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Moroccan Dental Students' Perspectives on Clinical Reasoning Learning in Orthodontics

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Received: December 17, 2021; **Published:** December 31, 2021

Abstract

Background: Clinical reasoning learning is a pedagogical method based on contextualized education and complements theoretical teaching in the dental training.

Objective: To gather the perceptions of undergraduate students at the Faculty of Dentistry of Casablanca towards clinical reasoning learning sessions in orthodontics and investigate the influence of different curricula on reasoning skills acquisition to improve basic orthodontic education.

Materials and Methods: We carried out a descriptive cross-sectional study of fifth year students at the Faculty of Dentistry in Casablanca at the end of their traineeship period. An anonymous self-completed questionnaire was used and consisted of four parts: demographic information, assessment of pedagogical and technical aspects, and general appreciations of the clinical reasoning learning sessions in orthodontic training. Statistical SPSS software (version 16.0, SPSS Inc, Chicago, IL, USA.) was used to analyze the data according to two descriptive and analytic approaches.

Results: Out of 122 questionnaires distributed, 120 were returned (a total response rate of 98.3%). 77.5% and 43.3% of students were 70% satisfied with the pedagogical and technical aspects respectively. Clinical reasoning learning method was rated as suitable for teaching orthodontics by 80% of the fifth year dental students. However, some difficulties with cephalometric tracing and documentary research have been reported. The need for early access to dento-Facial Orthopedics service has been declared by the participants to be able to confront the theoretical notions with clinical reality. Clinical reasoning learning sessions with clearly defined objectives are considered interesting and useful in orthodontic learning for 87,2% of students and 68.8% achieved more than 50% of the course objectives.

Conclusion: Learning through clinical reasoning is a constructive teaching method to adapt to the early years of orthodontic education to improve teaching effectiveness and learning outcomes.

Keywords: *Clinical Reasoning; Active Learning; Orthodontics; Perspectives; Undergraduate Students; Morocco*

Abbreviations

CRL: Clinical Reasoning Learning; M: Mean; SD: Standard Deviation

Introduction

When it comes to training practitioners, clinical reasoning learning (CRL) is an educational concept of significant interest across all medical fields and is based on learning and contextualized education [1].

Clinical reasoning is distinguished as a form of intellectual activity performed by the clinician, based on practice, which requires a background of research-based scientific and technological knowledge [2]. It is therefore a complex process in which a health care professional works through a clinical problem to find solutions using formal and informal strategies [3]. Through this philosophy of teaching, all aspects associated with disease are taken into account when diagnosing and implementing treatment [4]. This is one reason why this approach has been universally embraced.

The characteristics of the undergraduate program have been shown to affect the development of required skills in students [3] and long-term decision-making [5]. It can be argued that poor clinical reasoning leads to poor clinical decisions, which in turn lead to poor patient outcomes [1]. The role of learning by clinical reasoning is not to replace theoretical teaching but to complement it in the training of medical students [6]. However, it is important to say that the development of clinical reasoning skills is influenced by several factors [3].

In this light, the Department of Orthodontics has set itself the goal of continuously improving the various programs in which it is involved. This imposes a periodic evaluation to identify the failures and to propose appropriate adjustments and recommendations. This evaluation must be three-dimensional. In addition to self and peer evaluation, student-evaluation aims to involve students in improving and enriching their own teaching in a constructive and collaborative way.

The lack of studies specifically designed to evaluate the quality of clinical reasoning instruction in the Orthodontics Department among fifth year students ten years after the introduction of this pedagogical method motivated us to conduct this study whose main objective was to determine the value of clinical reasoning learning sessions, from the perspective of fifth year dental students.

Aim of the Study

We also aimed in a secondary way to investigate the influence of different curricula designs on the acquisition of clinical reasoning skills by students and to explore students' appreciation of the organization and evaluation methods to set up an improvement strategy.

Materials and Methods

A descriptive cross-sectional study was conducted among all fifth year dental students. Ethical clearance was obtained from the Ethics Committee of the Faculty of Dentistry, University of Hassan II University, and all students were informed about the aims of our study. In addition, Data collection was anonymous using a self-completed questionnaire containing 26 questions, 6 of which were open-ended. A four-point Likert scale was used to categorize participants' responses to closed-ended questions.

The questionnaire was organized into 4 main parts:

- Demographic information: age, gender and student group.
- Pedagogical aspects (14 questions): Clear communication of objectives/correspondence between content and objectives/quality of content/variety of content/structure of course/degree of assimilation/updating of content/difficulty/amount of work required/achievement of course objectives/time allotted for activities/clarity of instructions/satisfaction with evaluation procedures/supervision.

- Technical and media aspects (5 questions): Diversity of materials /technical assistance/adaptation of the audio-visual support to the course/quality of the audio-visual support/suggestion to improve the course on technical aspects.

- General appreciations (7 questions): Learning rate/course usefulness/percentage of course objectives achievement/course difficulty/most appreciated in the course/least appreciated in the course/relevance of the CRL to fifth year orthodontics teaching.

We described qualitative variables by number (count) and percentages, and quantitative variables by mean and standard deviation. Statistical SPSS software (version 16.0, SPSS Inc, Chicago, IL, USA.) was used to analyze the data. For analytical statistics, we calculated the Chi-square and the t-test for and the significance level was set at 5%.

Results

Of the 122 students contacted, 120 responded. 65.8% were women and 34.2% were men. The mean (M) age of the participants was 22 years with a SD of 1.004 (a minimum of 21 years and a maximum of 27 years).

Table 1 summarizes the results of the different pedagogical aspects. Concerning the overall satisfaction with the pedagogical aspect of CRL, 10.8% of students were less than 50% satisfied, 11.7% were between 50 and 70% satisfied, and 77.5% were more than 70% satisfied. The principal difficulties reported by the students were: cephalometric tracing, the establishment of a structured treatment plan, and documentary research.

	Completely agree	Somewhat agree	Somewhat disagree	Strongly disagree
Objectives communication	41,67%	48,33%	6,66%	3,34%
Content/objective match	38%	52%	8%	2%
The quality of the content	35,8%	45,8%	16,7%	1,7%
Variety of content	29,2%	52,5%	17,5%	0,8%
Course structure	36%	48,2%	14%	1,8%
Assimilation degree in a session	30,8%	48,4%	15,0%	5,8%
Content update	23,3%	49,2%	23,3%	4,2%
Amount of work required	26,2%	58%	13%	2,8%
Achievement of course objectives	32%	44,7%	22,3%	1%
The time allocated to activities	22%	53%	23%	2%
Clarity of instructions	29,2%	50%	19	1,8%
Satisfaction/evaluation methods	35%	51,7%	12,1%	1,2%
Supervision	40%	44,2%	13,5%	2,3%

Table 1: *Results of the different pedagogical aspects.*

Student appreciations of technical and media aspects are shown in table 2. To improve this area, the participants suggested to:

- Enhance the quality of equipment.

- Facilitate access to more audiovisual aids.

- Implement hybrid teaching to complement face-to-face sessions and to work on more clinical cases.

	Completely agree	Somewhat agree	Somewhat disagree	Strongly disagree
Diversity of documents	28,1%	52,7%	18%	1,2%
Technical support	19%	53,5%	24,2%	3,3%
Adaptation audio-visual support/course	26,5%	41%	22,5%	10%
Quality audio-visual support	30,6%	50,2%	16%	3,2%

Table 2: *Results of the technical and media aspects.*

Regarding the overall satisfaction with the technical aspect of CRL, 31.7% of students were less than 50% satisfied, 25% were between 50 and 70% satisfied, and 43.3% were over 70% satisfied.

General appreciations of the learning rate, course usefulness, percentage of course objectives achievement, and course difficulty are summarized in table 3. Additionally, students appreciated more in the course the following:

- Methodology of studying clinical cases (structuration, diversity).
- Teamwork and small working groups.
- Clear instructions and decision-making process.
- Interactivity, and involvement of all students in the course.
- Simulation of clinical reality.
- Evidence-based practice teaching sessions.

	Many	Moderately	A little	Not at all
Learning rate	43,3%	47,5%	8,3%	0,8%
Course Usefulness	42,5%	41,7%	14,2%	1,7%
	> 80%.	50% to 80%.	< 50%.	
Objectives achievement	26,5%	42,3%	19,9%	
	Little difficult	Moderate difficulty	Too difficult	
Course difficulty	25,8%	68,3%	5,8%	

Table 3: *Results of the general appreciations.*

On the other hand, students were less appreciative of the following:

- Limited time and insufficient number of sessions.
- Therapeutics were not sufficiently included.
- Interceptive treatment not sufficiently documented.
- Time scheduling of CRL sessions not adapted for all students groups.

The total satisfaction scores in pedagogical, technical, and general aspects analyzed by t-test and Chi-square revealed they were not significantly different when examined against gender and CRL programming semesters (p > 0,05). Scheduling the CRL sessions simultaneously with the fifth-year orthodontic lectures did not influence the students' learning and appreciation (Table 4).

	Semester	workforce	Average satisfaction	P
Pedagogical aspect	1st	60	73,2%	0,121
	2nd	60	68,2 %	
Technical Aspect	1st	60	65,4%	0,436
	2nd	60	61,6 %	
General Aspect	1st	60	81,4%	1
	2nd	60	81,7 %	

Table 4: *Association between student satisfaction and semesters.*

Discussion

Academic dental institutions vary in their pedagogical systems from traditional methods to more interactive methods such as case-based learning or group discussions [7-9]. The university courses at the faculty allow acquiring the theoretical bases. These bases are essential but insufficient to develop efficient clinical reasoning [10]. We believe that traditional teaching methods are outdated and lacking attributes necessary for student development [4]. Several studies [11,12] have shown that CRL allows students to develop critical thinking abilities in addition to clinical skills. Hence, our philosophy was to establish a new curriculum that encourages integrated learning in an environment where students feel like they belong [13].

The present study targeted Moroccan fifth-year dental students to evaluate clinical reasoning learning. As key stakeholders, their perception of the quality of teaching and their comments are valuable [14]. Our vision was to suggest concrete pedagogical proposals to optimize this educational method.

In our study, we noted the dominance of the female gender (65.8%) compared to the male gender (34.2%) and an average age of 22 years between the two sexes. The majority of participants had a positive attitude towards learning through clinical reasoning, 92% stated that the practical work objectives were well communicated and 90.8% judged the correspondence between the content and the aims as satisfactory.

Clear communication of pedagogical objectives, whether theoretical or practical, is crucial in any teaching method as it guides students in organizing their learning process. In addition, the mental representation of the clinical problem is a key element for its understanding [15]. The majority of our sample (81.7%) rated the course structure and variety of content as good. This was confirmed by Amey., *et al*. who found that clinical reasoning can become an essential, fun, and integrated component of teaching medical students by applying a structured approach to teaching clinical reasoning and incorporating interesting cases and exercises [16]. Complementary to the clinical internships, these sessions are designed to facilitate the development of students' clinical reasoning [17].

The degree of assimilation of the course in a single session was satisfactory for the majority (76.1%). These results are consistent with one of the primary goals of CRL [18], which is to facilitate the transmission of medical information and demonstrate the clarity of the instructions, the structuring, and the effectiveness of the course. Therefore, it's clear that students derive a real benefit from this teaching method. Furthermore, Chamberland., *et al*. showed that 48% of students estimated that between 20 and 30% of new clinical knowledge resulted from clinical reasoning sessions [11].

The majority of students feel that the amount of work required, the time allotted and the learning assessment methods are reasonable, which is in line with the results of the survey of Zairi., *et al*. who showed that students appreciate the atmosphere and the workload required by the CRL [6]. When asked about aspects of the content in which the students had difficulties, they referred to: Cephalometric tracing, establishment of a structured treatment plan and bibliographic research. In the same way, Anakin., *et al*. have reported that students find learning clinical reasoning skills challenging [19].

On the other side, the majority of students (80%) rated the technical assistance as satisfactory. Indeed, the strategies used by supervisors are a key process in helping learners develop clinical reasoning [19,20]. 80% of the students considered that the documents were of good quality, diversified and appropriate. These data, which seem paradoxical with the suggestions given by the students and the difficulties mentioned during the study, can be explained by the insufficient amount of time devoted to CRL sessions and bibliographic research and the need for the students to be in contact with the clinical practice to confront the theoretical notions with the clinical reality.

In terms of general appreciation, the majority of students learned a great deal from the course, which they rated as moderately difficult. 80% of students felt that the CRL was appropriate for teaching orthodontics in the fifth year of dental school.

With the fifth-year orthodontic course timetabled in the second semester, we wanted to know if there was a significant impact on students' assimilation and evaluation of the CRL. Statistical analysis detected no significant difference between the satisfaction rate of first and second-semester students. This shows that scheduling the CRL sessions at the same time as the course is not a condition for achieving the objectives. Indeed, the structuring and the organization of the CRL sessions allow students to have all the prerequisites and basic notions necessary to analyze and interpret the different clinical situations. Moreover, given clinical reasoning impact in the medical curriculum, clinical teachers should stress the importance of the pedagogical model that best describes how expert clinicians generate diagnostic decisions, thereby enabling students to rationalize reasoning learning processes in a context-specific manner [21].

Finally, several recommendations were made on the main lines of this study to ensure as optimal and effective a clinical teaching as possible:

- Adopt an e-learning typology offering more didactic material on the faculty platform to get the most out of it.
- Organize a hybrid face-to-face and online evaluation, whether formative or summative.
- Increase the number of clinical cases analyzed by incorporating intercept treatments.
- Provide students more time in the orthodontic department to see more direct, real-life clinical situations.

Conclusion

This work allowed us to assess our pedagogy concerning the learning of clinical reasoning from the view of fifth-year dental students. The student satisfaction would drive us to go further in this transition to a complete holistic approach. Novel approaches to investigating and interpreting clinical reasoning seem warranted and should become our top priority. Hence, it is necessary to invest in human and material resources; and develop staff skills in new technologies and evaluation strategies.

Conflict of Interest

All authors disclose no conflict.

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Volume 21 Issue 1 January 2022