



Clinical Reasoning Process in the Management of Fixed Prosthesis Cases Among Senior Year Dental Students Part I: Treatment Plan

A. CHAFII, S. BENFAIDA, Z. BENZHA, A. ANDOH

Summary: The aim of this study is to evaluate the clinical reasoning process among dental students at the Faculty of Dental Medicine in Casablanca. **Materials and methods:** A questionnaire including a clinical situation was distributed. 117 students in the last year of their training responded and the data were entered using a Microsoft Excel 2013 computer tool. **Results:** The majority of students were able to detect the objectives of the clinical case. 100% of them opted for pre-prosthetic care first and they placed prosthetic rehabilitation in the second step to replace the missing teeth. Each student proposed several prosthetic solutions for the clinical case, however the dental bridges was the most proposed treatment. Implant and removable solutions were also discussed. **Conclusion:** The students presented a difficulty to determine the treatment plan with a precise chronology. In order to develop an effective clinical reasoning strategy, educational strategies such as problem-based learning (PBL), learning clinical reasoning (LCR), community service learning and assessment methods need to be addressed. for rational decision-making in dentistry and more specifically in fixed prosthesis.

Keywords: Dental students. Clinical reasoning. Fixed prosthesis. Treatment plan.

I. Introduction

Dental professionals' competence in clinical reasoning is essential in the management of cases and in the delivery of oral health care. This skill requires mastery of knowledge to identify and solve clinical problems and need a good interaction with patients (critical thinking, professionalism, ethics and knowledge of the social and cultural context of the practice.). Yet we know very little about how these skills evolve, develop or integrate for dental students during their clinical education. As a result, dentistry lacks a complete model of clinical reasoning for case managing and decision making.

The existing models of clinical reasoning in dentistry, as in medicine, focus primarily on the process of diagnosing disease, but they do not allow for the more complex decisions associated with psychosocial determinants of health to be taken into account. As a result, they poorly contribute to the effectiveness of program models and assessment methods in dental education. Few studies have been conducted on dental clinical decision making in terms of how the clinician uses diagnostic thinking and integrates concepts and strategies into the clinical decisions. This state of affairs is untenable, as decisions in dental practice could be

made more stable and reproducible. Many statements about how to achieve a higher level of performance seem to be limited to general recommendations. Researchers as well as doctoral students working in dental academia have examined the challenges based on models rooted in paradigms that defend clinical performance and pedagogical excellence (1)

Many dentists rely on their experience and intuition when they should be relying on current evidence to make clinical decisions in their practices. Knowing the exact situations where intuition can be used will empower clinicians and also help them understand when not to use intuition, but rather to rely on evidence, even though the scientific evidence in prosthodontic is still insufficient. The fixed complete prosthetic restoration is often a complex process with different parameters to manage.

The challenge for dental education is to understand how clinical decision making can be characterized and improved in a deliberate manner while clearly articulating assumptions within an interpretive framework. (1)

The objective of this study is to assess the clinical reasoning process in dental students at the end of their training.

II. Materiel and method

A questionnaire was prepared for all students in their last year of the Faculty of Dentistry of Casablanca (169 students). The questionnaire includes a clinical case with documents (photos, x-rays, and plaster study models of the patient.)

The students must quote:

- the objectives of the treatment
- the treatment plan with justified arguments
- the chronology of the treatment in multiple sessions.

The questionnaires were distributed to all the students concerned at the end of their clinical shifts. The questionnaires were completed after 20 minutes and then collected, while preserving the anonymity of the participants.

The data collection was done at the Dental Consultation and Treatment Center of Casablanca, from April 30 to May 15, 2019. The information collected is processed in a global way, only for statistical purposes. As the study does not have an analytical purpose and can be done with a percentage calculation, the data were entered using a computer tool: Microsoft Excel 2013.

III. Results

Of the 169 students targeted by this study, 117 agreed to participate (69.2% of the initial population, 62.4% women and 37.6% men.) The majority of students believe that the main objectives of the clinical case are: Aesthetic (82,9%) and functional (77.8%) followed by responding the reason for consultation (39.3%). Fig 1

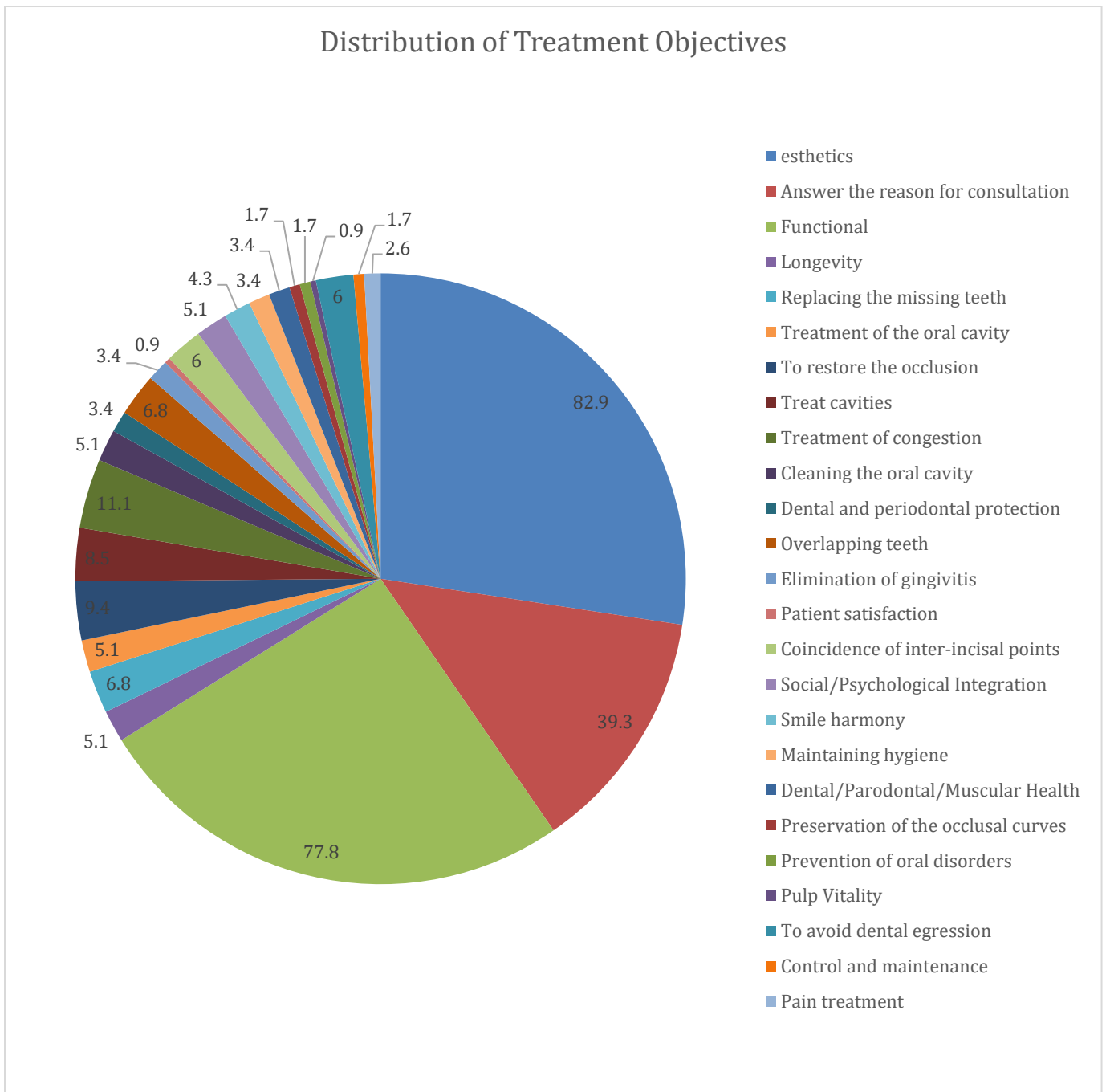


Figure 2: Distribution of Treatment Objectives

For the treatment plan, 100 % of the students opted for hygiene motivation, scaling and restorative care first (to remove plaque, and gingivitis and to treat infectious foci). The use of prosthetic rehabilitation to replace missing teeth was placed in the second place by all students.

The differences are found in the choice of wisdom tooth extraction (10.3%), endodontic treatment on 27 (35.9%), endodontic treatment on 46 (15.4%) and finally choice of orthodontic treatment (13.7%). Tab 1

Treatment plan	Arguments	Number and percentage
Hygiene motivation, scaling, restorative care of decayed teeth and prosthetic rehabilitation	To remove plaque, gingivitis and to treat the cavities and infection sites	29 (24,8%)
Hygiene motivation, scaling, wisdom teeth extraction, restorative care on decayed teeth and prosthetic rehabilitation	To remove plaque, gingivitis and to treat the cavities and infection sites	12 (10,3%)
Hygiene motivation, scaling, endodontic treatment on 27, restorative care on decayed teeth, and prosthetic rehabilitation	To remove plaque, gingivitis and to treat the cavities and necrotic teeth	42 (35,9%)
Hygiene motivation, scaling, orthodontic treatment, restorative care of decayed teeth, and prosthetic rehabilitation	To remove plaque, gingivitis and cavities, alignment of the arches and inter-incisal points	16 (13,7 %)
Hygiene motivation, scaling, endodontic treatment on 46, restorative care on decayed teeth, and prosthetic rehabilitation	To remove plaque and gingivitis and to treat cavities and necrotic teeth	18 (15,4%)
Total		117 (100%)

Table 1 : Treatment plan with arguments

Regarding the chronology of the treatment plan, 100% of the students thought that the first session should be devoted to dental hygiene motivation and scaling. Only 31% thought that restorative treatments should be started in the first session. 7% cited the extraction of wisdom teeth (Tab 2.)

1st session	number	Percentage
Dental hygiene motivation and scaling	117	100
Dental hygiene motivation, scaling and the beginning of restorative care	31	26,5
Dental hygiene motivation, scaling and wisdom teeth extraction	7	6

Table 2: Chronology of treatment: 1st session

For the second session: All the students estimated that it was necessary to restore the decayed teeth with composite. Only 6% felt that root canal treatment should also be done on 27 and 46 (Tab 3)

2nd session	Number	Percentage
Restorative care 18, 17, 16, 26, 27, 46, 26, 36, 37, 38	117	100
Restorative care 18, 17, 16, 26, 27, 46, 26, 36, 37, 38 and endodontic treatment on 27	19	16,2
Restorative care 18, 17, 16, 26, 27, 46, 26, 36, 37, 38 et endodontic treatment on 46	6	5,1

Table 3: Chronology of treatment: 2nd session

For the third session: All of the students judged that restorative treatments started during the first and second session should be completed. A small part (5%) thought that it was necessary to extract the wisdom teeth during this sequence. (Tab 4)

3rd session	Number	Percentage
Restorative care finishing	117	100
Restorative care finishing and wisdom teeth extraction	5	4,3

Table 4 : Chronology of treatment : 3rd session

For session 4 :17% Of the students felt that orthodontic treatment should be performed in this session and that prosthetic treatment should not be started until the orthodontic treatment is completed.

Each student for the sequence number five proposed several prosthetic solutions for the clinical case. Bridges to replace the missing teeth were the most proposed treatment. The main differences were in the proposed treatment to replace 12. The implant solution was also discussed by 57.3% of the students. The removable prosthetic solution was proposed by the most students (92.3%). Tab 5

5th session:	Number	Percentage
Implants 12,24,25,34	67	57,3
Bonded Bridge replacing the 12 and cemented bridge 24/25	106	90,6
Modified Bonded Bridge replacing the 12 (core inlay + crown on 11), cemented bridge 24/25 and crown on 27 and bonded bridge 34	95	81,2
Removableprosthesis12,24,25	108	92,3
Bonded Bridge replacing the 12, cemented bridge 24/25 and bonded bridge 34	10	8,5
Cemented Bridge replacing the 12, cemented bridge 24/25 and bonded bridge 34	13	11,1
Implants replacing 24/25 and crown on 46	9	7,7
Removableprosthesis 12,24,25,34	12	10,3
Cantilever bridge replacing 12, sealed bridge replacing 24/25 and glued bridge on 34	104	88,9
cantilever bridge replacing 12, modified glued bridge 24/25 and glued bridge on 34	13	11,1
Modified bonded bridge replacing 12 on 11 and dental splint on 13, cemented bridge 24/25 and bonded bridge on 34	14	12

Table 5 : Chronology of treatment :5th session

For the last session, only 16.2% of students remembered to do a control and maintenance phase at the end of the treatment.

IV. Discussion

Similar to studies carried out in various dental schools internationally (United States, Canada, Puerto Rico, India, Turkey). The students presented a difficulty in determining a treatment plan, with a precise chronology:

Objectives of the treatment:

The objectives most emphasized among our students are aesthetics (82.3%), functional (77,8%), and meet the reason for consultation (39,3 %)

Similarly, in a study done at the University of Buffalo in New York (3), in 1999, on the use of standardized patients to assess the presentation of a dental treatment plan by dental students, researchers have reported that

94% of dental students got a full set of patient information, but only 81% were successful in identifying treatment goals for the patient. Although the results are close to the values found in our survey, the fact remains that they are incomparable because the results are general and not detailed as in our study.

In our survey, 39.3% of the students took into consideration the patient's goal, which is to respond to their consultation reason, and 60.7% only mentioned the treatment goals from their personal point of view, without taking into account those of the patient. According to a 2007 study by Stefanac S. (8) of dentists who have already completed their training: Creating a modified treatment plan balances the patient's treatment goals with those of the dentist. However, this study does not present a precise figure and concerns dentists already trained and not trainees at the end of their training. Therefore, further studies should be done to study this parameter in students.

Treatment plan with justified arguments:

All the treatment plans proposed by our students have in common starting with initial periodontal care, with varying percentages depending on the type of pre-prosthetic care. 100% of the students proposed prosthetic rehabilitation at the end.

Collins J and his team carried out a study in Canada (1), in 2012, in order to identify the processes and the strategies of clinical reasoning used by the students to produce treatment plans. 9 residents of the dental school of dental specialties, 8 dental students at the beginning of their last year of the undergraduate dental program and 10 students at the end of their last year of the undergraduate dental program. Students at the start of their final year slowly shifted from biological characteristics to psychosocial ones. Students at the end of their final year program used rituals to gather information and plan treatment, like the written protocol of the hospital center.

They could prioritize by exploring patient expectations and motivations as well as their personal context. The more experienced residents were more flexible with their own routines. They also appear to be more aware of their personal frame of reference, their individual perspective or philosophy of care, and how this influenced their interpretation of issues and their approach to care.

Since our survey did not include residents, and did not present the psychosocial characteristics of the patient, comparative student / resident studies should take place in the future, taking this parameter into account.

Also in the same part, another study was carried out at the Faculty of Dentistry of the University of Puerto Rico (2), in 2000, in order to assess the qualitative differences in the process of diagnostic reasoning at different stages of development expertise. However, the percentages have not been indicated:

- The beginners were middle school students.
- participants classified as competent were recent graduates of the dental school
- The experts were dentists who had practiced in clinic for at least ten years as a general practitioner dentist.

Beginning students exhibited characteristics such as focusing their attention on irrelevant data, lack of organization of ideas, difficulty determining key clinical outcomes, and inability to predict required information. Competent dentists have shown organization in the organization of their ideas, the ability to identify key clinical findings, reference to facts learned in educational courses, and need additional diagnostic aids. On the other

hand, expert dentists have alluded to the contextual information of the patient. They demonstrated the ability to distinguish between relevant and irrelevant data, the organization of ideas, and the ability to determine key clinical outcomes. As our investigation did not include experts, studies.

Student/expert comparisons should be investigated in our faculty to assess differences in their clinical reasoning process.

Chronology of the treatment plan:

To sequence the treatment Plan, we based ourselves on the work of the Sivakumar (7), published in 2012, who was the only one to address this topic. He proposed 5 phases in the treatment plan.

The population affected by Sivakumar's work is represented by dentists who have completed their training. So we can't compare this parameter with the students at the end of the training. In addition, the rates have not been specified. However, this could be a model to follow in order to integrate the sequences of a treatment plan into a strategic framework:

Urgent phase: In our clinical case, there was no emergency to treat such as: Pain, bleeding or infection.

Control phase: This phase consists of undertaking preventive dentistry activities: 100% of the students cited the need to motivate the patient to hygiene in order to eliminate the inflammation, as well as to educate in the habits of correct oral hygiene. However, other measures were not proposed.

Re-evaluation phase: It is during this phase that home care habits are strengthened. Initial treatment and pulp responses are reassessed before the start of definitive treatment. The students did not mention this phase in their treatment plan.

Definitive phase: Endodontics: 35.9% suggested doing root canal treatment on 27, and 15.4% on 46. Periodontology: proposed by 100% of students. Surgical dentistry: suggested by 10.3%, 13.7% suggested performing orthodontic treatment. And 100% of the students cited doing a fixed or removable prosthetic rehabilitation.

Maintenance phase: Only 16.2% thought of carrying out a control and maintenance session at the end of the treatment. Our students began treatment with the initial periodontal treatment, then then conservative treatments and this in several sessions until the treatment was completed. 6% of students offered to extract wisdom teeth from the first session

4.3% felt that it was better to extract them after finishing carious tooth care. 16.2% suggested endodontic treatment on 27 and 5.1% on 46, after restorative care. 14.5% thought necessary for the patient to undergo orthodontic treatment after the necessary for the patient to undergo orthodontic treatment after the aforementioned treatments. 100 % offered prosthetic rehabilitation last.

Similar to our study, third and fourth year students from Harvard of Dental Medicine, and University of California, School of Dentistry (4), were asked in 2013 to perform diagnostic and treatment planning exercises. By chronology for two clinical scenarios. Only 41.7% were able to cite the treatment sequence chronologically correctly. However, the rate was cited in general and not for each treatment sequence. As a result, the rates are not really comparable. Since this study targeted third and fourth year students. They may not yet be able to plan the treatment plan chronologically as effectively as a comparable. Since this study targeted third and fourth year students. They may not yet be able to plan the treatment plan chronologically as effectively as a student at the end of training, due to the fact that their training has not yet been fully completed.

Regarding the chronology of choice between the removable prosthesis and the fixed prosthesis: 57.3% of the students proposed to perform implants as first choice, and 92.3% to do a partial removable prosthesis on 12/24/25 (92.3%) secondly. However, bridge alternatives were the most popular among students. Similarly, according to the study carried out by Marcel B. (5), in 2007, the fixed prosthesis on implants is the first-choice therapeutic solution in the restoration of edentulousness among dentists, without specifying the percentages of the results. However, this study is not about trainees, but graduate dentists. Therefore, further studies should be proposed to compare the fixed/removable prosthesis timeline in students.

International epidemiological literature is still scarce among trainees at the end of their training, so other studies must take place in the future in order to be able to compare the results.

V. Conclusion

The students were able to determine the goals of treatment, but they presented difficulties in choosing the treatment plan, as well as its timeline. There is now a need to broaden our perspective of clinical reasoning to draw attention to the healthcare environment in which dentists encounter the oral health issues of patients and the communities in which they live.

However, before that happens, we need some essential ingredients:

- A conceptual framework for clinical reasoning in dentistry based on empirical evidence and reflecting the contextual determinants of oral health and disease.
- A practical list of skills required for clinical reasoning based on this conceptual framework.
- Educational strategies such as Problem-Based Learning (PLA), Learning Clinical Reasoning (CRA), and Community Service Learning and Assessment Methods to address this broader view of clinical reasoning and decision making in dentistry and more specifically in joint prosthesis.

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QUESTIONNAIRE

Dear colleague,

I am a student in the process of writing my thesis at the Faculty of Dentistry of Casablanca. My thesis topic is entitled: "Decision-making in the management of cases in fixed prosthesis by trainees at the end of their training".

The purpose of my investigation is to evaluate the clinical reasoning process of trainees at the end of their training in the context of case management in fixed prosthesis.

The questionnaire includes a clinical case with documentation (photos, x-rays, and patient study template). I would like to ask you to state your decision regarding the therapeutic solution(s) to be proposed for the clinical situation. I would like to express my appreciation and thanks for the time you have given to this form.

Presentation of the case

- Mrs H.A, 38 years old, who consulted us for a restoration of the oral cavity and an aesthetic and functional prosthetic rehabilitation
- On the general plan: Good general health
- Periodontal: plaque-related gingivitis
- On the articular level: No clicking or cracking on closure
- Straight path on closure
- Occlusal level:
 - maxilla circumscribes the mandible
 - Class I canine and molar right and left
 - No coincidence of inter incisor points
 - functional anterior guidance

DENTAL EXAMINATION

- 18: Site 1 stage 2
- 17: Site 1 stage 1
- 16:
- 15: Bonded Bridge
- 14:
- 13: Healthy
- 12: absent
- 11: Correct root canal treatment
- 21: healthy
- 22: healthy
- 23: healthy
- 24: absent
- 25: absent
- 26: Site 1 stage 1
- 27: Caries S1 stage 4
- 28: I.S.O
- 48: absent (extracted)
- 47: Site 1 stage 2
- 46: Site 1 stage 2
- 45: healthy
- 44: healthy
- 43: healthy
- 42: healthy
- 41: healthy
- 31: healthy
- 32: healthy
- 33: healthy
- 34: absent
- 35: Caries stopped (M)
- 36: I.S.O
- 37: Site 1 stage 2
- 38: Site 1 stage 2







A) Treatment objectives

- 1-.....
- 2-.....
- 3-.....
- 4-.....

B) Treatment plan :

	<u>Treatment plan</u>	Arguments (justified)
1-		
2-		
3-		
4-		
5-		
6-		
7-		
8-		
9-		
10-		

C-Chronology of treatment :

Session 1:

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session 2:

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Session 3 :

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Session 4 :

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session 5:

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session X:

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Session X :

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Session X :

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