Original Research

Challenges Of Knowledge Transfer From Pre-Clinic To Dental Clinics Among Dental Students: The Restoration Dentistry Group

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Abstract

Background: The incompatibility between theoretical education and clinical situations brings diverse challenges among dental students.

Methods: The sample population of the current study was dental students of the restorative dentistry of Ardabil University of Medical Sciences. A semi-structured interview was used to collect data. The method proposed by Lundman and Graneheim was resorted to analyzing the data at the same time as conducting the interviews. To ensure the validity and reliability of the data, the validity, verifiability, and reliability criteria were used according to Lincoln and Gouba. After creating the initial codes, participants' opinions were asked to verify the codes and interpretations.

Results: The results of the study demonstrated that the challenges of transferring knowledge from the pre-clinical phase to the clinical phase in the current study include the eight challenges of lack or shortage of training equipment, weakness in covering the practical educational needs, differences between dentistry and the actual clinical field of the patient, weakness in covering principles of practical work (sterilization, set forth.), stress in contact with the patient, weakness in practical training (skills), weak training in the treatment plan, and weak physical presence of professors for training. Furthermore, the facilitators of knowledge transfer from the pre-clinical phase to the clinical phase included practical training on natural teeth, sufficient practice, creating a suitable atmosphere for stress-free training, individual study, and ethics and proper communication of professors. Then, the results showed no significant difference in most of the questions of knowledge transfer challenges and facilitators from the pre-clinical phase to the clinical phase based on gender, grade point average, and academic semester.

Conclusion: Dental students face many challenges in transferring knowledge from pre-clinic to clinic. However, these challenges can be lessened with careful planning.

Keywords: Pre-clinical phase, Clinical phase, Dental education, Restorative dentistry.

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Introduction

The final goal in education is to create desirable changes in students who are the primary beneficiaries of a curriculum (1). To achieve the goals of the curriculum, the needs of the learners should be identified and examined, appropriate methods for teaching knowledge and skills should be determined, and a suitable evaluation method should be taken into account to maintain the quality of the curriculum (2,3). The purpose of curriculum evaluation is to solve problems and improve the current situation. The decisions made about the curriculum are concerned with the components of that curriculum, which are interdependent and interact with each other (4). Thus, educational policymakers evaluate the curriculum according to the desired expectations from the program and its compliance with the goals. For instance, the performance of the graduates of a curriculum can underscore the problems of designing, implementing, and evaluating the goals of a curriculum (5). On the other side of the coin, as the trends in medical sciences are constantly changing and evolving, emphasizing the necessity of reforming education and revising curricula is evident (6). The curriculum of general dentistry was compiled and approved in the last revision of 2016 in line with the needs of society; then, it was communicated to dental schools in 2017 and is still being implemented (7). However, due to the need to update the curricula, including the general dental curriculum, curriculum revision is essential and inevitable; In the meantime, the following reasons can be mentioned: the emergence of new sciences, personal interests of new faculty members, demographic changes, progress in biological sciences, and fundamental changes in the health service delivery system (8,9). Thus, to evaluate and revise the curriculum, it is necessary to examine the opinions and views of the groups involved and interested in the curriculum, including professors, students, and society, which can be a suitable reference for educational planners (10). Practical dental units are classified into two main categories: pre-clinical and clinical units. The pre-clinical units of each department are usually presented before the clinical units; the purpose of presenting the pre-clinical units is to provide dental treatments on phantoms and non-living samples for the students to become prepared to treat live samples (9,10). After acquiring the necessary skills from the pre-clinical units, the students enter the clinical units and test the skills learned from the pre-clinical units on patients mixed with clinical skills (11). Restorative dentistry practical units include both clinic and pre-clinical phases.

The previous investigations demonstrated that transitioning from the pre-clinical phase to the clinical phase is associated with challenges. The difference between how to respond to the treatment of patients and the treatment in the phantom causes a series of challenges for students. The differences are due to the differences in the mechanical and biological characteristics of the patient's mouth with plastic and plaster specimens, as well as the interference of psychological conditions (12,13). Besides, students in the clinical phase might be with different professors in the pre-clinical phase, which causes other problems for the students due to the difference in taste and treatment plans of the professors (10). After analyzing the data, Yaghini et al. (14) provided four primary categories, including implementation, educational, lateral, and mental and structural challenges.

The participants in Serrano et al. (15) study stated that students often showed the necessary knowledge and skills at the beginning of the clinical phase. However, properly integrating knowledge, skill, and deep understanding still needed to be improved among these students. As the challenges of transferring from the pre-clinical phase to the clinical phase cause problems for both students and professors, the current study was conducted to evaluate the challenges and obstacles in the transition from the pre-clinical phase to the clinical phase in dental students of Ardabil University of Medical Sciences.

Methods

The present study (ethics code: IR.ARUMS.REC.1400.257) was conducted qualitatively-quantitatively (mixed) in Ardabil from November to February 2021. The statistical population includes dental students who passed the restorative pre-clinical course and are currently studying in the clinical course at Ardabil University of Medical Sciences. The study entry criteria were passing the restorative pre-clinical phase by dental students and their willingness to participate in the study. On the other hand, the exclusion criteria were their unwillingness to participate in the study. A purposive sampling method was used. In order to select the participants and ensure maximum variation, the total and previous academic semester grade point average (GPA), gender, and academic semester were taken into account. Like other qualitative studies, sampling continued until data saturation was reached; the interview participants provided no new data. A semi-structured interview was used to collect data. In addition, during the interview, exploratory questions were asked.

All the interviews were recorded in a quiet place. Like other qualitative studies, sampling continued to reach data saturation. After the initial codes were created, the participants' opinions were asked to verify the correctness of the codes and interpretations. If the codes were not in line with their views, the codes were modified; the control method was used by two faculty members and experts in qualitative research and dental education, and consensus was reached on the selection and classification of codes. In the quantitative part of the study, the six priorities of the highest score were compared based on GPA, semester, age, and gender.

Data analysis

Data analysis was done based on the method proposed by Lundman and Graneheim at the same time as conducting interviews (16). To ensure the validity and reliability of the data, the criteria of validity, verifiability, and reliability were used according to Lincoln and Gouba (17). In the quantitative part of the study, data analysis was run using an independent t-test and one-way analysis of variance between groups in SPSS version 22 software. A significance level of less than 0.05 was considered.

Results

The results of the study showed that the variables, including the lack or shortage of training equipment (phantoms, set forth.), the difference between dentistry and the actual clinical field of the patient, the weakness in practical training (skills), weakness in covering the principles of practical work (sterilization, set forth.), and stress in contact with the actual patient, respectively, are considered as the most critical challenges of transferring knowledge from the pre-clinical phase to the clinical phase in the restoration dentistry group (Table 1).

Also, the results of the current study showed that, respectively, the following variables considered the most fundamental facilitators of transferring knowledge from the pre-clinical phase to the clinical phase in the restoration dentistry group: practical training on natural teeth, sufficient practice, individual study, creating a suitable atmosphere for stress-free training, and ethics and proper communication of professors.

In general, the results of the investigations showed no significant difference in the challenges of knowledge transfer and the facilitators of knowledge transfer from the pre-clinical phase to the clinical phase in restorative dentistry by gender, GPA, and academic semester and gender ($P > 0.05$).

Discussion

In Health Professions Education, there should be a coordination between what is learned and what is used in the clinic (18). That is why the content of the curriculum should be adjusted as much as possible to the clinical situations. Clinical training, both in initial and continuous training, should be in sync with clinical situations. Students should be able to gain enough learning experiences, both from the theory and the clinical point of view, and the clinical professors should

provide this situation so that the student can master the theory and the clinical skills (19). The gap between theory and practice causes the new student, as a result of the conflicts between the expectations and the realities of the working environment, to be unable to adapt to the mentioned conditions suitably. As such, they show adverse reactions in physical and mental dimensions, such as feelings of helplessness, depression, lack of security due to lack of efficiency in the working environment, and finally, withdrawal from the profession (20). In 2021, Downey et al. (21) explored the challenges and solutions of returning to clinical training after research. It was a multidisciplinary survey of integrated university trainees in West Yorkshire, UK. The survey was completed by 33 participants (62% response rate). The most relevant challenges identified were thesis completion while transitioning to clinical work, rapid transition between full-time research and clinical practice, reduced confidence in clinical abilities, and isolation from colleagues. Farhad et al. (22), in a study in 2020, identified the influential factors and components in transferring learning to the workplace in the in-service training of nurses in hospitals under the Social Security Organization. The results revealed that the factors affecting the transfer of education could be in four dimensions, including individual factors, educational factors, organizational factors, and extra-organizational or environmental factors. Khakrah et al. (23), in 2019, designed a model of organizational factors affecting the transfer of learning to the working environment based on the Data Foundation Theory Method. Analyzing the interviews indicated 25 components, including organizational structure, organizational capabilities, financial and physical resources, knowledge-sharing culture, culture of excellence (CE), culture of openness, organizational policies and rules, job characteristics, organizational position of education, development of organizational learning culture, development of partnership and teamwork culture, institutionalization of experience and expertise in the organization, career path management, performance management, revision and refinement of rules and regulations, creation of use opportunities, improving scientific interactions, improving the status of the education unit, reducing job burnout, developing the capabilities and creativity of employees, increasing the effectiveness of organizational training, and increasing organizational success. These components are presented in the form of a paradigm model. In a study in 2018, Yaghini et al. (14) evaluated the challenges of implementing the general dentistry curriculum from the student's point of view. Downloading and analyzing the interviews, 104 codes, 20 subclasses, and four main classes were extracted. The four main classes included implementation challenges (immaturity and inexperience in implementation, lack of implementation planning, and lack of coordination of professors in presenting integrated courses); educational (lack of sufficient information resources to justify students, limited time to provide education, inability to employ expert professors for new courses, educational inequality, inappropriateness of integration, the use of low-skilled and untrained residents to educate students, the way of presenting topics, inappropriate content in new courses, failure to meet the educational and preparatory prerequisites, non-compliance with medical education standards by professors); lateral and subjective (Resident-oriented and expert-oriented professors, lack of resources to pose problems and provide practical solutions, habituation to the previous curriculum, negative attitude to the new curriculum); and structural (changes in curriculum structure, physical facilities, and lack of faculty members). In line with the results of the present study, Torres-Calixto et al. (24), in 2021, investigated the trends and challenges of medical education. They suggest that in dealing with changes, it is necessary to design curricula that include all aspects of health care, considering medical supply and demand; they also highlight

professionalism and compliance with quality standards. In 2020, Malau-Aduli et al. (25) examined the perceptions and processes influencing the transition of medical students from pre-clinical to clinical training. The qualitative findings unraveled workload and professional socialization as disruptive components. Ward et al. (26), in a study in 2009, investigated the development of a framework for transferring knowledge into action. They conducted a thematic analysis of the literature. They identified five standard components of the knowledge transfer process: problem identification and relevance, knowledge development and selection/research, context analysis, knowledge transfer activities or interventions, and application of knowledge/research. Sharif and Masoumi (2005) believe combining theory and practice in a clinical situation and proper clinical supervision can make students competent enough to care for patients (27). If students combine clinical experiences with evidence-based practice presented in theory classes, this work can develop their decision-making process and performance (28).

Conclusion

The challenges of transferring knowledge from the pre-clinical phase to the clinical phase in the present study included the eight challenges of lack or shortage of training equipment, weakness in covering the practical educational needs, differences between dentistry and the actual clinical field of the patient, weakness in covering principles of practical work (sterilization, set forth.), stress in contact with the patient, weakness in practical training (skills), weak training in the treatment plan, and weak physical presence of professors for training. Facilitators of knowledge transfer from the pre-clinical phase to the clinical phase were practical training on natural teeth, sufficient practice, creating a suitable atmosphere for stress-free training, individual study, and ethics and proper communication of professors. There was no significant difference in most of the questions about the challenges of realizing clinical education, knowledge transfer, and facilitators from the pre-clinical phase to the clinical phase on gender, grade point average, and academic semester.

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Ardabil University of Medical Sciences **Authors Contributions:**

UZ, AK, RF conceptualized the study objectives and design. FH, UZ are infectious disease specialists who contributed to data collection from patients along with RF. AK, UZ and FH drafted the study design protocols to be submitted to research centers. Data were was analyzed by UZ and RF. Manuscript was drafted by UZ, RF, and FH. All authors contributed in revisions.

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Tables:

Table 1: Challenges of transferring knowledge from the pre-clinical phase to the clinical phase in the restoration dentistry group

Challenges of transferring knowledge from the pre-clinical phase to the clinical phase	N	Total	M	SD	Priority
Weak physical presence of professors for training	6	12	2	0	16
Lack of cases (patients)	6	36	6	2	13
A large number of course units in the pre-clinical phase	6	28	6/4	2/1	14
Poor study of students	6	68	3/11	5/2	7
Weak training in the treatment plan	6	61	1/10	3/2	8
Weakness in practical training (skills)	6	88	6/14	2/2	3
Weak student motivation	6	52	6/8	4/2	9
Long interval between pre-clinical and clinical phases	6	23	8/3	2	15
Weak monitoring and management of education	6	46	6/7	7/1	10
Difference between dentistry and the actual clinical field of the patient	6	90	15	5/2	2
Stress in contact with the actual patient	6	77	8/12	4/1	5
Providing training by technicians	6	6	1	0	17
Lack or shortage of training equipment (phantoms, set forth.)	6	92	3/15	2/1	1
Weakness in covering the practical educational needs	6	77	8/12	8/1	6
Weakness in covering principles of practical work (sterilization, set forth.)	6	83	8/13	3/2	4
Poor compatibility of education with the curriculum of the course	6	37	1/6	4/0	12
Differences in professors' tastes in procedural education	6	42	7	4	11