

COMMENTARY

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Relevancy of Embryology in Modern Medical Curriculum

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ABSTRACT

Traditionally, embryology is considered a valuable part of the medical curriculum. Over the last few decades, the time allocated for anatomy teaching has reduced significantly with embryology suffering the most compared to other disciplines of anatomy. Consequently, some medical schools around the world have excluded embryology from their curriculum. In this commentary, we evaluate the relevance of embryology in the current medical curriculum including exploring the current state of embryology teaching and learning as well as student perceptions towards embryology.

Keywords: *Embryology, Anatomy, Medical education, Medical curriculum*

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INTRODUCTION

Embryology, normally considered a part of anatomy, is a science concerned with processes and mechanisms associated with normal human development from the moment of fertilisation until birth (1, 2). Through embryology, we get to know how our body is first formed and what changes occur throughout our intrauterine development (3). Traditionally, embryology has long been regarded as an important component of preclinical basic medical science in medical curricula throughout the

world. However, over the past few decades, for some reason, embryology has lost its allure within medical education, and could possibly be excluded from the medical curriculum (4–6). In fact, some medical schools in the US and Canada have already removed embryology from their curriculum (4, 7, 8). In this short commentary, we discuss the current state of embryology teaching from evidence available in the literature and explore student perceptions and the relevance of embryology in medical curricula.

How is embryology taught in medical schools throughout the world? Available evidence shows that the teaching of embryology not only varies considerably between countries but also between different universities within the same country (9). In the US, according to the most recent available survey, embryology is taught in an integrated curriculum in 92% of medical schools there, with the remaining 8% as a stand-alone course (7). A survey in Canada revealed that almost 100% of medical schools taught embryology in integrated curriculum (8). In addition, there is variation on how the embryology lectures are delivered to medical students. Some medical schools integrated embryology with gross anatomy, some medical schools taught embryology in conjunction with histology, and some taught it as stand-alone lectures (9, 10). At Universiti Sains Malaysia, and many other medical schools in Malaysia, embryology is taught as stand-alone lectures in fully integrated curriculum.

Data collected in the US indicate that there has been a significant decrease in the time allocated to embryology teaching over the past century (11, 12). Although such data do not seem to have been gathered elsewhere, it is likely that a similar reduction in the allocated time to embryology teaching has occurred in other parts of the world. As for the US, the time devoted to embryology was reduced by over 75% between 1955 and 2017, that is from approximately 60 hours to 14 hours on average (7, 11, 12). In Canada, a survey conducted during the 2016/2017 academic year, found only 7 hours on average were dedicated to the teaching of embryology (8), which is a significant reduction in embryology teaching hours compared to three to four decades ago.

As mentioned, a few medical schools in the US and Canada have removed embryology from their medical curriculum. Despite that, majority of the medical schools throughout the world still maintain embryology as a core subject in their medical curriculum. There are several reasons why embryology is still

regarded as an important component of medical curricula and many medical schools want to maintain it in their curriculum. Firstly, a clear understanding of embryology provides insight regarding human creation and intrauterine development. Good knowledge of embryology enables students to appreciate human beginnings, including their own, from fusion of two reproductive cells (sperm and ovum) which undergo tremendous transformation to form a complex multicellular, multisystem entity (4). This understanding may instil a sense of humility into a student's conscience which would produce empathic and responsible future health practitioners. The second reason is that embryology provides an understanding regarding the sacred interaction between the embryo and its mother during intrauterine development. This includes the role of the mother in providing nutrients and protection to the developing embryo during pregnancy. Thirdly, studying embryology provides a basis for understanding the mechanism and processes of birth defect. Congenital conditions and birth defects are sadly not uncommon in the community, and it is estimated that up to 6% of infants are born with congenital conditions worldwide, resulting in over 295,000 deaths per annum (13). Finally, students should also be educated and aware of factors such as endogenous genetic or external environmental elements that may influence or increase the incidence of various congenital malformations.

What is the perception of students towards embryology? It is often assumed that medical students regard embryology as a boring, not easy to learn and low-yield subject which can be neglected. It is also often assumed that students would be happy if embryology were to be removed from the medical curriculum. However, the available evidence from the literature suggests otherwise. Perhaps surprisingly, a majority of students would like embryology to remain within the medical curriculum. A study by Hamilton and Carachi (5) on 146 British medical students revealed

that despite being unhappy with their current embryology teaching, the majority of them (81%) would like embryology to be retained in the medical curriculum. A larger study by Moxham et al. (9) on 1,600 medical students across Europe revealed the same pattern of positive attitudes among medical students towards embryology. A recent study in Ethiopia in 2022 showed overall positive perception among 246 medical students towards embryology with more than half of the students (68%) perceived embryology as the most clinically relevant basic sciences subject (14). Another study in India shows that medical students recognised the importance of embryology knowledge for their professional career as future medical practitioners with overall positive perception towards embryology (15). A similar study among Australian medical graduates found overwhelming number of students reported that embryology knowledge helped them during their clinical works (16). Therefore, from these past studies, embryology is still deemed as relevant to medical students and majority of them want it in the medical curriculum.

Therefore, the issue now is not whether embryology is still relevant in medical curriculum, but how to deliver the embryology knowledge to medical students effectively. The shift from traditional to integrated curricula has led to the reduction in time allocation for anatomy teaching, in which embryology suffered the most compared to other disciplines of anatomical sciences. Traditionally, embryology was taught via a series of lectures with no laboratory activities (10). Due to current time constraints, absolute adherence to traditional teaching methods may no longer be suitable for embryology. There have been many innovative approaches introduced by various researchers to teach embryology effectively and efficiently despite the restricted allocated time for embryology. For instance, the use of 3D virtual computer images and models has been shown to be superior to the traditional 2D images as

3D approach permits students to visualise in greater detail on the spatial relationships between certain embryonic structures and their dynamic process of development (17). The use of multimedia approaches such as recorded videos and interactive animation to supplement the existing lectures has been shown to enhance student's learning experience (18). Web-based learning (e-learning) is increasingly being used in many medical schools worldwide to deliver various learning activities via the internet. This method offers unlimited access to instructional resources and at the same time makes the learning flexible and efficient. The use of e-learning has increased exponentially during the COVID-19 pandemic throughout the world. In fact, e-learning is the only method available to engage students in learning especially during total lockdown to prevent the spread of the virus in the community (19). E-learning can be integrated into a curriculum that turns into a complete stand-alone course or as a supplement to traditional courses. Furthermore, a greater focus on clinical implications during embryology teaching has been shown to be effective in improving student interest and understanding of the subject (16).

CONCLUSION

What is the future of embryology education? One thing is almost certain; embryology will continue to be part of the medical curriculum in many medical schools throughout the world for the foreseeable future. Secondly, embryology teaching time is unlikely to be increased within the current medical curriculum and this should be acknowledged and accepted by educators involved in embryology teaching. In spite of the time limitation, educators can and should make appropriate adjustments in terms of course delivery and teaching methods so that students acquire the necessary embryology knowledge for safe medical practice (16). It has been shown that well-planned and well-constructed

teaching resources result in a high degree of satisfaction and confidence among students even within modern time constraints (20). In conclusion, embryology should be taught in the context of clinical conditions and to an appropriate level and depth, which are topics for future discussion.

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