypt</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Sudan</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>USA/UK</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Participants were asked about their perceptions of two main topics; teaching anatomy in an integrated medical curriculum, and the current state and future perspectives of collaboration between anatomy departments in GCCMSs.
8.1.2 Teaching anatomy in an integrated curriculum

The analysis showed that anatomists’ perceptions about teaching anatomy in integrated curricula were centred on five main themes, which are relevance of anatomy to clinical practice, anatomy teaching time, the place of dissection, teachers, and students.

8.1.2.1 Relevance of anatomy to clinical practice

Participants identified the relevance of the anatomy they teach to medical practice as one of the advantages of teaching anatomy in an integrated curriculum.

“The key good point for this curriculum is relevance of whatever you are learning. The relevance of learning anatomy is highlighted from day one” (G3 P1)

In contrast to students of an integrated curriculum, students of a traditional curriculum had to study anatomy, as well as other basic medical sciences, in great depth and detail, as if they were going to graduate as anatomists rather than as physicians.

“In the traditional system, what we were taught? In every subject you are considered to be the specialist in this subject and you must be at the level of BSc in the subject” (G1 P2)

Medical students were always questioning having to spend all that time learning detailed anatomy, which has little to do with what they would be doing when exposed to patients.

“I was a student of the old curriculum and we kept asking ourselves; why do we need to know all this? I do not need all that” (G3 P4)

Anatomy in integrated curricula is being taught in a different way, as a clinical instead of as a basic science. This means that students are taught the anatomy which serves the purpose of graduating doctors. They learn the anatomical knowledge which is related to the diseases that they will face in the future.

“They have a disease and the problem related to it so they understand the relations between why they study anatomy and what is important for them to know” (G1 P1)

“In my opinion, everything that we teach has relevance to medical practice and this should, I think, be made clear to our students. We are not teaching basic science. We are teaching clinical sciences” (G2 P1).

“The most important thing I can bring is the clinical aspects of clinical anatomy and always relate them to the different diseases problems” (G2 P2).
According to the anatomists, medical students of the integrated curricula have a clear answer to the question that students of the traditional curricula always asked and found difficult to answer; why do we need to know anatomy? Knowing the relevance of anatomy to medical practice was seen to have positive effects on the students by increasing their motivation to study anatomy.

“They [students] realise that what they have taken before is really relevant and they need it. That makes them again increase their efforts” (G3 P4).

Teaching clinically relevant anatomy means that the load of anatomy information students need to learn is less. This approach was labelled “focused teaching” by one anatomist. Anatomists indicated that the reduced information load enhanced the recall of that information when needed at a later stage.

“We do not teach everything. We mainly focus on what they benefit from at the end when they graduate. They grasp these ideas and hopefully they will remember” (G1 P1).

“I know now that if I give a lot, none of it will stick so I need to stick to the basics which are really relevant. Like knowing areas where they are going to use rather than talking to them about the nerve where exactly it crosses and what are the relations because they are definitely going to lose that” (G2 P2)

Anatomists believed that teaching relevant anatomy improves students’ clinical experience when they join hospitals before and after graduation. It enables them to actively participate in the hospital rounds and gives them the confidence to speak as members of the medical teams in the wards.

“They [students] say: when we join the hospital in the morning rounds, the senior consultant asks a few questions and they say the residents could not answer it and we answer it. He says how do you know this? They say we had discussions in our anatomy demonstrations” (G1 P3).

“Students realise the benefits of learning anatomy immediately. They feel it and they feel the importance of anatomy applied to clinical cases. They go to hospitals sometimes and they relate what they learn” (G2 P1).

On the other hand, anatomists expressed their concerns that teaching relevant anatomy has caused some disadvantages to teaching anatomy as a subject despite the identified advantages to the overall maturation of the medical students. Teaching relevant anatomy was at the expense of basic anatomy. Students knew a lot of relevant anatomy which allowed them to acquire knowledge such as interpreting clinical cases and problems, but there was a big deficiency in their understanding of basic anatomical knowledge.
“We do find that there is some gap in their knowledge. They are very familiar with common cases and the anatomy relevant to it but their knowledge of other things which anatomists ask [appears as if] they do not have much idea” (G3 P2)

Moreover, teaching relevant anatomy has caused some gaps in the already limited basic anatomical knowledge itself. Anatomy in integrated curricula, unlike in traditional curricula, is not taught as one consistent subject. Instead, relevant anatomy is emphasised but the rest of basic anatomy which is “not relevant” is skipped, creating gaps.

“One of the disadvantages is the lack of taking all the anatomy that we have taken before. We have some deficits in some areas because it is not covered by the problems. There are gaps” (G1 P1)

“If you look at it as a graph, the learning is like in spikes. Some parts are like spikes with absolutely no base in between. They end up answering some questions at higher levels but they do not even know those of level one” (G3 P1)

Furthermore, teaching relevant anatomy disadvantaged anatomy as a subject by losing the sequence in which anatomical structures are presented to the students. For example, when PBL cases are used, the structures which are presented under one case are not topographically related. This presents anatomy as unrelated bits and pieces lacking coherence.

“When they study the problem they study specific aspects only, specific parts. But in the traditional teaching, they take the subject from the beginning. So sometimes they study this part, which is related to the problem that we have but, they take it out from the surrounding structures. So they lose the flow” (G1 P4)

“Anatomy has been scattered all over the different modules. The value of anatomy has been downsized” (G2 P1)

Anatomists attributed the loss of sequence to the fact that anatomy in integrated curricula is taught in a systemic approach instead of the regional approach of the traditional curricula.

“You start and you open the chest into the heart without knowing what is going on first with the thoracic wall and the lungs and so on. So regional anatomy is really, that is probably in the opinion of most of anatomists, the regional anatomy is the best way and easier way to teach anatomy” (G2 P4).

While anatomists admired the teaching of clinically relevant anatomy to medical students, they expressed the opinion that it is introduced to the students very early in the
curriculum without an appropriate foundation of basic anatomy. They thought that students should have a sound knowledge of basic anatomy first and from there they can pick the relevant anatomy that they require later.

“What is happening is that at the phase one level they start learning relevant things. That should be decreased a little bit with more basic anatomy first and the relevance should all come later with the modules” (G3 P2)

Moreover, exposing students to relevant clinically oriented anatomy at this early stage distorts their understanding of the normal anatomy of the human body by crossing the bridge from teaching normal structure and function towards stressing the abnormal anatomy of the PBL cases. As a result, anatomy as a subject does not exist in the students’ minds unless it is linked to a clinical problem.

“They [cases] are introduced early. I do not think there is any relevance. They [students] do not realise the relevance at that stage. It is like telling them too soon that you are learning the stomach is there to give you acidity and the colon is there to give you cancer and the heart is there to give you a heart attack rather than the normal structure” (G3 P1)

8.1.2.2 Anatomy teaching time in integrated curricula

Scheduled anatomy teaching time was one of the points that anatomists raised a lot of concerns about. Anatomists complained that integrated curricula have reduced the scheduled teaching time and replaced with SDL. The reduction affected the time for both lectures and practicals to the extent that one school has almost abolished anatomy practicals.

“The time is very limited. I feel the curriculum limited the time of practical anatomy. They removed almost all the practicals and lab work” (G2 P1)

“Here we have limited time because of the new PBL system. They have limited us in the number of lectures. Because now the new method of teaching is basically they are putting more time into self-learning” (G2 P2).

“We have locomotor system and we have only one lab for the whole course. So it is very difficult for the students to have the upper limb and the lower limb and the skeleton only in one lab” (G3 P4)

In one school, the reduced time was accompanied by reducing the learning objectives. This was not the case in another school. There the time was reduced but the objectives that the students needed to cover in anatomy remained as great, exacerbating the time shortage problem much to the anatomists’ concern.
“We have less time and less objectives, the amount of anatomy they are learning is a little bit less” (G2 P2)

“The other problem that we see in the curriculum in the system modules is that the objectives are fine. They are in depth but to fulfil the objectives there is no time” (G3 P1)

“There is a big mismatch between the objectives and the time allotted to fulfil those objectives” (G3 P2).

Anatomists indicated that the reduction of scheduled teaching time had negative impact on the way they teach anatomy. For example, they had to rely on SDL, which they could not guarantee that students will do. Moreover, they could not include dissection and students could not find the time for revision.

“They are giving the student more time to learn by himself and we give the objectives and need to be limited in how much we give in a lecture and depend on the students. So that I think is the main problem” (G2 P2)

“Again it goes back to the time. Unless they have time they will not bother to repeatedly learn” (G3 P2)

“[We want] to expand the anatomy department and expand dissection rooms and start to have space for students to see and dissect by themselves. And in the curriculum it cannot be done because of the integration and because of the little time that is given to the anatomy” (G3 P4)

Ultimately, the reduced time has affected the quality of anatomy teaching and consequently students’ learning of basic anatomy, leaving them to graduate with inadequate basic anatomical knowledge.

“Students do not have much of the basic knowledge because the curriculum is such that we cut down a lot of hours and we are squeezing in here and there everything” (G2 P4)

“All these things culminate in very poor quality teaching by all of us. Why poor quality? Because we give very little information to them” (G2 P4)

8.1.2.3 The place of dissection in integrated curricula

Anatomists started by acknowledging that the debate around the need for dissection in medical curricula in general and in integrated medical curricula in particular is rich and ongoing.

“The idea of to dissect or not to dissect is a big issue worldwide and a big debate” (G1 P1)
On the one hand, anatomists admired the advantages that dissection can add to the students’ learning of human anatomy. Such advantages included hands on experience, encouraging active learning, increasing time of students’ exposure to anatomy, and increasing their confidence in surgical techniques.

“There is no dissection and when there is no dissection the students go for spoon feeding” (G2 P1)

“Just looking at the dissected specimens or models is not good. They should have that and do dissection. That should be there. Not only anatomy but other subjects also. Practical experience is the key” (G2 P4)

“Even if they only have one lab for anatomy but [with dissection] they will have exposure” (G2 P4)

“If you come to surgery, it is touching the patient and cutting them open. That confidence they should get from day one of medical schools” (G3 P2)

Dissection also provides training opportunities for junior anatomists to master the skills of dissection and improve their knowledge of anatomy, which will translate in improving their teaching skills.

“I feel that dissection is very good for students and for tutors. For example, I have just finished the MD degree and come as a clinical lecturer. I need to do some dissection. If dissection is integrated or put in anatomy teaching, I would have more chance as a tutor to develop my own anatomy knowledge” (G3 P4)

On the other hand, anatomists realise the problems of the use of dissection, including those specific to the GCC region, such as the unavailability of cadavers due to the absence of body donation programs and the competition between the schools for the limited sources of imported cadavers.

“There is no [body] donation in the GCC. In the UK, people donate because burial is expensive. We do not have this issue in the GCC countries and we do not have donations. So we have to import bodies” (G1 P3)

“You know, for GCC countries, our source of bodies remains one, which is Germany. So all these GCC countries to get the bodies, it is only one place and that becomes a difficult issue. There is competition between the schools to get these bodies” (G1 P3)

Moreover, the regulations for importing cadavers to some countries can be a factor restricting the schools’ access to different sources of cadavers.
“The regulations do not allow us to get it [the body] from cheaper places like India. It has to be Germany and that becomes a big problem” (G1 P3)

The lack of availability of cadavers in the GCC makes it impossible to have full dissection courses for all of the high and increasing number of medical students.

“It is easy to say introduce dissection. But seeing the logistics, I do not think it is feasible in this college with 150 students” (G3 P2).

Other problems were related to the nature of integrated curricula. The main problem was the time shortage. Anatomists thought that dissection is time consuming and the time for anatomy teaching has been reduced and become unable to accommodate dissection.

“It is not appropriate to spend their [students’] time in the dissecting room because dissection takes too much time” (G1 P1)

“In the curriculum it [dissection] cannot be done because of integration and because of the little time that is given to anatomy” (G3 P4)

Moreover, having the hands-on experience of dissection may not be required by all students after graduation, because few of them will specialise in surgical fields. That is, it was seen that it may not be appropriate to offer dissection to all students at the undergraduate level.

“How many students will become surgeons? Not many. And they will have the chance to dissect when they become surgeons, to come and dissect in the anatomy department or to start to learn how to operate” (G1 P1).

After considering the advantages of dissection and the problems that they face in their schools, all anatomists indicated that there is no need for full body dissection for undergraduate medical students. Instead, some affordable modified version of limited dissection experience is needed.

“Because we have several reasons, in my opinion we do not need the students to dissect but special [dissection] we can offer” (G1 P1)

“We dissected in our times and we did hours and hours of dissection. We do not need that now” (G1 P3)

“You cannot have a full body dissection course but modified section can be done” (G3 P1)

Anatomists recommended settings for limited dissection such as optional or elective courses for interested students, dissection of a single region of body, dissection of
selected parts in parallel with the PBL cases, and revision dissection courses for clinical students.

“*We can offer Special [dissection] as optional for students who are interested to be surgeons and so on*” (G1 P1)

“*As elective dissection, they can do it*” (G1 P5).

“*We can have, for example, one tutorial you take and a selected topic like the occipital fossa just to get the experience of how to do the dissection*” (G3 P2)

“*At least like some will dissect the upper limb and others the lower limb all the way through the 16 weeks of the semester*” (G3 P3)

### 8.1.2.4 Anatomy teachers in an integrated curricula

Anatomists reflected on their experience of teaching anatomy in an integrated medical curriculum and how it influenced the way they teach anatomy. On the one hand, anatomists benefited from the integrated curriculum in many aspects. First of all, teaching anatomy in an integrated fashion required the anatomists to read about other basic and clinical medical sciences in order to fit anatomy well in the curriculum. This reading helped to expand their knowledge about other medical sciences and to update that knowledge with new advances.

“*The other thing that is also beneficial towards us as faculty members in anatomy, is being able to always remember the applied aspects of what we teach*” (G2 P1)

“*It is a learning process for the tutors also because we find ourselves reading other linked subjects besides anatomy and try to link everything especially for the cases. We might need to read some of pharmacology. That was a learning process for us in this curriculum*” (G3 P1).

“*We are reading some physiology and biochemistry and updating clinical and basic background and that is a useful process for us*” (G3 P2).

The anatomists learning can also happen from interaction with the students who sometimes inquire about things which are not only related to anatomy but to other medical sciences. Here, the anatomists are encouraged to expand his knowledge in order to properly respond to students’ inquiries.

“*When I teach them, I learn a lot from the students. Some of the students go and read new and updated things and they ask about it and I have to go with my colleague and bring the books. I told them I do not know so I have to go back and check if this is true or not*” (G1 P1).
Secondly, integrated curricula allowed anatomists to try the new advances in medical education. They could apply new methods in teaching and assessment. Anatomists found opportunities to be creative and innovative which were not available to them in the traditional curriculum.

“It is not only teaching and learning but even the way we are assessing the students. Learning to better assess is a very useful exercise because we find ourselves instead of traditionally asking to describe something or write short answers about something, we are trying to learn to make useful clinical vignettes” (G3 P1)

“The other thing with this curriculum is that we are developing ourselves in the new methods of medical education in the form of PBL, TBL, and case based learning. We are able to apply it much more in this curriculum than what we were doing previously” (G3 P2).

Finally, teaching anatomy in an integrated curriculum was a source of satisfaction for anatomists. They felt satisfied because anatomy teaching was not restricted to the lecture theatres and dissection rooms but it was also required for advanced students’ learning in the hospital wards.

“We are involved in the pre-clerkships. We do attend some departments like surgery and orthopaedics. We go and contribute to the anatomical teaching in the wards. We are able to do that in this curriculum because of positive features. So we feel we are contributing to the clinical departments” (G3 P2)

The other source of satisfaction comes from the sense of reward that anatomists feel when they know that the integrated curriculum has enabled them to equip their students with the anatomical knowledge to make them better medical graduates.

“The good thing that I found when we started graduating our students is that the top students in the licence exam are [our school’s] graduates. So this was very much encouraging to us when we found that all the top students are our graduates. So it helped us in the sense that we are not doing a bad job. It is a good job” (G1 P3)

On the other hand, anatomists expressed some concerns about teaching anatomy in an integrated curriculum. The first concern that they raised was related to the experience that is needed by teachers of anatomy in the integrated curriculum. It is not as simple as giving lectures and supervising demonstrations but the teachers are required to learn how to prepare and conduct new types of PBL and CBL sessions.
Disadvantages are many but to list some of them, first one is teaching per se is a very difficult task for this integrated curriculum. This problem is only for anatomy and not for any other department” (G2 P4).

“It needs experience. It is not simple to start teaching anatomy and to change from normal way to PBL. It needs experience of how to deal with lectures, how to make lectures” (G3 P1)

The second major disadvantage that anatomists suffer from in integrated curricula is the high work load. While this concern seems inconsistent with the complaint that integrated curricula have reduced scheduled anatomy time, some anatomists indicated that this is the case.

“A lot of people, even staff members, think that this is self-learning so the student does not see the staff member. But for us in anatomy, the students see us more” (G3 P1)

Anatomists indicated that they are actually spending more time on teaching because of the time needed to prepare for the teaching sessions, organise the courses, and because they are in contact with students of the integrated curricula more than those of the traditional curricula.

“Students come at any time to discuss problems and still we have demonstration sessions. We repeat and repeat and repeat for small groups of students, which is really beyond your imagination. If you count the teaching hours, they must be 10 times that of the traditional system” (G1 P2)

“Teaching load for us is a lot because we are not involved only in teaching anatomy but we have other responsibilities in PBL tutorials and administrative duties” (G3 P5).

The increased contact with the students was experienced by anatomists more than teachers of other disciplines because of the practical and visual nature of anatomy as a subject. Teachers need to show students the anatomical structures in small groups for educational and practical reasons.

“To identify the structure the student needs someone to show him that this is correct and this is wrong. This is the problem. Maybe in other disciplines they may need less numbers of staff but for anatomy, which is a concrete basic science, they need not only adequate numbers but patient teachers” (G3 P2)

The work load was also made worse by the students’ failure to adapt properly to the SDL strategy of the integrated curricula and staying dependent on spoon feeding by the teachers.
“They [students] are not ready. They are not mature enough to handle their study by themselves unless you push them very hard and then you really need to exhaust yourself as a teacher. You need to run after them and tell them you need to study this and you need to open your books” (G2 P1)

The time anatomists spend on teaching anatomy in integrated curriculum has left them with limited time to spend on other aspects of their academic career such as research. Their inability to find enough time to do research was seen to affect their capacity to apply for promotions.

“In anatomy we cannot do research because the exposure to students and interactions like that does not give time for research. So when it comes to promotions there is a criterion that you should have a number of papers and you should be the first author. You cannot fulfil that one because you have only those 24 hours in a day. You cannot do research” (G1 P3)

8.1.2.5 Students in integrated curricula

The type of the curriculum that medical schools adopt can have influence on students’ learning and development in general. Here, anatomists reflected on their experiences with the medical students that they taught in the integrated curricula. They identified both benefits and disadvantages.

Anatomists believed that students benefited a lot from the small group teaching sessions in integrated curricula. During those sessions, students are encouraged to have discussions with their peers and with the tutors in order to be able to fulfil their learning objectives.

“One good aspect of this is that we have a lot of discussions with the students for each problem. There are several demonstration sessions, in which there are different stations and the students have the opportunity to ask and to discuss and to answer” (G1 P1).

The discussions train students on some professional skills that will help them during their study years and later when they graduate such as sharing knowledge, teamwork, and communication skills.

“Among them [students], there is encouragement for discussion. So it is not that this knowledge is mine. It is shared. So there is sharing [of information] among them, which is very good. There is nothing like, I would not share with you. It is a team work and among themselves they solve many problems” (G1 P3)
“Our students communicate very well. Even when they graduate if you compare them with other doctors they communicate very well because of the system. All of it is tutorials and discussions” (G1 P3)

Moreover, the discussions allow the students to follow a deep approach to learning anatomy by focusing on understanding the concepts rather than memorization of the details.

“We are teaching not only classical anatomy lectures but we are doing a sort of interaction between the students. This way of interaction is helping the students not only to memorise but also to understand the concepts and the learning objectives that we are dealing with” (G1 P5)

“There is something good about medical students. They tend to analyse things and they tend to think a lot. They develop the reasoning skills” (G3 P4).

Besides discussions, small group teaching also involves student presentations of the PBL cases. This enables the students to develop their speaking and presentation skills in English.

“In our system all students present in English. So these [presentations] help them in developing the skills and their own personalities because they come here, they study and then they present. So when they go to GCC research presentations they are better because they have already been trained on presentations” (G1 P3)

“I have seen that speaking and presentation skills are excellent. They are in fact better than most in the world I would say” (G3 P2)

Last but not least, integration curricula depend on SDL. Students are required to spend some time on self-study where they fulfill the learning objectives independently but following the tutors’ guidance. This way, students are trained to acquire the skills of searching for information by themselves as part of their life-long learning.

“The philosophy of this system is not to give the entire curriculum to the students. We have to concentrate on the core curriculum and we have to teach the students how to catch the knowledge. So later on, he will be able when he faces anything to go and try to catch it” (G1 P1).

On the other hand, anatomists acknowledged that learning anatomy in integrated curricula is not an easy task for their students. They specifically pointed to the fact that because the integrated curricula in their schools depend a lot on student-centered and SDL, learning largely depends on the readiness of students to take the initiative and adapt to the system.
“It is also self-learning PBL and depends on students. It is student-centred and needs some sort of experience to deal with this kind of things. It is not easy. One of the problems is that you need really good students for the system. Weak students are disadvantaged” (G1 P1)

“In order to accommodate the problem based learning and case based learning we had to cut down on didactic teaching. That is fine as long as the students take the initiative to fill up the knowledge” (G2 P2)

However, anatomists revealed that SDL is not practiced by the majority of the students when they study anatomy. Students largely depend on the study materials provided by the tutors instead of fulfilling the study objectives by searching for the information on their own.

“They [students] only depend on notes; whatever notes we give them and they are very reluctant to go back to books. At the end of the day they stick to the notes completely and we rarely find more than 10% of our students are actually going to the books” (G2 P1)

“Because of these PBL, the students have to do more self-centred learning in the labs but it is not occurring actually” (G3 P2)

Anatomists attributed the students’ reluctance to adopt the SDL strategy to many factors. Some of them felt that because GCC students do not have adequate English language skills, having been educated in Arabic in school, they find it difficult to read textbooks in the English language.

“The students that we have over here are GCC students. Anatomy by itself is a new language and since they come with a background of Arabic, the main thing is the language. They face English language challenge” (G1 P3)

“If you are going to learn anatomy and you are coming from a public school, you do not know what a humerus is. You need all this vocab at the beginning and you need to translate that” (G2 P2)

Others think that the schooling system does not prepare the students to study medicine in general and to practise SDL in particular. Firstly, the level of the science subjects taught in schools in some GCC countries is much lower than that of the medical school. This creates a gap in knowledge that student may not be able to fill independently through SDL. Secondly, the schooling system largely depends on spoon feeding rather than training students how to search for information, so students find it difficult to quickly adapt to SDL when they come to the medical schools.
“The students that we get here are from different countries and the scientific background in high schools where they come from and the level of science is different in different countries. We get like differences in understanding based on their previous knowledge” (G1 P1)

“I think here we are facing two problems; the language and the system. They [students] are not acquainted with the PBL system and how to go and do the students centred education and have to find and read study resources” (G1 P3)

“I do not think they are ready enough because if you take our students, 80% of them come from public schools and we have 20% coming from private schools. Our teachers here in public schools are spoon feeding and students are memorising. So suddenly to tell them after they have learned for 18 years to come and do research by themselves and know how to search for information, it very difficult for them and we are facing a huge problem with them” (G2 P2)

Moreover, students were suspected of refraining from SDL because they do not have enough time to cover all the objectives that are required from them in many disciplines. They end up sticking to the lecture notes as a short cut that provides them with the information they just need to pass exams.

“They are also bombarded by loads from other departments. There is not enough time actually for them to really have a thorough knowledge of anatomy” (G1 P2)

“When somebody goes to the objectives it does look very comprehensive. But basically it is logistically not possible for students to go through the whole thing” (G3 P2)

Finally, the nature of anatomy as a visual subject makes it hard for the students to comprehend it simply by reading textbooks on their own. They need a tutor to guide them and show them the anatomical structures in the labs and explain the complicated concepts to them.

“To identify the structure, the student needs someone to show him that this is correct and this is wrong” (G1 P2)

“This [anatomy] is a practical-oriented subject. It is not just like they go and read and they read it on their own. You need also some exposure” (G3 P2)
8.2 Part two: Anatomists’ perception of collaboration between GCC anatomy departments

8.2.1 Introduction

This section presents the experience of anatomists in GCCMSs of collaboration and their perceptions of that experience. They also reflected on the collaboration they had with anatomists in the medical schools where they taught before coming to the GCC region.

8.2.2 Experience of collaboration in the GCC

Anatomists indicated that there is limited collaboration between them and their counterparts in other GCCMSs. The majority described an absence of collaboration between their department and other departments. Among the 13 anatomists who participated in the FGs, only four were involved in collaboration with others. Those collaborative activities included two visits; one for the exchange of experience and the other for program evaluation, and two workshops; one on electron microscopy and the other on neurobiology.

While many of the anatomists have been teaching anatomy in the region for many years they have witnessed very few collaborative activities. For example, one of them had only one occasion of collaboration during the 25 years of anatomy teaching in two GCC countries.

“I have been here in this region for a long time. I was in KSA and now here for more than 10 years, a total of 25 years. The only time when we have contact with others actually was when some staff from Oman took the initiative and came to us here in the department. We promised that we will go back and will start some contact and so on. This was the only one” (G1 P2).

In addition to the above mentioned activities, many anatomists indicated that they meet each other personally. The meetings were not officially arranged or endorsed by the departments, but occurred randomly at international anatomy conferences and other conferences in the GCC region.

“Usually we do have contacts in conferences, when it is international anatomical conferences or GCC medical students’ conferences. These are places where anatomists from different colleges come” (G1 P3).
“Anatomists do not meet [locally]. They only do in conferences which are mostly outside the region, mostly in Europe or America or Asia” (G1 P5).

Moreover, the opportunistic contact that happens at conferences has been described by the anatomists as “weak” because of it being unplanned and lasting for such a short time.

“Do we meet them [anatomists from the GCC region]? Yes we do sometimes but it is still very, very weak contact” (G1 P3)

Apart from that, the majority of the anatomists expressed the absence of collaboration between their department and other departments. They commented on their experience of collaboration thus:

“There is not any cooperation between any department of anatomy here and any other department even in the same country” (G1 P1)

“Even exchange of faculty we do not have” (G1 P3)

“Currently there is no such collaboration” (G2 P1)

“Right now we do not have any collaboration” (G2 P4)

“Nobody invited us” (G3 P3)

Ironically, some of the expatriate anatomists still maintained collaborations with anatomists from outside but not within the GCC region despite spending so many years here.

“We have collaboration with outside but this is from overseas but this is not fulfilling the criteria here to see what the deficiencies are, what the needs are, what we can offer, and what they can offer us in this region” (G1 P1).

“We have international collaborators. We have collaborators from outside the region from Europe and from America but we do not have collaborators from the GCC” (G1 P5).

However, that international collaboration did not seem to fulfill the need for collaboration when anatomists are in the GCC region. They felt the gap that the lack of local collaboration in the GCC region has caused when they compared their former situations in their home countries.

“We feel the deficiency. In our country we have so many contacts local and abroad but here we do not have” (G1 P1).
8.2.3 Experience of collaboration outside the GCC

Anatomists were asked to reflect on their experience of collaboration in the countries they taught in before they come to the GCC region. The majority of the expatriate anatomists worked in two countries; India and Egypt. In both countries anatomists experienced two levels of collaboration; regional collaboration and collaboration between individual schools or departments.

The regional level of collaboration manifests in the form of anatomical societies or bodies, which played the central role of organising and maintaining contact and communication between anatomists. The Anatomical Society of India and the Egyptian Anatomy Society were specifically admired by the anatomists. These anatomical societies organised annual meetings that provided the opportunities for local anatomists and their postgraduate students to meet, present their work and experience, and participate in workshops related to their profession. In a big country like India, there were anatomical societies at the state level in addition to the common national anatomical society of India.

“In Egypt for example, we have the society for anatomy, the Egyptian Anatomy Society” (G1 P1)

“We have Anatomical Society of India. Whatever we are doing we present there. And if there is anything new, they come and present. It is individual interactions between faculty members who find out what is going on and they send their postgrad students or they come to the meetings” (G3 P2)

Meetings at conferences and workshops organised by the anatomical societies were the only form of collaboration experienced by some anatomists when they were outside the GCC region. Apart from that, their experience of collaboration was limited.

“Unfortunately there was very little collaboration except when we are meeting at conferences or attending workshops and such things. There was very little professional [contact] unless somebody was mutually interested in the same project and you are working together. Very little or no resources are shared. Very little staff is shared to go there. At least I speak from personal experience” (G3 P1).

However, many anatomists, in particular Indian anatomists, described some forms of collaboration between individual anatomy departments outside the umbrella of the anatomical societies. The most common form of collaboration mentioned was faculty exchange. Anatomists visited other departments mainly as external examiners of
undergraduate medical courses and for supervising and examining postgraduate students. Junior anatomists benefited from such exchange programs by improving their teaching and technical skills. This type of collaboration was officially arranged and endorsed by the schools.

“We meet during exams. For example, in Egypt you can be an examiner and you can be a supervisor of theses in different colleges. So there is some sort of interaction” (G1 P1)

“We have collaboration in India between universities. They have the exchange program between faculties” (G2 P4).

“Back in India, as examiners yes we go. We go to different colleges as external examiners. The university appoints us to go within the state or out of the state” (G3 P1).

“We do have in India that from one university they come to our university to undergo training on the types of teaching and the labs. So faculty, new faculty members also come” (G3 P2)

The second form of collaboration between individual schools was the exchange and sharing of teaching resources. Well-funded schools were reported to help smaller less-funded schools by sharing their resources in order to reduce the cost of running proper gross anatomy and histological teaching facilities.

“Bodies can be shared also because some colleges have surplus that they do not use. It is official” (G3 P1)

“Some of the departments, like ours, make our own slides. We do not buy them but the smaller places like private colleges or even government colleges were not equipped with them. So our technicians were doing sections and these are given to other medical colleges. There was sharing of some resources because in some places they are expensive to buy” (G3 P2).

Moreover, well-equipped departments shared their facilities for processing teaching resources such as cadavers with less-equipped departments. They also went further to provide the training of staff members from less equipped departments on how to handle process, and maintain those teaching resources.

“As far as bodies are concerned, we have a high number of bodies. The only problem is that embalming is only done in some centres. So there are workshops on how we store our bodies and how when the body comes fresh from the hospital is injected. All these things some of the departments do not have” (G3 P2).
8.2.4 Benefits of collaboration

After exploring the current status of anatomists’ experience of collaboration between anatomy departments of GCCMSs and the factors that have led to the limited collaboration, this section presents the benefits of collaboration as they were identified by the anatomists who work in those departments.

8.2.4.1 Local collaboration is unique

First of all, anatomists believed that collaboration within the GCC region is more fruitful than collaboration with others from outside the region because of the similarities of culture, student backgrounds, and the learning environments. Exposure to what is available in the other schools in the region would help them because they are dealing with the same circumstances.

“We have the same quality of students and similar environments in the Gulf. So by you having a problem and solving it rather than us going through the hard way, we can learn from your department and you can learn from our department” (G2 P2)

“I think it is a good opportunity and a good experience to see what others are doing in the GCC even if we have an exchange program with universities in the USA or Canada. I would be good to see how they are teaching and what type of students they are having and so on. That would be something good to do. I would vote for that” (G2 P3).

Moreover, through collaboration, the whole GCC region would benefit from the vast experience that many of the senior expatriate anatomists have accumulated over the years though teaching in different parts of the world. Expatriates believed that collaboration allows them to serve the whole region instead of restricting the benefit to their schools only.

“We are in a GCC university here. We are here to help the region. So we need to see what the main needs of the region are. What the needs of other countries are. It is not only Bahrain. GCC universities cover all the six countries. We have collaboration with outside but this is from overseas and not fulfilling” (G1 P5)

The unique advantages of local collaboration were also appreciated by local anatomists, especially juniors. They believed that it would allow them to communicate with their counterparts in other GCC countries in order to discuss their current situations and plan for the future of anatomy teaching in the region. Such discussion would not be possible
if they just meet in international conferences but would be more fruitful if the there was a local basis for it.

“Definitely there is a need for that [collaboration], especially for us juniors. If we have a junior colleague from the GCC, we want to know what their problems in terms of teaching anatomy are, how they solved their problems, and whether they have training in some centres. So we will have discussions to know more how to solve our problems as juniors” (G3 P3).

In addition to the individual collaborative activities that were experienced by some anatomists, the appreciation of the need for collaboration by both local and expatriate anatomists has encouraged staff members from these departments to think about starting an initiative for regional collaboration. Although previous attempts have not been successful, it points to the interest of anatomists in pursuing collaboration.

“We tried with the HOD here to organise something like that and to get in contact and have collaboration with people and the initiative was taken but it stayed at this level. It stopped. We did not proceed further. I do not know what the obstacles are and why it stopped” (G1 P1).

“I was in [KSA] last month and I visited Jeddah. One of my colleagues was there and I went there for one day [...]. I sat with all the department faculties. I said to our president that it is a good chance, you are from KSA and you can help us to make some sort of society or something like this collaboration. You have many Saudi faculties” (G1 P1).

“[Our Head of Department] and I discussed it last year, to start a GCC anatomical society. If we have a meeting every year for few days, we can exchange many ideas and we can solve a lot of problems. Getting the manpower and all that will be easy for us” (G2 P4).

8.2.4.2 Benefits of local collaboration

The anatomists identified benefits of collaboration which could help them in fulfilling their professional duties. The benefits were categorised into three main aspects; resources, teaching, and personal development.

8.2.4.2.1 Teaching resources

With regards to resources, collaboration firstly allows anatomists to know what the available resources in all GCC anatomy departments are. Secondly, this knowledge makes them able to locate the resources that they need but which are not available in their own schools. If the resources were to be shared between the departments,
anatomists can think of new ideas that would be achieved using their own departments’ resources.

“One of the big ideas which I had when I went to Oman, I found that they have a big electron microscopy unit with very good staff and very good machines and so on. For me, I had so many ideas if I have this tool because I did my masters and PhD on electron microscopy. So I suggested that we start some projects. And actually the sky is the limit” (G1 P2).

Moreover, some departments do have the resources, some of which cost them a lot of money but despite that, those resources are rarely used. Instead of being unused, such resources would be better utilised if they are shared with other departments. Sharing the resources can also be beneficial from another angle. That is, sharing increases the expertise in those resources. This in return, will increase the number of people who can provide maintenance at a reduced cost.

“We had an old ultra microtome, which nobody has used since it was purchased 30 years ago. We tried just to get the people from the company to fix it. The big companies have agents. They do not want you to fix the old machine but to buy a new machine. I think there is room for a lot of work to be done between anatomists” (G1 P2).

Collaboration with regards to resources can extend beyond the exchange of physical resources to include the exchange of intellectual resources and expertise. Departments that have a shortage of expertise in one area can benefit from the expertise of members of other departments to fill the gaps.

“If they have a deficiency we can exchange expertise” (G1 P5).

“If one great molecular biologist is there in Sultan Qaboos University, he can help to establish a lab here” (G2 P4).

Anatomists emphasised the particular benefit of collaboration with regards to the provision of cadaveric materials. Through collaboration, GCC anatomy departments can join their efforts to find a central way for importing cadavers for the whole GCC instead of individual importation. This was seen to offer the possibility to insure the quality of the imported cadavers and reduce the competition between the departments for the limited supply.

“Another important point in terms of collaboration I think is ordering cadavers and anatomical specimens. I think this has to really be worked out between the different departments. If we have more centralised collaborative efforts to order good cadavers and good specimens through a central GCC supplier, somehow
that will be very helpful in terms of supplying the departments with good quality specimens” (G2 P1).

Collaboration can also reduce the cost of obtaining processed cadaveric materials such as prospected wet and plastinated specimens for teaching purposes. Setting up a processing facility such as a plastination unit for the use of one school is not a cost-effective measure, but if schools collaborate, they could establish a central unit that supplies the materials to all of the schools of the region at a reasonable cost compared to independent production or importing processed specimens.

“[Our Head of Department] was planning to have a plastination lab in here but we were thinking if we have it just for ourselves it is going to cost a lot. So if it was only for us it is not worth it to be funded. We would rather get something from outside and reduce the budget. But if we have it with GCC, and we establish our lab and we have GCC customers to take from us, then it would be worth for us to open such a facility and distribute to everyone” (G2 P2).

8.2.4.2.2 Teaching methods

Teaching is a central task in the profession of anatomists. The anatomists thought that collaboration would improve the way they teach anatomy in many ways.

Some anatomists were aware of the similarities between the anatomy curricula taught in GCCMSs. They thought that collaboration would allow them to obtain exposure to the way their counterparts deliver the anatomy content, how they assess it, and how they deal with the challenges that are common among them.

“Most of the GCC [medical schools] are incorporating new curricula more or less. So it will be good to know how much they are teaching anatomy, how much they are contributing to the curriculum, and how they are managing the load” (G3 P2).

This exposure would be beneficial for both sides in two ways. Firstly, to help in finding solutions for problems encountered with teaching anatomy to the students of the region. Here, collaboration provides shortcuts instead of each going the hard way about solving problems. Secondly, collaboration could also provide anatomists with feedback about their teaching, leading to improvement.

“If there is collaboration they can tell me that my students are bad in this area. They can show me my weakness so I can improve. They can show me my strengths where I can do better. So there is a room for this college to improve” (G1 P3).
“It will be of mutual benefit to collaborate more in terms of how they run the curriculum and how we run it, what their experiences are, what the problems they are facing are, and how they solved them” (G3 P3).

Regional collaboration between GCC anatomy departments would also benefit the departments though giving them the chance to reach common protocols for regulating anatomy teaching in the region. The efforts of all the departments on some issues such as addressing the position of anatomy in medical curricula and future of anatomy teaching in the region could be united.

“The role of anatomy can be highlighted by this [anatomical] body as a whole in the GCC countries” (G3 P1)

“We can also get regulations for anatomy teaching” (G3 P3)

8.2.4.2.3 Anatomists’ development

Besides benefiting resources and teaching, collaboration was been by the anatomists as offering personal benefit. They firstly indicated that through collaboration, anatomists can have social interaction with their professional colleagues in the region. The interaction that collaboration brings helps anatomists to “meet people” (G1 P5) and even in “making friends” (G1 P1). This, they felt, would increase professional relationships between anatomists of the region.

“I wish there was a faculty exchange program. I will go for a short while and teach there and one of them will come over here and teach. So with different GCC countries you have the flavour and you can develop relationships as faculty exchange. That really makes this bond very strong, which is very much lacking” (G1 P3).

“The interaction is always fruitful” (G3 P2)

Junior, mostly local, anatomists expressed the need for training early in their career in order to be qualified anatomists. However, the limited resources in some schools shorten their chance to have access to proper training courses. They saw collaboration with other departments to be the solution to providing them with the needed training.

“We need to have a program for the juniors in anatomy departments because we are joining anatomy departments and we have no anatomy training program. We do not have that” (G3 P3).

“We can develop like training courses for the juniors. And that will strengthen the anatomy role in the schools” (G3 P4).
Post graduate courses in anatomy, such as masters’ and doctorate courses were seen as important for the training of junior local anatomists. However, such courses are very rare in the GCC region. With the rarity of such courses, anatomists believed that collaboration could help both junior anatomists and the departments that offer such courses. The junior local anatomists benefit firstly by enrolling the courses in their own region without the need to travel abroad and secondly, by finding jobs in the collaborating departments. The departments benefit by advertising their postgraduate courses and recruiting local students from the collaborating departments.

“Maybe we are the only department that has MSc program. This point should be also emphasised. The other thing is that we are working on our PhD program. This requires a lot of collaboration with other GCC countries to get students from other GCC countries into anatomy. So instead of taking them outside, there is an opportunity in the GCC to have an MSc degree and PhD. I really would like this idea and propagate it for those who are local graduates” (G2 P1).

“Another advantage maybe we can train MSc and PhDs and find jobs for them if you have collaboration between GCC universities. Now if you go and produce MSc graduates and they do not get jobs then there is no point of doing it. If we have GCC collaboration between the medical schools, my MSc graduates can get jobs in all the medical schools” (G2 P4).

8.2.5 Factors discouraging collaboration

The limited collaboration experienced by anatomists in GCC anatomy departments in comparison to that they had experienced before coming to the region was attributed to a number of factors.

8.2.5.1 Lack of contact opportunities

The most commonly mentioned factor was the absence of the opportunities to have contact with other anatomists in the region. They mentioned examples of contact and meeting opportunities which, if available, could have increased the level of contact. Such opportunities included conferences, visiting as external examiners, and contact related to postgraduate courses in the region.

“The problem is that we do not have some sort of conferences. We do not have an oral exam for example so we can share and meet” (G1 P1)

“One of the aspects is exams. Hardly there are any external examiners. This has shortened the chance” (G1 P2)
“We do not have here postgraduate courses for anatomy, not only for anatomy but also for medical fields like surgery” (G1 P3)

The absence of a local anatomical society was emphasised by some anatomists as being a major factor that limited the contact between anatomists of the region. According to them, the local society could provide the venues for official and planned and continuous contact conducive to further and long-lasting collaboration.

“We are in contact but not in an official association of anatomists. This is very bad and lacking in this region” (G1 P1).

“We are members of several societies abroad but we do not have a body that can join the anatomists of the region” (G2 P1)

8.2.5.2 The need for formal endorsement by the schools

The absence of formal contact opportunities has lessened the chance for contact between GCC anatomists even if they wanted to do it on their own efforts. They reported a lack of official support and backup from their schools when they wanted to initiate personal contact.

“Collaboration between universities needs memorandums of understanding. It should be an agreement. It is not at the personal level. You cannot do it by yourself and go there and introduce yourself. You need something official so you can go and they can come” (G1 P5).

Anatomists believed that the official adoption of collaborative initiatives by the schools can boost their success and encourage further collaboration that can lead to mutual benefits.

“They do not have any agreement between the medical school here and the medical schools there. If they have that agreement we can help each other in teaching and in research and so on” (G3 P4)

According to one anatomist, that kind of official support from the schools was behind the success one of the rarely experienced contact between all the staff members in two GCC anatomy departments. He believed that the lack of that kind of support was one of the factors limiting his and his colleagues’ chance for initiating contact.

“Because they were given permission and support from the [...] University in [...], the whole department came. They have the means. Now here if I want to go, leave the rest of the department aside, I will struggle” (G1 P2).
8.2.5.3 Time constraints

Anatomists described how they struggle to find the time to devote to initiating contact and collaboration with anatomists from other departments. Schools were seen to give priority to teaching duties within the school over contacting others from outside. When an anatomist wanted to travel for collaboration purposes he/she had to do it at certain times to avoid compromising teaching.

“We are not allowed to take any leave during the teaching period. If you want, you have to go at your expense and from your money. Vacations are in July and August and you cannot take days off in other than that time” (G1 P1).

Finding the time to initiate collaboration was made even worse by the high teaching loads, which made anatomists unable to allocate time to meet other anatomists in conferences, workshops, personal visits. Teaching and administrative duties occupies all the time.

“I and [another colleague] tried to go a conference in South Africa. We could not go together because the department does not allow that. Even for an anatomical conference we could not go together. Here in this system you cannot find a week to do that. We are busy all the week and all the day. Even if we have only one hour of teaching per day, we are busy” (G1 P2).

8.2.5.4 The status of employment

The last of the identified factors discouraging collaboration between anatomists in anatomy departments of the region was the temporary status of expatriate anatomists. Expatriate anatomists raised the concern that the short-term contracts that they have with their schools gave them a sense of uncertainty, impeded the independence of their thinking, and caused them to be hesitant in taking decisions about initiating collaboration.

“Maybe because most of the people are expatriates so they do not have the chance to have some ideas or.... I do not know” (G1 P1)

“If you have nationals, in a day it [collaboration] can be done. But if you are an expat, no one will listen to you” (G1 P2)

“Due to the contract renewal, the faculty member is a bit scared to take decision because his colleagues have to sign his contract. Even the chairman does not have independent thinking” (G2 P4).

The feeling that short-term contracts do not favor thinking about long term collaboration was also shared by some local anatomists. Although they do not have the
same problem, they could sense its impact on expatriates’ commitment towards collaboration.

“In a two year contract, if you start a collaborative work after a year, then you start worrying, would get the next one? Suppose those who have 5 years or so, it comes in the back of the mind; will I get the next one? If you get the next one, within 6 months you start worrying about the next one. So these are the bad things about the short term [employment]” (G1 P3).

Expatriate anatomists raised the concern that they may not be given the credit they deserved when they get involved in collaborative activities. Despite the valuable support and expertise they can offer when initiating collaboration, they are worried that the credit will be mainly taken by the locals.

“I was one of the people who have laid down the GCC Dermatology and in KSA. At the beginning I was very active but after they [locals] took everything they just forgot about me as an expat. So as an expat, you are very vulnerable to be forgotten” (G1 P2).

Anatomists also indicated that the low numbers of the permanent local anatomists working in GCC anatomy departments could be one of the factors discouraging collaboration.

“Unfortunately, I am the only one who is local here. We do not have a Local anatomist in any other medical school in the country. I am the only one” (G1 P3)

“The body, which will organise these contacts should be an anatomical society of GCC countries. One negative aspect is that the GCC nationals who are in anatomy are very few. You can count them with your fingers” (G1 P4).

Expatriate anatomists felt that the rarity of locals in the profession adds more obstacles to collaboration. From his long experience in the region, one anatomist/dermatologist described how GCC collaborative initiatives such a professional bodies were easily established for the professions that have a lot of locals, unlike anatomy.

“Actually I have another experience in dermatology where you have a lot of GCC nationals. It was very easy to make a body, one for GCC country and one for each country for dermatology. And they meet and have conferences and they are very active” (G1 P2).
8.2.6 Factors encouraging collaboration

This section presents the anatomists’ views on the factors that they believed are needed in order to increase collaboration amongst themselves and amongst their departments. The anatomists came up with four main strategies, which they believe can help them in achieving that collaboration. These strategies were: establishing a local GCC anatomical body or society, increasing contact between individual anatomists and departments through faculty exchange, involvement of local anatomists, and the formal recognition of collaborative activity by the schools.

8.2.6.1 Anatomical body

The need for establishing a GCC anatomical body or society was agreed upon by almost all anatomists. They believed that such a body would play a central role in orchestrating all aspects of local collaboration through organising and conducting activities such as conferences, meetings, seminars, and workshops.

“I think if there is a body, then it can organise conferences, seminars, visits” (G1 P2).

“There can be an association of anatomists for GCC countries” (G1 P5)

“Start a GCC anatomical society. If we have a meeting every year for few days, we can exchange many ideas and we can solve a lot of problems” (G2 P3).

“To have a society for the GCC anatomists, where we have our own conference meetings and workshops” (G3 P1).

There was a comment that there is reasonable number of medical schools in the region employing a reasonable number of anatomists. Therefore, the establishment of a professional body to connect all these anatomists is needed. Some believed that the body has become a necessity.

“The other starting point is starting an anatomical society for the GCC. We have 41 medical schools and at least 400 anatomists if not more” (G2 P4).

“I think we have to start that” (G2 P3).

8.2.6.2 Faculty exchange

Faculty exchange programs between individual departments were also admired as a factor encouraging further collaboration. Such exchanges could range from one or few days in which anatomists meet and present and discuss matters of mutual interest, to
longer exchange missions where anatomists contribute to the teaching and examining in collaborating departments.

“I think between two departments, for example just like what [a neighbour department] did, we should exchange visits. If we have that then you can open doors.” (G1 P2).

“Somebody from say Dubai can come and give a lecture and go. What is bad about this? We will have a lot of discussion and you will have another experience” (G1 P2).

“For example, [staff from] Sultan Qaboos University can invite us for examination as examiners. We can invite professors from there and we can also do and evaluate their department” (G2 P4).

“Faculty exchange programs for at least two or three weeks, where you go either as an observer or participate in their teaching programs” (G3 P1).

More importantly, the exchange programs should be mutually maintained by both collaborating departments in order to ensure that they remain beneficial and to secure the interest of both sides.

“For example, people from Oman came to us but we did not go back to them so they forgot about us” (G1 P2).

“That would be a good experience for our faculty members. It could be done on a yearly basis having an exchange for two months or one semester” (G2 P1).

8.2.6.3 Involvement of local anatomists

Anatomists, especially expatriates thought that the interest of local anatomists in initiating collaboration is a boosting factor. Expatriates believed that locals know better how to tackle the administrative and logistic challenges that they may face initiating collaboration.

“One or two [locals] can take the plan and push it. It needs to get approval and a lot of administrative work as well” (G1 P2).

“We are ready to establish the body or the anatomy association or committee but we need the interest of at least few local people from the gulf area. They can start the initiative and they carry on with it” (G1 P5).

“GCC members are a must. Permanent members will be the ones who are within the GCC” (G3 P1).
Even in previous occasions where an expatriate was thinking of starting an initiative for collaboration, he had to ask for assistance from a local because of the perceived importance of locals’ involvement for the success of any initiative.

“I said to our president that it is a good chance to [start collaboration with a school in the KSA], you are from KSA and you can help us to make some sort of society or something like this collaboration. You have many Saudi faculties” (G1 P1).

8.2.6.4 Formal recognition by the schools

Anatomists view collaboration as a relationship between schools or departments rather than a personal relationship between individual anatomists. Therefore, they believed that collaboration is more likely to achieve success if it is officially recognised and adopted by the higher authorities in GCCMSs and other government bodies involved in medical education. This point was mainly emphasised by expatriate anatomists, who thought that such official adoption of collaboration is specifically needed in this part of the world.

“It should be between universities in a formal way in the form of a memorandum of understanding. It is like an agreement between the universities” (G1 P5).

“The other one is to initiate some processes and prepare some proposals and submit to universities. I think there is the GCC deans committee and we can submit the proposal for exchanges” (G2 P2)

“Maybe in this area in the middle east we can have more collaboration. We can have collaboration but it has to be done through the governments and the universities such as memorandums” (G2 P4).

Once achieved, this official adoption can act like a framework for collaboration, which enables anatomists and departments to pursue collaborative activities and initiatives with great confidence.

“It is not at the personal level. You cannot do it yourself and go there and introduce yourself. You need something official so you can go and they can come” (G1 P5).

“We need to create that collaboration as anatomists by working out a law to have the exchange and facilitate this kind of exchange between the two faculties and the departments” (G2 P1).
8.3 Summary

8.3.1 Anatomy teaching in the curriculum

Participants have identified the relevance to clinical practice as one of the major characteristics of teaching anatomy in integrated medical curricula. They admired the relevance for increasing students’ motivation to study anatomy and to better prepare them for clinical experience and performance in later years. On the other hand, teaching relevant anatomy was perceived to impact anatomical knowledge in some aspects. Firstly, it focuses on applied anatomy to the detriment of basic anatomy, and may create gaps in students’ anatomical knowledge. Secondly, anatomy as a subject dissolves because it is presented in fragmented bits and pieces. Thirdly, the applied clinically-relevant anatomy is presented too early to students without a good basis in anatomy, which may cause them to miss basic anatomical concepts.

Participants have also complained of the reduced structured anatomy teaching time and the reliance on SDL that has come with integrated curricula. In many schools, there was a mismatch between the teaching time and the learning objectives that students had to cover, which worsened the impact of inadequate time. Time inadequacy has impacted the way they teach anatomy though increasing SDL, abandoning dissection, and not having the time for revision, which, they felt, yielded poor quality teaching.

Participants acknowledged the debate over the role of dissection in modern medical curricula. They admired the usefulness of dissection for students’ learning of anatomy through promoting active learning, conferring hands-on experience and developing confidence in surgical techniques, and expanding the time of students’ exposure to anatomy. On the other hand, they admitted that dissection is faced with challenges arising from their curricula, such as inadequate time and integration that focuses on clinically relevant anatomy. They also referred to challenges related in particular to the GCC region, such as the unavailability of local cadavers due to the absence of body donation programs, competition between the GCC schools for imported cadavers, and regulations that restricted the sources of imported cadavers. Participants admitted that full body dissection is not logistically feasible in the regions’ medical schools. Instead, they supported offering a modified form of limited experience, such as optional dissection.
As teachers, participants expressed their satisfaction with teaching anatomy in an integrated curriculum. The sources of satisfaction were their ability to expand and update their knowledge through reading in other disciplines when preparing for the integrated sessions and also from students. They were exposed to the new trends in medical education. They were able to expand anatomy teaching from the lecture theatres to the hospital wards. On the other hand, participants perceived teaching anatomy in integrated curricula as demanding in terms of workload. It required them to gain more experience in preparation for the sessions. They also had more contact with students who were not equipped with the skills of SDL. Consequently, teachers had less time to spare for other activities, like research.

Participants felt that teaching anatomy in an integrated curriculum benefited the students. However, all the benefits were related to the overall professional maturation of the students rather than their anatomical knowledge as such. Small group teaching was seen to train the students in professional skills such as teamwork, communication, and reasoning and research skills. This was believed to encourage deep learning by the students instead of a dependence on memorisation. Presentations were seen to improve students’ speaking and presentation skills. On the down side, participants raised concerns over the dependence of teaching anatomy in an integrated curriculum on the students’ skills in SDL and independent learning. They expressed worries that their students lacked such skills due reasons such as inadequate English skills and science backgrounds and to the spoon feeding approach of the schooling systems in GCC countries.

8.3.2 Collaboration

Participants revealed that there is limited collaboration between them and their colleagues in anatomy departments from other GCCMSs, despite some of them having taught anatomy in the region for many years. Only two of them had visited other departments and another two participated in workshops in other departments. They had met one another randomly and briefly in international anatomy conferences and in general conferences in the GCC region.

On the other hand, before coming to the GCC, most of expatriate anatomists had more frequent meetings with colleagues from other departments at the annual meetings of anatomical societies in the countries where they worked before. In those meetings, they could have discussions, present their work, and participate in workshops. Moreover,
they had frequent visits to other departments, mainly as external examiners for undergraduate medical students and postgraduate anatomy students. Although not common, there was also exchange of teaching resources and sharing of facilities.

Participants believed that local collaboration within the GCC would be more beneficial than collaborating with people from outside because of the similarities in types of students, learning environments, and culture. The whole GCC region could benefit from the vast experience of the expatriates with collaboration. Local junior anatomists could benefit from collaboration in terms of facing challenges, solving problems, and gaining access to training opportunities in other departments. Collaboration could also benefit anatomists by allowing them access to resources and facilities in other departments. Such sharing would result in better utilisation of those resources and increase the distribution of expertise in their use in the region. Collaboration could also help in establishing central facilities such as cadaver importation and processing centres. Participants felt that collaboration could improve their teaching through solving problems, getting feedback, and setting regulations and protocols. They could benefit personally through socialising with the people who share the same profession in the region.

Participants identified some factors that they perceived as being behind the limited collaboration amongst them. The lack of opportunities for communication and contact was one of them. They mentioned the absence of anatomy conferences, invitations for being external examiners, and the absences of a regional anatomical professional body. The lack of formal endorsement and support was believed to be another factor. The lack of time, attributed to the time overload of activities in the departments, was also seen as a factor inhibiting collaboration. Finally, expatriate participants pointed to the uncertainly due to the temporary status in the region because of the short-term contracts, and the worry of not gaining the long-term credit of collaboration as being additional factors. Therefore, they felt that locals are more likely to succeed in initiating collaborative activities such as an anatomical society.

Participants identified some factors that they believed can encourage collaboration. Firstly, they pointed to the need for a GCC professional anatomical body. The absence of this body was particularly felt by the expatriates who had such a body in their home countries. According to them, such a body could organise conferences, seminars, workshops, where they can meet and discuss points of interest. Secondly, they saw a
need for faculty exchange in the form of short visits for meetings, presentations, and discussions or in the form of longer visits for teaching or evaluation. Participants identified two additional factors that they believed could increase the success of any collaborative activities. The first one was the involvement of local anatomists, because they are permanent and can maintain momentum, and because they know better how to deal with the administrative and policy requirements for initiating collaboration. The second was the formal adoption and recognition of collaboration by the schools and related government departments, which is perceived, would cause anatomists to approach collaboration with more confidence.
Chapter nine: Discussion

9.1 Introduction

The GCC region has a record of medical education that started less than five decades ago. However, the last decade has witnessed a massive increase in the number of medical schools in the region. While there have been some studies that investigated medical education in the region, the topic of the place of anatomy in the regions’ medical curricula remains largely unreported in times when this particular topic has become a much discussed topic. This is an exploratory study aimed at investigating the largely under-researched area of anatomy teaching in GCCMSs. To do so, the study aims to shed some light on the following three dimensions of this vast topic: the current status of anatomy teaching, the role and practice of dissection, and the collaboration between anatomy departments in GCCMSs. This chapter discusses and merges the most important findings of the three phases of the study.

9.2 The presence of anatomy in GCC countries

This study has found that all but one anatomy department in GCCMSs teach anatomy only in relation to medicine. Medical students and students of allied medical sciences such as nursing, pharmacy, physiotherapy, and medical laboratory sciences are the only students who study anatomy in the region. Students of basic degrees in anatomical sciences were not encountered in this study. There could be some basic degrees in anatomy offered by schools other than medical schools, but the researcher speculates that this is unlikely to be the case in the GCC region.

The GCC region is a conservative region that follows the Islamic teachings in almost all aspects of life including education at all levels. Regarding the study of anatomy, most of the “fatwas” indicate that the study of anatomy, especially through dissecting the human body is not desired. However, it is permissible in three situations: study of medicine, pathologic investigations, and forensic investigations (General Presidency of Scholarly Research and Ifta’ in Saudi Arabia, 2012). However, the same document showed that some prominent religious leaders in the GCC region still have some objections regarding the three permissible situations for dissection. Consequently, anatomy departments in GCCMSs are present to serve health sciences education including medicine.
Anatomy departments also offer postgraduate programs. More than 33% of the departments that performed dissection did so for the purpose of postgraduate teaching. Two of the interviewed HODs also indicated that their departments offer such programs; one Master’s level program with planning for a PhD program and the other has a PhD program. Neither of the two departments has a basic degree program in anatomy, which may indicate that the postgraduate programs are largely research-based.

9.3 Staff demographics

The teaching faculty in anatomy departments has been among the issues previously given considerable attention in literature, specifically the student: staff ratio and the percentage of medically qualified teachers. This study has shown that the 20 schools surveyed employ 217 (mean= 10.8±7.9) anatomy teachers, 94.5% of whom are on a full-time basis. Those departments teach a gross total annual student intake of 2630 (mean= 138.4±77.3). GCC anatomy departments have an average student: staff ratio of 21.7±13.0, comparable to ratios reported from many parts of the world in the past 10 years. For example, ratios were reported as standing at 20.6 in the UK and Ireland (Heylings, 2002) and ranging from 15-35 in Africa (Kramer, et al., 2008). However, it is much lower than the ratio of 58 in Scottish medical schools (Pryde & Black, 2005). Therefore, the findings of this study indicate that GCC anatomy departments are on the good side of the internationally reported figures of student: staff ratios. The noticeable observation in this study was that there was a huge range in the ratios (from 10-50) in GCCMSs. The range was probably due to the similarly huge range of the number of students per practical class, which was 15-120. This indicates that GCCMSs managed to couple the number of students with the number of teachers in anatomy practical classes, which was confirmed by the significant positive correlation between the two variables.

Medically qualified anatomy teachers formed the majority (81.5%) in GCC anatomy departments. While the decline in the number of medically qualified anatomists has been identified as one of the changes to anatomy teaching in modern medical curricula (Bergman, et al., 2011), the GCC region seems to prosper, by having the second highest reported percentage, after the three Egyptian medical schools (100%), and the Two Zambian schools (100%) reported by Kramer et al (2008). Schools in the Republic of South Africa had an average of 45% (Kramer, et al., 2008). In the Western World, medically qualified anatomists composed 66% in Australia and New Zealand (Craig, et
al., 2010), 47% in Scotland (Pryde & Black, 2005), 38% in the Netherlands (Van Mameren, 2004), and as low as 6.7% in the UK and Ireland (Heylings, 2002).

The replacement of medically qualified anatomists with basic scientists accompanied the move towards anatomy departments changing from being teaching-oriented to research-oriented, which can help in attracting funding through research (Cahill, et al., 2000; Older, 2004). The higher percentage of medically qualified anatomists in GCCMSs may relate to the possibility that the anatomy departments are teaching-oriented rather than research-oriented. The quantitative data showing that only 33.3% of the departments offer postgraduate courses support this explanation, reflecting the low emphasis on research. The literature review (Figure 4.4) also supports this explanation when it showed that 68% of GCCMSs are public in an economically rich region, which may reflect less reliance on funding through research. Moreover, the prevalence of integrated curricula could also contribute towards the preference for medically-qualified anatomists, who are thought to be more able to teach anatomy in a clinical context (Fitzgerald, et al., 2008).

Teaching anatomy by non-medically qualified teachers has been linked, although without empirical evidence, to the insufficient anatomy knowledge of medical graduates (Bergman, et al., 2011). Older (2004) believed that non-medically qualified anatomy teachers cannot teach anatomy in a clinical context and he supported having medically qualified anatomists in medical schools. Others suggested that anatomy departments in medical schools should have at least a mixture of medically qualified and basic scientist anatomists (R. Pabst, 1992).

Another unique characteristic of anatomy teachers in GCCMSs, which was not observed or explored in previous similar studies, was the citizenship of the anatomists. This study has found 79% of the teachers to be expatriates. This finding raised questions about the rarity of local anatomy teachers. The researcher argues that this has three reasons. Firstly, as has been mentioned earlier, anatomy in the region is taught in the context of medicine and its allied sciences. The students being taught had already made choices about their future career either as doctors, nurses, or physiotherapists and were unlikely to choose anatomy teaching as a profession. Secondly, religious opinions on the study of anatomy may have discouraged GCC youngsters from pursuing specialisation in this area. Thirdly, there were rare referrals to possible social stigma around dissecting bodies in the GCC region briefly reflected upon by a few HODs in the
interviews. For example, one of them indicated: “It is due to the stigma attached to it [anatomy] the stigma that you are dealing with dead bodies is there. Now I have been here for 20 odd years and the highest number of locals in the department is the 3 that we currently have” (P7).

The huge difference between the number of expatriate and local anatomists may not be directly related to anatomy as a profession. It could just be a reflection of the representation of nationals and expatriates in the overall population of the GCC region. In 2012, expatriates formed about 38% of the population of all academics in the universities of the GCC region (GCC Secretary General, 2012b). According to this figure, it seems that the much higher percentage of expatriates in anatomy teaching positions in medical schools is an exception. The finding that 82.7% of those expatriate anatomists hold medical degrees (Table 6.8) should encourage a comparison with the percentage of expatriates working in hospitals holding the same qualification. The same report (GCC Secretary General, 2012b) showed that expatriate medical doctors form 84% of the population of medical doctors working in the regions’ public hospitals. That is, the high percentage of anatomy teachers may just be a reflection of the percentage of all medically qualified expatriates in the region.

Under those circumstances and with the rarity of local anatomists, GCCMSs resorted to recruiting expatriate anatomists. Although the actual citizenships of the expatriates was beyond the scope of this study, there were anatomists from the UK, Australia, Sudan, Egypt, Iraq, India, Pakistan, USA, and Jordan included in the interviews and FGs. However, the majority were from India and Egypt.

It was also found that the majority of both local (67.4%) and expatriate (82.7%) anatomists were medically qualified. This may indicate firstly that GCCMSs purposely recruited medically qualified expatriate anatomists. Secondly, it may also indicate that GCC anatomists were in fact medical graduates who chose a career in anatomy teaching after medical school. However, there was not enough evidence to suggest whether GCCMSs purposely recruited local medically qualified anatomists, or just because it was hard to find locals who have basic degrees in anatomy.

With a percentage of 79%, it was not surprising to find that expatriates form the majority in all academic positions, especially in the three senior positions of professors. This was also supported by the fact that almost all of the eleven interviewed HODs were senior expatriates. The gap between the percentages of local and expatriate anatomists
was smaller in the junior positions of demonstrator and lecturer. This might be an indication that GCCMSs are moving towards attracting and educating locals to pursue careers in this profession, which can ensure stability of faculty and reduce the reliance on the competitive international demand for qualified anatomists.

9.3.1 Collaboration in light of staff demographic data

The nationality of the anatomists in GCCMSs has had some influence on the collaboration between the anatomy departments. Qualitative data showed that expatriate anatomists may not engage in collaborative activities for three main reasons; the temporary nature of their stay, the lack of authority, and the fear of loss of attribution of credit (section 7.4.4.3.4). Expatriates thought locals to be more likely to succeed in initiating collaboration because they have more authority and know better how to deal with the local policies and administrative requirements. Moreover, local anatomists may have more interest in maintaining collaboration because they are staying in the GCC region permanently and can claim its benefits and credit on the long run.

The finding that 57% of local anatomists were in junior academic positions of demonstrator and lecturer while 76% of the expatriates were in the three senior positions of professor adds to this argument (Table 6.7). According to the qualitative data, one of the factors behind the feeling by expatriates of no need to collaborate with others in the GCC was that senior expatriates had accumulated huge experiences in teaching anatomy in several countries (section 7.4.4.1). Therefore, local experience may not add new benefits for them. On the other hand, junior local anatomists felt the need for collaboration for career development by having access to training courses and sharing experiences with the juniors in other departments. Moreover, postgraduate courses offered in some departments would allow them to acquire qualifications without the need to travel abroad.

Ironically, one expatriate saw the vast experience of his fellow expatriates as a reason for having collaboration because it allows them to share their experiences with the whole region rather than restricting it to their own departments. The diversity of those expatriates’ experience was huge. For example, one HOD described the background of his staff members: “We come from different parts of the world. They have different exposures. For example, we had two from India, one from Sudan, two from Egypt, one is [local], and one from Jordan. We had a good mixture and all backgrounds of postgraduate qualifications. I had mine from the UK, the Sudanese also from the UK,
One expatriate was from America and another from Canada, and the Bahraini was from the UK (P1). It would benefit the region to have such an accumulation and diversity of experience shared around.

Other expatriates did not see the temporary stay as an obstacle to collaboration for two reasons. Firstly, collaboration is institutional rather than personal. Therefore, it can be maintained even after the expatriate who was involved in it leaves the department. Secondly, expatriates can maintain the GCC collaboration after leaving the region and benefit from it, such as keeping the membership of any professional body that is formed. Moreover, many expatriates move between the departments within the GCC. Therefore, they can in fact be a factor for initiating links and maybe collaboration among those departments.

Expatriate anatomists felt another deficiency after coming to the GCC region, which was the lack of communication and contact opportunities with other anatomists (sections 7.4.3.2 and 8.2.5.1). They identified the absence of a regional professional body such as an anatomical society as a major factor in their isolation. In their home countries, such bodies were pivotal for communication between anatomists through conducting conferences, meetings, seminars, workshops, and even social events. In the GCC, such activities were extremely rare. They could only meet their fellow GCC anatomists at international anatomical conferences and GCC general conferences. Even online communication media such as web pages and discussion forums specific to the region do not exist.

The lack of communication has possibly affected anatomists in two ways. Firstly many of them felt isolated from the local anatomy teaching community in the region, although many of them still had overseas connections. They felt that local collaboration could benefit them through allowing them to meet people, develop friendships, and strengthen the bond with others. Secondly, the lack of regional communication has led to “secrecy”. That is, lack of information about the anatomy teaching in the regions’ medical schools such as the teachers, facilities, research, and types of curricula.

The anatomists participating in this study, especially expatriates have put the GCC anatomical body on the top of the list of factors to increase communication and consequently collaboration among the region’s anatomists and anatomy departments. This corresponds with the importance of the roles played by anatomical societies in facilitating collaboration for anatomy teaching (section 2.7.1).
9.4 The Curriculum

The findings of this study indicate that medical schools of the GCC region have adopted medical curricula of varying lengths, ranging from four to seven years, although just under three quarters of them adopted six year curricula. While the length of medical curricula that have been reported from other parts of the world lay within the same range, it seems that there is much more agreement between the GCC medical curricula than between medical curricula in Australian and New Zealand medical schools (Craig, et al., 2010). A medical curriculum that extends for up to seven years still exists in one GCC school. Such a curriculum was rarely reported elsewhere in the world nowadays. Within similar regional studies it has been only reported from the African country of Zambia (Kramer, et al., 2008).

The majority of GCC medical curricula were divided into two phases; a pre-clinical phase followed by a clinical phase, with anatomy more likely to be taught in the first phase. The findings indicated that anatomy was taught early in the first year in more than half of the schools, peaked in the second and third years with 90% and 80% of the school teaching anatomy in these years, respectively, and then ceased towards the second half the curriculum with only 18.8% continuing to teach anatomy in the sixth year (Table 6.13). In other words, 70%, 84.2%, and 81.2% of the GCC schools do not offer any anatomy teaching in the fourth, fifth, and sixth years, respectively. This data does not fit with the overall description of anatomy being taught in an integrated fashion in GCCMSs (sections 6.4.1 and 7.2.1). However, when referring to vertical integration, which warrants expanding the teaching of anatomy into the later parts of the curriculum, it seems that the discrepancy is less, knowing that not more than 53.3% of the HODs rated their anatomy 4 and 5 for vertical integration. Moreover, qualitative data showed that a big part of the sessions that implement vertical integration were conducted by clinicians, not full-time anatomists (section 7.2.4.1.2.1). This arrangement anatomy teaching is not unique to GCCMSs as Craig et al (2009) have reported a similar arrangement in Australian and New Zealand schools, where 74% of the schools integrated anatomy with other subjects including clinical skills, while over 90% of anatomy was taught in the first three years of the curriculum. Anatomy teaching also peaked in the second year in these schools but began to decline earlier from the third year with very little anatomy teaching hours in later years.
9.4.1 Characteristics of the anatomy curriculum

There are many characteristics that should be taken into consideration when trying to describe a medical curriculum in general and the anatomy curriculum in particular. The characteristics of anatomy curricula that were the centre of focus for this study were the following:

Integration: discipline-based versus integrated
The core of teaching: subject-based versus problem-based
The approach: regional versus systems-based
The type of learning: self-directed learning versus tutor-led

The current study tried to define the spectrum of the implementation of each of the four characteristics of anatomy curricula, based on the HODs description of their schools’ anatomy curricula. Anatomy curricula in GCCMSs implemented each characteristic to varying degrees. However, the overall description of anatomy curricula in GCCMSs based on this study’s findings is that they are significantly integrated ($p=0.004$), significantly system oriented ($p=0.006$), and lean towards PBL ($p=0.36$), and self-directed learning ($p=0.21$).

Qualitative data supported these finding. All of the interviewed HODs described their medical schools anatomy curricula as integrated. Nine of the eleven indicated that they teach anatomy in a systems-based approach. The other two whose departments teach anatomy in a regional approach revealed that it was in fact aligned and taught in parallel with overall systems-based modules.

Nine of the interviewed HODs also indicated that they had a hybrid form of curricula in which PBL was combined with didactic lecturing. In other words, pure PBL curricula do not exist in GCCMSs. On the other hand, pure didactic lectures with no PBL component were described by two HODs. Moreover, quantitative data indicated that the average time occupied by didactic lectures and practicals was 40% each, which leaves a small percentage for other forms of teaching modalities such as PBL. Unfortunately, the quantitative data did not disclose anything about the time dedicated to SDL, which is a major component of PBL. However, qualitative data (section 7.2.2) indicated that many of the interviewed HODs emphasised the use of SDL in the context of PBL. They admired its usefulness for increasing the time for students’ exposure to anatomical
knowledge when they search for information to prepare for discussions and presentations.

The findings with regard to the use of PBL indicated that it is not enough to describe a curriculum as problem-based but it would be relevant to ask for more details about the balance between problem-based and didactic lecture-based strategies. If any of the nine HODs were directly asked whether their schools’ curriculum was problem-based, in the manner of Heylings (2002) study, they would possibly have said yes. However, this would still have left the issue of the extent to which PBL was adopted. Our findings indicate that having a small component of PBL does not qualify a curriculum to be generally described as problem-based. This also applies to the other characteristics.

Literature has shown that SDL is one of the pillars of modern integrated medical curricula. However, the balance between tutor-led (TLL) and SDL was the most ambiguous one in this study. It is worth mentioning that the majority (46%) of the participants rated the balance of the two characteristics in the middle of the scale between 4 and 6. This may indicate that there could be a possibility that the HODs were not feeling confident enough to support one side of the scale due to the difficulty of estimating the magnitude of SDL in practice. Nevertheless, the quantitative findings imply that, although GCCMSs are adopting integrated curricula, their use of SDL in anatomy teaching was not significantly different than the use of TLL. First of all, that SDL was rated close degree to TLL reflects a high level of adoption of SDL. If a school or a group of schools adopt 70% or 80% SDL, this would theoretically mean that this is largely a distance learning course, which is not the case in medical education. Secondly, qualitative data from FGs (section 8.1.2.5) indicate that the anatomy teachers were not satisfied with the readiness of GCC medical students to blend with the SDL strategy due to inadequate English language skills, inadequate background of scientific subjects when leaving high school, and inadequate research skills.

The literature shows that all except one GCC medical school have undergraduate medical courses (Hamdy, et al., 2010a; Hamdy, et al., 2010b). This means that students join medical schools just after leaving high school, which may explain the reason behind skill inadequacy. The earlier quantitative data showed that more than half of GCCMSs started teaching anatomy in the first year of the medical curriculum, which means that the students’ learning of anatomy may be affected by their inadequate tertiary learning skill sets.

252
Overall, the literature has reported various models of anatomy curricula. However, in his review Drake (1998) described three general models; the traditional lecture-practical based and faculty-centred, the problem-based and student-centred, and the systems-oriented types. Considering the points of strength and weakness of each general model, he suggested a truly integrated curricular model which combines the positive features of the three models. This study showed that anatomy curricula in GCCMSs fit with that suggested curricular model. The majority of schools combined the dominant traditional lecture-practical teaching with PBL sessions in an overall systems-oriented medical curriculum. Moreover, SDL and TLL were given a relatively comparable emphasis.

### 9.4.2 Implementation of integration

Integration in medical curricula is a well-defined term, which implies that a subject like anatomy is taught in a way that it becomes linked with other basic medical sciences (horizontal integration) and clinical disciplines (vertical integration). In reality however, integration is a vague term when it comes to implementation in practice.

Quantitative data indicated that the organisation of the whole medical curriculum affects the degree to which integration is achieved. That is, whether the curriculum is “organisationally” integrated or sequential. Teaching anatomy in a one-phase integrated curriculum was seen to result in better integration of anatomy ($p=0.03$) in general, and better vertical integration of anatomy in particular ($p=0.04$). There was also a tendency for integrated curricula to implement vertical and horizontal integration to the same degree, while sequential curricula tended to put more emphasis on horizontal integration ($p=0.22$). With the majority (75%) of GCCMSs adopting sequential medical curricula, it appears that the implementation of integration maybe impacted, but this does not seem to have happened according to the high integration rating given to these curricula. In addition, there are some indications that the anatomy teaching environment in GCCMSs favours integration such as the prevalence of medically qualified anatomists (Table Tables 6.8 & 6.19 and section 7.2.4). Moreover, there is room for increased integration, especially vertical integration, by moving towards reducing the division between the first and the second half of the curriculum.

### 9.4.3 Anatomy curriculum in light of collaboration

Overall, quantitative data from this study regarding the hours available for anatomy teaching, the distribution of those hours between the sub-disciplines and different
teaching modalities, and characteristics of the curricula reflected great variation among GCCMSs. It reflects a lack of consensus about the way anatomy should be taught, which was also felt by the HODs: “Every college or department of the university have their own style of curriculum. Curricula are different and teaching methods are different” (P1). It also raises questions about the anatomical knowledge of the region’s medical graduates. This study is the first to shed some light on this issue and points to the need to have a minimum core curriculum for anatomy teaching in the region.

Qualitative data showed that HODs believed that collaboration can help anatomy departments in GCCMSs to reach consensus on a core anatomy curriculum (section 7.4.3.1). Data from FGs also indicated that local collaboration is needed to deal with the common inheritance of students with the same cultural background and learning environment (section 8.2.4.1). This may be a factor behind the need and potential success of a core anatomy curriculum. Moreover, HODs believed that defining a core curriculum would unify the teaching of anatomy across the region, to the benefit of students after graduation, when sitting for licensing exams, or even when looking for jobs across the region. Having a regional curriculum could also address the consequences of the GCC culture on the educational systems, in order to devise strategies and methods that best fit the learning strategies of the GCC students.

Having different anatomy curricula in the region’s medical schools was identified as a reason behind the reluctance of some departments to exchange faculty for examinations or teaching and the preference for anatomists from outside the region who had the experience with similar curricula (section 7.4.4.1). A core curriculum can work towards minimising the impact of curriculum variation and hence increase local collaboration between departments.

The idea of a national or regional minimum core curriculum for anatomy has been discussed in other parts of the world and has initiated calls to the adoption of such curricula (Australian Medical Students' Association, 2013; Chapuis, et al., 2010; Craig, et al., 2010; Heylings, 2002). There have been some real attempts to define core curricula for medical schools in the US and Canada (American Association of clinical Anatomists, 1996; Association of Anatomy Cell Biology and Neurobiology Chairpersons, 1997) and the UK and Ireland (McHanwell, et al., 2007). However, the resultant core curricula are more for provision of guidance to decision-makers including medical school faculty, curriculum committees, and medical educationalists with some
guidelines from the perspectives of anatomists as to what is defined as basic anatomical knowledge for medical graduates.

Interestingly, all of the above attempts to define a core curriculum have been adopted, initiated, and conducted under the regional anatomical bodies rather than through individual attempts by the schools or individual anatomists. This observation points again to the need for a regional anatomical body if a core anatomy curriculum to achieve realisation. This point was acknowledged in the qualitative data by referring to the benefit of the body for organising and setting strategies related to anatomy teaching in the region’s medical schools. This supports calls by (Monkhouse, 1992) and (R. Pabst, 1992) that the anatomical societies should discuss the new ideas of anatomy teaching in their meetings and discussions.

**9.5 Anatomy teaching time**

Over the past few decades, anatomy teaching time in medical curricula has been progressively reduced. This wave of change has been experienced and reported in medical schools in many parts of the world but, there is a big gap in the knowledge about anatomy teaching time in GCCMSs. This study provided, for the first time, data that would shed some light on this topic. The topic will be discussed in light of local circumstances and the international trends of anatomy teaching time in medical curricula.

**9.5.1 The current status of anatomy teaching time**

Qualitative data first revealed a wide range of the number of anatomy teaching hours across the region’s medical schools. Schools taught from as low as less than 100 hours to as high as more than 400 hours. This variation was expected due to the lack of a regional core curriculum (O. Habbal, 2009) and to the finding that 30% of the schools did not even have a defined minimum core anatomy knowledge requirement. However, it was surprising because 89% of the schools had a either five or six year curriculum and because all HODs, through the quantitative and qualitative data, described their schools’ curricula as integrated, and nine of the eleven schools included in the HOD interviews used PBL.

The variation in terms of anatomy teaching hours is not unique to the GCC region’s schools but it has also been reported from many parts of the world. The reported range of total anatomy hours in Australian and New Zealand medical schools was from 56 to
560 hours, despite all the schools being described as having problem-based curricula (Craig, et al., 2010). Anatomy teaching hours varied from less than 200 to more than 500 hours in Africa (Kramer, et al., 2008), gross anatomy teaching hours from 20 to 219 hours in the UK and Ireland (Heylings, 2002) and from 55 to 252 hours in the US (R. L. Drake, et al., 2002). The variation in the teaching hours of anatomy sub-disciplines of histology and embryology was also huge.

Quantitative data from this study showed that the highest percentage (39%) of GCCMSs taught between 200 and 300 hours of anatomy. The average total anatomy hours taught by Australian and New Zealand schools was 171 hours. However, the average hours from the schools that had a six year curriculum (the median of curriculum length in the GCC region) was 221.7 hours (Craig, et al., 2010). The highest percentage (44%) of African schools taught between 200 and 300 hours of anatomy (Kramer 2008). Moreover, there were more African schools (49%) that taught more than 300 hours of anatomy than GCC schools (28%). Figures from the UK and Ireland and from the US were also comparable with the GCC figures. The total of the average teaching hours of the four sub-disciplines of anatomy (gross anatomy, histology, embryology, and neuroscience) was 204.3 hours in the UK and Ireland schools (Heylings, 2002), and 318 in the US schools (Richard L. Drake, et al., 2009). Therefore, GCCMSs seemed to have anatomy teaching hours close to international available data. In particular, they are very close to the figures from Australia and New Zealand and from the UK and Ireland, but somewhat on the lesser side when compared with African and some American medical schools.

The literature has shown that reduction of anatomy teaching hours is linked to the increased use of PBL. This study showed that schools taught less anatomy hours when their curriculum was described to be more problem-based ($p=0.01$). This finding agreed with those of Heylings (2002), who found that the UK and Ireland schools that had problem-based curricula had the lowest number of teaching hours in all four anatomy sub-disciplines.

Several studies have made historic comparisons tracing the change in anatomy teaching hours in the Western world (Richard L. Drake, et al., 2009; Gartner, 2003; Pryde & Black, 2005). This is the first study to report on the patterns of anatomy teaching hours in GCCMSs, however. There is no literature to indicate whether the region’s medical schools have witnessed a reduction in anatomy teaching time over the past years. This
study aimed to provide the answer in a different way, by asking the HODs if their schools’ curricula had changed in the past decade and how such change affected the anatomy teaching time. More than half of the schools (especially older schools, \( p=0.07 \)) had significantly changed their curricula. The change caused reduction of anatomy teaching time in 72.1% of the schools. That is, GCCMSs were not isolated from the global reduction of anatomy teaching time. The changes have also resulted in reducing the anatomy content and didactic traditional methods of teaching, and increasing the level of integration of anatomy with other medical disciplines.

The distribution of anatomy teaching hours between the different sub disciplines is also one of the aspects for discussion. Across all of the GCCMSs, gross anatomy occupied the majority (65.3%) of the teaching hours, leaving 22.1% and 12.5% for histology and embryology, respectively. This was in agreement with data from the UK and Ireland and from the US, where gross anatomy has been reported to occupy 70% and 61%, histology occupied 22% and 30%, and embryology occupied 7% and 7% of the anatomy teaching time respectively (Richard L. Drake, et al., 2009; Heylings, 2002). No such details were provided from the Australian and New Zealand study and it was not possible to obtain the detailed percentages from the African study. However, it was possible to observe that gross anatomy occupied the highest percentage of the anatomy course in African schools. Moreover, it was also apparent that African schools gave equal time to histology and embryology, as 66.6% of the schools that gave the detailed breakdown of time, did so (Kramer, et al., 2008). Overall the distribution of anatomy teaching hours according to the sub-disciplines in GCCMSs was comparable to the schools in UK and Ireland and in the US.

The distribution of anatomy teaching hours between the different teaching formats is also another point of interest. Quantitative data showed that most teaching occurred in lectures and practicals, each method occupying an average of more than 40% of the total teaching hours, leaving the remaining time largely for small group sessions or tutorials. This resembles the distribution of lectures and practicals in the American schools, where the average of each was 50% of the sum of averages of all teaching methods (Richard L. Drake, et al., 2009). This dominance of didactic lectures and laboratory practicals in GCCMSs is intriguing in curricula largely described as using PBL. However, the quantitative data further indicated that there was a tendency to use fewer lectures in the problem-based curricula (\( p=0.06 \)). A decreased use of lectures in problem-based curricula was also reported by Heylings (2002), who found that only one
of the four schools with problem-based curricula he studied used lectures for teaching anatomy. The data from this study did not allow determination of whether those schools used more practicals or small group session hours to compensate for the lost lectures. They also did not reveal the extent to which SDL was used by those schools.

### 9.5.2 The time dedicated to self-directed learning (SDL)

None of the previous regional or national studies of anatomy teaching in medical schools have provided details about SDL hours, maybe because it is not practically feasible to estimate those hours, let alone give exact figures because students largely differ in utilising them. Kramer et al (2008) was the only known study to attempt to do so but it could only obtain such data from four out of the nineteen schools included in their study.

This study managed to provide qualitative data from the HOD interviews about the use of SDL in anatomy teaching (section 7.2.2). The majority of the eleven schools included in the interview phase used SDL. Eight of the interviewed HODs (73%) mentioned that they depend on SDL. They described various forms of SDL including studying cadaveric materials and models in anatomy laboratories, requesting appointments with teachers, offering limited dissection tasks, and accessing online resources such as recordings of dissection demonstrations. Again, it was not possible to estimate how much time students spent on SDL. Nevertheless, this study suggests a widespread dependence on SDL in anatomy teaching in GCCMSs, although it was not possible to quantitatively estimate its share of the total teaching hours.

This study also raises concerns about the suitability of SDL as a learning strategy for medical sciences in general and anatomy in particular, in the light of the perceived inadequacy of GCC students’ skills by their anatomy teachers (section 8.1.2.5). The consequences of the GCC culture on the educational system according to Hofstede’s (1996; 2001) work do not favour the success of student-centred learning and SDL strategies. The schools’ educational system does not prepare the students to be independent learners. For example, students speak in classes only when the teachers request them to speak, they like precise objectives, in depth assignments, one correct answer, and strict timetables. Students also split in small groups according to predefined social criteria such as ethnicity rather than on the basis of the tasks they are required to do. The teacher transfers the un-contradicted and respected wisdom to his students and he is expected to initiate communication with the students and to outline the path for the
students to follow. Kassab et al (2006) also found that medical students in a GCC medical school perceived the facilitative-collaborative style of the PBL tutors insufficient for their actual learning. Students thought that it was important that the tutors should provide academic help and have a broad knowledge about the PBL cases (Kassab, Al-Shboul, Abu-Hijleh, & Hamdy, 2006). It would then be expected that the GCC students, who have been taught like this for twelve years in schools, find difficulty when they suddenly transfer to the medical school where they are expected to adapt to the SDL strategy. Those cultural consequences may have contributed to the perceived inadequacy of the GCC medical students’ skills as independent learners.

In contrast, the educational systems in the countries that were leaders in adopting PBL such as the Netherlands are totally different (Hofstede 2001). There, students are rewarded for being innovative in problem solving. They feel comfortable with unstructured learning environment such as ambiguous objectives, open assignments, more than one correct answer, and the absence of strict timetables. They can seek the truth from any competent person other than the teacher. The purpose of education there is to learn how to learn, which makes it a life-long process. The teachers are expected to respect the independence of students and to allow them to find their own path for learning. Such a system trains students to be independent learners, which is one of the qualities required for PBL and lifelong clinical practice.

Luckily, GCCMSs seem to be aware of this point. That is why some HODs indicated that their schools include a pre-medical phase to allow the students to increase their scientific knowledge and English language skills before joining the medical program, as one staff member indicated: “we have a foundation year where they improve their English for those who need it. It is mainly English and medical vocabulary and so on” (G1 P3). Hamdy et al (2010a,b) also found that most of the GCC schools have foundation years to improve the level of week students. However, most of those courses concentrate on English language skills and science subjects. It is not clear whether students were also trained on being independent learners.

9.5.3 Anatomy teaching time: anatomists’ perception

After describing the current status of anatomy teaching time in GCCMSs and how it compares to the literature from other parts of the world, the next step in this study was
to analyse what anatomy departments, represented by their HODs and staff members, think about this current state of affairs.

Qualitative data from HODs interviews (section 7.2.5.1) and FGs indicated that anatomy time in GCCMSs was inadequate. Both HODs and staff members were dissatisfied with the time available. The only exceptions were HODs from two schools, one of which appeared to obtain satisfaction with their time by including full body dissection and the other by significantly reducing the anatomy content. Staff members from those schools were not included in the FGs because both had only two staff members.

HODs acknowledged that anatomy, unlike other basic medical sciences requires more time to meet the following demands: the high factual content, the need for revision and repetitions to ensure gradual assimilation of knowledge, and the visual nature of anatomy as a subject which requires more tutor-led teaching in the laboratories. Moreover, anatomy is taught in integrated curricula in a way that lacks coherence, sequence, and depth due to priority being given to clinically relevant anatomy over basic factual anatomy (section 7.2.5.2). HODs and staff members believed that anatomy time in integrated curricula should be sufficient to meet the demands above. It should also be sufficient to minimise the disadvantages caused by the nature of integrated curricula by delivering more basic anatomy and fill the knowledge gaps created by the integrated curriculum.

Having inadequate anatomy teaching time means that GCC anatomy departments face challenges in fulfilling the perceived demands described in the previous paragraph. Qualitative data from HODs interviews (section 7.2.5.3) indicated that the departments have been impacted by the inadequate time allocated in many ways, including:

- Reducing time for practicals and the abolition of dissection
- Inclusion of more SDL
- Lack of depth of anatomical knowledge
- Students resorting to memorisation
- Lack of time for repetition and revision.

Therefore, it seems that time inadequacy has left anatomy departments unable to fulfil the demands of teaching anatomy. Moreover, inadequate teaching time has additional impacts, such as compromising integration and compromising students’ motivation to
study anatomy due to the reduced specific contribution of anatomy to the overall assessment of integrated course modules.

That there had been a reduction in the quantity and significance of anatomy assessment was also supported by the quantitative data, which showed that more than half (53%) of the schools did not have a minimum achievement level of gross anatomy. HODs and staff members complained about the bias against anatomy in assessment which allowed students to pass integrated courses without real barrier assessments of their anatomical knowledge. The lack of a minimum achievement level for anatomy is not unique to GCCMSs, as 58% of Australia and New Zealand schools do not have such a requirement either (Craig, et al., 2010).

Some GCC anatomy departments found ways to deal with the problem of inadequate anatomy teaching time and to minimise its impact on students’ learning. According to the HODs interviewed, such departments used three main strategies: focusing on relevant applied anatomy and reducing clinically irrelevant basic anatomy, encouraging students to do more SDL in order to cover the anatomy content, and returning to dissection as optional offerings to interested students (section 7.2.5.4). The question that arises is: how do these three strategies satisfy the basic demands of teaching anatomy perceived by the HODs? That is, do they work towards fulfilling the demands?

Teaching clinically relevant applied anatomy does not need more teaching time but it in fact reduces the anatomy content to make it fit within the available time. However, focusing on teaching relevant applied anatomy could negatively affect the teaching of anatomy in an integrated curriculum by giving priority to applied anatomy over basic anatomy and thus widening the gaps in basic knowledge. However, staff members described teaching relevant anatomy as one of the aspects they liked about teaching anatomy in an integrated medical curriculum. This response was not directly related to the anatomical knowledge as such but was related to improving vertical integration, which helps teaching anatomy in context.

Resorting to SDL also contradicts the HODs demands for more TLL and supervised practicals in anatomy teaching due to the visual nature of anatomy. While SDL provides the practical time needed if students properly utilise it, the TLL is lost. Moreover, the staff members’ concerns about the suitability of SDL for GCC students adds more dimension to the usefulness of this teaching strategy as a solution to provide more time for anatomy teaching. These concerns about SDL could have been the reason for
transferring SDL time in one school to more structured and supervised practical classes. Literature has shown also that another GCC medical school has had to re-organise their anatomy museum to make it possible for the students doing SDL to find all the materials related to each theme of a PBL curriculum in one station. That is, the department provided the students with a shortcut in looking for the study materials relevant to the problems (Pallab K. Ganguly, et al., 2003).

Optional dissection courses seemed to provide more time without any major negative effects for the participating students. Dissection, although optional, meets the perceived demands for teaching anatomy in general and for integrated curricula in particular. It delivers high content of basic anatomy in the body region of interest for the students, which increases students’ understanding of anatomy (Rizzolo & Stewart, 2006). This may lead to filling the perceived gaps in basic knowledge created by integrated curricula. It also provides a rich practical visual experience under the supervision of tutors. Whether students take it in parallel with or after the main stream anatomy course, it ensures repetition and graduate assimilation of knowledge.

Data from HODs interviews and FGs indicated that optional dissection may be more beneficial to students. First of all, staff members complained that students in integrated curricula were introduced too early to applied knowledge without a proper basis of anatomical understanding. Here, dissection contributes towards providing that basic knowledge if it is offered to students in parallel with the mainstream anatomy course. Secondly, HODs indicated that dissection becomes more relevant to advanced students because they immediately apply the anatomical knowledge in clinical practice. This agreed with the findings reported by (Rizzolo & Stewart, 2006) that most students enrolled the elective dissection courses either in the first year or fourth year of the curriculum, which may reflect an appreciation of the usefulness of dissection in those years. The concerning pitfall of optional dissection is that it is offered to some students.

9.6 Anatomy teaching tools

Modern medical curricula have been reported through the literature review of this study to reduce the use of dissection for gross anatomy teaching. Instead, they increased the use of other resources such as prosections, models, medical imaging, surface and living anatomy, and modern resources like CAL and body painting. The findings of this study indicate that GCCMSs were following the international trends in this regard.
9.6.1 The currently used tools

Compulsory dissection was almost abandoned by the regions’ schools, as it was only offered in three schools (Table 6.22). Although optional dissection was available in half of the schools, it was found that the majority of those schools (60%) rarely used it. GCCMSs depended largely on prosections (wet and plastinated) and models for most of the teaching. Clinically oriented resources and CAL were in the middle order between dissection on one side and prosections and models on the other side. Artistic ways of teaching such as drawing and body painting were rarely used. Drawing was used by ten schools (50% rarely used it), and body painting was used in five schools (60% rarely used it).

These findings, when compared to the latest published literature from different parts of the world, indicate that GCCMSs are among the lowest users of dissection. Student compulsory dissection was used in only 15% of GCCMSs in comparisons to 76% of UK and Irish schools (Heylings, 2002), 90% of African schools (Kramer, et al., 2008), 58% of Australian and New Zealand schools (Craig, et al., 2010), and 97% of American schools (Richard L. Drake, et al., 2009). On the other hand, GCCMSs are among the highest users of prosections (90% use wet prosections and 95% used plastinated prosections) compared to 71% of the UK and Irish schools (Heylings, 2002) and 41% of American schools (Richard L. Drake, et al., 2009).

Most previous studies have focused on the use of dissection and prosections with little information about other tools. The only exception was the study by Craig et al (2009). In comparison to the Australia and New Zealand schools, higher percentages of GCCMSs used plastinated prosections (95% compared to 47%), but lower percentages of used CAL (80% compared to 91%) and medical imaging (90% compared to 100%). Overall, the reduced use of dissection and the increased use of prosections and CAL in GCCMSs corresponds with the international trends (Cahill, et al., 2000).

9.6.2 The place of dissection

This study is the first to report on the collective use of student dissection in GCCMSs. The rare use of this tool is of great interest. The quantitative and qualitative data provided some evidence that helped to explain the circumstances that made 85% of GCCMSs abandon dissection as a preferred tool for teaching anatomy.
According to the quantitative data, 90% of GCCMSs used cadavers, all of which were obtained as intact cadavers. Therefore, it would be assumed that dissection was performed in those schools. This was confirmed by the additional data that showed that 89% of the schools that used cadavers performed dissection. Students performed their own dissection in only 39% of these schools. However the data did not determine whether student dissection was performed by undergraduate medical students or by postgraduate students, as 37.5% of the schools conducted dissection as part of postgraduate teaching. Nevertheless, the data supports the rare use of student dissection for teaching anatomy despite the majority of schools possessing cadavers and conduct dissection. Moreover, the rare use of dissection does not fit with HODs’ admiration of the role dissection in enhancing student’s acquisition and retention of anatomical knowledge and for equipping them with manual and professional skills.

9.6.2.1 Dissection and time inadequacy

Dissection as a teaching tool requires three basic things; time, cadavers, and facilities. The degree of availability of these requirements dictates the extent to which dissection is used by a school or a group of schools in a region. Qualitative data from HODs interviews (section 7.3.3) and FGs (section 8.1.2.3) indicated that inadequate anatomy teaching time was a major factor rendering their schools unable to offer dissection to all students. Both HODs and staff members criticised dissection for being time-consuming and accordingly it was practically not possible to allocate sufficient time for it. Moreover, many HODs acknowledged that time inadequacy was the most important limiting factor against dissection and it remained the problem which blocked the use of dissection even when other factors or problems were solved.

By looking more closely at the time allocated to anatomy in the three schools that offered compulsory dissection, it was found that two of them taught in the range of 201-300 hours of anatomy, like the majority of the rest of schools. Moreover, the average percentage of gross anatomy hours and the average percentage of laboratory hours of those two schools were very close to the overall averages (63.3% compared to 65.3%, and 46.7% compared to 42.9%, respectively). This indicates that the anatomy time in the schools that offered compulsory dissection was not different from the rest of the region’s schools. Moreover, the overall anatomy teaching time, percentage of hours allocated to gross anatomy, and percentage of hours allocated to practicals in GCCMSs were not very different to the published figures from other parts of the world, where
student dissection was used as a primary anatomy teaching tool. That is, it seems that the quantitative data does not support the qualitative data, which referred to time inadequacy as a major factor against student dissection in GCCMSs.

Teaching time from the point of view of teachers in general can be divided into three main parts; the actual scheduled contact hours, the time spent on preparing the teaching material, and the time spent on teacher-student contact outside the scheduled teaching hours. Qualitative data showed that 82% of the interviewed HODs indicated that they used PBL for teaching anatomy. PBL when first introduced into medical education was thought to be less labour intensive in the sense that it requires less scheduled teaching hours. Later, it was found that it was in fact more demanding than the traditional didactic lectures and practicals (Cahill, et al., 2000). Cottam (1999) also reported that 81% of the anatomy departments in the US medical schools felt that PBL needed more faculty or teaching hours for proper implementation (Cottam, 1999).

Qualitative data from the FGs provided some indications that the feeling of time inadequacy was triggered by the teachers in anatomy departments feeling overwhelmed by the teaching load in integrated curricula (section 8.1.2.4). They indicated that teaching anatomy in an integrated medical curriculum increases the work load. It requires more time to prepare the teaching material, which involves reading material in other disciplines and about new methods of medical education such as PBL and TBL. It also involves participating in teaching outside the department such as in hospital wards.

Although there was adoption of SDL in integrated curricula, teaching required more student contact because of the perceived inadequacy of GCC students’ skills for independent learning. It may well be that time overload contributed towards the perceived time shortage more than the actual scheduled teaching hours to making dissection impractical in GCCMSs. A few HODs also briefly reflected on the demand for student contact, as one of them stated: “students used to make appointments with different faculty from the same department. It was not really a good teaching or learning practice for the department of anatomy. The rest of departments that is fine with them because it is more about theoretical questions but here it is always to go down and get specimens out and prepare the lab. It demands a lot” (P1). The finding that the departments of only three of the eleven interviewed HODs and none of the staff members included in the FGs actually used compulsory dissection may also indicate that the contribution of time inadequacy towards abandoning dissection was mainly
speculative. That is, they were worried that the scheduled anatomy time may not accommodate student dissection from one side, and they may not be able to find the time to supervise dissection practicals because they were already overwhelmed with the current work load, from the other side.

9.6.2.2 Dissection and unavailability of cadavers

Dissection has been criticised by HODs for being unsustainable. That is, it needs a continuous supply of cadavers at an affordable cost in order to be successfully used as a primary anatomy teaching tool. The qualitative data indicated that cadaveric unavailability was a major factor for abandoning dissection by GCCMSs. This was supported by the positive correlation between the use of compulsory dissection and the annual number of new cadavers obtained ($p=0.03$). Quantitative data showed that none of the schools used locally donated or unclaimed bodies. Qualitative data also showed that both HODs and the staff members blamed the absence of a body donation program for their schools not having a regular source of local bodies.

According to a few HODs, local culture does not support body donation for dissection for educational purposes. This does not seem to be unique to the GCC region, however. Gangata et al (2010) reported that among ten African countries, the Islamic country of Libya was the only one that imported cadavers, because of the absence of body donation program and not using unclaimed bodies (Gangata, Ntaba, Akol, & Louw, 2010). However, there is a secrecy around the topic in the region as the literature on body donation in the GCC is rare, suggesting that the topic is not openly discussed. The exception was a single reported appeal from one anatomist from KSA to encourage body donation (Najm Aldeen, 2011). Moreover, from the experience of one HOD, schools administrators did not seem to be supportive of the idea of pursuing body donation programs. From a religious point of view, there was a rare Islamic fatwa to allow body donation for dissection for medical education but it was from Turkey (Mohammed, 2006). Another Islamic scholar from Egypt had a similar opinion (Moheet, 2013). But until now there has been no such fatwa from the more conservative GCC region. All in all, the actual reasons for the lack of locally sourced cadavers were beyond the objectives of this exploratory study and it needs to be thoroughly explored in future studies.

Availability of local cadavers is a common characteristic of the regions of the world where medical schools used dissection more than GCCMSs. Countries such as Australia
(The University of Western Australia, 2013), New Zealand (University of Otago, 2013), the UK (Anatomical Society of Great Britain and Ireland, 2013), and the US (University of Florida, 2013) have body donation programs. Moreover African countries were able to maintain student dissection because they had easy access to cadavers (Kramer, et al., 2008), mainly through the use unclaimed bodies, although a few African countries have body donation programs (Gangata 2010). Therefore, the inability of GCCMSs to obtain donated or unclaimed bodies was the main disadvantage in comparison to the other schools, and may be a major contributor to the abandonment of dissection as a primary anatomy teaching tool in the region.

Being unable to obtain local cadavers, all GCCMSs had to import cadavers. Importing cadavers requires two things; securing funding and getting the cadavers into the country. Although neither of the two HODs whose departments did not use cadavers attributed this to the lack of funding, qualitative data from HODs interviews indicated that the high cost of importing cadavers was a major obstacle. For example, one school paid $US 40,000 for one cadaver, while medical schools in the Western world spend a fraction of that figure. For example, one US medical school that is yet to establish a body donation program pays only $US 3000 per cadaver (Guthrie, 2013). Yet, Administrators of that school described cadavers as expensive and the cost as extreme. In Australia, schools pay about $AU 6000 ($US 5600) to obtain, process, and store each cadaver (O'Rourke, 2011), and a similar cost was reported from the UK (Melik, 2010). That is, the cost of obtaining cadavers by GCCMSs was very high in comparison to the Western world.

The high cost was not a common obstacle against dissection as many of the well-funded public schools provided funding when requested by anatomy departments. However, that may be because those departments did not request many cadavers because they did not offer compulsory dissection in the first place. If those schools were to offer compulsory dissection to all students, the administrators’ financial support may not be guaranteed. The cost of purchasing a total of 1-10 cadavers per year (the range in GCCMSs) is inconceivable if scaled up to match the University of Sydney, which has 90 stored cadavers at any time or the University of Melbourne, which receives 200 to 300 cadavers every year, for example (O'Rourke, 2011).

The second obstacle when importing cadavers, besides the high cost, was the process itself. More than 61% of the surveyed HODs described the process of importing
cadavers as difficult. The difficulty was caused, as shown by qualitative data, by factors such as securing funding for purchasing, strict local and international policies, bureaucracy and the lengthy process (section 7.3.3.2.1), and restricted options for importation which created competition between the GCC schools for the limited supply (sections 7.3.3.3 and 8.1.2.3).

The integrated and system-oriented anatomy curriculum can also be an obstacle to dissection, according to the qualitative data. Dissection is usually conducted in a regional approach where the students move from one region to another systematically. However, focusing on relevant anatomy in integrated curricula and teaching systemic anatomy makes it hard for dissection to be aligned with that curriculum. This was supported by the finding that the school that used dissection as a primary teaching tool taught purely regional anatomy and aligned it with a system oriented integrated medical curriculum. Data from the UK and Ireland and from the US support the notion that dissection fits better with a regional approach. While 75% of the schools with systems-based curricula in the UK and Ireland used dissection, half of them actually taught anatomy in a regional approach (Heylings, 2002). Similarly, while 97% of the American schools used dissection, 94% of them taught anatomy in a regional approach (Richard L. Drake, et al., 2009). Data from the two groups of schools also supported the notion that dissection fits better with teaching anatomy as a stand-alone subject. About 71% of the American schools taught it as a stand-alone subject (Richard L. Drake, et al., 2009). Moreover, in the UK and Ireland, the use of dissection decreased with increased integration. Dissection was used in 100% of schools with traditional curricula, 75% of schools with systems-based curricula, and 50% of schools with problem-based curricula (Heylings, 2002).

9.6.2.3 Dealing with the challenges to dissection

Many HODs and staff members took a pragmatic stand towards the challenges of using dissection in GCCMSs. Although they admired its importance in the development of students’ anatomical knowledge and professional skills, they acknowledged that, due to its disadvantages they would not support offering full-body dissection to all students. Luckily, dissection was not totally abandoned by most of the schools in the region.

Optional dissection was at the centre of GCCMSs’ strategies to maintain dissection. Quantitative data showed that 50% of the schools offered optional dissection. This was also qualitatively supported by the finding that five of the eleven interviewed HODs
offered optional dissection experience either as structured optional courses or SDL. Staff members also indicated that there is no need for full body dissection but instead suggested a modified dissection experience in the form of special courses. The benefit of optional dissection has already been discussed in relation to finding extra time for more anatomy teaching. As scheduled anatomy time was unable to accommodate offering dissection to all students, GCC anatomy departments offered optional dissection to interested students only.

Optional dissection also enabled GCC anatomy departments to minimise the impact of cadaver unavailability by reducing the demand for them in the first place. Instead of importing a high number of expensive cadavers, the schools could import a few cadavers just enough to run the optional dissection sessions. Consequently, the departments managed to avoid completely abandoning dissection, and request fewer cadavers at a cost acceptable to the administrators.

Offering optional dissection could be behind ameliorating the perception of the impact of cadaver shortage by the departments. While 67% of the HODs described the process of obtaining cadavers as difficult or very difficult, only 33% of them indicated that their departments were experiencing shortage of cadavers. That is, only third of them were unable to obtain enough cadavers to meet their educational needs. This could be related to the reduced demand for new cadavers due to offering just optional dissection experience.

Optional and selective dissection is not unique to the GCC schools. It was also a common practice in Australian and New Zealand schools. Optional dissection was offered by 37% of schools in this region, and dissection of a single anatomical region or part was practiced in 80% of them (Craig, et al., 2010). This indicates that even schools with plentiful supply of cadaver resort to optional and selective dissection.

**9.6.3 Dissection and the role of collaboration**

Besides offering optional dissection, collaboration was another strategy that GCCMSs adopted in order to secure cadavers at a reduced cost. Qualititative data showed three levels of collaboration that resulted in facing the challenge of cadaver unavailability: collaboration with Western medical schools; with local medical schools; and with local government departments that use cadavers.
Collaboration with a Western medical school was behind the most successful use of dissection. The success of the particular school employing that strategy may be attributed to three main factors. First of all, it has strong partnership with a Western medical school that has a body donation program. The school is actually a branch of the Western “mother” school. Secondly, organising the importation of the donated bodies into the GCC country required agreements between the governments of both countries. Thirdly, the use of dissection and body acquisition was discussed and agreed upon before the school started enrolling students. It was decided that the GCC students should have exactly the same experience as the students of the main campus in the western country, including that of learning anatomy. This example remains an exception in the region but can provide a strategy for other GCC schools to consider if they want to similar success.

One GCC medical school collaborated with a neighbouring school to import cadavers. While it had previously paid $US 40,000 for importing one single cadaver independently, it managed to reduce the cost to just $US 10,800 per cadaver through collaborating with the other GCC school. This example points to the benefits that GCCMSs can gain from collaborating for importing cadavers. Collaboration can also reverse the perceived impact of competition between the schools for cadavers, which has been identified by some staff members as one of the obstacles to dissection. Departments that cannot obtain enough cadavers to offer even optional dissection can benefit from local collaboration through student exchange. Students from one department can attend the optional dissection courses offered by other departments. Actually, one of those HODs whose department has optional dissection courses expressed his department’s interest in such collaboration: “for example if Oman does not have any dissection at all, [our] university has a four week dissection session. We may take students from outside” (P8).

Qualitative data also showed other possible ways in which local collaboration help in providing cadaveric material. The first one was the development of a central GCC anatomical centre that can import, process, and distribute cadaveric materials to GCCMSs at the cost price. This body can help incorporate dissection into curricula by ensuring the provision of high quality cadaveric material at a reduced cost, minimising the reliance on a single supplier and consequently the competition between the departments for the limited supply, and working as a training centre for junior local anatomists on anatomical techniques. The other way was the establishment of a central
plastination centre which could also provide plastinated specimens at cost price. One department actually thought of establishing such a centre but the idea was abandoned due to the lack of collaboration with other departments on this issue. Such a centre may become a necessity, because the quantitative data of this study showed that 95% of GCCMSs used plastinated prosections.

Collaboration with other government departments within the same country proved to be of great benefit in reducing the cost of importing cadavers. The example of the school that collaborated with the Ministry of Health was beneficial. The Ministry of Health used the cadavers and the school’s facilities for postgraduate speciality training and they both shared the cost of cadavers. That specific school managed to offer elective dissection courses. This type of collaboration is not uncommon in the region as 44% of the departments that performed dissection did that for so purpose of postgraduate speciality training.

Enthusiasm about dissection from Anatomy departments and their HODs played a role in pursuing collaboration to ensure the provision of dissection experience for their students. Qualitative data showed that the enthusiasm of some HODs led them take actions, such as to start a dissection facility, expand the current dissection facility, offer optional dissection, and organise dissection as part of a postgraduate speciality course. HODs enthusiasm towards collaboration as a means for providing dissection experience may be as important. However, according to the qualitative data, the enthusiasm from HODs may not be guaranteed as some of them lacked the initiative to start new collaborative activities with other departments or even to follow-up the previous initiatives in the first place.

While initiating new and following up existing collaborative initiatives can be attributed to anatomists themselves, it can also be attributed to the overall work culture in GCCMSs. Qualitative data indicated that administrative factors such as bureaucracy and lack of recognition can discourage collaboration. This can be attributed to the culture of the GCC and its implications for work organisation. Hofstede (2001) pointed to the following characteristics of high power distance societies and high uncertainty avoidance societies such as those in the GCC region:

- Highly degree of centralisation, which manifests in a centralised decision structure with concentration of authority, the Head sees him/herself as the benevolent decision maker and the staff members below them expect to be told
what to do. The senior managers are involved in operative decisions. Therefore, it is not surprising to discover that previous HOD meetings were in fact suggested by the Deans. When there were no further requests for more meetings from the Deans, the HODs did not arrange such meetings.

- Tall organisation pyramids, high proportions of supervisory personnel, and managers who rely on formal rules. These characteristics may lie behind the complaint from HODs and staff members of the need to go through a lot of paperwork in order to request permission to pursue collaboration.

- Innovation needs good support from hierarchy and innovators feel constrained by the rules. If we can metaphorically regard collaboration initiatives like the anatomical society as innovative tasks, the anatomist may not have been able to attract the hierarchy support for local collaboration due to the perceived lack of recognition. In general, there is resistance against innovation in high uncertainty avoidance societies (Hofstede, 2001)

Therefore, it could be argued that the factors that discouraged collaboration reported by this study may not be unique to the context of anatomy teaching in the GCC region, but it may also be attributed to the GCC culture in general.

9.7 Summary

This chapter discussed the findings of the three phases of this study in an integrated way. The major findings of this study were discussed in light of the culture and environmental circumstances in GCC countries and the available published literature on the topic.
Chapter ten: Conclusion and recommendations

10.1 Introduction

This study was conducted at a time that was of special interest to anatomy teaching in medical curricula and to GCCMSs. Medical curricula have witnessed progressive changes that started in the second half of the 20th century and peaked in the last two decades. GCCMSs have also witnessed a substantial explosion of numbers since the beginning of the last decade with minimal evaluation and investigation, especially with regards to anatomy teaching. While there has been substantial accumulated literature on the topic of anatomy teaching in medical schools, there is an outstanding shortage of literature on the topic from the GCC region. Data obtained from studies conducted in other regions and countries of the world cannot always be transferred and applied to other regions due to cultural, educational, and socioeconomic differences.

This study primarily aimed to explore the topic of anatomy teaching in GCCMSs. In particular, it aimed to investigate the characteristics of anatomy curricula in the medical schools of the GCC region, and how anatomy is taught and assessed in those curricula. It also aimed to investigate the practice of dissection in anatomy departments of the medical schools of the GCC region. Finally, it aimed to investigate the extent of collaboration between anatomy departments of the GCC medicals schools in relation to anatomy teaching, and how collaboration can improve the future of anatomy teaching in these schools.

This chapter will reflect on the whole research process and present the conclusions drawn from this study. It will do so through presenting the research questions and the concluding statements related to each of these. It will also reflect on the methodology followed by this study. Finally it will provide some recommendations for the purpose of improving the state of anatomy teaching in the region based on the conclusions, and for future research.

10.2 Reflections of the methodology

This is an exploratory study that aimed to investigate a largely unstudied area. It used three data collection methods. The first one was a survey questionnaire that collected factual data about aspects of anatomy teaching in the anatomy departments of GCCMSs. The analysis resulted in three categories of findings. The first category was
basic findings that were necessary to complete the overall picture of the topic. The second category of findings needed further expansion to explore how they are implemented in practice. The third category of findings needed to be further explained. The HOD interviews were conducted to expand and explain the second and third categories, respectively. More importantly, they were used to know the departments’ policies and positions towards the aspects of anatomy teaching as reflected by their HODs. The FGs were conducted to triangulate with the HOD interviews in order to enrich the data by including an additional data collection method and an additional type of participants, who may differ from the HODs in their perceptions towards the aspects of the research topic. The three data collection methods contributed to the overall comprehensive picture drawn about the state of anatomy teaching in GCCMSs.

While the data analysis of the quantitative findings was facilitated by standard statistical methods, the analysis of the qualitative data needed to be carefully chosen. Thematic analysis was chosen due to its popularity and for its appropriateness for this type of investigation. The exploratory scope of this study favoured the need to aim for a rich description of the data set instead of giving a detailed account of one or a few particular aspects during analysis. While this approach provided an overall description, it has a down side of losing some of the depth and complexity. However, the expected loss of depth and details was compensated for by following a theoretical thematic analysis approach, which allowed more detailed analysis of some aspects such as the anatomy teaching time and the use of dissection. Therefore, the qualitative data represented an overall description of the data with more detailed description of some aspects.

10.3 Research questions

Q1. What are the characteristics of anatomy curricula taught in the GCC medical schools?

This research question was addressed by parts A and B of the questionnaire, which provided a brief description of the whole medical curriculum and a more detailed description of the anatomy curriculum. The HODs interview expanded the quantitative data by describing further the range of ways of implementing the curricula in the schools. Although the majority of the schools had dichotomous sequential medical curricula, and anatomy was mainly taught in the first half of the curriculum, the questionnaire results indicated that anatomy curricula were highly rated for being
integrated rather than discipline-based. Vertical integration of anatomy was implemented more by the medical curricula that consisted of one integrated phase.

The HOD interviews emphasised that the anatomy curricula were integrated. The interviews further indicated that horizontal integration was implemented in the lectures and PBL sessions by anatomists alone and with collaboration with teachers of other basic medical sciences, mainly in PBL sessions. Vertical integration was implemented by anatomists in their lectures, with collaboration with other teachers in PBL sessions, and by students in SDL. It was also implemented in practical sessions using clinically oriented resources under the supervision of anatomists or clinicians.

Based on the questionnaire and HOD interviews, anatomy was largely taught in GCCMSs in a systems-oriented approach. The regional approach was followed by few schools and in those schools it was aligned with an overall systems-oriented medical curriculum. The interviews showed that the schools that used a regional approach were local branches of Western schools.

Although not significant, anatomy curricula were rated as being more problem-based than subject-based in the questionnaire data. The HOD interviews added that the majority of the curricula were hybrid between PBL and didactic teaching.

Anatomy curricula were not differently rated for using SDL and TLL. The HODs rating of this pair of characteristics was ambiguous, which may be related to the difficulty of quantifying SDL. However, the Interviews showed that the majority of the schools utilised SDL for teaching anatomy and the departments provided a wide range of resources available for SDL, although it was not quantified.

Overall, the findings of this study indicate that the anatomy curricula used a combination of styles, which agreed with the increasing suggestions that anatomy curricula should combine the features of the typical traditional and innovative integrated curricula available today.

**Q2. How anatomy is taught and assessed in the GCC medical schools?**

The questionnaire findings provided quantitative data about the way anatomy is taught in GCCMSs in terms of total hours and the distribution of hours between teaching methods and between anatomy sub-disciplines. The findings reflected a great variation between the schools in the three aspects. Teaching between 200 and 300 total hours of
anatomy was the most frequent. Gross anatomy occupied the highest average percentage of the teaching hours, and relatively similar emphasis was given to lectures and laboratory hours. Small group teaching was used by the majority of the schools but it was given a small overall emphasis. Due to the difficulty of quantifying SDL, it was explored qualitatively by the HOD interviews and FGs, which revealed a widespread use of it.

The teaching of practical gross anatomy was mainly based on prosections and plastic models. Clinically oriented tools and computer assisted imaging were less frequently used. Compulsory dissection was largely abandoned and optional dissection was available in half of the schools, more than half of which rarely used it. Newer tools such as body painting were available in a quarter of the schools, half of which rarely used it.

Anatomy was assessed in GCCMSs largely through written exams and practical exams. Other forms of assessment were far less frequently used. Continuous assessment such as logbooks and portfolios were rarely used. Qualitative data revealed that the majority of the schools integrated the assessment of anatomy with that of other medical sciences. The assessment was largely dominated by MCQs and short answer questions, with very rare use of essays. Diagram drawing and labelling were also rarely used. More than half of the schools did not have a minimum achievement level in anatomy for passing courses. HOD interviews indicated that the majority of schools, except those that did not use PBL, assess anatomy through integration with other disciplines.

Q3. How do anatomy curricula in the GCC medical schools compare to the internationally reported anatomy curricula?

This research question was addressed by discussing the findings of this study in light of the literature review in general and the data published from similar studies from other regions or countries including the US, the UK and Ireland, Scotland, Australia and New Zealand, and Africa in particular. This study revealed that teaching of anatomy in GCCMSs was influenced by global trends of anatomy teaching in medical curricula. These influences manifested in the reduction of teaching time, reduced reliance on dissection, and a shift towards integrated PBL with adoption of SDL. On the other hand, unlike schools in many regions and countries, GCCMSs employed mainly medically qualified faculty for teaching anatomy.
Many schools (55.5%) have witnessed reduction of anatomy teaching time in the past decade. However, total anatomy teaching hours, the distribution of teaching hours among teaching methods, and the distribution of teaching hours among anatomy sub-disciplines were within the internationally published ranges. Moreover, the data from this study agreed with the previous studies in the variations in teaching hours among schools, which reflected a lack of common regional or national core anatomy curricula. However, the difference was that other regions had reported attempts to suggest a core curriculum but no such attempts were reported by GCCMSs.

GCCMSs’ use of dissection was far less than all the published data. Compulsory dissection was used in 15% of GCCMSs in comparison to 76% of UK and Irish schools, 90% of African schools, 58% of Australian and New Zealand schools, and 97% of American schools. The GCC schools instead were found to use prosections, models, clinically-oriented tools such as surface and living anatomy and medical imaging, and CAI.

Although questionnaire data indicated that lectures and practicals occupied the highest percentages of total teaching hours, HOD interviews indicated that the vast majority of schools used PBL and SDL for teaching anatomy. Together with the data about the impact of the curriculum change in the past decade, these findings reflected a shift towards adopting innovative teaching methods.

**Q4. What are perceptions of anatomists in GCC medical schools about anatomy teaching in their schools?**

1. Dissection

Qualitative data indicated that there was a little support for the use of dissection as a primary tool for teaching gross anatomy in GCCMSs. A pragmatic stand towards the use of dissection was prevalent. Although it was perceived to improve students’ acquisition and retention of anatomical knowledge and their manual and professional skills, the participants admitted that it was faced with challenges such as unavailability of time and cadavers, the high cost, difficulty in making this fit into a systems-oriented anatomy curriculum, and concerns about the usefulness offering it to all students.

2. Anatomy teaching time
HODs and staff members perceived anatomy teaching time in their schools as inadequate to meet the requirements for appropriately delivering the anatomy curriculum. This perception was also shared in some schools by students and external examiners. Among many other impacts, time inadequacy manifested mainly in reduction of laboratory time, which made the departments unable to use dissection, and the depth of anatomical knowledge presented and acquired. The departments managed to respond to time inadequacy by reducing the content and focusing on clinically relevant anatomy, encouraging SDL, offering elective courses, and requesting review of the curriculum.

3. Assessment

Qualitative data revealed dissatisfaction with anatomy assessment in integrated medical curricula. The main concerns raised about anatomy assessment were related to integration, which was perceived to cause reduction in specific anatomy assessment. This perceived bias manifested in giving less emphasis to the basic anatomical in favour of applied anatomical knowledge. There was reduction in the contribution of anatomy to the overall assessment of integrated courses, and lack of a minimum achievement level in anatomy in those integrated courses. This was believed to reduce students’ motivation to study anatomy because they were able to pass the course even if they failed the anatomy component, which allowed them to pass without adequate knowledge of anatomy.

4. Students

Teaching anatomy in integrated curricula was perceived to equip the students with many professional skills such as teamwork, communication skills, presentation skills and research skills. However, GCC medical students were perceived to be inadequately prepared for SDL. This was believed to be caused by the schooling system, which does not train students to be independent learners. Other factors were the inadequate English language skills and scientific background of the students after leaving high schools. Moreover, the study suggests that the consequences of the GCC culture on educational systems were a major contributor to the deficiency in adopting SDL by the GCC students.

5. Teachers
Staff members perceived teaching anatomy in an integrated curriculum as beneficial through allowing them to expand and update their scientific knowledge, try new methods of medical education, and teach in a clinical context. On the other hand, they perceived it as demanding much more time, when it came to preparing the teaching material and to student contact.

Q5. What are the characteristics of the anatomy teaching faculty in GCC medical schools?

The questionnaire findings indicated that anatomy departments of GCCMSs were mainly employed as full-time faculty. The vast majority of the faculty were medically qualified. Additionally, the vast majority of the faculty were expatriates. There were very few local GCC anatomists and they were mainly in junior academic positions. Demographic data of the participants in the interviews and FGs supported these findings. All of the interviewed HODs were senior expatriates and most of the participants of the FGs were expatriates and the majority of the locals were juniors. The number of anatomists in practicals was well coupled to the number of students as it was confirmed by the positive correlation in student: staff ratios.

Q6. What is the extent of the use of dissection and what are the factors influencing the adoption of dissection by anatomy departments in the GCC medical schools?

The questionnaire findings showed a big variation in the number of cadavers obtained each year by the schools from as low as one to as high as ten. All the cadavers were imported and none of the schools used donated or unclaimed local bodies. Cadavers were used repeatedly, mostly for 2-5 years, but there were schools that used them for more than 10 years. Dissection was largely conducted by the faculty for the purpose of teaching undergraduate students. Students in more than half of the schools did not have the chance to conduct dissection.

Qualitative data explained the very low use of dissection by GCCMSs by the inadequacy of anatomy teaching time and unavailability of cadavers due to the lack of local cadavers, and the high cost and the complicated process of importing cadavers. The difficulty to make dissection fit into the integrated systems-oriented curricula was another but less important factor. The lack of facilities was not identified as one of these factors.
The questionnaire findings indicated that all the departments that suffered from shortage of cadavers had responded by using the available cadavers for demonstration only, which allowed them to keep using them for many years. Moreover, HODs indicated that their departments managed to avoid completely abandoning dissection by their students by providing limited dissection experience that was possible to fit in the curriculum and required fewer cadavers. This was facilitated by collaborating with other schools or government departments in order to obtain enough cadavers at an affordable cost. In this regard, HODs enthusiasm about offering dissection was found to be critical.

**Q7. What is the extent of collaboration between anatomy departments in the GCC medical schools and what are the factors influencing it?**

This research question was largely addressed qualitatively. The questionnaire only provided brief and preliminary data about the extent of collaboration between the anatomy departments in GCCMSs. It was found that there is no regional framework for collaboration between the region’s anatomy departments. Questionnaire data showed that only a few departments were collaborating with others in the region, and FGs showed that a few staff members were involved in collaboration. HOD interviews showed some one-to-one sporadic collaborative activities between individual departments rather than a longer-term formal collaboration. Moreover, the limited collaboration in the region was emphasised by the expatriate anatomists as they compared this to the extent of collaboration they experienced where they taught anatomy, before coming to the GCC region.

Collaboration was found to be of great interest and rewarding to some departments or anatomists. Moreover, there was a great appreciation of the benefits that anatomy teaching in GCCMSs can gain from collaboration. That appreciation was expressed by HODs and staff members. Students, medical graduates, teachers, anatomy departments, and the schools of the region were all perceived to gain from collaboration. This appreciation was reflected in previous thoughts, discussions, and attempts by some schools’ Deans, anatomy department HODs, and staff members for the purpose of initiating a regional framework for collaboration between all or some departments. However, this study revealed that such a framework does not exist.

The factors that were identified by the HODs and the staff members as discouraging collaboration were many. Based on their administrative positions, HODs emphasised the key administrative factors such as bureaucracy, lack of administrative follow-up,
lack of initiative, and lack of recognition of local collaboration by schools administrations. From the perspective of staff members including HODs, there was a common lack of communication and meeting opportunities between them and their colleagues in other departments, which created a shortage of information about many aspects of anatomy teaching in the region’s medical schools. Some expatriate HODs and staff members pointed to their temporary status in their schools and the region, lack of authority, and concerns about not being acknowledged as important factors that may impact their interest, motivation, and commitment towards local collaboration.

In light of the identified factors that discouraged collaboration, HODs and staff members proposed many ways to increase collaboration between the anatomy departments and anatomists in GCCMSs. These factors were in two categories. The first one was enhancing communication and meeting opportunities between the departments and the anatomists through regular conferences, meetings, seminars, workshops and electronic means. The second one was obtaining formal recognition of local collaborative activities by the schools and other related government departments. A regional anatomical professional body was highlighted as pivotal by HODs and staff members in this regard.

10.4 Limitations of the research

The major limitation of the research is the small number of returned questionnaires. Although the response rate was 69% of the targeted sample, inferential quantitative analysis was largely limited by having only twenty questionnaires returned. That is why most of the analysis was descriptive in nature. Nevertheless, the researcher believes that the extent of analysis done was enough to fulfil the aims of this study. Moreover, the quantitative data represented one of three major sets of data for this study and it was triangulated by two additional sets of qualitative data.

The other possible limitation is the high representation (60%) of schools from the KSA in the number of returned questionnaire, which may suggest that the questionnaire findings were largely influenced by the status of anatomy teaching in KAS rather than the whole GCC region. However, the correspondence between the returned questionnaires and the actual number of medical schools in each GCC country suggests that such influence less likely.
The final number of participants in the three phases of this study was largely influenced by the willingness and openness of the deans, HODs, and staff members to take part. The researcher believes that this factor could have influenced the outcomes of this study in the sense that only participants who were willing to disclose information about their schools and departments agreed to participate. There was an HOD from a leading medical school in one GCC country who declined to include his department due to worries about confidentiality. This factor particularly applies to the FGs where the permission from the HOD for including his staff members was required. It is also possible that the participants happy with the status of anatomy teaching in their departments were more likely to participate than those feeling embarrassed about it. In contrast, it is possible that those participants who were unhappy about the status of anatomy teaching in their schools were more likely to participate and expose the situation in the hope the research outcome would trigger call for improvement.

Finally, the researcher is a lecturer of anatomy in one GCC medical school, which makes it hard to deny personal interest in the research topic of this study. This point raises concerns about possible investigator’s bias, which could have affected the confirmability of the qualitative findings. That is, whether those findings were the results of the experiences of the participants rather than the preferences of the researcher. Such possible bias was minimised by triangulation in terms of the use of different data collection methods and different types of participants. The methodology of the research was also described in details in order to allow scrutiny of the results.

10.5 Recommendations

This study has revealed important findings about the topic of anatomy teaching in GCCMSs. The above conclusions suggest recommendations for several personnel involved in the planning and delivery of the anatomy curriculum in those schools and for future research.

10.5.1 Recommendations for administrators of the medical schools

- Encourage GCC nationals to pursue a career in anatomy teaching. This will enable the schools to have a continuous supply of local anatomists and minimise the impact of international competition for qualified anatomists.
• Offer basic degree programs and advanced training programs in anatomical sciences in the hope that their graduates will cover the shortage of local anatomists.
• Recognise the collaboration with anatomists or anatomy departments from the GCC region as important as the collaboration with anatomists or departments from the developed world.
• Allow anatomy departments more authority and autonomy when exploring collaboration opportunities with departments from other schools and minimise the involvement of the schools’ administrators in the early stages.
• Re-consider the need for setting a contract period for expatriate anatomists or at least expand it and give them a similar level of authority to take actions regarding the way they teach anatomy and pursue collaboration to the level of the local academics.
• Increase students’ independent learning skills before joining the medical programs. Special emphasis should be put on self-directed learning skills and English language skills.

10.5.2 Recommendations for anatomy departments and their staff members

• Promote the topic of dissection and body donation in the GCC community and establish a taskforce to openly discuss it in the community. This may require involving many related government departments in the hope of reaching a framework to legalise, organise, and facilitate the practice of dissection and body donation, which incorporates local circumstances and culture.
• Collaboratively establish a central facility to import, store, process, and distribute cadavers to all GCCMSs. Such facilities can also prepare wet and plastinated prosections, work as a research centre for anatomical sciences, and provide training for junior anatomists and postgraduate students.
• Form a task force to suggest a unified core anatomy curriculum for all GCCMSs. Such a core curriculum is important to minimise the variations in the manner in which anatomy is currently taught.
• Expand the use of optional dissection as teaching tools for gross anatomy under the current situations.
• Encourage student exchange for enrolling into the optional dissection courses offered by other schools.
• Establish a GCC anatomical society, which will work as a pivot for facilitating communication and contact between the anatomists in GCCMSs.
• Increase personal contact, communication, and discussions between anatomists in GCCMSs through the available electronic media.
• Establish a database of anatomy teaching in GCCMSs. That database would include information about anatomists, teaching methods and tools, resources, facilities, and research projects. This will help anatomists and departments to know, locate, and approach others when there is a need.
• Consider students’ individual differences in learning skills when adopting SDL strategies.
• Pre-test any innovation in anatomy teaching adopted from other parts of the world before applying these methods to medical students in the GCC region.

10.5.3 Recommendations for future research

This study gave an overall picture about anatomy teaching in GCCMSs. It covered with variable degrees of detail many aspects related to the research topic. However, this topic of research remains extensive and requires further studies to more deeply investigate many aspects of delivery of anatomy education. In the light of the findings of this study, it would be appropriate to suggest the following:

• This study revealed a very low number of local anatomists in comparison to expatriates. The topic of the low numbers of local anatomists needs to be investigated to uncover the reasons behind it and the strategies to resolve this issue.
• This study raised anatomists’ concerns about the adequacy of GCC medical students’ skills in independent learning. Consequently, this topic may be investigated in more detail to explore the extent of the problem and its impact on students’ learning of medicine in general and anatomy in particular. Such a study is required with increasing adoption of PBL by GCCMSs.
• This study has used qualitative methods to investigate the perceptions of HODs and staff members about teaching anatomy in their medical schools. Therefore, using another method such as a large scale questionnaire directed to staff
members in all the schools may give a different insight regarding this particular research question.

- This study has investigated the perceptions of HODs and staff members about teaching anatomy in their medical schools. There is a need for another study to investigate the perceptions of students about learning anatomy in their schools.

- Very new medical schools that have not yet finished their anatomy course at the time of data collection of this study were not included. Further research should be done to investigate anatomy teaching in those schools, especially with regards to need and benefits of collaboration and the challenges that face new schools with regards to anatomy teaching.

- The study reported that many schools have witnessed curriculum change over the last ten years, which had impacted their anatomy teaching. That impact needs to be further investigated though other data collection methods such as documentary analysis of the old and new curricula of those schools to uncover how anatomy was positively and negatively affected.

- This study has revealed a wide range of tools and resources for teaching practical gross anatomy. This warrants further investigation into the preferences of GCC students and teachers of anatomy about those resources in the hope to increase the use of preferred resources.

- The study reported the state of anatomy teaching in GCCMSs in the academic year 2010-2011. There is a need to conduct similar studies every decade to monitor the change in anatomy teaching over the years and continue the historic documentation of the topic in this particular region.
References


287


General Presidency of Scholarly Research and Ifta' in Saudi Arabia. (2012). Dissecting the dead and exposing their private parts for educational purposes Retrieved 4 October, 2012, from http://www.alifta.net/Search/ResultDetails.aspx?languagename=en&amp;lang=en&amp;view=result&amp;fatwaNum=&amp;FatwaNumID=&amp;ID=4417&amp;searchScope=7&amp;SearchScopeLevels1=&amp;SearchScopeLevels2=&amp;highLight=1&amp;SearchType=exact&amp;SearchMoesar=false&amp;bookID=&amp;LeftVal=0&amp;RightVal=0&amp;simple=&amp;SearchCriteria=all words&amp;PagePath=&amp;siteSection=1&amp;searchkeyword=1001051151151099116105111110#firstKeyWordFound


Moheet. (2013). Body donation for education Retrieved 12 December, 2013, from http://moheet.com/News/NewDetails/99644/1/%D8%A3%D8%B3%D8%AA%D8%A7%D8%B0-%D8%A7%D9%84%D8%B4%D8%B1%D9%8A%D8%B9%D8%A9-%D8%A7%D9%84%D8%A5%D8%B3%D9%84%D8%A7%D9%85%D9%8A%D8%A9-%D9%8A%D8%A4%D9%83%D8%AF-%D8%A3%D9%86-%D8%A7%D9%84%D8%AA%D8%A8%D8%B1%D8%B9-%D8%A8.html


Appendices
Appendix I: The Survey Questionnaire

Anatomy Education in the Gulf Cooperation Council (GCC) Countries’ Medical Schools

This survey investigates the status of anatomy education in GCC medical schools and attempts to determine how it fits into the global trends in medical education. The findings of this study could benefit anatomy departments in the region, besides the wider community of medical education. This could provide the basis for further analysis and potential collaborations in the future.

We would be grateful if you could kindly fill in this questionnaire on behalf of your anatomy department. Please complete this to the best of your knowledge. If you would like to make comments please use the space on the last page.

The study has been approved by the Human Research Ethics Committee at the University of Western Australia (UWA). Confidentiality and anonymity will be guaranteed as only my supervisors and I will have access to all aspects of the study including results. No information that could identify specific departments will be published.

This study is part of the requirements of my PhD degree at UWA.

Mohamed Al-Mushaiqri
PhD student, School of Anatomy, Physiology, and Human Biology, The University of Western Australia
Lecturer, Department of Human and Clinical Anatomy, Sultan Qaboos University, Oman
For further information please contact:
Email: 10367600@student.uwa.edu.au; mohamed@squ.edu.om
Tel: +61 4 04754375 (Australia); +968 99238218 (Oman)
Part A. Background information

A1. In which GCC country is your medical school located? Please tick as applicable

☐ 1 Kingdom of Bahrain  ☐ 2 Kingdom of Saudi Arabia
☐ 3 State of Kuwait  ☐ 4 State of Qatar
☐ 5 Sultanate of Oman  ☐ 6 United Arab Emirates

A2. What type of institution is your medical school? Please tick as applicable

☐ 1 Public  ☐ 2 Private

A3. In which year did the department receive its first class of medical students?

A4. Which of the following administrative categories apply to your department? Please tick as applicable

☐ 1 Stand-alone anatomy department  ☐ 2 Basic medical sciences department

A5. Do you teach any other programs besides medicine?

☐ 1 Yes  ☐ 2 No. Please go to question A7

A6. What programs do you teach besides medicine? Please tick more than one if necessary

☐ 1 Nursing  ☐ 2 Dentistry
☐ 3 Physiotherapy  ☐ 4 Medical laboratory sciences
☐ 5 Others: specify

A7. What is the approximate annual medical student intake?

A8. How many full-time employed anatomy teaching faculty members does the department have in each category in the table below? Please enter the number of faculty in the corresponding box.

<table>
<thead>
<tr>
<th>Academic rank</th>
<th>GCC citizens</th>
<th>Non-GCC citizens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associate professor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant professor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecturer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical specialist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of medically qualified faculty</th>
<th></th>
</tr>
</thead>
</table>
A9. Does the department have part-time anatomy teaching staff?

1. Yes  
2. No. Please go to question A11

A10. How many Part-time anatomy teaching personnel does the department have in each of the categories in the table below?

<table>
<thead>
<tr>
<th>Type of assistant teaching staff</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical staff from adjunct hospital</td>
<td></td>
</tr>
<tr>
<td>Temporarily employed demonstrators</td>
<td></td>
</tr>
<tr>
<td>Postgraduate students</td>
<td></td>
</tr>
<tr>
<td>Clinical years students</td>
<td></td>
</tr>
<tr>
<td>Senior pre-clinical students</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
</tbody>
</table>

A11. In a typical gross anatomy laboratory session, what is the standard number of tutors and students?

1. Tutors:  
2. Students:

Part B. Curriculum

B1. What is the standard length of your school’s medical curriculum? 

Years and months

B2. Which of the following categories apply to your school’s medical curriculum?

1. A multiple phase sequential curriculum. (Curriculum is divided into consecutive phases such as pre-medical, pre-clinical, and clinical)

2. A single phase integrated curriculum. (Curriculum is not divided into separate phases or stages but pre-clinical and clinical sciences are taught in parallel).

3. Other arrangements

B3. In which years of the curriculum is anatomy taught? Please tick as applicable according to the length of your school’s curriculum. For example, if you have a 5 years curriculum ignore years 6 and 7.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

B4. Does the department deliver anatomy teaching to clinical students?

1. Yes  
2. No. Please go to question B6  
3. Not applicable Please go to question B6
B5. What is the nature of anatomy teaching delivered to clinical students? *Please tick more than one box if necessary.*

- [ ] 1. Practical revision sessions
- [ ] 2. Online revision materials
- [ ] 3. Formal elective courses
- [ ] 4. Formal compulsory courses
- [ ] 5. Others: Specify

B6. How would you scale your school’s anatomy curriculum for the following characteristics? *Please tick the appropriate box that best describes the balance between each two opposed characteristics.*

<table>
<thead>
<tr>
<th>Percentage</th>
<th>100:0</th>
<th>80:20</th>
<th>60:40</th>
<th>50:50</th>
<th>40:60</th>
<th>20:80</th>
<th>0:100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discipline-based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject-based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutor-led</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- [ ] 1. Integrated
- [ ] 2. Problem-based
- [ ] 3. System-based
- [ ] 4. Self-directed

B7. What is the degree of integration of anatomy with other basic medical sciences and clinical sciences? *Please tick the box that best describes the degree of integration.*

- [ ] 1. No integration
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5. Full integration

<table>
<thead>
<tr>
<th>Basic medical sciences</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B8. What is the level of authority the department has over the following aspects of anatomy teaching in your medical school? *Please tick the box that best describes the level of authority.*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>When anatomy is first introduced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The anatomy teaching hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The range of topics taught (content)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The method of teaching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The degree of integration of anatomy with other medical sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- [ ] 1. No authority
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5. Absolute authority

B9. Is there a statement for minimum core knowledge of anatomy in your school’s curriculum?

- [ ] 1. Yes
- [ ] 2. No

B10. In the past 10 years, has your medical school changed to a new medical curriculum? *Please tick as applicable*

- [ ] 1. Yes
- [ ] 2. No. Please go to part C
B11. Did the curriculum change affect the following aspects of anatomy teaching? If yes, Please indicate how. Please tick as applicable

<table>
<thead>
<tr>
<th>Time when anatomy is first introduced</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Brought forward</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Deferred</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anatomy teaching hours</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Increased</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Decreased</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The range of topics covered (content)</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Increased</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Decreased</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The method of teaching</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>More traditional</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>More innovative</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The degree of integration with other basic medical sciences</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Increased</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Decreased</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The degree of integration with clinical sciences</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Increased</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Decreased</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B12. What were the reasons behind the change?

Part C. Teaching and assessment

C1. What is the approximate number of total anatomy teaching hours that students receive through the entire curriculum? (All hours of lectures, laboratories, and other teaching formats)

<table>
<thead>
<tr>
<th>1-100 hours</th>
<th>101-200 hours</th>
<th>201-300 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

C2. What is the approximate percentage of the three anatomy sub-disciplines' contribution to the total anatomy teaching hours?

<table>
<thead>
<tr>
<th>Sub-discipline</th>
<th>Gross anatomy</th>
<th>Histology</th>
<th>Embryology</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>100 %</td>
</tr>
</tbody>
</table>

C3. What is the approximate percentage of the following teaching formats' contribution to the total anatomy teaching hours?

<table>
<thead>
<tr>
<th>Teaching format</th>
<th>Lecture</th>
<th>Laboratory</th>
<th>Small group tutorial</th>
<th>Other formats</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>100 %</td>
</tr>
</tbody>
</table>
C4. In the previous academic year, how frequently were the following **resources** used in gross anatomy laboratory sessions? *Please tick as applicable.* If other resources were used, please specify them in the provided space, and rate the frequency of their use.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory dissection by students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional dissection by students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastinated prosections</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic Models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical imaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedural anatomy and clinical skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface and living anatomy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer assisted imaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation softwares</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawing and colouring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body painting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C5. In the previous academic year, how frequently were the following **assessment formats** used to assess gross anatomy knowledge? *Please tick as applicable.* If other assessment tools were used, please specify them in the provided space, and rate the frequency of their use.

<table>
<thead>
<tr>
<th>Assessment format</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-based exams</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab-based tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer-based tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral vivas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research-based assignments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logbooks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portfolios</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C6. In the previous academic year, how frequently were the following **types of questions** used to assess gross anatomy knowledge? *Please tick as applicable.* If other types of questions were used, please specify them in the provided space, and rate the frequency of their use.

<table>
<thead>
<tr>
<th>Type of Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple choice questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matching questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long essays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short answers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagram drawing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagram labelling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C7. How frequently was **formative assessment** *(assessment for feedback purposes and doesn’t contribute to students’ grades)* used to assess gross anatomy knowledge? *Please tick as applicable.*

<table>
<thead>
<tr>
<th>Frequency</th>
<th>None</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C8. Is there **minimum achievement level** in gross anatomy for passing courses? *Please tick as applicable.* *(Minimum achievement level implies that a student is not eligible to pass a specific course or unit if he/she does not achieve that level of performance in anatomy).*

- [ ] 1 Yes, in all courses
- [ ] 2 Yes, in some courses
- [ ] 3 No

**Part D. Practice of dissection**

D1. Are cadavers used in the department? *Please tick as applicable*

- [ ] 1 Yes. *Please go to question D3*
- [ ] 2 No

D2. What is/are the reason/s for not using cadavers? *Please tick more than one if necessary*

- [ ] 1 Lack of cadaver sources
- [ ] 2 Lack of funding
- [ ] 3 Lack of appropriate facility
- [ ] 4 Lack of expertise
- [ ] 5 Cadavers are not required for teaching
- [ ] 6 Cultural and religious considerations
- [ ] 7 Others: specify

*Please skip to part E*

D3. What is the average number of cadavers you obtain per year?
D4. For how long is a single cadaver usually used for teaching purposes? *Please tick as applicable*

- [ ] 1 1 semester
- [ ] 2 1 year
- [ ] 3 2-5 years
- [ ] 4 6-10 years
- [ ] 5 Over 10 years

D5. How does the department obtain cadavers? *Please tick more than one if necessary*

- [ ] 1 Body donation programme
- [ ] 2 Local unclaimed bodies
- [ ] 3 Imported whole bodies
- [ ] 4 Imported dissected bodies
- [ ] 5 Others: Specify

D6. How do you describe the process of obtaining new cadavers? *Please tick as applicable*

- [ ] 1 Very easy
- [ ] 2 Easy
- [ ] 3 Neutral
- [ ] 4 Difficult
- [ ] 5 Very difficult

D7. Does the department experience shortage of cadavers? *Please tick as applicable*

- [ ] 1 Yes
- [ ] 2 No, Please go to Question D9

D8. How does the department compensate for the shortage of cadavers? *Please tick as applicable*

- [ ] 1 Use each cadaver for as long as possible
- [ ] 2 Use cadavers for demonstration only
- [ ] 3 Plastinate prosections
- [ ] 4 Use more medical imaging
- [ ] 5 Use more surface and living anatomy
- [ ] 6 Develop a curriculum that does not rely on cadavers
- [ ] 7 Others: Please specify

D9. Is dissection practiced in your department?

- [ ] 1 Yes
- [ ] 2 No, Please go to part E

D10. Who performs the dissection in your department? *Please tick more than one if necessary*

- [ ] 1 Faculty
- [ ] 2 Technical staff
- [ ] 3 Demonstrators
- [ ] 4 Prosectors
- [ ] 5 Students
- [ ] 6 Others: Specify

D11. What is the purpose of dissection? *Please tick more than one if necessary*

- [ ] 1 Undergraduate teaching
- [ ] 2 Postgraduate teaching
- [ ] 3 Clinical speciality training
- [ ] 4 Research
- [ ] 5 Others: Specify

---

**Part E. Collaboration between GCC anatomy departments**

E1. Does the department have collaboration or communication with other GCC anatomy departments? *Please tick as applicable*

- [ ] 1 Yes. Please go to question E3
- [ ] 2 No.
E2. What is/are the reason/s for not having collaboration or communication with other GCC anatomy departments? Please tick more than one if necessary

☐ 1 Lack of Initiative
☐ 2 Lack of perspective
☐ 3 Lack of encouragement from other departments
☐ 4 Lack of interest
☐ 5 Over occupation by internal responsibilities
☐ 6 Absence of a regional anatomical body or society
☐ 7 Bureaucracy
☐ 8 Others: specify

Thank you for participation, please stop here and go to page 10

E3. Is the communication or collaboration with departments in? Please tick as applicable

☐ 1 The same country  ☐ 2 Other GCC countries  ☐ 3 Both

E4. What type of communication or collaboration does your department has with other GCC anatomy departments? Please tick more than one if necessary

☐ 1 Faculty exchange  ☐ 2 Student exchange
☐ 3 Educational and curriculum policies  ☐ 4 Exchange of teaching resources
☐ 5 Collaborative research  ☐ 6 Staff recruitment policies
☐ 7 Conferences  ☐ 8 Others: specify

E5. What are the most significant outcomes of that communication or collaboration?

END OF QUESTIONNAIRE
Please go to page 10
This page will be detached from the rest of the questionnaire during analysis and storage for the purpose of anonymity and confidentiality.

Thank you for participating in this study on behalf of your department. Your contribution is most appreciated and highly valued. Follow up surveys or interviews investigating the same subject may be conducted in the future after analysing this questionnaire. Will you be interested in participating in such studies? Please indicate your response.

☐ 1  No  □ 2  Yes. Please provide your email or contact details below

If you have further comments that can add value to the current study, would you please write them below?

A summary report of the survey results will be sent to the participants upon request. Will you be interested in receiving a copy? Please indicate your response.

☐ 1  No  □ 2  Yes. Please provide your email or contact details below
Appendix II: The Semi-structured Interview Schedule

This schedule includes the list of questions prepared as a template for the semi-structured face-to-face interviews. The actual number and order of questions asked in every interview depends on the flow and direction of discussion. Additional probing question other than those included below may have been used.

1. Background information
   1. Would you please introduce yourself?
   2. Would you briefly tell me about your academic qualifications and your experience in anatomy teaching?
   3. Would you please tell me specifically about your experience in anatomy teaching in the GCC region?

2. The curriculum
   1. How would you briefly describe the type of medical curriculum of your medical school?
   2. How do you describe the place of anatomy in your school’s medical curriculum?
   3. What are the points of strength and weakness of delivering the anatomy content in the context of your schools’ medical curriculum?
   4. Can you reflect on your department’s position towards the implementation of the following aspects of anatomy teaching?
      i. Anatomy content
      ii. Anatomy teaching time
      iii. Methods of teaching
      iv. Integration
      v. Assessment
   5. To what extent does the current implementation of the aspects of anatomy teaching satisfy your departments’ needs?
   6. What modifications you would suggest to improve the way anatomy is taught at your medical school?

3. The practice of dissection
   1. What do you think of the value of dissection as a teaching tool for teaching anatomy to medical students today? Can you explain your answer?
   2. Have you taught gross anatomy to medical students before coming to GCC? If yes, to what extent did you use dissection as a teaching tool before coming to GCC?
   3. To what extent dissection is used to teach gross anatomy at your current GCC medical school?
4. How would you explain the reasons behind the change between your previous and current use of dissection?
5. Did the change in the extent to which you used dissection before coming to the GCC and the extent of using dissection currently affect the way your previous and current students learned anatomy? If yes, how? Can you give examples?
6. How do you describe feasibility of using dissection as a primary anatomy teaching tool in GCC medical schools?
7. What are the challenges that face the use of dissection as a primary teaching tool at your school and at GCC medical schools?
8. Did you or your department take any measures to address any of those challenges? If yes, can you give me examples?
9. How can the anatomy curriculum be delivered in GCC medical schools, taking the challenges facing dissection into consideration?
10. In your opinion, what are the other practical teaching tools that can replace the value of dissection in the context of GCC medical schools?

4. Collaboration with other departments
   1. Does your department or any of your staff members have collaboration with anatomy departments or anatomists in other GCC anatomy departments? If yes, what is the nature of this collaboration? If no, what do you think is behind the absence of collaboration?
   2. Based on your experience of anatomy teaching in GCC medical schools, what is the extent of collaboration between anatomists and between anatomy departments in the region?
   3. Are you aware of any collaborative initiatives between anatomy departments in the GCC or between anatomists that your department is not involved in? If yes, what are they?
   4. Can you reflect on how collaboration between anatomy departments and between anatomists can change the way anatomy is currently in the regions’ medical schools? Can you explain your answer?
   5. Does your department feel a need for collaboration with other anatomy departments in GCC medical schools? If yes, in what aspects? Has your department taken actions towards fulfilling that need?
   6. Are there specific needs of GCC anatomy departments that can be fulfilled through local but not international collaboration? If yes, can you elaborate on them?
   7. What are the experienced or anticipated challenges/ barriers that can face the collaboration between anatomy departments in the GCC medical schools?
   8. If you feel that local collaboration is needed, have you or your department thought of any circumstances or strategies that can promote it?
Appendix III: The Focus Group Schedule

Focus group interview questions

1. From your experience in teaching anatomy in this medical school, what are the good aspects of teaching anatomy in your schools’ medical curriculum?

2. Similarly, what are the negative aspects of teaching anatomy in your schools’ medical curriculum?

3. How would you imagine teaching the subject differently in current practice?

4. What do you think of the place of dissection as a teaching tool in the integrated curriculum of your medical school? Is there a need for it? Can you explain your answer?

5. Can you reflect on the readiness of medical students of your school for learning anatomy within the context of the available curriculum?

6. Can you reflect on your experience of collaboration between anatomists and anatomy departments in medical schools outside the GCC? How did it influence your teaching?

7. Can you reflect on your experience of collaboration between anatomists and anatomy departments in GCC medical schools? How does it influence your teaching?

8. Can you reflect on how can collaboration change the way anatomy is taught at your medical school and other GCC medical schools?

9. What are the forms of collaboration that you think are needed between anatomists and anatomy departments in the GCC?
Appendix IV: Deans’ Recruitment Letter

RECRUITMENT ADVERTISEMENT

Anatomy Education in the Gulf Cooperation Council (GCC) Countries’ Medical Schools Study

Respected Prof. xxxxxxxxx, Dean of xxxxxxxxxxxxxxxxxxx, The University of xxxxxxxxx,

I am a lecturer of anatomy at the Sultan Qaboos University, Oman. I am currently working on a research project as part of my PhD study at the University of Western Australia. The project investigates the status of anatomy teaching and learning in the Gulf Cooperation Council (GCC) countries.

In this study, anatomy departments in all GCC medical schools are kindly requested to participate by filling out a survey. This elaborates on some aspects regarding their experience of anatomy teaching and learning such as staffing, teaching resources and tools, assessment, and the practice of dissection. Such a study is needed to document the status of anatomy education in the region and compare it with other parts of the world. It will also help GCC anatomy departments to collaboratively maximise their synergies and face their challenges.

The study has been approved by the ethics committee at the University of Western Australia (UWA). Confidentiality and anonymity will be guaranteed as only my supervisor and I will have access to all aspects of the study including results. No information that could identify specific departments will be published.

We would be very grateful if you accept our request to nominate a member of your anatomy department/faculty (preferably the head of anatomy department or any of its senior faculty) to participate in our study on behalf of your medical school.

Your school’s input will add value to the outcomes of the study and will help in reaching a comprehensive understanding of the current status of anatomy education in the region, which will ultimately benefit current and future medical students in the GCC region.

Sincerely yours,

Mohamed Al-Mushaiqri
PhD student, School of Anatomy, Physiology and Human Biology, The University of Western Australia
Lecturer, Department of Human and Clinical Anatomy, Sultan Qaboos University, Oman

For response or further information please contact:
Mohamed Al-Mushaiqri | Email: 10367600@student.uwa.edu.au; or mohamed@squ.edu.om | Tel: +61 4 04754375 (Australia); +968 99238218 (Oman)
Supervisor: Professor Luis Filgueira | Email: luis.filgueira@uwa.edu.au | Tel: +61 8 64883907
[RECRUITMENT ADVERTISEMENT]

Anatomy Education in the Gulf Cooperation Council (GCC) Countries’ Medical Schools Study

Dear Chairperson of Anatomy department,

I am a lecturer of anatomy at the Sultan Qaboos University, Oman. I am currently working on a research project as part of my PhD study. The project investigates the status of anatomy teaching and learning in the Gulf Cooperation Council (GCC) countries. In this study, anatomy departments in all GCC medical schools will be kindly asked to participate by filling out a survey. This will elaborate on some aspects regarding their experience of anatomy teaching and learning such as staffing, teaching resources and tools, assessment, and the practice of dissection. Such a study is needed to document the status of anatomy education in the region and compare it with other parts of the world. It will also help GCC anatomy departments to collaboratively maximise their synergies and face their challenges.

The study has been approved by the ethics committee at the University of Western Australia (UWA), where I am currently enrolled as a PhD student. Confidentiality and anonymity will be guaranteed as only my supervisors and I will have access to all aspects of the study including results. No information that could identify specific departments will be published.

This message is an initial approach to alert you about a survey that will be emailed to you in the coming weeks.

Sincerely yours,

Mohamed Al-Mushaiqri
PhD student, School of Anatomy and Human Biology, The University of Western Australia
Lecturer, Department of Human and Clinical Anatomy, Sultan Qaboos University, Oman

For further information please contact:
Mohamed Al-Mushaiqri
By Email: 10367600@student.uwa.edu.au; or mohamed@squ.edu.om
Or Tel: +61 4 04754375 (Australia); +968 99238218 (Oman)

Supervisor:
Professor Luis Filgueira; email: luis.filgueira@uwa.edu.au, Tel: +61 8 64883907
CONFIRMATION OF AVAILABILITY FOR INTERVIEW
STUDY OF ANATOMY TEACHING IN GCC MEDICAL SCHOOLS

Dear colleague,

I would like to take this opportunity to thank you for participating in the survey on Anatomy teaching in the Gulf Cooperation Council (GCC) countries, earlier this year. Your contribution was very helpful in achieving a good response rate. It was also helpful in producing a comprehensive view of the state of anatomy teaching in medical schools of the region. Your contribution is highly appreciated and acknowledged. This has allowed me to complete the first phase of my PhD studies.

I would like also to thank you for indicating in the earlier survey that you are interested in participating in the second phase of this study. The analysis of the survey showed, for the first time, some key results that will help us in developing a better understanding of anatomy teaching in our region and the challenges that may face anatomy departments in the future.

As part of the research methodology that I am following in my doctoral studies, the survey results have led to the development of questions for a qualitative phase in the form of face-to-face interviews. This will allow me to gain a deeper understanding about the research topic and to explain some aspects of the results. Your personal experience in teaching anatomy in GCC medical schools will be essential in this regard.

I would like to conduct the interviews in the months of November and December 2012. This face-to-face interview will take about one hour. The interview is planned to be conducted at your office or another venue that is more convenient for you. I shall send a further email to arrange the best date, time, and venue that suits you.

Would you please reply to this email to confirm your interest and availability for the interview?

Sincerely yours,
Mohamed Al-Mushaiqri
PhD student, School of Anatomy, Physiology and Human Biology, The University of Western Australia
Lecturer, Department of Human and Clinical Anatomy, Sultan Qaboos University, Oman

For response or further information please contact:
Mohamed Al-Mushaiqri | Email: 10367600@student.uwa.edu.au; or mohamed@squ.edu.om | Tel: +968 99238218 (Oman); +61 4 04754375 (Australia)
CONFIRMATION OF AVAILABILITY FOR FOCUS GROUP INTERVIEW 
STUDY OF ANATOMY TEACHING IN GCC MEDICAL SCHOOLS

Dear colleague,

I am a lecturer at the Department of Human and Clinical anatomy at the Sultan Qaboos University in Oman. I am currently working on my PHD study which investigates the state of anatomy education in the medical schools of the Gulf Cooperation Council (GCC) countries. The study is hoped to help us in producing a comprehensive view of the state of anatomy teaching in medical schools of the region.

The study has already included a first phase of a survey that was distributed to the chairmen of anatomy departments in the region and a second phase of face-to-face interviews with them. The analysis of the survey and the interviews showed, for the first time, some key results that will help us in developing a better understanding of anatomy teaching in our region and the challenges that may face anatomy departments in the future.

As part of the research methodology that I am following in my doctoral study, a third phase of data collection is required. This will take the form of focus group interviews with staff members of selected anatomy departments in the region. This will allow me to gain a deeper understanding about the research topic and to explain some aspects of the results. Your personal experience in teaching anatomy in GCC medical schools will be essential in this regard. It will also help me to achieve the requirements of my PHD candidature.

This focus group interview will take about one hour. I have already contacted the chairmen of your department and he approved my request to include you and the other staff members in the department in the focus group interview. I would be very grateful if you respond to this invitational E-mail and confirm your availability for the interview so I can start planning my visit to your department.

Please do not hesitate to contact me should you need any help or clarification.

Sincerely yours,

Mohamed Al-Mushaiqri
PhD student, School of Anatomy, Physiology and Human Biology, The University of Western Australia
Lecturer, Department of Human and Clinical Anatomy, Sultan Qaboos University, Oman

For response or further information please contact:
Mohamed Al-Mushaiqri | Email:10367600@student.uwa.edu.au; or mohamed@squ.edu.om | Tel: +968 99238218 (Oman); +61 4 04754375 (Australia)
CONSENT FORM

I (the participant) have read the information provided and any questions I have been clearly explained in the information above, to my satisfaction.

I agree to participate in this activity though participating in a focus group interview, realizing that I may withdraw at any time without reason and without prejudice.

I understand that all information provided is treated as strictly confidential and will not be released by the investigator. The only exception to this principle of confidentiality is if documents are required by law. I have been advised as to what data is being collected, what the purpose is, and what will be done with the data upon completion of the research.

The Human Research Ethics Committee at the University of Western Australia requires that all participants are informed that if they have any complaint regarding the manner in which a research project is conducted, it may be given to the researcher or, alternatively to the Secretary, Human Research Ethics Committee, Registrar’s Office, University of Western Australia, 35 Stirling Highway, Crawley, WA 6009 (telephone number +61 8 6488 3703). All study participants will be provided with a copy of the Information Sheet and Consent Form for their personal records.

I agree that research data gathered for the study may be published provided my name or other identifying information is not used.

Please print this page for your reference.

Please answer as best you can and complete all the questions.

Thank you for your participation.

Participant:

Date:
Appendix IX: Staff members demographic data form used for focus groups

1. What is your first name? ...........................................

2. What is your nationality status?
   - GCC national
   - Expatriate

3. What is your gender?
   - Male
   - Female

4. What is your academic position?
   - Professor
   - Associate professor
   - Assistant professor
   - Lecture
   - Instructor
   - Other: Specify...............................

5. What qualifications do you have? (You may tick more than one)
   - MBBS or MD
   - PHD
   - MSc
   - BSc
   - Others: Specify...............................

6. How long have you been teaching anatomy to medical students in general?
   - Less than 5 years
   - 5-10 years
   - 11-15 years
   - 16-20 years
   - More than 20 years

7. How long have you been teaching anatomy to medical students in the GCC?
   - Less than 5 years
   - 5-10 years
   - 11-15 years
   - 16-20 years
   - More than 20 years

8. In which countries did you teaching anatomy to medical students before coming to your current school?
   1. ........................................................
   2. ........................................................
   3. ........................................................
   4. ........................................................
Appendix X: Ethics approval

HUMAN RESEARCH ETHICS APPROVAL - THE UNIVERSITY OF WESTERN AUSTRALIA

Anatomy education in the Gulf Cooperation Council (GCC) countries’ medical schools

Student(s): Mohamed Al-Mushaiqi - PhD - 10367600

Ethics approval for the above project has been granted in accordance with the requirements of the National Statement on Ethical Conduct in Human Research (National Statement) and the policies and procedures of The University of Western Australia. Please note that the period of ethics approval for this project is five (5) years from the date of this notification. However, ethics approval is conditional upon the submission of satisfactory progress reports by the designated renewal date. Therefore initial approval has been granted from 19 January 2012 to 01 January 2013.

You are reminded of the following requirements:

1. The application and all supporting documentation form the basis of the ethics approval and you must not depart from the research protocol that has been approved.
2. The Human Research Ethics Office must be approached for approval in advance for any requested amendments to the approved research protocol.
3. The Chief Investigator is required to report immediately to the Human Research Ethics Office any adverse or unexpected event or any other event that may impact on the ethics approval for the project.
4. The Chief Investigator must inform the Human Research Ethics Office as soon as practicable if a research project is discontinued before the expected date of completion, providing reasons.

Any conditions of ethics approval that have been imposed are listed below:

**Special Conditions**

*None specified*

The University of Western Australia is bound by the National Statement to monitor the progress of all approved projects until completion to ensure continued compliance with ethical standards and requirements.

The Human Research Ethics Office will forward a request for a Progress Report approximately 60 days before the due date. A further reminder will be forwarded approximately 30 days before the due date.
If your progress report is not received by the due date for renewal of ethics approval, **your ethics approval will expire**, requiring that all research activities involving human participants cease immediately.

If you have any queries please do not hesitate to contact the Human Research Ethics Office (HREO) at hreoresearch@uwa.edu.au or on (08) 6488 3703.

Please ensure that you quote the file reference – RA/4/1/5067 – and the associated project title in all future correspondence.

Yours sincerely

[Signature]

Peter Johnstone
Manager
Human Research Ethics Committee
Appendix XI: Example of coding and theme generation

<table>
<thead>
<tr>
<th>Extract from transcript</th>
<th>Code</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>On my own, I would not initiate contact even if I have the name and contact of the head</td>
<td>Initiative</td>
<td>Factors discouraging</td>
</tr>
<tr>
<td>of the department in [...].</td>
<td></td>
<td>collaboration</td>
</tr>
<tr>
<td>To have some sort of a list on in internet or facebook or a group. There I can say</td>
<td>Online communication</td>
<td>Factors encouraging</td>
</tr>
<tr>
<td>that one student has written this spelling for an anatomical term, would you give</td>
<td>Student support</td>
<td>collaboration</td>
</tr>
<tr>
<td>credit or marks for such an answer?</td>
<td></td>
<td>Benefits of collaboration</td>
</tr>
<tr>
<td>One week we examine in my college and next week in another college. Some people will</td>
<td>Faculty exchange</td>
<td>Benefits of collaboration</td>
</tr>
<tr>
<td>go to 3 colleges. So that is a lot of cross talk. There is a lot of seeing other</td>
<td>Exchange of experience</td>
<td></td>
</tr>
<tr>
<td>departments</td>
<td>Exposure</td>
<td></td>
</tr>
<tr>
<td>Currently there are only two Kuwaitis with a master’s degree from here [...]. So there</td>
<td>local anatomists</td>
<td>Factors discouraging</td>
</tr>
<tr>
<td>are no Kuwaitis in anatomy.</td>
<td></td>
<td>collaboration</td>
</tr>
<tr>
<td>We order 10 cadavers, 8 to 10 cadavers every year. It costs the university a</td>
<td>Expensive</td>
<td>Challenges against</td>
</tr>
<tr>
<td>reasonable amount of money but that is the only way because we do not have a</td>
<td>Local supply</td>
<td>dissection</td>
</tr>
<tr>
<td>donation system in the country so we have to purchase from outside</td>
<td>Importation</td>
<td></td>
</tr>
<tr>
<td>They stopped dissection because of the rarity of cadavers and even the time because</td>
<td>Cadavers</td>
<td></td>
</tr>
<tr>
<td>most colleges started shifting from pure traditional to hybrid type, and this requires</td>
<td>Anatomy teaching time</td>
<td></td>
</tr>
<tr>
<td>more time</td>
<td>Curriculum</td>
<td></td>
</tr>
</tbody>
</table>