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Vertical integration of anatomy curriculum in the undergraduate clinical education period: medical students' perspectives

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Abstract

Objectives: The adaptation of the knowledge and skills acquired in preclinical medical education to the clinics by vertical integration would be more permanent when combined with clinical skills. The aim of the study was to determine the needs of the students in clinical internship education on anatomy and to plan the relevant anatomy subjects before clinical internships by rearranging the curriculum as needed.

Methods: The study was carried out on a questionnaire form applied to 4th, 5th, and 6th-grade students of Bursa Uludağ University Faculty of Medicine. In addition to demographic information, 16 multiple-choice and open-ended evaluation questions were asked in the questionnaire.

Results: 335 students participated in the study. 84.4% of the participants reported that they had needed basic anatomy knowledge and they had to study again before the clinical internship. 69.59% of the participants stated that among the courses taken in the basic sciences education period, anatomy should be integrated into the clinical internships. 88.24% of the participants stated that anatomy education should be integrated before starting clinical internships in the surgical departments.

Conclusion: As a result of the feedback received from the students with the current study, it was seen that some of the anatomy information obtained during the preclinical basic sciences period was forgotten until the clinical internship period and they should be remembered again. We support that integrated clinical anatomy lessons should be taken into the clinical education period.

Keywords: anatomy education; clinical anatomy, medical education; vertical integration

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Introduction

Anatomy, which has been the cornerstone of medical education for hundreds of years, is an important resource for the examination of a patient, putting diagnosis, and informing the pathological findings to the patient and other healthcare professionals. The role of anatomy in the process of raising physician candidates and supporting modern medical practices is very well known. Since the beginning of medical education, anatomy has been included in the curriculum in all medical faculties.[1] The knowledge of anatomy is significant not only for medical education but also for the use of the obtained information in medical practice.[2] For medical students to minimize the medical errors, anatomy taught with both theoretical and practical applications should be supported with a clinical approach. Knowing the importance of anatomy and experiencing the anatomical knowledge in clinical practice will also contribute to the development of medical skills of students.[3]

Reducing time in anatomy education, which is the indispensable touchstone of the medical curriculum, leads to the suffocation of anatomy knowledge.[4] In recent years, there have been debates in the community of surgical professionals regarding the decline in anatomy education at the undergraduate level. In these discussions, issues related to the decrease in the time allocated to anatomy

lesson, the teaching staff and the dissections performed draw attention. Although it is difficult to evaluate this decrease in anatomy education objectively, some studies show that the knowledge level of physicians who should be qualified is below the acceptable level.[1,5,6]

Integration has been established between the disciplines taught at the same stage in traditional medical education such as anatomy, physiology, biochemistry. Integration in medical education can be horizontal, vertical and spiral. By definition, horizontal integration is the simultaneous delivery of similar subjects in basic sciences by different disciplines within the scope of a committee or block. Vertical integration is the simultaneous basic and clinical sciences education. Spiral integration is a combination of horizontal and vertical integration.[7]

In Turkey, basic medicine is taught particularly in the first three years. However, it is well known that, the knowledge and skills acquired especially in the early periods needs to be repeated to combine the basic knowledge with clinical experience.[8] For this reason, horizontal and vertical integration of the education program in Turkey is one of the national accreditation requirements of pregraduate medical education.[9]

The aim of the study was to determine the needs of anatomy knowledge in clinical practice, considering the views of students in clinical practice and raise awareness of the inclusion of clinical anatomy education in the medical education curriculum with vertical integration.

Materials and Methods

Students (4th and 5th grades and intern doctors) of Bursa Uludağ University Faculty of Medicine were included in the study. Due to the Covid-19 pandemic, questionnaire forms were applied online. The link addresses of the questionnaire are shared in student contact groups. Only volunteer students participated in the study. Filling out the questionnaire forms for the study was finalized in January 2021. Each student had the right to participate the survey once. A total of 335 volunteers (129 from fourth grade, 111 from fifth grade and 95 from intern doctors) participated in the study. In the questionnaire form, sixteen questions prepared with the five-point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree) for their opinions on the vertical integration of clinical anatomy education in addition to open-ended questions. SPSS (Statistical Package for Social Sciences) for Windows (Version 22, Chicago, IL, USA) was used for descriptive statistical analysis including the frequency distributions, mean score and standard deviation.

Results

The questionnaire form was answered by 335 volunteers (129 fourth-grade students, 111 fifth-grade students, and 95 intern doctors). Of these volunteers, 150 were males (44.8%) and 185 were females (55.2%).

The questionnaire and the rate of answers given in Likert scale were shown in **Table 1**.

The highest rate of the answers given to the direct question of "In which clinical training did you need to have your anatomy knowledge repeated?" was as "surgical trainings" at a rate of 82.98%. Among the surgical educations, the most common answer was general surgery with a rate of 42.38% and gynecology with a rate of 19.41%.

The highest rate of the answers given to the direct question of "How did you complete your forgotten information and lack of anatomy information?" was as "anatomy books and atlases" at a rate of 37.31%. This answer was followed by "anatomy lecture notes" (21.01%) and online sources (9.85%).

Another direct question was: "What do you think should be the difference between clinical anatomy education and basic topographic and systematic anatomy education?" To this question; 51.34% of the participants stated that the clinical anatomy should be taught with examples of the cases related to diseases, 32.53% stated that more usable information should be taught without unnecessary details.

The direct question "Which of the courses taken during the basic medical education period should be integrated into clinical education?" was answered as "anatomy" by 60.59% of the participants. Additionally, 37.91% declared that physiology and pharmacology should be integrated in clinical education.

Another direct question was: "In which internship did you most need to have your anatomy knowledge repeated?" To answer this question, 88.24% of the participants stated that anatomy education should be integrated before starting the clinical internships in the surgical departments and 31.37% of the participants stated that anatomy education should be integrated before the general surgery internship. In addition to this, %14.32 of the participants declared that the anatomy education should be integrated to clinical education of the orthopedics and traumatology internship.

The final direct question was: "Which of the courses given during the basic medical education period should be integrated into the clinical training education?". The results showed that 69.59% of the participants suggested anatomy to be integrated to the clinical internships. In addition to anatomy, the other answers were physiology and pharmacology.

Discussion

There have been debates about the place of anatomy in the medical curriculum.[5,10–12] There has been little consensus among medical education models on issues such as how much time should be devoted to anatomy education, how much content should be included, and how anatomy education should be given.[13]

Considering the history of medical education, it is seen that anatomy education is generally given in the first year of the undergraduate period. Although the specialists in clinical training re-evaluate the anatomy during the examinations, the physician candidates are exposed to very limited anatomy teaching in the following periods. It may be a solution to integrate anatomy education with vertical integration into the medical curriculum so that students can be exposed to anatomy education both in pre-clinical and clinical practice and in later professional life. By adapting this method, the amount of unnecessary theoretical anatomy knowledge given as a basis for clinical training and practice at the beginning of medical education will be reduced.[1]

In the report titled "Tomorrow's doctors: recommendations for undergraduate medical education" published by the General Medical Council in 1993, it was stated that the discontinuation of discipline-based education and the application of integrated (integrated) medicine formed by the combination of basic medicine and clinical medicine disciplines would be more effective.[14] Tomorrow's doctors (1993) stipulated that basic education in the first years of undergraduate education should be revised in later years.

The clinical importance and application of the anatomy, which is acquired in the first years of basic education is forgotten in the following years. Clinical educators reported that basic knowledge of clinical education should be reconstructed before moving into clinical practice.[2,15–17] The needs for the integration of the subjects in the curriculum have been clearly discussed in medical education meetings and published in the literature.[3] It was emphasized that the contents of the curriculum applied in medical schools should be oriented to the application by integration.[15]

In our study, 82.98% of the volunteers who participated in the survey answered that they needed to repeat anatomy knowledge in surgical trainings. Although anatomy education seems necessary mostly for surgical sciences, it is also important for any healthcare provider who will apply invasive procedures to the patients. Anatomy is necessary for performing emergency procedures, evaluating radiological images, performing a physical examination of a patient, and referring the patient to another doctor. This requirement is common to all branches of medicine.[1]

In the study of Waterson and Steward[12] in which 362 specialist doctors from Aberdeen University hospitals consulted, 64% of the participants stated that the current students did not have sufficient anatomy knowledge and 22% stated that the knowledge base was sufficient. In our study, totally 61.5% of the participants (18.8 strongly disagree, 42.7 disagree) declared that at the beginning of the clinical education, they didn't remember most of the anatomy knowledge they received during the basic medical education (Survey question 1, **Table 1**).

In the study by Waterson and Steward,[12] 68% of the participants stated that extending anatomy education to the medical curriculum would be valuable, while 17% stated that it would not be. In our study, in total, 53.1% of participants (39.1% agree, 14.0 strongly agree) stated that topographic anatomy should be integrated into clinical education (Survey question 7) and totally 82.3% of the participants (51.6 agree, 30.7 strongly agree) declared that systematic anatomy should be integrated into clinical education (Survey question 9, **Table 1**).

In current study, 51.34% of the participants stated that the clinical anatomy should be taught with examples of the cases related to diseases and 32.53% stated that more usable information should be taught without unnecessary details. In the study of Waterson and Steward,[12] the participants have come to a general consensus that the clinical significance of the anatomical structures should be taught rather than morphological details in the first years of undergraduate education.

Medical education is an interactive transformation process that results in students learning to care for patients by actively interacting with people. Much of this process can take place in clinical skill laboratories where basic and clinical sciences can be integrated.[18] Educators who organize medical education curriculum should adjust the most appropriate balance between basic and clinical sciences. In innovative educational approaches such as problem-based learning it is aimed to integrate clinical sciences with basic sciences.[6]

In a study of Khan et al.[19] majority of the 200 participants agreed that "Applying anatomy knowledge to clinical practice is a skill that should be reinforced early in medical education". And nearly all of them agreed "With anatomy, it is first necessary to learn as many facts as possible and then learn to apply them in the clinical skills".

As a result of the study conducted by Dawson et al.;[2] 48% of the students who were at the beginning of the clinical education stated that the basic anatomy education received in the first years should be given in the form of teaching packages in the following years. Most of the students who are at the beginning of their clinical practice

Table 1

The descriptive statistical analysis including the frequency distributions (%), mean score and standard deviation values of the answers given to the questions. .

Questions	Strongly disagree	Disagree	Undecided	Agree	Strongly agree	Mean±SD
At the beginning of the clinical education (Period 4-5), I remembered most of the anatomy knowledge I received during the basic medical education.	18.8%	42.7%	21.5%	15.8%	1.2%	2.37±0.54
In the clinical education process, I used and benefited most of the anatomy knowledge I received during basic medical education.	9.0%	32.8%	27.5%	28.1%	2.7%	2.83±0.56
During the clinical education process, I needed the anatomy knowledge I received during the basic medical education period, but I needed to study this information again.	0.3%	6.6%	8.7%	54.3%	30.1%	4.07±0.45
In my clinical education, I used my resources in basic medical education in terms of anatomy knowledge.	9.0%	30.1%	11.6%	37.9%	11.3%	3.12±0.66
In the clinical training, deeper and advanced information was given in terms of anatomy.	18.5%	45.4%	18.2%	13.4%	4.5%	2.40±0.6
Education of topographic anatomy (introduction to anatomy, basic information about anatomy, muscle, bone and joint anatomy) is sufficient to be given in basic medical sciences.	8.1%	36.4%	17.3%	31.6%	6.6%	2.92±0.61
Topographic anatomy training should also be given within clinical sciences.	5.4%	23.0%	18.5%	39.1%	14.0%	3.33±0.62
Systematic anatomy (circulatory, respiratory, urogenital, digestive and nervous system anatomy) education is sufficient during the basic medical education period.	15.8%	45.1%	19.7%	15.2%	4.2%	2.46±0.57
Systematic anatomy training should also be given at the beginning of the relevant clinical education within the clinical sciences.	5.0%	6.3%	9.9%	51.6%	30.7%	4.03±0.48
Anatomy education in the clinical sciences period should be given by the specialist of the relevant clinical education.	3.0%	11.9%	28.4%	45.7%	11.0%	3.50±0.52
Anatomy education should be given by anatomists during the clinical education period.	7.2%	27.5%	31.6%	25.7%	8.1%	3.00±0.58
Anatomy education in the clinical education period should only be repeated as a seminar.	7.5%	7.5%	21.5%	43.9%	4.2%	3.14±0.57
Anatomy training during the clinical training period should be repeated on the cadaver.	15.5%	31.9%	18.5%	25.7%	8.4%	2.79± 0.66
Anatomy training during the clinical training period should be repeated both as a seminar and on the cadaver.	9.3%	29.9%	20.0%	28.1%	12.8%	3.05±0.66
Anatomy education in the clinical education period should be interactive and student-centered.	1.2%	6.6%	10.7%	52.2%	29.3%	4.01±0.48
Anatomy training should also be in the 3rd year	13.4%	27.5%	23.9%	26.3%	9.0%	2.89±0.65

agreed that anatomy lectures should be given in general surgery, cardiology and orthopedics departments. 69.6% of those who completed their clinical practice stated that anatomy lectures should be given in general surgery and orthopedics departments.

In our study, 31.37% of the participants stated that anatomy education should be integrated before starting the general surgery internship and %14.32 of the participants suggested that the anatomy education should be integrated to clinical education of the orthopedics and traumatology internship. Finally we would like to emphasize once more that anatomy education is an important part of clinical education, and that education should be based on practical training with cadavers.[20]

As conclusion, the results of the feedback received from the students indicated that some of the anatomy knowledge obtained in the period of pre-clinical period was forgotten until the clinical internship education and they had to be remembered again. In this context, we believe that integrating anatomy courses into clinical internship education and applying the vertical integration model by reviewing the curriculum will increase the quality of medical education.

Conflict of Interest

There are no conflicts of interest.

Author Contributions

All the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version. All authors have read the content of the article and accept their responsibility. SB: project development, data collection, data analysis, manuscript writing, editing manuscript; NTC: project development, manuscript writing; IMK: project development, data analysis, manuscript editing; MOA: data analysis, manuscript editing.

Ethics Approval

The study was conducted with the approval of Bursa Uludağ University Faculty of Medicine Clinical Research Ethics Committee (2019-20/20).

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