



# Effect of Clinical Pathology Course on Attitude and Learning in Medical Students Taking Clinical Laboratory Course in Kerman University of Medical Sciences

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## Abstract

**Background:** According to the importance of the clinical pathology for diagnosis, decision making regarding preventive and minimally invasive methods, and treatment follow-ups, it is useful to familiarize medical students with better utilization of laboratory tests before clinical practice and incorporate them into the curriculum.

**Objectives:** The current study aimed at investigating the quality of education and satisfaction with clinical pathology course among medical students at physiopathology level initiated since 2014 at Kerman University of Medical Sciences for further systematization of the curriculum, and its efficacy in increasing students' knowledge.

**Methods:** In the current interventional study, medical students at physiopathology level were enrolled and, after making necessary coordination with the Deputy of Education, a one-unit clinical pathology course was added to routine (five-unit) physiopathology course for the students attending the second semester of 2013 - 2014 academic year. Two groups of students attending internship program including 42 subjects that took the clinical pathology course and 42 other ones that did not take the course were consecutively enrolled. A questionnaire was distributed among the subjects in the two groups and the obtained data were analyzed with SPSS version 19.0 using chi-square test.

**Results:** Overall, the medical students in both groups believed that clinical pathology course was essential for both theoretical and practical education. Most of the students in the two groups perceived that the inclusion of clinical pathology course in physiopathology course was good. Both groups perceived the course as useful for better management of patients in postgraduate studies.

**Conclusions:** There is no theoretical and applied academic course with rational systematic training objectives in the clinical pathology field for better utilization of laboratory tests. It highlights the need for paying further attention and planning in this field.

**Keywords:** Clinical Pathology, Learning, Medical Education

## 1. Background

Appropriate interpretation of laboratory test results is an essential part of medical education, and academic centers play the main role in achieving this goal (1). Regarding the importance of clinical pathology for diagnosis, decision making regarding preventive and minimally invasive methods, and treatment follow-ups, it is essential to familiarize students with this applied science that addresses rational request for a laboratory test, use of laboratory tests to confirm or reject the diagnosis, sampling and sample transfer methods, necessary conditions for laboratory tests, interactions, and occasionally fatal errors (1-3). There are different methods to teach the laboratory sciences to

medical students; to ensure taking important educational principles into consideration, medical universities should first set their specific goals and plan for achieving them (3). In recent years, unnecessary repeated requests for laboratory tests and misinterpretation of the test results in medical education centers have inevitably led to misdiagnoses and additional costs, highlighting the importance of further education in this field (4). However, teaching clinical pathology to medical students is neglected in many countries including Iran (5). Insufficient educational facilities in pathology laboratories and mere theoretical education in universities resulted in dissatisfaction among medical students (6), as observed in a study from the United States

(1). Therefore, the selection of effective teaching method as well as time, location, and target group of education in this field is an important challenge in academic centers precluding efficient utilization of laboratory services as reported by Iran Ministry of Health and Medical Education (6, 7). In addition, new sophisticated laboratory techniques make it essential to increase the knowledge of medical students to make the best interpretations of the requested laboratory tests through appropriate training (8).

## 2. Objectives

The current study aimed at investigating the quality of education in clinical pathology science from the perspective of medical students at physiopathology level. The program was initiated in 2014 at Kerman University of Medical Sciences to increase the capabilities of students with respect to applied laboratory skills.

## 3. Methods

In the current interventional study, 84 medical students at physiopathology level were consecutively enrolled and, after making the necessary coordination with the Deputy of Education, a one-unit clinical pathology course was added to the routine (five-unit) pathology course in the second semester of 2013 - 2014 academic year. Inclusion criteria for the subjects were being a medical student and having interest to participate in the study; the exclusion criteria were failure to complete participation in the study and incomplete data. Two groups of internship students including 42 subjects that took the clinical pathology course and 42 ones that did not take this course were consecutively enrolled. The main topics were selected after consultation with the Deputy of Education and the Department of Internal Medicine, and according to the students' requirements in different clinical areas including knowledge and interpretation of biochemical (liver, gastrointestinal, pancreas, rheumatology, kidney, and pregnancy) tests, urinalysis, body fluid, hematology, and coagulation tests, hemovigilance system and blood bank, and infectious diseases and immunological tests.

Therefore, a program was designed and offered as a 17-session (25-hour) teaching theoretical course using PowerPoint by a pathologist. After completion of the semester, the evaluation was performed by a questionnaire presented by the department and separately administered to the two groups of medical students. The questionnaire included multiple choice questions with four to six options about the time and method of teaching (pathology or clinical practitioners versus basic sciences experts), necessity

of assessment, and the effect of clinical pathology course on increasing the knowledge and interest among medical students.

For validity, the pathologists were asked to comment on the questionnaire items and for reliability, the Cronbach's alpha coefficient was calculated at 90%. The study design and objectives were explained to participants in order to encourage them to better cooperate with the study. The data obtained from the questionnaires were analyzed with SPSS version 19.0 using chi-square test.

## 4. Results

In the current study, 30 male and 54 female students were enrolled with the mean age of 23 years. Regarding the necessity of the course, 31 (73.9%) and 29 (69.1%) subjects respectively perceived it as almost and highly necessary and totally 28 (66%) subjects in each group reported the continuation of this course as necessary. The majority of subjects that completed the course (40.5%) believed that it should be offered at clerkship level (clinical stage) and 38.1% believed that the physiopathology level (pre-clinical stage) is the best time to offer the course. Of the subjects that did not take the course, 59.5% perceived the clerkship level as most appropriate time to offer the course; however, there was no statistically significant difference between the two groups ( $P > 0.05$ ). In addition, 21 (51.2%) and 20 (47.6%) subjects who respectively took and did not take the course believed that the course would be useful for the management of patients, with no significant difference ( $P > 0.05$ ). Both groups perceived that recommendation of reference book has no priority, and there was no significant difference in this regard between the groups.

Nineteen (42.5%) students who took the course and 10 (23.8%) students who did not take the course believed that they needed further training in biochemistry and hematology tests, respectively. The students who took the course reported the clinical specialists (internal medicine specialists, pediatricians, and infectious diseases specialists) as being the better group, in comparison to with pathologists, for teaching [20 (47.6%) versus 17 (40.5%)], while the corresponding rates were, respectively 12 (28.6%) and 21 (50%) in students that did not take the course, yet the difference between the two groups was not statistically significant ( $P > 0.05$ ). The opinions of the two groups regarding the discrepancies of the laboratory tests interpretations during the visit of patients were elicited. Trained and non-trained students believed that 50% and 82.9% of their interpretations were respectively different from those of the other group ( $P < 0.05$ ). Only 21 (50%) subjects who completed the course were interested in being a direct observer or operator in the hospital's medical laboratory.

Among the subjects who did not take the course, 55% believed that the need for laboratory references would be moderate to high mainly due to the interpretation of the laboratory tests results, drug and food interactions with laboratory tests, preparations for tests, and correct sampling; 19 (79.2%) students in this group reported insufficiency of education in the interpretation of biochemical test results and blood transfusion in the medical education (Table 1).

**Table 1.** Comparison of the Viewpoints of Medical Interns About the Clinical Pathology Course in Kerman University of Medical Sciences Based on the Status of Taking the Course

Variable	Course		P Value
	Taken	Not Taken	
<b>Necessity</b>			0.306
High	18 (42.9)	22 (52.4)	
Moderate	13 (31.0)	7 (16.7)	
Low	11 (26.2)	13 (31.0)	
<b>Efficacy</b>			0.920
High	21 (51.2)	20 (47.6)	
Moderate	12 (29.3)	14 (33.3)	
Low, not interested and no idea	8 (19.5)	8 (19.0)	
<b>Continuation</b>			0.114
High	8 (19.5)	17 (40.5)	
Moderate	19 (46.3)	11 (26.2)	
Low	5 (12.2)	7 (16.7)	
Not interested and no idea	9 (22.0)	7 (16.7)	
<b>Quality</b>			0.621
High	10 (23.8)	14 (33.3)	
Moderate	20 (47.6)	18 (42.9)	
Low and no idea	12 (28.6)	10 (23.8)	
<b>Effects on clinical practice</b>			0.002
High and moderate	21 (50.0)	34 (82.9)	
Low, not interested and no idea	21 (50.0)	7 (17.1)	

## 5. Discussion

Rational request for clinical tests and their correct interpretation could result in appropriate utilization of laboratory tests and less costs, in addition to better therapeutic and diagnostic outcomes (4). Smith et al., from the United States investigated teaching of clinical laboratory tests (clinical pathology) and reported that approximately

all (93%) of the participants attending the clinical laboratory course considered teaching based on a predetermined curriculum as necessary (9). The current study results revealed that in both groups, the majority of subjects perceived this course as necessary with desirable effects on the management of patients in clinical course. It is, therefore, necessary that medical students believe in the necessity of appropriate utilization of laboratory tests, interpretation of their results, and their clinical relevance. The study by Gottfried et al. (10), from the United States recommended a two-week clinical course for the undergraduate medical students.

The study by Smith et al., showed that clinical pathology course should be incorporated in the clinical and preclinical stages (3). Omidifar et al., (5) investigated the efficacy of a 1.5-day applied laboratory workshop for three groups of medical students, consisting of physiopathology (first year), the clinical course and the last year (traineeship), by comparison of the multiple choice question test results before and after the intervention. They suggested an applied course of clinical pathology by clinical pathologists for the students of clinical fields at clerkship stage with other applied rotations. All students perceived simultaneous offering of theoretical and applied courses as necessary, but neither of the groups were interested in using reference books due to low preference for them. Currently, in the majority of universities in Iran, the clinical pathology is taught theoretically with booklets instead of the reference books (6, 7). The study by Smith et al., suggested this course to be incorporated into small focus groups discussing clinical relevance, case-based discussions, and problem-based learning. The study by Talebi et al., (11) demonstrated that despite being old, question-answer method was useful to teach the clinical pathology.

The study by Nikolic et al., revealed that students were not interested in being a direct observer or operator during this course, but presentation of the course in the laboratory and direct contact with the laboratory staff resulted in better learning due to higher motivation (12). The study by Smith et al., (9) showed that the barriers this course faced included lack of sufficient time specified in the clinical curriculum or before clinical stages, and lack of knowledge and interest among physicians. In that study, 78% of the participants were enrolled in this course in the first or second years of medical education and only 19% preferred its inclusion in the clinical course. The majority of the current study subjects in the two groups perceived the clinical stage better than physiopathology stage to offer the course. Therefore, it seems useful to revise the curricula. The most interesting topics were biochemical tests, body fluid assessments, and hematology tests. The study by Smith et al., (3) showed that the main purposes of the

course were relied on chemical and immunological tests, molecular diagnosis, hematology, blood transfusion, and microbiology, which were also incorporated in the one-unit course in the current study. The students who completed the course believed that it is better to be taught by clinical specialists, as compared to pathologists preferred by the subjects that did not take the course; however, the difference was insignificant. This is likely to be due to the fact that pathologists mainly teach theoretical courses, while clinical specialists teach clinical courses. The study by Smith et al., (9) revealed that only 52% of medical education centers had medical lab consulting services and perceived the collaboration of a pathologist and a scientific working group in providing such services as necessary due to lack of sufficient knowledge among non-pathologist physicians.

The advantages of this program included increased knowledge about the use of specific tests in various clinical fields, increased awareness of biological variables, confounding factors, and potential errors in the interpretation of laboratory tests, incorporation of hemovigilance system into the hospital, increased knowledge about appropriate test request, sampling methods and pre-analysis parameters, and encouraging patients to attend clinical laboratories.

### 5.1. Conclusions

The current study results revealed that there was no modern rational training course for appropriate utilization of laboratory tests; it is therefore essential to drag attentions to these courses and plan for them.

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### Footnotes

**Conflict of Interests:** The authors declared no conflicts of interest.

**Ethical Approval:** The study protocol was approved by the Ethics Committee of Kerman University of Medical Sciences (code: IR.KMU.REC.1397.552).

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