ORIGINAL ARTICLE

The Impact of Pre-internship Training Programs on Medical Students' Perspectives, Knowledge, and Performance during the Transition from Medical School to Internship

Mina AkbariRad[1,2], Majid Khadem-Rezaiyan[2,3], Seyed Ali zolfaghari[4], Shima Nabavi Mahali[1,2], Rajabzadeh Somayeh[5], Mahdi Rafiee[4], Reza Habibzadeh[6,*], AmirAli Moodi Ghalibaf[7], Shima Sadat Zarif Nahad[8]

[1]Internist, Department of Internal Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[2]Medical Sciences Education Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[3]Department of Community Medicine, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[4]Student Research Committee, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[5]Department of E-learning in Medical Sciences, Smart University of Medical Sciences, Tehran, Iran
[6]Department of Emergency Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[7]Student Research Committee, Faculty of Medicine, Birjand University of Medical Sciences, Birjand, Iran
[8]Department of Medical Education, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
[*]Imam Reza Hospital, Ibn Sina St. Mashhad University of Medical Sciences, Mashhad, 9137913316 Iran
Tell: +98 38583952
Email: HabibzadehR@mums.ac.ir

Background: This study aims to evaluate the impact of pre-internship training programs on the perspective, knowledge, and performance of medical students transitioning from medical school to internship at Mashhad University of Medical Sciences.

Method: A quantitative, interventional study was conducted at Mashhad University of Medical Sciences on medical students entering their internship in the first and second semesters of 2021-2022. The participants were divided into intervention and control groups. A baseline preparedness assessment included a pretest using an Objective Structured Clinical Examination (OSCE) and a questionnaire assessing interns' views. The intervention group received training in the final month of their medical education before beginning their internships. Both groups were re-evaluated with a post-test after gaining internship experience, and data were analyzed using SPSS software.

Results: Of 144 participants, 133 completed the study. The control group had higher pre-test scores in knowledge and skills related to starting an internship, familiarity with patient hospitalization and discharge processes, and overall questionnaire scores ($p = 0.018$, $p = 0.008$, $p = 0.005$, $p = 0.012$, respectively). Conversely, the intervention group exhibited significantly higher knowledge related to internship processes, self-confidence, and working interactions post-training ($p < 0.001$). While pre-test OSCE scores were similar ($p = 0.254$), the intervention group outperformed the control group in the post-test ($p < 0.001$).

Conclusion: The study demonstrates that pre-internship training programs significantly enhance the preparedness of medical students for their internships, highlighting their importance in equipping future health professionals with essential competencies for effective patient care.

Keywords: Transition to internship, Internship preparation, Medical education, Clinical skills

سلوك أعضاء هيئة التدريس الطبيّة في تقديم التغذية الراجعة للطلاب في التعليم السريري بناءً على نموذج تحليل النتائج الموجه بالجدول (ALOBA) في مستشفى ابن سينا التعليمي، مشهد، إيران

الخلفية: تُعد التغذية الراجعة ضرورية لتطوير المتعلمين، وينبغي تدريب المعلمين والأساتذة على أهمية التغذية الراجعة. هدفت هذه الدراسة إلى تحديد حالة التغذية الراجعة في التعليم السريري باستخدام نموذج التغذية الراجعة الموجه بالجدول لتحليل النتائج (ALOBA).

الطريقة: في هذه الدراسة المستعرضة، تم شمل ٨ أعضاء هيئة تدريس الذين كانوا يدرّسون خلال فترة ٤ أشهر، في مستشفى ابن سينا التعليمي في مشهد، إيران، عام ٢٠٢٠. تم تسجيل أدائهم في تقديم التغذية الراجعة خلال إجمالي ٦٦ جولة سريرية. واستُخدمت قائمة تحقق صالحة بناءً على نموذج التغذية الراجعة ALOBA لجمع البيانات.

النتائج: كانت حالة المجالات الثلاثة للتغذية الراجعة، بما في ذلك تنظيم التغذية الراجعة التعليمية، والتغذية الراجعة البناءة، ونتائج التغذية الراجعة، والحالة العامة للتغذية الراجعة، مرغوبة. كان لأعضاء هيئة التدريس الذكور حالة تغذية راجعة تعليمية أفضل من الإناث ($p<0.001$). بالإضافة إلى ذلك، كان هناك فرق ذو دلالة إحصائية بين درجات أعضاء هيئة التدريس ذوي الخبرة العملية الأقل والأكثر من ١٥ عاماً ($p<0.001$). أما بخصوص الرتبة الأكاديمية، فإن الحالة العامة للتغذية الراجعة والتغذية الراجعة في كل مجال من المجالات الثلاثة كانت تختلف اختلافًا ذا دلالة إحصائية بين الأساتذة المساعدين وأساتذة المناصب العليا ($p<0.001$) وبين الأساتذة المساعدين والأساتذة المساعدين ($p<0.001$).

الخلاصة: كانت التغذية الراجعة في المجالات الثلاثة لنموذج ALOBA على مستوى مرغوب، وتأثرت بعوامل مثل الجنس والخبرة العملية والرتبة الأكاديمية. هناك حاجة إلى دراسات إضافية لفحص حالة تقديم التغذية الراجعة في التعليم السريري.

الكلمات المفتاحية: التغذية الراجعة، نموذج ALOBA، التعليم السريري، التعليم الطبي، أداء أعضاء هيئة التدريس

تأثیر برنامه‌های آموزشی پیش از کارآموزی بر دیدگاه‌ها، دانش و عملکرد دانشجویان پزشکی در طول انتقال از دانشکده پزشکی به دوره کارآموزی

زمینه و هدف: این مطالعه به ارزیابی تأثیر برنامه‌های آموزشی پیش از کارآموزی بر نگرش، دانش و عملکرد دانشجویان پزشکی که به کارآموزی در دانشگاه علوم پزشکی مشهد منتقل می‌شوند، می‌پردازد.

روش: یک مطالعه کمی و مداخله‌ای با دانشجویان دکترای عمومی دانشگاه علوم پزشکی مشهد که در نیمسال‌های اول و دوم ۱۴۰۰-۱۳۹۹ وارد دوره کارآموزی می‌شدند، انجام شد. شرکت‌کنندگان به دو گروه مداخله و کنترل تقسیم شدند. ارزیابی آمادگی پایه شامل پیش آزمون با استفاده از آزمون بالینی ساختاریافته عینی (OSCE) و یک پرسشنامه برای ارزیابی نظرات کارآموزان بود. گروه مداخله در آخرین ماه تحصیلات پزشکی خود قبل از شروع کارآموزی آموزش دریافت کردند. هر دو گروه بعد از کسب تجربه کارآموزی دوباره با پس آزمون ارزیابی شدند و داده‌ها با استفاده از نرم‌افزار SPSS تحلیل شدند.

یافته‌ها: از ۱۴۴ شرکت‌کننده، ۱۳۳ نفر مطالعه را کامل کردند. گروه کنترل نمرات پیش‌آزمون بالاتری در دانش و مهارت‌های مرتبط با شروع کارآموزی، آشنایی با فرآیندهای بستری و ترخیص بیماران و نمرات کلی پرسشنامه داشتند (به‌ترتیب $p = ۰/۰۱۸$، $p = ۰/۰۰۸$، $p = ۰/۰۰۵$، $p = ۰/۰۱۲$). برعکس، گروه مداخله دانش به‌مراتب بالاتری در زمینه فرآیندهای کارآموزی، اعتماد به نفس و تعاملات کاری پس از آموزش نشان دادند ($p < ۰/۰۰۱$). در حالی که نمرات پیش‌آزمون OSCE مشابه بود ($p = ۰/۲۵۴$)، گروه مداخله در پس‌آزمون نسبت به گروه کنترل عملکرد بهتری داشت ($p < ۰/۰۰۱$).

نتیجه گیری: این مطالعه نشان می‌دهد که برنامه‌های آموزشی پیش از کارآموزی به‌طور قابل توجهی آمادگی دانشجویان پزشکی را برای کارآموزی‌هایشان افزایش می‌دهد و اهمیت آن‌ها در تجهیز متخصصان بهداشتی آینده با مهارت‌های اسلسی برای مراقبت مؤثر از بیماران را مورد تأکید قرار می‌دهد.

واژه های کلیدی: گذار به کارآموزی، آمادگی برای کارآموزی، آموزش پزشکی، مهارت‌های بالینی

ایران کے مشہد میں ابن سائن ٹیچنگ ہسپتال میں کینیڈا کے تحت طبی اسٹنڈ کی طرف سے طلبۂ کو کلینیکل تعلیم میں فیڈ بیک دینے کا رویہ، ایجینڈا لیکڈ آؤٹ کم بیسڈ اینلیسز (ALOBA) کے مطابق

پس منظر: فیڈ بیک سیکھنے والوں کی ترقی کے لیے ضروری ہے، اور اساتذہ اور استادوں کو فیڈ بیک کی اہمیت پر تربیت دی جانی چاہیے۔ اس تحقیق کا مقصد ایجنڈا لیکڈ آؤٹ کم بیسڈ اینالیسز (ALOBA) فیڈ بیک ماڈل کا استعمال کرتے ہوئے کلینیکل تعلیم میں فیڈ بیک کی حیثیت کا تعین کرنا تھا۔

طریقہ: اس کراس سیکشنل تحقیق میں، ۲۰۲۰ میں ایران کے مشہد میں ابن سائن ٹیچنگ ہسپتال میں ۳ مہینوں کی مدت میں تدریس کرنے والے ۸ اساتذہ عملہ شامل کیے گئے۔ کلینیکل راؤنڈز کی کل ٦٦ میں ان کے فیڈ بیک دینے کا کارکردگی ریکارڈ کیا گیا۔ ڈیٹا اکٹھا کرنے کے لیے ALOBA فیڈ بیک ماڈل پر مبنی ایک درست چیک لسٹ کا استعمال کیا گیا۔

نتائج: فیڈ بیک کے تینوں شعبوں، جن میں تعلیمی فیڈ بیک کی تنظیم، تعمیراتی فیڈ بیک، اور فیڈ بیک کے نتائج شامل ہیں، اور فیڈ بیک کی مجموعی حیثیت مرغوب تھی۔ مرد اساتذہ کی تعلیمی فیڈ بیک کی حیثیت خواتین سے بہتر تھی ($p<0.001$)۔ اس کے علاوہ، ۱۵ سال سے کم اور زیادہ پریکٹیکل تجربات رکھنے والے اساتذہ کی اسکورنگ کے درمیان نمایاں فرق پایا گیا ($p<0.001$)۔ ایکادیمک رینک کے حوالے سے، فیڈ بیک کی مجموعی حیثیت اور فیڈ بیک کے ہر تینوں شعبوں میں فیڈ بیک پروفیسرز اور اسسٹنٹ پروفیسرز ($p<0.001$) اور اسسٹنٹ پروفیسرز اور پروفیسرز ($p<0.001$) کے درمیان نمایاں فرق پایا گیا۔

نتیجہ: ALOBA ماڈل کے تینوں شعبوں میں فیڈ بیک مرغوب سطح پر تھا اور اس پر جنس، کام کا تجربہ اور ایکادیمک رینک جیسے عوامل نے اثر انداز کیا۔ کلینیکل تعلیم میں فیڈ بیک دینے کی حیثیت کا مطالعہ کرنے کے لیے مزید تحقیق کی ضرورت ہے۔

کلیدی الفاظ: فیڈ بیک، ALOBA ماڈل، کلینیکل تعلیم، طبی تعلیم، اساتذہ کی کارکردگی

INTRODUCTION

A physician is a collection of many abilities. Medical schools are making efforts to train physicians that can manage different health situations. Still, many medical schools may train medical doctors that have unclear training and may not be suitable for the management of various health situations (1). Medical doctors play a pivotal role in health crises, making the quality of physician training programs a top priority in the medical education system (2).

At first glance, the history of medical education curricula for general practitioners training in the world dates back to years before Christ, but modern medical education was created two centuries ago (3). From 1765 to the present, medical education in North American countries has gone through five periods, and according to the need, pivotal points can be seen in this period (3). Educational models used in North American countries have become the world's dominant form of educational programming (4). The major changes in medical education models from 1765 to the present are classified as follows: the apprenticeship model (1765-1870), the discipline-based model (1871-1950), the organ-system-based model (1951-1970), the problem-based learning model (1971-1990), and the clinical-presentation-based model (1991 to present) (5).

Training gap between academic courses and clinical internship courses is one of the basic challenges of the Iran's medical education (6). Internship training has a different role in different countries; in some curriculums, internship is a pathfinder to higher-level degrees, and in others, it is the last step before independent medical practice (7). While participating in the internship, physicians not only take on new tasks but also put their present talents to use while simultaneously acquiring new ones. As a consequence, this level of general medical education places a greater emphasis on the acquisition of skills for professional performance than the preceding stages (8). There is a continual process involved in all stages of medical education; nevertheless, the transition to an internship is of utmost importance. This is due to the fact that the safety of patients must be guaranteed, and previous research has demonstrated that there is an increased risk of error connected with transitions in many different professions (9). Given the significance of the internship time and the various studies that have been conducted in the past, it is possible to admit that effective training during this phase leads to enhanced intern performance, improved patient care, and improved well-being for the interns themselves (10). As a result, the critical aspect of this phase highlights the requirement of utilizing teaching approaches that are both effective and efficient in order to maximize the benefits of clinical education at this crucial phase.

Some medical universities around the world have pre-internship programs that prepare students and introduce them to internships. Preparation for internship (PRINT) courses are a good example of what is being done at the University of New South Wales to facilitate the transition of students to internships (11). Various protocols and processes have been designed and implemented by medical universities and faculties worldwide to prepare medical students and assess their readiness for entering the internship period. Among these, Brennan et al. demonstrated that educated interns in Australia have full readiness for performing various therapeutic procedures, completing patient records, conducting comprehensive patient evaluations, interpreting tests, and managing preclinical processes for patients (12). Additionally, Beltz et al., in their study in South Africa, found that the majority of the study participants believed they were fully prepared for comprehensive physical examinations, fundamental procedures, responsibility in patient care, and teamwork during their internship (13).

Despite the importance of assessing medical students' readiness for entering the internship phase and performing their duties correctly during this period, few studies have been conducted in Iran to investigate this matter. In a study, Nazem et al. acknowledged that medical interns at Isfahan University of Medical Sciences had very poor readiness for entering the internship course, and their evaluations indicated the need for fundamental interventions to improve the existing situation (14). These findings underscore the significance of the internship period and the necessity for students to be adequately prepared for this educational phase. Furthermore, the scant studies conducted in Iran highlight the urgent need for interventions to enhance the current conditions. Therefore, the present study was carried out to design and assess the impact of pre-internship training programs on the perspectives, knowledge, and performance of medical students at Mashhad University of Medical Sciences as they prepare to enter the internship phase.

METHODS

This quasi-experimental study was conducted in accordance with the Helsinki Declaration and was approved by the Ethics Committee at Mashhad University of Medical Sciences under the code IR.MUMS.REC.1400.206. Informed consent was obtained from all participants.

Study Population

In this study, the sample comprised medical students of Mashhad University of Medical Sciences who began their internship in the academic year of 2021-2022. The students who failed the pre-internship examination were

excluded from the study. The participants were divided into two different groups, the intervention and the control groups.

Demographic Characteristics

Among 133 participants (control: n = 67; intervention: n = 66), the groups differed significantly only in age and residence status. The students in control group were slightly older than those in the intervention group (24.10 ± 1.32 vs. 23.72 ± 0.78 years; p = 0.046), and a higher proportion of students in the intervention group lived in private housing, whereas dormitory residence was more common in the control group (p = 0.002). All other demographic and academic variables were comparable between groups.

Intervention

The intervention group received an online six-hour course as a form of pre-internship training program. The course content was uploaded as videos on the Aparat website, and its links were distributed among the participants. The training program covered various topics, including clinical skills, that is, prescription and rational use of drugs, writing medical orders, getting familiar with common diseases and their presentations, interpretation of laboratory findings, proper and adequate use of various tools in common processes and procedures, suturing, venipuncture skills, Cardio Pulmonary Revive (CPR), proper and timely use of para-clinical services, how to find and use valid scientific resources, familiarity with emergencies, and basic examination skills in dealing with each patient. Hospital procedures included knowledge of Health Information System (HIS) and Picture Archiving and Communication System (PACS), working principles of the referral system, indications for discharge of a patient, process of admitting a patient, legal responsibilities of an intern, and medical forms and documents. Communication skills encompassed knowledge of the roles of people involved in the department and the hospital and how to approach them, skills of earning the trust of patients, knowledge about tackling patient-attendants in different situations like death, conflict, etc., and skills regarding educating patients to carry out required therapeutic processes outside the treatment setup. Psychosocial and management skills included understanding boundaries between personal and work life, training of skills in exercising control of oneself in several situations, and knowledge about working in a team and the principles of leading in a team.

The control group was comprised of students who started the pre-internships in the first semester of 2021 after passing the pre-internship exam. There was no intervention of a pre-internship training program in the control group.

Assessment

Data were collected through the use of the following instruments:

A demographic checklist was acquired on age, gender, tuition payment status, marital status, native status, residence status, nationality, number of conditional courses, overall Grade Point Average (GPA), pre-internship exam score, and national ranking in the national university entrance exam.

Interns' Perceptions Questionnaire: The researchers prepared this tool in 2005. The tool which examines the aspects of preparedness from the interns' perspectives consisted of 20 items assessing four domains: knowledge, skills, familiarity with the patients' admission and discharge processes, and self-confidence and work-related relationships with medical and nursing staff and patients based on a 5-point Likert scale with a range from "Excellent" to "Very Poor". Approbation of the questionnaire was done in terms of content and face validity. It checked out for reliability by feeding the responses obtained from the test tool in Cronbach's alpha between 0.91 and 0.93.

Observed Structured Clinical Examination (OSCE): It is given to assess the interns in front of internal medicine department staff in terms of practical (skills) and theoretical (knowledge) parts. The exam was graded by scores out of 20 by numbers.

A pre-test was conducted before the intervention process to determine the baseline level of preparedness of the students who were about to enter the internship period. Training and interventions were provided to the students during the last month of their internship period. After pre-internship exam and entry into departments/wards as interns, and after fulfilling the routines in one ward, the effectiveness of interventions at a post-test is calculated. Pre- and post-tests included a scientific exam, an OSCE, and the questionnaire of interns' perspectives following entry into the internship period.

Statistical analysis

Analysis of data was conducted using SPSS version 26. Continuous variables were described using means and standard deviations, whereas categorical variables were described using frequencies and percentages. Continuous variables in the two groups were compared using independent sample t-tests, and categorical variables among the two groups were compared using the chi-square test or Fisher's exact test if applicable. Paired t-tests were conducted for within-group differences. In the case of non-normal distribution of the data, nonparametric tests were carried out. The significance level was taken as 0.05.

Sample Size

The sample size was calculated based on a previous study by Nazem and colleagues where 43% of the students were considered to have started the internship period with an average or less than average level of knowledge. The authors had estimated that this percentage would reach 20%

after the intervention with training. Keeping in mind this formula to evaluate one qualitative attribute in two groups, assuming an alpha error of 5% and a power of 80%, the sample size obtained was 65 participants in each group. With the risk of a potential dropout rate of 10%, a total of 144 participants were assessed.

RESULTS

In this study, we examined the impact of an intervention on interns' knowledge, skills, and confidence. A total of 144 students were included in the study; 72 students were in the intervention group, and 72 students were in the control group. By the end of the study, 5 students from the control group and 6 students from the intervention group had been excluded, and finally, 67 students from the control group and 66 students from the intervention group were included in the final analysis (Figure 1).

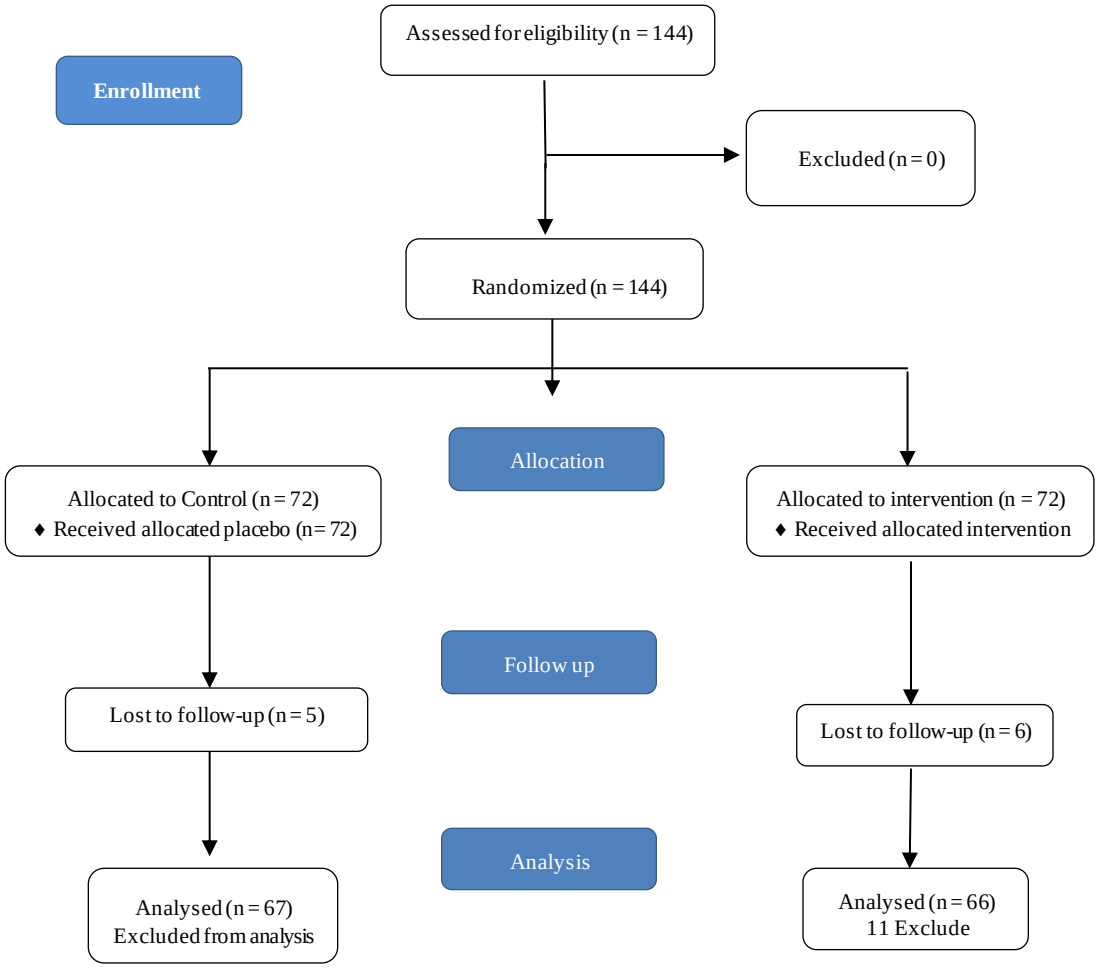

Figure 1. CONSORT diagram of the study

The demographic characteristics of the participants were analyzed. The groups' residence differed from each other, and the control group's age was higher than that of the intervention group, but other demographic characteristics were not significantly different between the two groups (Table 1).

The pretest scores of the control group in 3 areas and the overall score were significantly higher than those of the intervention group (knowledge of starting an internship, skill of starting an internship, familiarity with the process of admission and discharge of patients, and the overall score).

The post-test scores of both groups are presented in table 2. The post-test score of the intervention group in the areas of knowledge of starting an internship, familiarity with the process of hospitalization and discharge of patients, self-confidence and working interactions with medical and nursing staff and patients, and the overall score of the questionnaire was significantly higher than that of the control group. The difference between pretest and post-test scores in the control group has been compared with the intervention group. The score of the control group had decreased in all areas, while the score of the intervention group had increased, and this

difference was statistically significant in all cases. The pre-test and post-test scores, as well as the differences between the two groups, have been compared (Table 3). There was no significant difference between the two groups in the pre-test, but in the post-test, the score of the intervention group was significantly higher than that of the control group. The pre-test and post-test scores of the OSCE exam, as well as the differences between the two groups, were compared (Table 4). There was no significant difference between the two groups in the pre-test, but in the post-test, the score of the intervention group was significantly higher than that of the control group (Table 5).

Table 1. Comparison of pre-test score between the two groups

Fields of the questionnaire	Control group, mean (SD)	Intervention group, mean (SD)	P-value*
Knowledge of starting an internship	3.16 (0.54)	2.94 (0.50)	0.018
The skill of starting an internship	3.16 (0.57)	2.89 (0.55)	0.008
Familiarity with the process of admission and discharge of patients	2.95 (0.63)	2.65 (0.56)	0.005
Confidence and work interactions with medical and nursing staff and patients	3.45 (0.58)	3.40 (0.65)	0.598
Overall score	3.20 (0.44)	3.00 (0.45)	0.012

*Independent T-test

Table 2. Comparison of post-test score between the two groups

Fields of the questionnaire	Control group, mean (SD)	Intervention group, mean (SD)	P-value*
Knowledge of starting an internship	2.98 (0.58)	3.26 (0.57)	0.006
The skill of starting an internship	3.12 (0.73)	3.32 (0.67)	0.099
Familiarity with the process of admission and discharge of patients	2.60 (0.81)	2.96 (0.67)	0.006
Confidence and work interactions with medical and nursing staff and patients	3.44 (0.66)	3.67 (0.62)	0.038
Overall score	3.06 (0.55)	3.33 (0.52)	0.005

*Independent T-test

DISCUSSION

In this study, we evaluated the impact of a pre-internship training course on enhancing the

Table 3. Comparison of test scores in pre-test and post-test and the difference between the two groups

Characteristic	Control group, mean (SD)	Intervention group, mean (SD)	P-value*
The score of the pre-test	6.02 (2.30)	5.62 (1.77)	0.254
The score of the post-test	5.88 (1.82)	7.83 (1.55)	< 0.001
The difference between post-test and pre-test scores	-0.14 (2.93)	2.21 (2.45)	< 0.001

*Independent T-test

Table 4. Comparison of post-test score difference with pre-test score in control and intervention groups

Fields of the questionnaire	Control group, mean (SD)	Intervention group, mean (SD)	P-value*
Knowledge of starting an internship	-0.18 (0.77)	0.31 (0.55)	< 0.001
The skill of starting an internship	-0.03 (0.98)	0.43 (0.70)	0.002
Familiarity with the process of admission and discharge of patients	-0.35 (1.02)	0.30 (0.59)	< 0.001
Confidence and work interactions with medical and nursing staff and patients	-0.01 (0.94)	0.27 (0.64)	0.041
Overall score	-0.13 (0.72)	0.32 (0.46)	< 0.001

*Independent T-test

Table 5. Comparison of test scores in pre-test and post-test and the difference between the two groups			
Characteristic	**Control group, middle (first quartile, third quartile)**	**Intervention group, middle (first quartile, third quartile)**	**P-value***
OSCE test score in the pre-test	12 (14,12)	12 (13,12)	0.481
OSCE test score in the post-test	13.5 (14.5,12.5)	17 (18,15,87)	< 0.001
The difference between post-test and pre-test	1 (2, -0.5)	4 (6,3)	< 0.001
*Mann-Whitney test			

perspective, knowledge, and performance of medical students as they transition into their internship. Our study involved medical students on the cusp of their internship period. The results revealed that this training course significantly improved the participants' knowledge and skills necessary for their internship. It also familiarized them with the patient admission and discharge process and boosted their self-confidence in interacting with medical and nursing staff. These findings underscore the positive influence of the training course on the students' readiness for their internship. Given the increasing complexity of treatment processes and the diverse specializations involved in hospital settings, the ability and self-confidence to collaborate with other healthcare workers are crucial for medical interns.

We also examined the scientific status of the participating students before and after the implementation of this training course, and the results showed that there was a significant improvement in the level of scientific knowledge of the intervention group after the training course, whereas in the control group, the scientific test score did not change much at the end of the study. Also, the OSCE score of the participants in the intervention group improved significantly at the end of the study and increased compared to the control group. All the cases mentioned indicate that the implementation of this training course significantly helped to increase the ability of the participants to enter the internship and achieve the predetermined goals.

Although Iranian students have a comprehensive pre-internship examination before entering the internship period, it does not seem that the scores obtained from this exam can fully reflect the students' practical skills to enter the internship period. In a previous study, it was shown that the score of the pre-internship exam is only correlated with the knowledge level of the interns and has little to do with their practical skills (14). The existence of a correlation between the pre-internship score and the required knowledge indicates that currently the goals of the test developers in the pre-internship examination are based on scientific knowledge, that perhaps many of the scientific materials are not very useful for general practitioners, and therefore it is necessary that practical skills also be taken into consideration.

In a 2020 study, a patient-centered training course was investigated for students at the onset of their internship (15). The course was conducted in small groups, each with a coach, and focused on managing common cases encountered during the internship. The results showed that many students believed that the training course helped them to enter the internship, and in the follow-ups in the following years, the participants still felt that they were well prepared for the internship. The findings of this study align with ours, demonstrating that short-term courses can enhance students' scientific knowledge to manage common patients they encounter during their internship. However, our training course had an added advantage of teaching practical skills to the students, which is arguably more important than imparting theoretical knowledge.

In a study published in 2017, the authors examined the impact of an internship preparation course on 4th year medical students in the United States (16). The goal of this course was to increase students' cognitive and practical skills in various fields, and to achieve this goal, small-group and skill lab sessions were held in which providers from the fields of medicine, nursing, and pharmacy were present. The findings indicated that all students reported an increase in their self-confidence in caring for patients after participating in a three-day course. Also, in the follow-up, it was found that 82% of the participants routinely used what they learned in the course to care for patients. We also showed that holding a training course before starting the internship can improve students' knowledge and skills to perform the tasks assigned to them during the internship, and therefore the wide implementation of such programs can be beneficial.

In a study published in 2016, the authors examined the impact of an internship preparation course at a university in Germany (17). In order to do this, questionnaires were distributed among the participants to evaluate the usefulness of the course. The obtained results showed that, in general, the participating students evaluated the effect of the seminars very well in preparing for the start of the internship course. In the end, the authors stated that the implementation of the training courses can help

medical students understand their role in patient care and perform the tasks they will face better. The findings of our study are also consistent with the results of this study. However, in our study, the level of preparation of students was measured using a validated questionnaire, while the previous study only asked the students' opinion about the course, and according to this, the results of our study are more accurate and reliable.

The key skills necessary for the internship period, such as writing prescriptions, medical orders, performing cardiopulmonary resuscitation, and other practical measures before suturing, were evaluated using a validated questionnaire (14). The increase in the score of this questionnaire at the end of the study indicates that the interns were better prepared for their internship after participating in this training course. The findings from our study can inform educational planners in medical schools that by planning short-term training courses for medical students before their internship, their skills for performing practical procedures, dealing with patients, and collaborating with other hospital staff can be enhanced.

The findings obtained from the present study are useful for the educational planning at medical schools. Based on the findings of our study, by planning short-term training courses for medical students before entering the internship period, it is possible to increase their skills for performing practical procedures, dealing with patients, and cooperating with other members of the medical staff in hospitals.

Our study also had some strengths and weaknesses. One of the weaknesses of the current study was that long-term follow-up of the participating students was not done in order to evaluate the durability of the training provided in this study. Also, in the present study, a limited number of students were present at one point in time, so the obtained results may not be generalizable to all students. On the other hand, there were important strengths in our research, among which we can point out the innovation of the present research in evaluating the impact of a pre-internship training course on medical students' knowledge and skills.

CONCLUSION

Medical education for medical students in Iran is a seven-year course that is divided into different phases. In the final phase, which is called internship, students are present in hospitals and directly participate in the process of managing and treating patients. In the current study, we investigated the implementation of a short-term training course to increase the necessary knowledge and skills of students before entering the internship. Based on the results obtained from the present study, the pre-internship training course can provide students with the necessary knowledge and skills to enter the internship period. These findings can be used by policymakers and planners in medical schools, and they can provide the possibility of benefiting all students from these courses by including similar training courses in the curriculum.

ACKNOWLEDGMENTS

The authors would like to thank everyone who supports this project.

Ethical Considerations:

Ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc., have been completely observed by the authors. The current research was approved by the Ethics Committee of Mashhad University of Medical Sciences under the code IR.MUMS.REC.1400.206

Financial Support: None

Conflict of Interest: The authors have no conflicts of interest.

REFERENCES

1. Dent J, Harden RM, Hunt D. A practical guide for medical teachers, e-book: Elsevier health sciences; 2021.

2. Chen L, Evans T, Anand S, Boufford JI, Brown H, Chowdhury M, et al. Human resources for health: overcoming the crisis. The Lancet. 2004;364(9449):1984-90.

3. Papa FJ, Harasym PH. Medical curriculum reform in North America, 1765 to the present: a cognitive science perspective. Acad Med. 1999;74(2):154-64.

4. Arky RA. Abe Flexner, where are you? We need you! Transactions of the American Clinical and Climatological Association. 2007;118:89.

5. Ashoorion v, Sharif M. Trend of Recent Changes in Medical Education Curriculum in the World: The Location of Iranian Medical Education Curriculum. Iranian Journal of Medical Education. 2011, 10(4): 383-397

6. Ghaffari R, Amini A, Yazdani S, Alizadeh M, Salek Ranjbarzadeh F, Hassanzadeh Salmasi S. Comparative Study: Curriculum of Undergraduate Medical Education in Iran and in a Selected Number of the World's Renowned Medical Schools. Iranian Journal of Medical Education. 2012;11(7):819-31.

7. Peluso MJ, Luckett R, Mantzor S, Bedada AG, Saleeb P, Haverkamp M, et al. Strengthening medical training programmes by focusing on professional transitions: a national bridging programme to prepare medical school graduates for their role as medical interns in Botswana. BMC Med Educ. 2017;17(1):261.

8. McNeil HP, Scicluna HA, Boyle P, Grimm MC, Gibson KA, Jones PD. Successful development of generic capabilities in an undergraduate medical education program. Higher Education Research & Development. 2012;31(4):525-39.

9. Kilminster S, Zukas M, Quinton N, Roberts T. Preparedness is not enough: understanding transitions as critically intensive learning periods. Medical Education. 2011;45(10):1006-15.

10. Sherertz RJ, Ely EW, Westbrook DM, Gledhill KS, Streed SA, Kiger B, et al. Education of physicians-in-training can decrease the risk for vascular catheter infection. Annals of internal medicine.

2000;132(8):641-8.
11. Scicluna HA, Grimm MC, Jones PD, Pilotto LS, McNeil HP. Improving the transition from medical school to internship - evaluation of a preparation for internship course. BMC Med Educ. 2014;14(1):23.
12. Brennan N, Corrigan O, Allard J, Archer J, Barnes R, Bleakley A, et al. The transition from medical student to junior doctor: today's experiences of Tomorrow's Doctors. Medical Education. 2010;44(5):449-58.
13. Blitz J, Kok N, van Heerden B, Van Schalkwyk S. PIQUE-ing an interest in curriculum renewal: research. African Journal of Health Professions Education. 2014;6(1):23-7.
14. Nazem M, Garak YM, Hosseinpour M, Khoddami A. Interns' viewpoints concerning their readiness for entering internship in Isfahan Medical University. Iranian Journal of Medical Education. 2005;5(4):291-8
15. Lescinskas E, Sargsyan Z, Ayyala US, Fisher J. Preparing for Medical Internship: A Case-Based Strategy to Teach Management of Common Overnight Calls to Students. MedEdPORTAL. 2020;16:10966.
16. Bontempo LJ, Frayha N, Dittmar PC. The Internship Preparation Camp at the University of Maryland. Postgrad Med J. 2017;93(1095):8-14.
17. Spura A, Werwick K, Feißel A, Gottschalk M, Winkler-Stuck K, Robra BP, et al. Preparation courses for medical clerkships and the final clinical internship in medical education - The Magdeburg Curriculum for Healthcare Competence. GMS J Med Educ. 2016;33(3):Doc40