



## Integration of Basic Sciences with Clinical Medicine

### Introduction

Flexner in twenty century reported that one of the most important parts of medical education is teaching the science from basic to clinical (1). Before his report, medical science was professing as a traditional in medical universities. With extension of basic sciences, the association of modern clinical science with it, was undeniable. In Flexner report, with emphasizing on raising scientific dimension of clinical medicine, it has been suggested to change educational curriculum into two years of basic sciences in the medical faculty plus two years of clinical education in educational hospitals (2+2 curriculum) (2). Years after applying this change in medical curriculum, complete dissociation of these two phases raised concerns, and integration of basic sciences with clinical medicine, namely "vertical integration" was introduced (3). Since then, how this integration should take place is a matter of question.

This approach led to obviate barriers between basic sciences and clinical medicine, making students to think deeply and brighter in facing clinical issues in future. Based on this integration, in the two years of basic sciences, lessons are studied based on clinical medicine, which prevent overload of data, what happens in traditional method with over emphasizing on minor details, and in two years of clinical medicine some courses recalling basic sciences (back to basic science) are presented (4,5). The most beneficial aspects of this integration is to emphasizing the importance of basic sciences in clinical medicine (6). For example, considering a patient with biliary stone and pancreatitis, the importance of bile formation and pancreas function, anatomy of biliary tract and pancreas and their approximation becomes clear. Moreover, in presenting a patient with chronic obstructive pulmonary disease, the importance of air circulation physiology, oxygenation and histology of air disease becomes

prominent. Previous studies showed that in students of integrated curriculum, comparing to those of traditional method, scientific data has better half-life, due to deep concepts, make it applicable and removing less important details (7,8). In conclusion, integration, makes lessons more understandable with thinking deeper in basic sciences. University professors and students welcomed this integration (9).

Students in higher grades review basic sciences with integration method for its importance and utilization (10). Integration has three basic principles including (4):

1. Early clinical experience: introducing important topics to medical students (11)
2. Clinician-scientist partnership
3. Ongoing incorporation of science in later years

There are many ways to change study methods using integration. The two major ways are (7-9, 12):

1. Contextualization of basic sciences' concept teaching
2. Shared teaching

### Contextualization of basic science concept teaching

It is the applicability of basic sciences in clinical cases. For this reason, there are some ways including problem based learning methods, simulated cases with basic science application and teaching clinical points within basic science courses. Simulated cases with basic science application is the best way (13), especially in the first two years of study leading to better understanding (14, 15).

### Current approach

In a review of medical universities around the world we found that Rochester University has integrated basic and clinical sciences from the beginning of the course (16). In Cleveland clinic university, basic science is taught in organ based system through problem based learning with early

clinical experience exposure in year one. Organ based system teaching is also evident in Duke, University of Central Florida, Temple University school of medicine, University of Virginia and Pennsylvania university too (17-20). In Oxford and McGill universities, fundamental of medicine is taught in first years, and then by early exposure to clinical setting, attention to clinical significance will encouraged (21, 22). In Yale University the first 18 months is dedicated to integrated clinical and basic science (23). In Melbourne Medical School, integration of bioscience and clinical features is through case-based teaching approach (24).

### Shared teaching

Shared teaching or consecutive teaching of basic and clinical sciences needs major coordination between these groups. In summary, integration of basic and clinical sciences is a modern educational technique, which has following advantages:

1. Prevention of overloading details with minor significance
2. Clearing the position of basic science in clinical practice between students
3. Making the basic sciences practical and meaningful
4. Targeting basic sciences teaching needed by medical students by creating a two-way relationship between clinical and basic sciences faculty members
5. Providing incentives for further educational and research among medical students of basic sciences

### Our approach

In Tehran University of Medical Sciences, we have early clinical exposure in which students join clinical rounds as observers and then in ground round and conference room the cases are discussed to become clarified. Moreover, we have organ specific integrated blocks, which at end of it a clinical scenario will presented and discussed with basic and clinical professors. Also, we have some "back to basic science" sessions, which basic science professors participate in clinical rounds, depending on the cases.

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