

Research Paper: The Extent of Learning the Minimum Level of Training From Orthopedics Courses in Medical Students



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ABSTRACT

Introduction: The present research aimed to determine the minimum level of theoretical orthopedic learning for trainees and interns.

Methods: A cross-sectional analysis was conducted in 3 Universities of Medical Sciences from 2013 to 2014. In total, 25 questions were obtained from third-year medical students (before entering the clinical course) and seventh-year medical internship students (with completed orthopedics internship course). Total test scores and minimum acceptance scores were considered 100 and 70, respectively.

Results: In total, 396 students [168 (42.4%) from the third-year & 228 (57.6%) from seventh-year students]; 130 (32.8%), 189 (7.47%), and 77 (19.5%) individuals were from Guilan, Kerman, and Shahid Beheshti Universities of Medical Sciences, respectively. Moreover, 2 (1.2%) third-year students and 84 (36.8%) seventh-year students passed the exam.

Conclusion: Despite the global attention to the importance and high prevalence of musculoskeletal diseases, the medical education system was detected as inefficient in Iran. Immediate and substantial actions, such as compulsory orthopedic courses for all students and the improvement of the length and educational approaches, must be designed to overcome this issue. Otherwise, increased levels of healthcare quality seem entirely unavailable.

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1. Introduction

Based on the recommendation of the World Health Organization (WHO), 2001-2010 and 2011-2020 were identified as the Bone and Joint decades to improve road safety. These activities highlighted the significance of Musculoskeletal (MSK) diseases [1-5].

In the hospitals of the United States, 25% of referrals to primary care unit, 20% of referrals to the emergency rooms, and 20% of non-routine referrals of children are related to MSK complications. Of which, the back and spine MSK complaints were the most prevalent conditions [6]. Furthermore, the prevalence of these issues was detected as 27% in Italy [7]. MSK diseases are not limited to adults; the incidence of such diseases equals 2.6%-36% in children [8].

Numerous reports have demonstrated the inefficiency of graduated students in MSK-related examinations [9-12]. The orthopedic training of medical students was in progress for 50 years in Iran [13]. In recent years, the level of scientific development has dramatically increased in Iran. In the current ranking, based on the SciMago Journal Rating (SJR), Iran's scientific ranking has been promoted to 17th in the world and first in the Middle East. The quality and quantity of orthopedic training and scientific development have been improved. Moreover, concerning orthopedics development, Iran achieved fourth in the world, seventh in Asia, and third in the Middle East [14].

To our knowledge, no similar study examined the theoretical and practical skills of medical students respecting MSK-related diseases in developing countries. Thus, this study aimed to assess the minimum level of theoretical preparation of externs and interns and the effectiveness of the educational curriculum, in Iran.

2. Materials and Methods

The authorization of the research design was accepted by the Institutional Review Board (IRB). The study sample of this descriptive, cross-sectional, and single-blind research consisted of two groups; third-year medical students prior to clinical trials, and seventh-year medical internship students who completed one month of orthopedic internships.

The research was performed based on a 25-item questionnaire designed by Friedman and Bernstein [15]. The

questionnaire was translated into Persian by an English translator and an orthopedic surgeon. To ensure the accuracy of the translation, another specialist English expert translated the Persian form of the questionnaire back into English. The final translation was compared with the initial questions. Subsequently, the accuracy of the early translation was accepted. Eventually, this questionnaire was modified to the aims of the Curriculum Guidance of the Ministry of Health and Medical Education on Orthopedics [16]. Concerning the educational objectives, 5 questions were discarded and replaced by new questions.

The most frequent questionnaire was verified by 20 orthopedic surgeons of faculty members. The reliability of the questionnaire was validated by a pilot sample (n=20 students) and Spearman's correlation coefficient (0.89, P=0.01). Other questions, including demographic information (age & educational level), and the scores of basic sciences and pre-internship exams were collected. Finally, the examined students were requested to specify whether the questions were compatible with the minimum levels of orthopedic training or not. Students were also requested to assess the difficulty of questions depending on the Visual Analog Scale (VAS).

All students from Guilan, Kerman, and Shahid Beheshti Universities of Medical Sciences in the academic year of 2012-2013 were invited to participate in this investigation. These cities were selected based on the availability of executors and their tendency to cooperate.

The questionnaire was provided for third-year students to receive basic information. These students had no training in theoretical or practical orthopedic courses. Questions were written in essay forms with brief responses, and each question had one score.

The test papers were examined by an orthopedic specialist according to the standard key answer in a blind manner (no knowledge of the students' institution, grade, the scores of basic science, & pre-internship). The final score achieved by the research participants was multiplied by 4. The minimum passing score was set at 70 (out of 100) per previous studies and the above-mentioned committee [17, 18].

All explored students were informed about the purposes of the analysis. They were also reassured that this exam and received scores remain confidential and without effects or bias on their orthopedic or other scores. These individuals also participated in this study voluntarily. The concept and execution of the study was approved by the IRB was implemented based on the Helsinki

Declaration [17]. After assessing paper sheets (by key answers), obtained scores and other data were collected and recorded in a computer to be analyzed in SPSS v. 21.

Mann-Whitney U test was used to compare nonparametric variables (VAS & the test score) among universities. Spearman's rank correlation coefficient was employed to find the relationship between these parameters. Fisher's exact test and Chi-squared test were applied to compare the demographic variables (age, gender, & college) and the passing rate between the research groups. The significance level of all tests was considered to be $P < 0.05$.

3. Results

A total of 396 students (198 males & 198 females), including 130 (32.8%), 189 (47.7%), and 77 (19.5%) students respectively from the University of Medical Sciences of Guilan, Kerman, and Shahid Beheshti were enrolled and received the study questionnaire. Of these, 168 (42.4%) were third-year students who did not take theoretical and practical orthopedic courses before participating in the study. Moreover, 228 (57.6%) subjects were seventh-year students who received an examination after fulfilling the theoretical and practical orthopedic course. The orthopedic internship and externship periods were identical in the explored universities (Table 1).

In Guilan and Kerman universities, the passing score of students who received an orthopedic course was significantly higher than those who had not pursued this course (Table 2). No gender-wise variations were observed in the obtained mean scores ($P = 0.256$); however, the frequency of males passing the exam was significantly higher than that in females (62%) ($P = 0.021$).

According to male and female-related results, the difficulty rate was 6.60 (95%, CI: 6.37-6.84) and 6.86 (95%, CI: 6.63-7.11), respectively. There was no significant difference between these individuals ($P = 0.113$). The investigated students who obtained a lower score offered a higher degree of difficulty, according to the VAS ($P < 0.001$). There was also a significant and positive association between the score received and the questionnaire conformity rate, and minimum training level ($P < 0.001$, $\rho = 0.254$).

There was also a significant correlation between pre-training and the basic science examination with the score obtained in the 25 questions exam ($P < 0.001$, $\rho = 0.659$ & $P = 0.002$, $\rho = 0.316$, respectively).

4. Discussion

In addition to the high prevalence of MSK diseases according to the WHO report of road safety, road crashes have been listed as the eighth major cause of death globally; they contribute to the deaths of 1.26 million individuals in 2010 [18]. It is notable that 92% of fatal accidents occur in low- and middle-income countries. Montazeri classified 16000 road accidents as the second most frequent cause of death in all ages [19].

The numbers of deaths in automobile crashes are only a portion of the victims of the trauma. In the current WHO report, the multiple forms of trauma are responsible for 17 of the total diseases [20]. Recent reports have indicated a high incidence of trauma in motor vehicle crashes, falling from heights and beatings, in Iran [21-24].

Current issues have demonstrated the significance of education and care for MSK conditions. However, evaluating medical education in Iran highlighted that one month of orthopedic internships only accounted for 2% of the whole medical education curriculum. This span is equal to the time spent on courses, such as ophthalmology or urology. There is no referral to general physicians and most medical procedures are restricted to specialists in these fields. This evidence revealed a great contradiction between what a general practitioner wants to know and what needs to be learned.

However, the inadequate education of orthopedics and MSK diseases are not restricted to Iran [9, 10, 12, 25, 26]. To evaluate the MSK skills in the United States, Freedman and Bernstein developed a simple competency exam with 25 questions. They proved the exam validity by considering the ideas of 124 orthopedic surgeons throughout the United States. They offered questions to 85 new residents of the state university; accordingly, 85% of the subjects failed the exam [15]. The aim of new residents' selection was to determine their knowledge in studying the general medicine. They concluded that the graduates who completed the elective orthopedic courses reported better outcomes than others. They proposed that in addition to increasing orthopedic clinical courses, the curriculum content should be revised. i.e., given by senior residents & professors), the questionnaire was re-examined in 2002. Furthermore, according to the ideas of 240 (58%) individuals out of 417 curriculum editors, the examination was re-designed by internal residents. By confidence, 15% of new residents in various clinical fields failed to achieve passing scores in this new exam again [27]. Their curriculum was developed, and the last revised version of the exam was performed in 2005. Ac-

Table 1. Baseline characteristics of the examined medical students

Variables		Guilan (n=130)	Kerman (n=189)	Shahid Beheshti (n=77)
Gender, No. (%)	Female	68 (52.3)	87 (46)	43 (55.8)
	Male	62 (47.7)	102 (54)	34 (44.2)
Basic Sciences exam score, Mean (95%CI)		118.38 (115.90-120.87)	127.98 (125.80-130.17)	134.79 (131.30-138.29)
Pre-internship exam score, Mean (95%CI)		137.00 (121.41-152.59)	140.55 (133.14-147.97)	145.67 (141.95-149.38)

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cordingly, 23% of the admissions to the previous study achieved 43% in Washington University and gained 60% in Harvard University [28]. In addition to the increased passing rate, a study was conducted at Harvard University, in 2007. According to the obtained results, the students of this university represented more awareness of the incidence of MSK diseases and the importance of this subject [29].

In 2007, in Ireland, the final questionnaire was provided in 5 classes; pre- and post-orthopedic medical students, orthopedic trainees, general practitioners, and orthopedic surgeons as resident educational planners. Besides, respectively 0%, 12%, 28.2%, 24.5%, and 10% of which completed the course. Moreover, general practitioners and interns who passed orthopedics or rheumatology as optimal courses in addition to the educational curriculum revealed a 67.9% acceptance rate. This value was significantly higher than that in those who did not pass these courses [26]. Additionally, in the research of Lynch et al. 64% of the general practitioners missed the same exam [30].

The outcome of our research indicated insufficient training in an orthopedic course in Iran. The inability of 98.2% and 63.2% of students to attend orthopedic classes, respectively, reflected an increase in orthopedic skills by passing this exam. It signified that two-thirds of medical graduates in Iran fail to learn the most basic knowledge about musculoskeletal diseases.

However, Dehghani et al. observed that the interns received no or less training in most medical fields. Out of the 14 training chapters assessed, the interns received no training in 5 sections (35.7%), and all received training in only one field. Interestingly, in 12 out of 14 (85.7%) of the education chapters, more than half of the students received no training [31].

Raeesi et al [32] investigated the graduates of the 24 University of Medical Sciences; they concluded that 92.9% of general practitioners believed there was insufficient training on MSK diseases during their studies. Almost 70% of individuals visited one patient with disabilities monthly. Besides, 85% received no training related to individuals with disabilities.

Table 2. Exam results in 3 universities before and after passing orthopedics courses

University	Orthopedic Course	Score Mean (95%CI)	Exam Results No. (%)		Fisher's Exact Test (P)
			Passed	Failed	
Guilan	Before	37.42 (34.42-40.42)	0 (0)	86 (100)	0.001
	After	58.97 (52.99-64.97)	14 (31.8)	30 (68.2)	
Kerman	Before	22.58 (18.49-26.67)	2 (2.5)	78 (97.5)	< 0.001
	After	58.14 (54.60-61.68)	42 (38.5)	67 (61.5)	
Shahid Beheshti	Before	51	0 (0)	2 (100)	0.139
	After	58.69 (54.54-62.84)	28 (37.3)	47 (62.7)	
Total	Before	30.51 (27.79-33.24)	2 (1.2)	166 (98.8)	<0.001
	After	58.48 (56.06-60.91)	84 (36.8)	144 (63.2)	

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According to the current study results, more attention should be paid to the training of SMK diseases. Furthermore, immediate actions are required to reform medical education in this field. However, despite the critical and rising need for physicians to learn more expertise and knowledge respecting MSK diseases, only half of the students followed an orthopedic course during their internship.

A reason for obtaining a poor test outcome could be associated with the lack of attention to internships courses. Strategies for the future include enhancing instructional curriculum and consistent implementation across the country; increasing orthopedic training courses and making them compulsory; offering optional courses in similar fields (e.g. physiotherapy, rehabilitation, & physical medicine); conducting seminars on modern teaching approaches for faculty members, and providing MSK theoretical courses.

5. Conclusion

According to the present research results, despite the global focus on the significance and high incidence of MSK diseases, the medical education system is inefficient in Iran. Immediate and substantial actions, such as compulsory orthopedic courses for all students and the modification of length and teaching methods are established to overcome this issue. Otherwise, the increasing quality of healthcare is entirely unavailable.

The limitations of the present research included the lack of online exams to facilitate expanding the sample size and the number of universities involved in the experiment. By providing this opportunity to the Ministry of Health and Medical Education, it is suggested that online quizzes be used in future studies.

The exams are held in the form of multiple choices; therefore, the descriptive form of this test can affect the results due to the lack of planning and the students' habit of taking such exams. The descriptive form of the analysis was attributed to assessing the factual details and the avoidance of the improvement of false findings. As a result, the short response questions were developed.

The poor test results of students with a low level of education could significantly affect the conclusion of this report. To minimize this impact, the students were requested in the questionnaire to declare their basic science or pre-internship score to change the test score to the academic level of students.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article.

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Authors' contributions

All authors equally contributed in preparing this article.

Conflict of interest

The authors declared no conflicts of interest.

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