



Anatomy teaching in Saudi medical colleges- is there necessity of the national core syllabus of anatomy

Srinivasa Rao Bolla¹, Radi Ali Al Saffar²

¹Department of Biomedical Sciences, School of Medicine, Nazarbayev University, Nur-Sultan City, Kazakhstan, ²Department of Anatomy, College of Medicine, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

Abstract: Curricular updates in medicine resulted in changes in gross anatomy teaching. We aim to find the trends and methods of gross anatomy teaching in medicine programs in Saudi Arabia. Further, examine whether the data would help to discuss whether a core Anatomy syllabus is required. A survey questionnaire based on the earlier studies, was sent to the anatomy faculty of 25 medical colleges to collect the data on the pedagogic and dissection/laboratory approaches, inclusion of radiological, clinical, surface anatomy sessions, and the total number of hours allocated for anatomy education. A total of 15 responses were received from different medical colleges of which nine provided complete details. A wide variation in the component and mode of delivery of anatomy was observed. The number of hours for the anatomy course ranged from 89 to 388 hours. These data will provide an update on gross anatomy teaching approaches, which will help in making informed decisions in course revisions and adopting the best practices. The variations in anatomy course with short duration raises concern about whether the essential learning outcomes are achieved to prepare a skillful and safe clinician? do we require a core syllabus of Anatomy to be adopted at the national level to achieve the essential learning outcomes? The Anatomical Society, UK has developed core syllabi of Anatomy for undergraduate medical, dental, nursing, and pharmacy students, which can serve as a guide in developing the core syllabus of Anatomy for medicine in Saudi.

Key words: Anatomy, Curriculum, Teaching, Dissection, Medicine

Received February 24, 2022; Revised June 3, 2022; Accepted June 22, 2022

Introduction

The medical curriculum has undergone many transformations from traditional core subject-wise teaching to integrated teaching, integrating the basic sciences and clinical disciplines vertically and horizontally. Sound knowledge of human gross anatomy forms a firm foundation for the medi-

cal student to achieve precise clinical skills, especially the physical examination, radiological diagnosis, and surgical expertise. Anatomy teaching has undergone many make-overs from cadaveric dissection and didactic pedagogic approaches to augmented reality, virtual reality, and student-centered active learning approaches.

Medical colleges in Saudi Arabia are following diverse curricula. In the last decade, they have reformed and espoused the new medical curricula keeping abreast with the curricular changes in medical education. The updated curricula in many of the Saudi medical colleges, changed the Anatomy component in the curriculum. There is a shift from traditional anatomy teaching methods such as didactic lectures and cadaveric dissection to inquiry-based and coop-

Corresponding author:

Srinivasa Rao Bolla 

Department of Biomedical Sciences, School of Medicine, Nazarbayev University, Nur-Sultan City 010000, Kazakhstan
E-mail: bolla.srinivas@gmail.com

Copyright © 2022. Anatomy & Cell Biology

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

erative teaching methods such as case-based learning (CBL), problem-based learning (PBL), and team-based learning (TBL) [1-3] to instill student-centered active learning. The modification in the anatomy component is because students are also trained in non-discipline soft competencies such as leadership, professionalism, communication, and ethics in their curricula [4]. These skills are emphasized as essential competencies in preparation for medical students as not only future clinicians but also as leaders of healthcare by immersing them in the foundations of interpersonal, ethical, and leadership skills required to excel in the future workplace [5]. With the inclusion of new skills and molecular biology, there has been a reduction in the basic sciences component. In the current overcrowded curricula with soft competencies, many niceties of anatomical sciences have been snipped citing the abundance of material and lacking proper clinical relevance [6, 7]. These reductions in the basic medical sciences component especially the anatomy component have raised concerns about the effect on the quality of the surgical expertise and the safety of the patient [8].

These wide variations raise the query of whether all the essential learning outcomes are being achieved and whether the anatomy component includes the most frequent cases of Saudi and their relevant anatomy. Is the anatomy component sufficient to graduate a skillful and safe clinical practitioner?

In this context, our study has proposed to find and analyze the gross anatomy teaching practices in Saudi Arabian medical colleges. The results would help in finding the differences in the anatomy component. The purpose of this study is to determine whether the differences in the anatomy component are too wide. Would this warrant the need for discussion for the national core curriculum or syllabus of anatomy in Saudi medical colleges.

Materials and Methods

A cross-sectional survey was sent to the faculty of Anatomy during 2018–2019 to 25 medical colleges across Saudi Arabia. The survey tool was prepared based on previous studies [9-11]. The prepared questionnaire was circulated among the peers to provide feedback on the readability of the questions and to avoid ambiguity in the responses after the survey was finalized. The final questionnaire has 20 items enquiring about the approach of anatomy teaching, years of the program during which anatomy is taught and anatomical sciences teaching methods. Teaching approaches included

questions about the number of didactic, PBL, TBL sessions, Laboratory sessions, and type of laboratory activities (dissection, prosection, virtual anatomy, and workbook), radiology sessions (X-ray, computed tomography [CT], or magnetic resonance imaging [MRI]), surface anatomy sessions, and clinical anatomy sessions. The Institutional Review Board of Imam Abdulrahman bin Faisal University, Dammam, approved this study (IRB-2019-01-186). Finally received the completed questionnaire from 15 medical colleges. All 15 participants answered the questions about the approach of anatomy teaching, the years during which the course is delivered, pedagogic methods used, and laboratory sessions. Only nine medical colleges have provided the details of the number of hours allocated for pedagogic and laboratory sessions of Anatomy. All the data are presented in tables and a graphical representation of the number of hours allocated to each mode of pedagogic approaches used in the Anatomy course is done using GraphPad Prism 9.1.1 (GraphPad Software, San Diego CA, USA).

Results

The anatomy in the curricular structure

Twelve out of these fifteen medical colleges have informed that they approach anatomy teaching system-wise, and the remaining three have informed that they approach region-wise. Based on the curricular structure anatomy is delivered in different years of the medical program. Four institutions are teaching only in the first year of the medicine program, four institutions in 1st and 2nd years, four institutions in 1st, 2nd, and 3rd years, one institution in 1st, 2nd, 3rd, 4th, and 5th years and two institutions have informed that they deliver anatomy course in 3rd year of the program (Table 1).

The anatomy pedagogic approaches

The pedagogic teaching methods used in these medical colleges are diverse. All colleges have didactic lectures as pedagogic methods, but the number varied. Twelve medical colleges have PBL as one of the pedagogic approaches with a variable number of sessions. Four colleges have TBL as a pedagogic approach. Of these four colleges, three colleges

Table 1. Years of the program during which anatomy is taught

Year	Year I	Year I & II	Year I, II & III	Years I, II, III & IV	Years III
Colleges	4	4	4	1	2

Table 2. Teaching approach and pedagogic methods used in anatomy course instruction

Gross anatomy Colleges	Teaching approach		Pedagogic methods practiced				
	Regional	Systemic	Lecture	Lab	PBL	TBL	PBL & TBL
	3	12	15	15	12	4	3

PBL, problem-based learning; TBL, team-based learning.

Table 3. Laboratory approaches in anatomy

Teaching approach	Cadaveric dissection	Virtual dissection table	Prosection	Radiology	Surface anatomy
Number of colleges	10	6	15	15	15

have both PBL and TBL, only one college has only TBL without any PBL (Table 2).

The anatomy laboratory activities

We have also enquired about the laboratory component used in their colleges. In the laboratory sessions, cadaveric dissection is done in ten institutions and there is no dissection in five. Out of 3 teaching regional approach of anatomy 1 has no dissection. Out of 12 teaching systemic approach of anatomy 4 have no dissection. Virtual dissection tables are available in six institutions, of these six; five institutions have both cadaveric and virtual dissections available. Only one institution has virtual dissection tables and prosection without cadaveric dissection. All the institutions have prosection irrespective of whether there is a dissection or not. All 15 colleges that responded have surface anatomy and radiology component (Tables 2 and 3). The radiology component is mainly based on the demonstration of radiographic images of X-ray, CT, and MRI, no college has ultrasonography in their anatomy course.

Hours allocated for anatomy in curriculum

The detailed information on pedagogic approaches and hours allocated for each approach was given by 9 medical colleges. There is a great degree of variability in the number of hours allocated for the anatomy course in general and in the hours allocated for different pedagogic and laboratory sessions among the colleges that have responded with details of hours allocated. The total number of hours allocated in total for the anatomy course ranged from 89 hours to 388. The number of didactic lectures ranged from 30 hours to 140 hours. In the institutions, which have PBL, the sessions ranged from four to 20, and in the institutions where TBL is an instructional method the sessions allocated were between

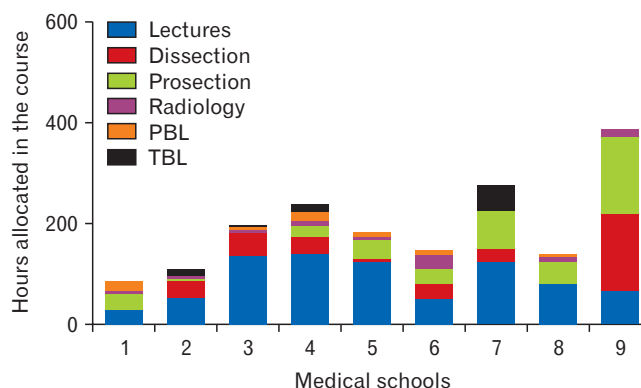


Fig. 1. Gross anatomy pedagogic approaches and hours allocated. X, axis numbers represent the medical colleges; Y, axis represent the number of hours allocated for gross anatomy. The colors of the histogram represent the mode of instruction of gross anatomy. PBL, problem-based learning; TBL, team-based learning.

2 to 50. Dissection ranged from 6 to 153, prosection ranged from 5 to 153 (Fig. 1). The wide variability of the teaching sessions reported is due to the variability of the curriculum in different medical colleges.

Discussion

Our study is the first attempt to get information on the Anatomy teaching methods and hours allocated in different medical colleges in Saudi Arabia. The information acquired indicates diversity in teaching approaches, time allocation, and years during which the course is taught.

The reduced number of hours allocated for anatomy is a topic of debate on whether anatomical competency is adequate to become a skillful surgeon and be able to avoid damage to structures especially when there is variant anatomy. To avoid the discrepancies in the anatomy component devising a national syllabus could provide a solution.

The waning anatomy component is hazardous to medical professions and society. A seven-fold increase in medicolegal claims against surgeons for surgical damage to underlying structures was reported [12], and atrophy of the anatomy component in medical curricula could be a reason for this situation. Evidence from the studies has revealed that ana-

tomical ignorance has become a basis of apprehension about anatomy education in present medical education. The medical trainee's anatomical competence is discerned to be inadequate for a safe practice by the training clinicians [13, 14]. Substantial reduction in anatomy teaching, as much as 80% contact hours was seen in the study that reviewed anatomy education medical colleges of Australia and New Zealand [15]. In North America, also there was a reduction in the contact hours of Anatomy teaching [10]. This shrinkage in anatomical knowledge raises severe concerns about the required level of competency for safe clinical practice.

Many medical colleges around the world have discarded dissection due to the unavailability of donors and embraced the modern tech gizmos such as virtual dissection tables and augmented reality. Cadaveric dissection is still considered an important tool of medical education by many anatomy educators. It introduces death at an early stage of medical education to prepare the future physician to cope with death and dying, appreciate the anatomical variations and pathology in different individuals, facilitate acquiring the manual dexterity to be a skilled surgeon, and helps attain communication, teamwork, and leadership skills by working as a team during the dissection sessions. Despite the difficulties in procuring the donors and high economic encumbrance, in Saudi Arabia, nine out of fifteen colleges responded are still using cadaveric dissection as the main tool of laboratory activity. Declining hours allocated for anatomy component and teaching hours has been evident in the modern medical curricula for many years. Cadaveric workshops based on clinical procedures for some components would benefit the students who has limited or no dissection to actively engage and appreciate a surgical experience [16].

In the efforts of standardization of the anatomy content in different health sciences programs many authors have proposed the core anatomy syllabi. The aim of the core anatomy syllabus is to have the essential learning outcomes required for safe and efficient clinical expertise and reduce the detailed description of the clinically not relevant topics. This can provide a solution in a diverse curriculum with varied component of anatomy, some having too many and some having inadequate anatomical competencies. The core anatomy syllabus will provide the essential learning outcomes which can be fit in the curricula at appropriate time using the appropriate method deemed by the instructor. core regional anatomy syllabus (CRAS) was published by Anatomical society of UK and Ireland in 2003. This CRAS has under-

gone three revisions [17]. The recent CRAS3 was developed using Delphi approach of consensus group of anatomists [18]. The CRAS2 is included as reference in UK's General Medical Council's Tomorrow's Doctor [19]. A clear guide of competencies to be acquired and facilitation to be given to achieve them to prepare a good doctor for the society.

There are other efforts to standardize the core syllabus at undergraduate program level for medicine [17, 20-22] dentistry [23, 24], Nursing [25] and Pharmacy [26]. Also, some core syllabi are prepared at regional level such as musculoskeletal anatomy [27], Thorax [28] head and neck [29, 30] and neuroanatomy [31].

To make sure that medical colleges have necessary Anatomy learning outcomes are included in their curricula an Anatomical society is formation would be a good initiative in Saudi. The Anatomists should meet alongside with the clinicians to develop the core anatomy syllabus for undergraduate medicine program that encompasses the core content and skills required for making a competent clinician and reduce the unnecessary details. With recent Covid-19 whole world has implemented online teaching, to be future ready some sessions can be suggested as online sessions in the national core syllabus.

Limitations of the study

Our study is the first attempt to collect comprehensive information on Anatomy teaching in Saudi medical colleges. Not all the colleges have responded to our questionnaire. Only 50% of the colleges 15 of 25 have responded and in these 15 only 9 colleges provided detailed information on the hours spent and methods adopted for anatomy teaching. I hope that our attempt after publication will encourage others also come on board, provide the information, and involve in active discussion for excellence in anatomy teaching and learning in Saudi Arabia and elsewhere.

Conclusion

In the present study, we have observed that anatomy teaching and contact hours are variable across the institutions. This raises an important question, should there be a national core syllabus of anatomy emphasizing the essential anatomical component for undergraduate medical students across all the medical colleges in Saudi Arabia? Should there be a reinforcing more detailed anatomy course for the residents of surgical and radiology specialties which could also include cadaveric dissection, especially in the surgical ana-

tomical regions they are undergoing training? The Anatomical Society of Great Britain and Ireland [17] already made an attempt in this direction, for Anatomy. They have developed a core anatomy syllabus with the minimum essential anatomical knowledge for qualified medical graduates. It would be useful to adopt a core curriculum and colleges should have the freedom to embrace differences in teaching and learning approaches based on available resources, expertise, and learner motivation.

ORCID

Srinivasa Rao Bolla:

<https://orcid.org/0000-0002-2644-5169>

Radi Ali Al Saffar: <https://orcid.org/0000-0001-9463-2188>

Author Contributions

Conceptualization: SRB. Data acquisition: SRB, RAAS. Data analysis or interpretation: SRB, RAAS. Drafting of the manuscript: SRB, RAAS. Critical revision of the manuscript: SRB, RAAS. Approval of the final version of the manuscript: all authors.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

References

1. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, MacDougall C, Matthews P, Purkis J, Clay D. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. *Med Teach* 2012;34:e421-44.
2. Burgess A, Ayton T, Mellis C. Implementation of team-based learning in year 1 of a PBL based medical program: a pilot study. *BMC Med Educ* 2016;16:49.
3. Burgess A, Bleasel J, Haq I, Roberts C, Garsia R, Robertson T, Mellis C. Team-based learning (TBL) in the medical curriculum: better than PBL? *BMC Med Educ* 2017;17:243.
4. Birden H, Glass N, Wilson I, Harrison M, Usherwood T, Nass D. Teaching professionalism in medical education: a Best Evidence Medical Education (BEME) systematic review. BEME Guide No. 25. *Med Teach* 2013;35:e1252-66.
5. Franco CAGDS, Franco RS, Lopes JMC, Severo M, Ferreira MA. Clinical communication skills and professionalism education are required from the beginning of medical training - a point of view of family physicians. *BMC Med Educ* 2018;18:43.
6. Finucane PM, Johnson SM, Prideaux DJ. Problem-based learning: its rationale and efficacy. *Med J Aust* 1998;168:445-8.
7. McMenamin PG. Body painting as a tool in clinical anatomy teaching. *Anat Sci Educ* 2008;1:139-44.
8. Singh R, Shane Tubbs R, Gupta K, Singh M, Jones DG, Kumar R. Is the decline of human anatomy hazardous to medical education/profession?--A review. *Surg Radiol Anat* 2015;37:1257-65.
9. Drake RL, Lowrie DJ Jr, Prewitt CM. Survey of gross anatomy, microscopic anatomy, neuroscience, and embryology courses in medical school curricula in the United States. *Anat Rec* 2002;269:118-22.
10. Drake RL, McBride JM, Lachman N, Pawlina W. Medical education in the anatomical sciences: the winds of change continue to blow. *Anat Sci Educ* 2009;2:253-9.
11. Drake RL, McBride JM, Pawlina W. An update on the status of anatomical sciences education in United States medical schools. *Anat Sci Educ* 2014;7:321-5.
12. Ellis H. Medico-legal litigation and its links with surgical anatomy. *Surgery (Oxford)* 2002;20:i-ii.
13. Regenbogen SE, Greenberg CC, Studdert DM, Lipsitz SR, Zinner MJ, Gawande AA. Patterns of technical error among surgical malpractice claims: an analysis of strategies to prevent injury to surgical patients. *Ann Surg* 2007;246:705-11.
14. Waterston SW, Stewart IJ. Survey of clinicians' attitudes to the anatomical teaching and knowledge of medical students. *Clin Anat* 2005;18:380-4.
15. Craig S, Tait N, Boers D, McAndrew D. Review of anatomy education in Australian and New Zealand medical schools. *ANZ J Surg* 2010;80:212-6.
16. Dissabandara LO, Nirthanan SN, Khoo TK, Tedman R. Role of cadaveric dissections in modern medical curricula: a study on student perceptions. *Anat Cell Biol* 2015;48:205-12.
17. Smith CF, Finn GM, Stewart J, Atkinson MA, Davies DC, Dyball R, Morris J, Ockleford C, Parkin I, Standring S, Whiten S, Wilton J, McHanwell S. The Anatomical Society core regional anatomy syllabus for undergraduate medicine. *J Anat* 2016;228:15-23.
18. Smith CF, Finn GM, Stewart J, McHanwell S. Anatomical Society core regional anatomy syllabus for undergraduate medicine: the Delphi process. *J Anat* 2016;228:2-14.
19. General Medical Council (GMC). [Internet]. Dudley: The Ron Grimley Undergraduate Centre; c2022 [cited 2021 Dec 18]. Available from: http://www.rguc.co.uk/wp-content/uploads/2019/03/Outcomes_for_graduates_July15.pdf.
20. Leonard RJ. A clinical anatomy curriculum for the medical student of the 21st century: gross anatomy. *Clin Anat* 1996;9:71-99.
21. Griffioen FM, Drukker J, Hoogland PV, Godschalk M. General plan anatomy objectives of the teaching of anatomy/embryology in medical curricula in The Netherlands. *Eur J Morphol* 1999;37:288-325.
22. McHanwell S, Atkinson M, Davies DC, Dyball R, Morris J, Ockleford C, Parkin I, Standring S, Whiten S, Wilton J. A core syllabus in anatomy for medical students - adding common

- sense to need to know. *Eur J Anat* 2007;11(Suppl 1):3-18.
23. Moxham BJ, McHanwell S, Berkovitz B. The development of a core syllabus for the teaching of oral anatomy, histology, and embryology to dental students via an international 'Delphi Panel'. *Clin Anat* 2018;31:231-49.
 24. Matthan J, Cobb M, McHanwell S, Moxham BJ, Finn GM. The Anatomical Society's core anatomy syllabus for dental undergraduates. *J Anat* 2020;236:737-51.
 25. Connolly SA, Gillingwater TH, Chandler C, Grant AW, Greig J, Meskill M, Ross MT, Smith CF, Wood AF, Finn GM. The Anatomical Society's core anatomy syllabus for undergraduate nursing. *J Anat* 2018;232:721-8.
 26. Finn GM, Hitch G, Apampa B, Hennessy CM, Smith CF, Stewart J, Gard PR. The Anatomical Society core anatomy syllabus for pharmacists: outcomes to create a foundation for practice. *J Anat* 2018;232:729-38.
 27. Webb AL, Green RA, Woodley SJ. The development of a core syllabus for teaching musculoskeletal anatomy of the vertebral column and limbs to medical students. *Clin Anat* 2019;32:974-1007.
 28. Moxham BJ, Stephens S, Sharma D, Loukas M. A core syllabus for the teaching of gross anatomy of the thorax to medical students. *Clin Anat* 2020;33:300-15.
 29. Tubbs RS, Sorenson EP, Sharma A, Benninger B, Norton N, Loukas M, Moxham BJ. The development of a core syllabus for the teaching of head and neck anatomy to medical students. *Clin Anat* 2014;27:321-30.
 30. Tubbs RS, Paulk PB. Essential anatomy of the head and neck: the complete Delphi Panel list. *Clin Anat* 2015;28:423.
 31. Moxham B, McHanwell S, Plaisant O, Pais D. A core syllabus for the teaching of neuroanatomy to medical students. *Clin Anat* 2015;28:706-16.