

Basic medical sciences should be mainly taught by clinicians for a tight integration of basic and clinical sciences in medical education.

Tıp eğitiminde temel ve klinik bilimlerin sıkı entegrasyonu için temel bilimler esas olarak klinisyenler tarafından öğretilmelidir.

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ABSTRACT

Today, medical education faces many problems. However, the most serious problem is the inability to integrate basic and clinical sciences. For this reason, students alienate from basic sciences, and clinicians are leaving sciences to basic scientists every day. Basic medical sciences learned in the preclinical term are remembered less by students and cannot be sufficiently associated with clinical reality. This is because basic scientific knowledge learned without a clinical framework is low-value data that the student does not know how to use. Therefore, all reform initiatives in the medical education curriculum stick to the obstacle of basic sciences. Now is the time to take bold steps. The first step should be to remove the preclinical term from medical education. Medical education should only consist of clinical education terms. This will gain the student and clinician a lot more time for clinical training. The second step should be to take basic sciences education from basic scientists and place it under the responsibility of clinicians. Clinicians can decide much better how much of basic science knowledge is clinically relevant. As a component of clinical education, it is best for students to internalize the basic sciences during classes, at the bedside, and in other clinical practices under the clinician's authority. Thus, students may be graduated as academic clinicians who have internalized the basic sciences and integrated the basic sciences with clinical reality.

Keywords: medical education, curriculum, clinical apprenticeship, integration, basic medical sciences

ÖZ

Bugün tıp eğitimi birçok sorunla karşı karşıyadır. Fakat en ağır sorun temel ve klinik bilimlerin entegre edilememesidir. Bu nedenle öğrenciler temel bilimlerden soğumuş, klinisyenler ise bilimi temel bilimcilere bırakmıştır. Klinik öncesi dönemde öğrenilen temel bilimler öğrenciler tarafından unutulmakta, klinik bilgiyle bağdaştırılmamaktadır. Çünkü klinik bilgi olmadan öğrenilen bir temel bilim bilgisi öğrenci için nasıl kullanacağını bilmediği düşük değerli bir bilgidir. Bu yüzden tıp eğitimi müfredatındaki her reform temel bilimlere takılıp kalmaktadır. Artık cesur adımlar atmanın zamanı gelmiştir. Birinci adım tıp eğitiminden klinik öncesi dönemin çıkarılması olmalıdır. Tıp eğitimi tamamen klinik eğitim döneminden oluşmalıdır. Bu durum klinik eğitim için öğrenciye ve klinisyen öğreticiye çok daha fazla zaman kazandıracaktır. İkinci adım temel bilim eğitiminin temel bilimcilerden alınıp klinisyenlerin sorumluluğuna verilmesi olmalıdır. Bir temel bilim bilgisinin ne kadarının hangi şekilde klinikle ilişkili olduğuna bir temel bilimci değil ancak klinisyen karar verebilir. Temel bilimlerin klinik eğitimin bir bileşeni olarak klinisyen tarafından derslik, hasta başı ve diğer klinik uygulamalar sırasında öğrenciye özümsetilmesi en doğrusudur. Böylece öğrenciler temel bilimleri özümsemiş ve temel bilimleri klinik durumla entegre etmiş akademik klinisyenler olarak yetişecektir.

Anahtar Kelimeler: tıp eğitimi, müfredat, klinik stajlar, entegrasyon, temel bilimler

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Introduction

Today, medical education faces serious challenges [1]. Contrary to popular belief, this difficulty is not caused by new developments. The main reason for the problem is that medical education has been divided into basic and clinical sciences since the Flexner report. The inclusion of basic sciences in medical education originally integrated research into teaching and patient care. A clinician could be an equally good researcher, doctor, and teacher. However, over time, as the basic sciences became molecular, clinicians could not cope with this situation and had to leave the basic sciences to the scientists [2].

Many innovations such as problem-based learning, team-based learning, and the use of simulation have occurred in medical education. However, the impact of all these developments on clinician training has been quite limited [3]. Therefore, reforming the medical education curriculum is an ongoing issue. However, interventions remain at the level of curricular tampering rather than producing a fundamental change [4]. The main focus of the reform is on the preclinical years of the curriculum, while the internship structure of the undergraduate clinical years has remained largely unchanged [5]. In other words, despite many interventions, basic and clinical sciences still could not be integrated [4].

While students receive basic sciences education, they cannot establish an adequate relationship with clinical reality. Therefore, basic sciences begin to be forgotten in the early days of clinical education [3]. To solve this problem, there are suggestions such as a revision of basic sciences at the end of clinical education. More precisely, it is recommended that students review basic sciences after acquiring clinical knowledge and in this way integrate basic and clinical sciences [6].

The biggest obstacle to reforming the medical curriculum is the separation of education into basic and clinical sciences [4]. In the author's opinion, there are two main problems arising from this separation. The first problem is the perception that basic sciences should be taught before clinical sciences. This situation ossifies the curriculum and hampers any serious reform. The second problem is that basic sciences are taught

separately from and before clinical education, leading to the perception that this education should be mainly given by basic scientists. As a result, today, physicians who do not remember the knowledge they learned in the preclinical years and who cannot integrate basic sciences with clinical knowledge can still become good clinicians [7].

It is an important problem that clinicians do not grow well in the field of basic sciences and leave basic sciences to scientists [8]. In medical education, it does not seem right to teach basic sciences first and then clinical sciences. The author proposes that basic sciences be taught as a component of clinical sciences- not first and foremost. More importantly, as a basic scientist, the author recommend that basic sciences be taught mainly by clinicians.

The involvement of basic sciences in the medical education curriculum

Abraham Flexner convinced the medical authority of his time that basic sciences should be a critical component of the medical education curriculum, thus creating the "preclinical curriculum" [6]. Today, more than 100 years after the Flexner Report initiated major reforms in American and Canadian medical schools, the overall format of medical education is still more or less the same. The preclinical education period is followed by a series of clinical education experiences. Since the time basic medical sciences education entered the curriculum, it has been taught mainly in a didactic format [3]. However, it is seen that didactic education is not effective even in the professional period [9].

The medical education system today follows a similar path all over the world. The medical school curriculum, which accepts high school graduates, consists of premedical sciences, basic medical sciences, and clinical medicine (usually 5 to 7 years). The curriculum of medical faculties that accept bachelor's graduates consists of basic medicine and clinical medicine (usually 4 years) [10]. Preclinical and basic sciences are taught before clinical sciences. In some medical schools, clinical courses are started to be given from the beginning of medical education in order to introduce the student to the clinical environment

at an early stage.

The aim of basic sciences education is for the clinician to establish a relationship between the disease and its biological basis when making clinical decisions [7]. Basic medical sciences include mainly anatomy, physiology, biochemistry, microbiology, pharmacology, and pathology. The student receives basic sciences education for 1.5 to 2 years in a 4-year curriculum and 2 to 3 years in a longer curriculum. The education is given by basic scientists who are not clinicians but have a doctorate in the relevant field. Thus, it is aimed that medical doctors will be educated as academic clinicians.

The decline of basic sciences in medical education

Unfortunately, medical students' interest in basic sciences has decreased considerably in recent years. Today, in many places of the world, medical school students do not actually attend preclinical classes unless attendance is compulsory. Instead, they prefer self-learning the lessons from video recordings or other sources [11]. Many students question the necessity of basic sciences in medical education. Many clinical students state that they do not understand why they are taught preclinical subjects that do not seem relevant to clinical sciences [12]. An important reason for the decrease in students' interest is that basic sciences are taught independently from the clinical sciences. Conversations with medical students about the first-year medical curriculum reveal that about half of the lessons progress without even a simple case of a patient [13]. As a result, it has been observed that senior medical students do not remember much from their first-year basic sciences subjects [12].

The fact that preclinical courses are not remembered in the following years and are not associated with clinical reality has discredited basic sciences. Today, the interest in basic sciences has decreased considerably, and it is seen as a burden by students. Some scholars propose a basic medical sciences recovery plan and recommend that basic sciences be given in clinical years [5]. They claim that revising the basic sciences in the senior year will both increase the extent to which students recall basic sciences and

improve their understanding of clinical medicine [6]. Some researchers, on the other hand, suggest that preclinical courses should be taught with a video system outside the lecture hall, or even teaching preclinical courses in the classroom should be abolished altogether [11-13]. Emanuel boldly emphasizes that from 2025, all basic sciences courses should be offered online only [11].

Integration of basic sciences into clinical medicine

A major challenge to reform in medical education is the historical separation of basic and clinical sciences. It is necessary to integrate basic and clinical medical sciences throughout medical education. In this way, students should be able to think about clinical practices while learning basic sciences and scientific principles while learning clinical practice [4]. However, today, the separated curriculum structure has largely left to the student's own efforts the integration of discipline-based knowledge with disease-oriented knowledge [14]. One of the problems is that basic sciences are taught independently and before clinical sciences. As a result of this situation, it is not possible for students to associate the concepts of basic sciences with clinical practice without adequate clinical training [6]. Basic sciences are the language of medicine and the basis of clinical knowledge, so the integration problem should be solved by ensuring harmony between basic and clinical sciences in the curriculum [15]. According to medical professionals, an understanding of the content of basic sciences is essential for competent clinical practice. They suggest that basic sciences education should be integrated with clinical practice throughout all undergraduate medical education [5].

While clinicians are in favor of the integration of basic sciences, basic scientists are reluctant. It is reported that in general, basic scientists have a negative attitude toward integration and change [4]. The idea of integration often assumes that the basic scientist and clinician come together to teach students in a hall or sometimes at the bedside. Imagine a discussion in a classroom involving students, a child with a metabolic disease, their parents, the treating clinician, and a biochemistry

professor [13]. Or imagine basic scientists included in departmental visits of clinicians [8]. It is difficult to even imagine people in such different positions coming together. Also, what kind of a scientific hierarchical relationship will be established between a basic scientist and a clinician in the same hall or at the bedside? Where the clinician is, a basic scientist will always feel compelled to withdraw. This is because the students in the hall or at the bedside are medical students, and their role models are primarily clinicians. The clinician will naturally be in a dominant position. Moreover, while the clinician is familiar with all clinical and partially all basic sciences related to the patient's disease, the basic scientist is only an expert in their field. In this case, a basic scientist cannot be expected to want to come together to lecture with the clinician for integration purposes. The main problem here is the point of view of clinicians and basic scientists. While clinicians have patient and disease-focused assessments, basic scientists often have a molecular-based scientific perspective, far from the clinic. In the end, students will not be able to integrate two differently originated types of knowledge, so the knowledge emphasized by the clinician will be dominant.

It is clear that the idea of bringing basic scientists together with clinicians is not a solution for integration. If students are desired to gain scientific curiosity and the research spirit, it should be ensured that each student participates in at least a few basic scientific studies throughout their study period. Make sure basic scientists are very enthusiastic about it.

Teaching basic medical sciences to medical students by clinicians

Preclinical sciences are taught, often didactically, by basic scientists. Basic scientists are not physicians or clinicians; they are trained in non-medical fields. They have little or no knowledge of clinical medicine. They know little about the relevance of the knowledge they teach to both other branches in the basic sciences and clinical reality. If radical reform and integration in medical education are desired, it must start with the teaching staff first. Researchers interested in educational transformation largely agree that any

attempt to significantly change the curriculum must begin with the teaching staff and continue to keep them at the center of change [4].

This article's suggestion is that basic medical sciences education should be given mainly by clinicians. Clinical education should begin at the beginning of medical education. Basic sciences should be given by clinicians during classroom and bedside practices of clinical medical education. The reality is that much of the knowledge learned in the preclinical term is lost during the clinical years. Much of the knowledge of basic sciences given is unrelated to clinical reality and leads the student to waste their time. What needs to be done is a review of all basic sciences by relevant clinicians; thus, the revised knowledge is transferred to the student by the clinician in the clinical context.

In fact, there is also a decline in clinical sciences today. For example, bedside learning is seen as one of the most important methods of teaching various skills important to the medical profession, but its use is decreasing [16]. Clinicians have left the science to basic scientists, and the bedside teaching and apprenticeship model has also declined [8-17]. What needs to be done is a student-centered education in a more professional climate where basic and clinical sciences are integrated with the clinician's identity by revising the classical apprenticeship model [17]. At this point, two important inadequacies of clinicians emerge. The first is the issue of developing teaching skills because clinician teachers acquire their teaching skills without any formal training [18]. Secondly, clinicians should achieve competency in the basic sciences of their field since they do not feel knowledgeable enough about teaching basic sciences [5].

What basic sciences courses should be taught by a clinician? Take epilepsy, for example. Neurosurgeons can teach the anatomy of the brain, and pathologists can introduce the histology of the brain cells as much as the student needs in the clinical context. A neurologist can easily teach the physiology, biochemistry, and pathophysiology of the brain. In fact, a neurologist, not a pharmacologist, can explain in detail antiepileptic drugs in the clinical context. As a pharmacologist

and medical doctor but not a neurologist, the author is of this opinion, because students express often their discomfort which they learn this information away from the clinical context.

The student should learn about a drug from the clinician who made the decision to administer it to the patient. The student should learn the anatomy of the brain from a neurosurgeon performing brain surgery. This is because knowledge detached from clinical context is of low value, dry, and unlovable for a medical student.

In fact, a clinician, for example, a cardiologist, should already know the anatomy, histology, physiology, biochemistry, pathology, and pharmacology of the heart. Medical doctors already learn all this during their medical training but forget most of it because too much information is loaded, and the clinical context is not established. For example, a cardiologist can teach the essence of all basic sciences of the heart to their students by spending 5 to 10 minutes in each lesson during the clinical term. A clinician can teach basic subjects at the right times during clinical applications and in other clinical education practices, so the internalization and absorption of basic sciences can be enabled.

How will the clinician learn basic medical sciences? All clinicians have already taken all courses related to basic sciences during their school years. However, they remember less of a lot of knowledge of basic sciences as time passes. By watching short videos (5 to 10 minutes), they can overcome their inadequacy in basic sciences [3]. Basic scientists will have more time when basic sciences education is placed under the responsibility of clinicians. As an alternative option, basic scientists can provide brief lectures for clinicians. Thus, the relationship between the clinician and the basic scientist continues in a different dimension. The clinician learns the most up-to-date knowledge from the basic scientist and internalizes it by relating it to clinical reality. Then, the clinician transfers the internalized knowledge to students little by little and continuously throughout the clinical education term. Thus, both students may be trained to become academic clinicians and the clinician may gain new academic and scientific skills.

Clinicians are responsible for conveying basic

medical knowledge to students, providing clinical skills, and instilling the values of the profession into students [2]. Today, apprenticeship experience with clinical instructors is becoming more and more important in medical education. Exposure to physician-educator-scientist role models that demonstrate the integration of sciences and clinical practice during education is important to motivate clinical students into investing in research education [7]. It is necessary to increase the contact between faculty members and clinical students [19]. The involvement of basic sciences in clinical education will lead to the abolition of the preclinical period in medical education. Thus, medical education will consist of only clinical education terms from the beginning. This will prolong the clinical education term, and the clinician and apprentice relationship will continue for a much longer time. One of the things that medical students need most is to establish more communication and relationship with their scholars, both professionally and humanely [19].

Conclusion

The uniqueness of medical school is not classroom-based preclinical education. The most important aspect of medical education emerges in the apprenticeship model, where an experienced physician and student share clinical situations, and the transfer of knowledge and learning is inextricably intertwined with patient care. The main task of medical schools is to focus their students on clinical education and redesign medical education [11]. The challenge in fundamentally redesigning the content of medical education is to find and prepare faculty members to teach the revised curriculum [2]. Putting new courses in the medical education curriculum and putting a new burden on the student is not the solution. As a matter of fact, studies show that one in two students suffer from burnout even before they start residency [20]. For students, graduating from medical school as soon as possible and entering the physician workforce is critical and should be supported [3].

In conclusion, the main problem in medical education is that basic and clinical sciences are learned in isolation from each other, and basic sciences are taught by non-clinician professors. The primary solution to this problem is to remove

all preclinical terms from the curriculum and to continue medical education completely in the clinical context. Then, clinicians should teach basic sciences and enable students to internalize them as part of clinical knowledge. Thus, the new generation of medical doctors can graduate as academic clinicians who have internalized the basic sciences and integrated the basic sciences with clinical reality.

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