Towards Effective Oral Healthcare Management and Provision: A Mixed Methods Study on Quality within Academic Dentistry in the UAE

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PREFACE

The work described in this dissertation is original and unpublished, except where acknowledgements and references are made to work of others. This dissertation is written by Nuha Hawas (NH) and is submitted for the Doctor of Philosophy degree at McGill University. The fieldwork presented in this dissertation was carried out at the University Dental Hospital Sharjah between January and October 2014.

I (Nuha Hawas) being the author of this dissertation and the principal investigator for this research project, proposed the original concept of the research protocol and designed it. I carried out all of the steps of the systematic review and all stages of the research project including data collection, analysis, interpretation and thesis writing.

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ABSTRACT - ENGLISH

Within dental school clinics, it is important not only to consider the training of dental students, but also to address the clinic patients' needs and provide high quality oral healthcare. Continuous quality assessment allows us to identify and understand areas of strength, as well as areas that require improvement. This, in turn, will maximize health benefits for the patients, ensure adequate clinical experience for dental students and control costs. Therefore, the aim of this study was to provide a descriptive assessment of the elements of oral healthcare quality provided to adult patients at the University Dental Hospital Sharjah (UDHS) using individual auditing procedures and in-depth interviews with all stakeholders, with the intent to recommend effective intervention(s) to improve oral healthcare management and provision. We started with a systematic literature review (SLR) to determine what aspects of care are used to assess quality of oral healthcare by patients and providers in the Middle Eastern Culture. Based on the results of the SLR (narrative synthesis), we designed a mixed methods study that involved an audit of patient medical records and qualitative interviews with all stakeholders involved at the UDHS. The results of this investigation were shared with the providers at UDHS, and recommendations for improvements were discussed, some of which were immediately implemented; others are being further reviewed, as they require additional time and planning. The data collected from the audit provided descriptive information on the sample characteristics that include the socio-demographic, general health and oral health characteristics of the patients. The 16-month retrospective audit in Phase I also provided a descriptive assessment of oral healthcare by focusing on the treatment progress of direct restorations carried out by the students. One problem identified was the high

prevalence of incomplete planned treatments in the patients' dental records (87.4%), and this was explained using in-depth individual and focus group interviews with all stakeholders in Phase II. The different stakeholders showed many unique and common perspectives. Analysis across the multiple stakeholders' perspectives provided an explanation for the problem through the emergence of four integrated key themes. First: weakness in the 'Structure' of oral healthcare, second: weakness in the interpersonal aspects of the 'Process' of oral healthcare, third: weakness in the clinical aspects of the 'Process' of oral healthcare, and finally: patient population characteristics. These led to either having patients who do not want to / cannot come back or students who do not want to / cannot give appointments to their patients, both of which could cause the problem under study. Including all stakeholders provided an exceptional richness of the data that wouldn't have been possible otherwise. In conclusion, using individual auditing procedures and applying a qualitative methodological approach with all stakeholders in a system can provide information that will enrich understanding and lead to appropriate and effective change.

RÉSUMÉ - FRANÇAIS

Dans le contexte des cliniques dentaires universitaires, il est non seulement important de tenir compte de la formation des étudiants en dentisterie, mais également de répondre aux besoins des patients des cliniques et de leur offrir des soins dentaires de grande qualité. Une évaluation continue de la qualité nous permet de découvrir et de comprendre les points forts, tout comme les points à améliorer. Cela permettra en retour d'optimiser les bienfaits pour la santé des patients, de faire en sorte que les étudiants en dentisterie reçoivent une expérience clinique adéquate, et de maîtriser les coûts. L'objectif de cette étude est donc de fournir une évaluation descriptive des éléments de la qualité des soins dentaires fournis à des patients adultes à la *University Dental Hospital Sharjah (UDHS)* en se servant de méthodes de vérification individuelles et d'entretiens en profondeur avec toutes les parties prenantes, dans le but de recommander des interventions efficaces pour améliorer la prise en charge et la prestation des soins dentaires. Nous avons commencé par une revue systématique (RS) de la documentation pour déterminer les aspects des soins qui servent à évaluer la qualité des soins dentaires chez les patients et les prestateurs de soins dans la culture du Moyen-Orient. À partir des résultats de la RS, nous avons planifié une étude à méthodologie mixte qui comprend une vérification des dossiers médicaux des patients et des entretiens qualitatifs avec toutes les parties prenantes concernées à l'UDHS. Les résultats de cette enquête ont été communiqués aux prestateurs de soins de l'UDHS et des recommandations d'améliorations ont été discutées, certaines d'entre elles étant mises en œuvre immédiatement tandis que d'autres faisaient l'objet d'études supplémentaires, puisqu'elles demandaient plus de temps et de planification. Les données de l'évaluation ont fourni des renseignements

descriptifs sur les caractéristiques de l'échantillon, notamment les renseignements sociodémographiques de même que les caractéristiques de la santé générale et de la santé dentaire des patients. La vérification rétrospective de 16 mois de la Phase I a également fourni une évaluation descriptive de soins dentaires en se concentrant sur l'évolution du traitement des restaurations directes effectuées par les étudiants. On a déterminé qu'un des problèmes était la prévalence élevée de traitements planifiés non terminés dans les dossiers dentaires des patients (87,4 %), ce qu'on a expliqué à l'aide d'entretiens en profondeur menés individuellement et en groupes auprès de toutes les parties prenantes pendant la Phase II. Les parties prenantes ont révélé de nombreux points de vue uniques et communs. Une analyse de tous les points de vue multiples des parties prenantes a permis d'expliquer le problème par l'émergence de quatre thèmes intégrés importants : (1) une faiblesse dans la 'structure' des soins dentaires, (2) une faiblesse dans les aspects interpersonnels du 'processus' des soins dentaires, (3) une faiblesse dans les aspects cliniques du 'processus' des soins dentaires et (4) les caractéristiques de la population de patients. Cela s'est traduit soit par des patients qui ne veulent pas / ne peuvent pas revenir, soit par des étudiants qui ne veulent pas / ne peuvent pas donner de rendez-vous à leurs patients, les deux aspects étant susceptibles de causer le problème à l'étude. L'inclusion de toutes les parties prenantes a fourni une richesse de données exceptionnelle qu'il n'aurait pas été possible d'obtenir autrement. En conclusion, l'application d'une démarche méthodologique qualitative à toutes les parties prenantes d'un système peut procurer des renseignements qui enrichissent la compréhension et qui mènent à des changements appropriés et efficaces

1. INTRODUCTION

Oral diseases cause pain and disability that affect the quality of life of millions of individuals in a population (1). The cost of treatment of oral diseases is tremendously high creating a significant burden on the country's economy (2, 3). This has led to the increasing interests in quality measurement to improve healthcare, maximize health benefits for the citizens and decrease medical expenditure (4, 5).

Quality in healthcare is a complex, multidimensional yet important construct. Many have attempted to define quality of healthcare (6-9), but there is still no agreement on the best way to measure 'quality'. That is mainly because the dimensions and indicators of quality in the healthcare industry are assumed to differ according to:

[1] the type of health service provided (e.g., medical, dental) (10)

[2] the mode of delivery addresses where care is delivered (e.g., out-patient, clinic) and the mechanism of care delivery (e.g., managed care, fee-for-service) (7)

[3] the culture and values (e.g., personal choices, quality of life concept) (11)

[4] the stakeholders involved (e.g., patients, providers) (12)

Based on the work proposed by Donabedian, information about quality of care can be produced based on three components. Structure (the environment in which healthcare service is delivered), Process (how the service is delivered) and Outcome (the consequences of the service delivery) (6). Information obtained from 'Process' measures are in most cases preferable over 'Structure' and 'Outcome' measures with some exception depending on the goal of quality measurement (13).

Defining quality and developing quality measures have received relatively little focus in oral health, compared to medical, practice. Although there is a large amount of literature on the assessment of oral healthcare, few of these have been applied or translated into guidelines and procedures for measuring quality care in dentistry (14). Even today, we do not have indicators that have been shown to be valid and reliable measures of quality in dentistry (10).

However, we have multiple data sources that can be used to collect useful data on quality, and it is worthwhile to use as many valid data sources as possible to create the most accurate descriptive evaluation of quality of oral healthcare (15). By doing that, we can continuously collect and evaluate data on quality, getting us closer to improving the quality in oral healthcare and to providing “the right care at the right time, the first time” (16).

Given the urgent need for quality improvement in the field of dentistry, this PhD dissertation was designed to describe the elements of quality of oral healthcare services provided at the University Dental Hospital Sharjah (UDHS) in the United Arab Emirates (UAE), with the intent to recommend effective intervention(s) to improve oral healthcare management and provision.

2. BACKGROUND

2.1. Burden of Oral Diseases

2.1.1. Burden of oral diseases worldwide

Oral disease causes pain and disability, affecting the quality of life of millions of individuals in a population (1). Poor oral health not only causes pain and discomfort, but it also affects the communication and learning abilities of children. Oral health diseases lead to the annual loss of 50 million school hours. These diseases, ranging from a tooth cavity to oral cancer, affect some groups more than others, such as low income families and disadvantaged racial and ethnic groups (1, 17). Many risk factors have been identified for oral diseases, and they include an unhealthy diet, tobacco use, harmful alcohol use and poor oral hygiene, as well as social determinants of health(17).

In recognition of the tremendous impact of oral disease and its consequences on general health, well-being and quality of life in most countries, oral diseases have recently been declared to share common risk factors with Non Communicable Diseases like cardiovascular disease, cancers, diabetes, and chronic lung disease (18). The enduring burden of oral disease follows a pattern comparable to other chronic diseases. These diseases are dominant in middle- and high-income countries, and their prevalence is increasing in many low income countries. Oral diseases “create a double burden on top of the infectious diseases by which these countries continue to be afflicted” (19).

In most high-income countries, dental caries are found to present in 60 – 90% of school children, making it a major public health problem. In numerous Latin American and Asian

countries, dental caries is considered to be the most prevalent oral disease, with , dental cavities present in almost all adults (20). Severe periodontal disease is present in 15 – 20% of middle-aged adults globally and its aggressive form leading to premature tooth loss in 2% of the young population (21). In several countries oral cancer incidence in men is found to range from 1 to 10 cases per 100,000 individuals (20). Currently, in the greater part of Africa, the prevalence and severity of dental caries appears to be smaller. However, it is predicted that dental caries incidence will increase in some of Africa's low income countries because of their changing lifestyles and dietary practices, such as high sugar consumption and deficient fluoride exposure (22).

The cost of traditional treatment of oral disease is tremendously high, creating a significant burden on a country's economy; oral disease ranks as fourth of the most expensive diseases to treat. Over the past years, there has been a marked reduction in the prevalence of dental caries in industrialized countries due to the implementation of prevention measures, like dental health education programs, to increase dental awareness and the use of preventive measures, like fluoride (23, 24). An example of this reduction was reported in Italy, where the caries index (DMFT) dropped from 4.3+/-3.1 in 1989 to 0.8+/-1.5 in 2004 (25).

2.1.2. Burden of oral disease in the Middle East

In the Middle East, caries prevalence research is not as abundant; however, the available evidence suggests a high level of caries amongst children and young adults. For example, in Kuwait in 2006, it was reported that 6-year old children had an average DMFT index of

4.6 (26) and, in 2013, the results of a systematic review indicated that, in Saudi Arabian children's and adult's, the DMFT indices were 5.0 and 3.5, respectively (27).

Studies (28) describing oral health issues in the Middle East demonstrate that:

- awareness of the most appropriate oral hygiene approaches is poor and the importance of oral health to general health and quality of life is not acknowledged,
- distribution of health resources are directed primarily to the relief of pain and emergency oral health services,
- un-healthy lifestyle practices, such as smoking and increased sugar consumption, expand the problem
- cost-effective oral health preventive methods (like proper oral hygiene, fluorides and sealants) and health education to promote awareness has not received adequate attention (28-31)
- oral health services are provided mostly in urban hospitals, while rural areas receive limited care (19, 28)

2.2. Management and Quality of Healthcare

Healthcare management and quality measurement has become a major concern in all healthcare systems (9, 32). Quality improvement has been crystallized to be a part of the health professionals' daily routine and statutory obligation in many countries aiming to promote an atmosphere that flourishes with high quality clinical services (9, 33, 34).

Management in the field of healthcare has come a very long way. In the early 1900's, the tasks of hospital administration and management were given to employees, usually from the nursing field, who were called "superintendents"(35). However, in recent years, the role of management in healthcare has noticeably been on the rise, largely due to the increasing challenge of balancing cost and quality in healthcare services (36). Today, health care organizations assign well-trained professionals in administration, financing and management who are challenged with more numerous and diverse roles and responsibilities than ever before.

Over the last 30 years, advances in technology have improved the quality of oral healthcare and allowed for the development of new treatment methods (37, 38). However, the management of quality of services in the entire healthcare industry is challenged, due to many factors. First, it is one of the largest of all industries, consisting of many establishments and divisions that differ in size, organizational structure and staffing composition (39). In fact, health-related occupations include ten of the twenty fastest proliferating jobs. Second, the environment of this industry is hazardous and stressful for those providing the care, as well as for those receiving it; workers are exposed to multiple risks, such as radiation, chemicals, infections, etc.; patients are also at risk, not only from similar risks that affect the workers, but also because they mostly seek treatment when they are ill; if they are at a critical stage in their health condition, they must receive the correct examination, diagnosis and treatment in a limited amount of time (40). Third, advances in technology and the complex needs of our changing society have forced the healthcare industry to evolve and transform (41). These evolving and highly costly technologies add to the challenges that this industry faces, requiring economic studies

(eg. cost-effectiveness) and health technology assessment approaches for appropriate decision-making (42). Fourth, the shift towards increased patient involvement in the decision making process has led to the development of personalized care (43). An essential part of the advancements in modern healthcare is attributed to the progressive rise in the involvement of patients in the decisions concerning their care and treatment. Fifth, the health care industry has many concepts that are not yet defined or measured, and multiple scientific debates include the construct of quality of healthcare itself (44, 45)

Securing quality improvement is high in the agenda of many countries for the following reasons: growing demand for healthcare (46); the public's interest in high technology medicine (32); healthcare users are more sophisticated customers and demand more accountability from all professions (37); the high and rising costs of hospital care (32, 40); evidence of variation in clinical practice (46); and the availability of organizations' performance data (47).

2.3. The Benefits of Quality Measurement and Improvements

This increased focus on quality of healthcare has led and aims to:

a. Allow countries to improve their healthcare and maximize health benefits for their citizens (46, 48).
b. Reduce variability of care by encouraging medical practitioners to follow evidence-based treatment guidelines, thereby reducing inappropriate care (48).

c. Limit the growth of medical expenditures by decreasing expensive complications and unnecessary procedures, as well as by increasing the efficiency of health resource allocation and avoiding over- and under-use of health services (2, 3).
d. Informing the process of implementation of quality improvement programs as a preventive measure or when quality problems are present, by flagging such problems; this will lead to the implementation of corrective measures and the evaluation of changes in quality (48, 49).
e. Assuring the continuous improvement of care by all health practitioners through both the identification and reinforcement of strengths, as well as rectification of weaknesses within the system as a whole (37).
f. From management's perspective, it is vital to "today's competitive and cost-conscious healthcare market" to improve the corporate image and gain positive word of mouth recommendation, thereby increasing the retention of current customers and attraction of new ones (3).
g. Improve tracking quality of healthcare over time through national benchmarking, in additional to within-facility evaluation (50).

Thus, it is generally agreed that quality in health services should be defined, measured, monitored and improved (3, 37, 46, 48, 50).

2.4. Definitions and Frameworks of 'Quality'

Quality means different things to different people (37, 38). In the context of healthcare, quality is difficult to describe and measure because of the dynamic and complex nature

of healthcare. It is a broad-ranging concept. It can be defined in numerous ways and tailored for specific functions (38, 51).

In healthcare services, we define and assess the individual him/herself and the quality of his/her life (3) in addition to the perspectives of other stakeholders (9). Over 50 stakeholder groups have proposed more than 300 measures to assess quality of health services (52) and over a hundred definitions of quality of care have been identified (53). Therefore, a single definition of quality cannot be applied to all healthcare fields and stakeholders (9, 37, 48, 51).

Donabedian's research in quality assurance has laid down the foundation for the definition and determination of quality in health care (6, 54-56). His concept of quality differentiated between health components and categories of health care. He divided the individual measures of care into three categories. (1) Structure: measures the relatively rigid aspects of the medical delivery system such as the kind, quantity and qualifications of health care providers and settings. (2) Process: describes what is done to and for the patient during medical procedures, arranging for further care when needed and providing drugs. (3) Outcome: measures the effect on health status that can be accredited to the care provided. He also divided quality into three components: interpersonal aspects, amenities of care and technical aspects. He later defined "the seven pillars of quality" as efficacy, effectiveness, efficiency, optimality, acceptability, legitimacy and equity.

Others have also defined and described the attributes of quality, and many have modified or further broke down Donabedian's quality attributes. These definitions share common

dimensions, such as effective clinical and interpersonal skills, patient satisfaction, efficiency, risk management, etc., as summarized in Table (1).

Table 1: Previously described common dimensions of quality of care
(a ✓ represents the presence of that quality dimension in the quality definition)

Quality Dimensions	Donabedian 1990	O'Leary & O'Leary 1992	HSRG 1992	Turner & Pol 1995	Campbell, Roland et al 2000
Accessibility		✔	✔	✔	✔ For an individual
Patient Perspective\satisfaction		✔	✔	✔	
Effectiveness	✔	✔	✔		✔ For an individual
Efficiency	✔	✔	✔		✔ For a population
Continuity		✔	✔		
Efficacy	✔	✔			
Acceptability	✔				
Equity	✔				✔ For a population
Legitimacy	✔				
Comprehensiveness			✔		
Clinical Outcome				✔	
Health Care Personnel				✔	

2.5. Quality Framework Adaptation for this Study

While most other models described quality of care as a concept at a general, macro level, Campbell and colleagues provide a framework that can be used to investigate quality of care at an organizational level. As well as clear descriptions of the components and elements within the model, the authors also provide examples of its application. It is a comprehensive framework, as it enables a systematic evaluation of quality in the structure, process and outcome of a healthcare system and further permits the inclusion of all of the important dimensions of care within the domains of access and effectiveness. Moreover, this framework can be used on a practical basis to show which aspects of

health care are emphasized and/or assessed/measured and which are not. Quality indicators can further be critically analyzed using this model. This PhD provides a descriptive evaluation of quality of oral health provision in a teaching hospital setting, and the Campbell et al's model will be adapted to guide our investigation.

In the context of care provided by institutional healthcare systems, Campbell et al (2000), based on Donabedian's three components of healthcare, defined "healthcare" and "quality" separately, then integrated these components into a detailed conceptual framework that describes quality of care viewed either from an individual's or population's perspective (Figure 1).

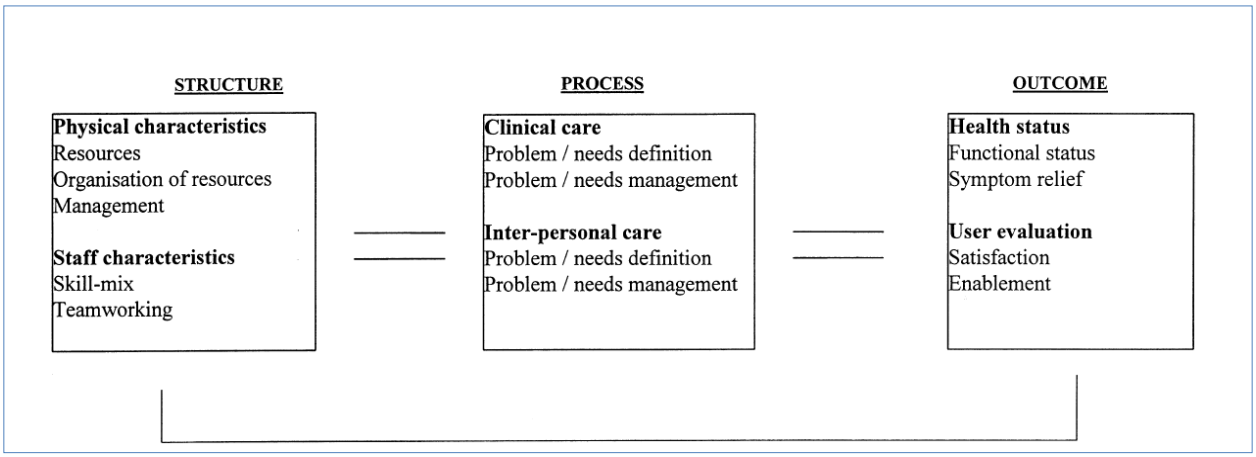

Figure 1: A system based model for assessing care by Campbell, Roland et al. (9)

Instead of considering Donabedian's components as categories of care, 'Process' is considered as the actual care provided to the individual, 'Structure' is the avenue in which the interaction between the individual (receiver) and the healthcare system takes place, and 'Outcome' is a consequence of the interaction. 'Process', 'Structure' and 'Outcome' were further developed and elaborated in this conceptual framework. There are two domains to 'Structure', namely "physical characteristics" and "staff characteristics", and

each domain was further developed into multiple dimensions that, in turn, have their own components. Similarly 'Process' also has two key domains; "clinical care" that describes the application of clinical medicine to a personal health problem, and "interpersonal care", referring to "the management of the social and psychological interactions between the client and the practitioner". Finally "health status" and "user evaluation" were considered the two key domains in 'Outcome' that are influenced directly and indirectly by 'Structure' and 'Process'. All of these components are important; however, the relative importance of each of the components differs according to different situations.

In terms of the definition of 'quality of healthcare', Campbell and colleagues defined quality of care in terms of 'access' and 'effectiveness', i.e. "whether individuals can access the health structures and processes of care that they need and whether the care received is "effective". In their framework, a tabulation of quality of care for individual patients is produced by enclosing access and effectiveness with the domains of structure, process and outcome, and their associated dimensions (Figure 2).

	Care		
	Health care system (Structure)	*Patient-centred care* (Process)	*Consequences of care* (Outcome)
Quality			
Accessibility	Geographic /physical access Affordability Availability	Affordablility Availability	Health status User evaluation
Effectiveness		Effectiveness of Clinical care Effectiveness of Inter-personal care	Health status User evaluation

Figure 2: Dimensions of quality of care for individual patients as proposed by Campbell, Roland, et al (9)

Essentially, this quality of care model recognizes that the patients should first be able to have access to a variety of healthcare services, and the care should not only be proficient and knowledge-based (clinical effectiveness), but also considerate and humane in nature (interpersonal effectiveness).

Finally, from a population's perspective, health resources should be allocated to maximize the society's health gain (efficiency), and all individuals in a population should have fair access to the care provided (equity).

2.6. Quality Assessment Measures

Many indicators have been developed to measure the performance of healthcare systems and quality of care. They are explicitly defined and measurable items that help create a judgment about the provided quality of healthcare (57). Inevitably, quality indicators are measures related to the structure, process and outcome of healthcare. Different weights have been given to the aspects of care depending on the goal of the quality assessment (13).

From the patients' perspective, not only the outcome, but also the structure and process measures, are important; this is because, when patients receive healthcare, they want to know that the healthcare service is structured and provided in such a way that their chances of gaining their desired health outcome are maximized (58).

The multidimensional nature of healthcare and the various requirements of all stakeholders necessitate a balanced quality monitoring process that includes all

measures so that the quality of healthcare can be fully evaluated. Furthermore, each kind of measure provides insight on a key element of healthcare quality (16, 58, 59).

2.6.1. Structure

Structure measures provide important information about the capacity of a provider to deliver quality healthcare and are associated with improved outcomes (60). The infrastructure and characteristics of a healthcare setting can have a significant influence on the quality of the provided healthcare, and the healthcare settings in which specific standards are met have an advantage over other settings to provide high quality healthcare (16). Although better structural components may improve the process and outcome of healthcare, these do not guarantee it (61). Although these are considered a key component of quality measurement, they should not be depended on solely when measuring quality, because they provide only one piece of the complete quality picture (16).

2.6.2. Process

Process measures provide insight on clinical performance and allow the identification of areas that require corrective actions. Process indicators have been receiving much focus and are considered the primary part of quality evaluation and improvement (57). They are widely accepted by providers and clinicians because they clearly demonstrate the ways in which performance and outcomes can be improved (59). However, process measures are considered to produce the harshest assessments of quality, and emphasizing them may lead to over-prescription and overutilization of a healthcare service (13, 62). It is important that process measures be backed up by scientific evidence linking them with

improved outcomes of healthcare (16). Moreover, process measures need constant updating to be in line with advances in medical sciences. Therefore, implementing them can be challenging (59).

Structure and process indicators may be affected by factors like overcrowding and patient to staff ratios; however, they are very important to measure especially for comparisons across systems and practices of healthcare (63).

2.6.3. Outcome

Outcome measures are, in some instances, considered the “gold standard” for measuring quality because the ultimate purpose of any healthcare system is improving the health of an individual and the population (58). On the other hand, there are a number weaknesses in the available outcome measures, rendering them in some ways as poor measures of quality (13). Outcome measures have little ability to inform quality improvements for clinical practice because they indicate “how well it worked and not why it works” (58).

Although recently there has been a paradigm shift towards developing and implementing outcome indicators, this aspect of healthcare is considered difficult to measure because some desired health outcomes are rare and others occur only after a considerable amount of and time in medical care (34, 48, 63). Also, outcomes are only partly generated from healthcare services and frequently other factors, like the socio-demographic and physiologic reserves of a patient, have an influence on them (13).

2.7. The Complexity of Quality Assessment in Healthcare

The complexity of healthcare has rendered unsuccessful all attempts to find a universally accepted definition of quality in healthcare. Moreover, a single measure for quality assessment cannot be applied for all healthcare fields and stakeholders. That is due primarily to the multidimensional nature of quality, and these dimensions and indicators of quality are assumed to differ according to:

- the involved stakeholders (e.g., patients, providers) (12)
- the mode of delivery sites where care is delivered (e.g., out-patient, clinic) and the mechanism of care delivery (e.g., managed care, fee-for-service) (7)
- the culture and values (e.g., personal choices, quality of life concept) (11)
- the type of health service provided (e.g., medical, dental) (10)

2.7.1. The different perceptions of the stakeholders involved

2.7.1.1. Patients' and Providers' Perception

Perceived service quality often differs between physicians and patients (7, 12), where physicians have been found to misperceive their patients' service evaluations, creating a gap with negative consequences on the satisfaction with and the success of the healthcare practice (64, 65).

A small number of recent studies on oral healthcare have examined the fulfillment of expectations by comparing patients' views on ideal and actual behavior of dentists (66-69).

Newsome and Wolfe (70) summarized the value gaps that can exist during the process of delivering dental care . The first of these gaps relates to the values held by the entire practice (clinic staff members) and those held by dental patients. To understand how such a gap can arise, it is first necessary to understand the way in which patients evaluate the dental care they receive.

Burke and Croucher (71) compiled a list of 16 criteria that reflected how patients viewed a good dental practice. Eight criteria were proposed by dentists and eight were proposed by patients. The dentists taking part were asked to think like patients. Once the two lists of criteria had been consolidated into one, a second group of patients was asked to rank these criteria, not knowing which had been suggested by dentists and which by patients. The three highest ranked had been proposed by patients (explanation of procedures, sterilization/hygiene and dentist's skills). The three lowest ranked had been proposed by dentists (up-to-date equipment, pleasant décor and good practice image).

Holt & McHugh (67) studied the factors considered by adult regular dental attendees to be the most important in choosing to stay with a particular dentist or practice. They found that the factors rated most important reflected the dentist's behavior and personal skills regarding time and attention to the patient. Other similar studies also showed that dentists believe that they know what patients should want, rather than finding out what they do want (70, 72, 73).

Furthermore, consumers/patients can not only provide management with information regarding quality of care, but also can provide a unique perspective on the overall coordination and organization of the service provided within a facility because they

interact with many parties from various departments on daily basis (74). Consequently, a wise management would consider the valuable consumers'/patients' comments and perspectives on the quality of healthcare provided by their healthcare service facility (12). Along these lines, one of the strategic recommendations of the American Dental Association's Future of Dentistry project was the following: "Establish regular forums to meet with groups representing patients and families. By listening to the needs and experiences of these groups the profession will be better positioned to identify priorities and take action on activities that will make a difference to the health of the nation and the world" (75).

2.7.1.2. Providers' Perceptions

On the other hand, it is argued that consumers/patients cannot assess the complete healthcare delivery process performance, in which there are technical qualities that they might not be aware of (76). Moreover, there are some instances when the consumers/patients have faulty perceptions, making their observations less valid. Examples for that could be a consumers' misunderstanding about the use of an appropriate healthcare service or that expectations of the healthcare service performance might be unrealistic (77).

2.7.1.3. Nurses' Perceptions

This lack of agreement is not only confined to physicians, but it also extends to include the nurses' perspectives. The dental team in an oral healthcare facility cannot be complete without dental nurses/assistants, who are considered as important members of that team since they assist the dentist in delivering oral healthcare (78). Researchers

have reported that physicians and nurses define quality of healthcare in a different way than do patients (54, 79-82). For example, quality of healthcare to physicians and nurses refers to how well they perform the treatment process; however, for patients the interpersonal aspect of health care is more important (82).

2.7.1.4. The Management's Perception

Although some contradiction of perception and standards may arise, this may reflect the fact that providers and consumers/patients of healthcare normally carry their own values and perceptions of healthcare quality(83). From the managers' perspective, opinions of both the healthcare consumers and providers are important and complementary (84). Moreover, including the managers perspective on quality of healthcare not only helps bridge the gap in perceptions, but also adds the factor of commitment; "This positive attitude must first be adopted at the top because the staff will act only when it behaves that top management is fully committed" (77).

Accordingly, the evaluation of healthcare quality relies on the manner in which the different parties (consumers, providers and managers) define quality of care (12). This evidence in the literature highlights the importance of considering views and perceptions of all the stakeholders involved in the oral healthcare delivery process.

2.7.2. The mode and mechanism of delivery

Quality dimensions are considered to be affected by the mode of delivery; the setting in which and mechanism through which the healthcare service is provided (7). For example, the healthcare options provided to patients in an outpatient clinic, retirement facility,

teaching hospital, private clinic, etc. would vary. Accordingly patients' expectations of the healthcare service would differ with the different modes and mechanism of delivery. The same patient would have different values and beliefs about the healthcare service and physician-patient relationships when visiting different settings(7). A patients expectations may be higher when receiving healthcare in a private clinic as compared to a crowded public hospital. Similarly, patient expectations and quality dimensions are expected to differ in a teaching clinic. Although the number and length of dental visits are higher at a dental teaching facility than in a private office, many patients seek dental treatment from a teaching facility. The high quality of oral healthcare and the low fees are attractive to patients, which makes it worthwhile spending extra time and visits. Similarly, providers in a teaching hospital work within a larger team; thus, they would have different roles, responsibilities and perspectives when providing quality healthcare (85).

There is little evidence on patient satisfaction and quality of oral healthcare in the dental educational setting. In a quantitative cross-sectional study, investigators measured patients' satisfaction with the facility, services and treatment received at a dental school clinic in New Orleans and reported that the vast majority of those surveyed were satisfied (86). Similarly based on information obtained from previous studies and areas relevant to self-assessments of Japanese dental schools, Imanaka, Nomura et al. (87) constructed and validated a questionnaire designed to measure patient satisfaction in their dental teaching hospital and found that 'communication with the dentist' was the most important factor for overall satisfaction. Only one qualitative study exploring issues of quality was found in our preliminary review. This Iranian study used face-to-face in-depth interviews with patients, nurses, academic staff and dental students to evaluate the satisfaction of

oral healthcare provided at their dental school in Kerman (88). They identified a list of the main causes of patient satisfaction ("good infection control, service accessibility, patient appointments and visits were not assigned on merit, precise examinations, and comprehensive treatment plans") and dissatisfaction ("long wait time, lack of options to pass waiting time, such as newspapers and television, an insufficient number of nurses, and not enough professors for supervision") at their institution, and a list of suggestions and recommendations towards improving satisfaction.

2.7.3. The culture and values

Culture is defined as "the collective programming of the mind which distinguishes the members of one category of people from those of another." (11) In some instances religious and cultural beliefs are thought to shape the patients' specific health needs; for example, the religious beliefs of Muslim patients creates their preference for same gender provider (89), a phenomenon widely seen in the Arab Middle Eastern countries. This also creates additional challenges for providers when trying to meet their patients' needs. Moreover, the cultural environment in which the patient was brought up plays a role in influencing the personal choices of a patient. An addition, the meaning of quality of life (an outcome of healthcare quality) is assumed to differ depending on the cultural background of the patient (11).

2.7.4. The type of health service provided

The stakeholders' perception of quality in primary medical care is different from that for dentistry. As proposed by Campbell and Tickle, the dental profession differs from other medical fields in many significant ways that affect the perception of quality and the nature

of the patient-clinician relationship (10). First, aspects like continuity of care and patient satisfaction are important in dentistry because a large number of patients seek dental care without symptoms, for cosmetic reasons and on regular basis for preventive reasons. On the contrary, many patients seek medical care for symptom relief. Second, dentistry is mostly a surgical discipline and associated with dental anxiety and pain, therefore influencing a patients' perception of quality. Third, the dental profession deals primarily with two infectious diseases, while medical care is concerned with a wide range of diseases with more serious and life threatening consequences. Therefore, when assessing quality and its dimensions in dentistry, using the same domains as in medicine will not be valid, and the stakeholders' perceptions of the significance of the different domains will not be equivalent (10).

Maidment (34) attempted to locate studies on clinical governance in primary oral healthcare and found only a few publications, most of which were descriptive rather than reports of scientific studies. The research on quality of oral healthcare and patient satisfaction with dental services is limited (90).

Quality health services, quality assurance projects and clinical governance have received relatively little focus in the dental field. In many areas of general healthcare, performance measures such as quality indicators have been created and are increasingly used in cardiac care, diabetes, mental health, patient safety, and primary care/prevention (91). Although there is a large amount of literature on the assessment of oral healthcare, few of these have been applied or translated into guidelines and procedures for measuring quality care in dentistry (14). To date, dentistry lacks the adequate information and

evidence-based guidelines necessary for developing valid and reliable quality indicators and assessment measures (4, 5).

However, we have multiple data sources that can be used to collect useful data on quality, and it is worthwhile to use as many valid data sources to create the most accurate descriptive evaluation possible of quality of oral healthcare (15)

2.8. Information Sources for Quality Assessment

There are multiple sources from which data on quality can be obtained (13, 59). The four most common sources are: (a) administrative (secondary) data; this includes hospital / physician billing systems or health insurance claims. These are easily available and inexpensive to use; however, they lack specificity and important details. (b) Patient medical records (retrospective abstraction): in which healthcare providers record detailed patient information, making it a richer source of data; however, it is less available and more expensive if paper records are used. Even electronic records data require standardization, as there are different recording systems used. In addition to this, there is complexity resulting from having incomplete data and inaccuracy in data documentation or extraction. (c) Qualitative data: can be obtained through focus groups or interviews. These provide the most useful, detailed and specific information describing patient health status and experience on different elements of care. However, these data are not readily available and are expensive to obtain unless incorporated in electronic medical records. (d) Disease registries: are data systems that collect information on specific diseases using

multiple sources like patients' insurance claims, and data from census and birth / death records.

Each data source has its strengths and weakness, and a variety of information can be obtained from different data sources (15). The source from which data should be obtained is dictated by the measurement goal and data availability (60). Accurate reporting of quality of healthcare depends on the completeness of the information obtained, and using one source alone can result in a worse or better picture of quality than what really exists through over or under reporting of flaws and complications, respectively. For example, using hospital billing alone as a data source to calculate quality indicators may lead to their underestimation (15).

Therefore, even if to-date we have been unable to locate any evidence based quality measures in oral healthcare that can be used in quality assessment (4), there are multiple data sources that can be used to collect useful data on quality, and it is worthwhile to use as many valid data sources to create the most accurate descriptive evaluation possible of quality of oral healthcare. By doing that and by collecting and evaluating data on quality, we can get closer to improving the quality in oral healthcare and to providing "the right care at the right time, the first time" (16)

2.9. Research Objectives

2.9.1. General objective

Given the urgent need for quality improvement in oral healthcare through scientific research the general aim of this research was:

to provide a descriptive assessment of the elements of oral healthcare quality provided to adult patients at the University Dental Hospital Sharjah (UDHS) in the UAE using individual auditing procedures and in-depth interviews with all stakeholders, with the intent to recommend effective intervention(s) to improve oral healthcare management and provision.

2.9.2. Specific objectives

- To provide a descriptive evaluation of the elements of the oral healthcare service quality provided, by dental students, in the UDHS through an audit of hospital records.
- To explain any systematic problem, identified through the auditing procedure**,** considering the life experiences of the various stakeholders (patients, providers and managers)

2.10. Study Overview

In this study (figure 3), we started with a Pre-Research Phase, in which we carried out a systematic literature review, described in section 3. The results of this review helped us to decide on how to modify the study methods to best address our study aim and objectives. Therefore, we designed the following four research phases that followed a

sequential explanatory mixed methods research design: Phase I was a quantitative phase that included an audit of the medical records at UDHS and focused on describing the elements of oral healthcare service provided by the dental students to the adult patient population. During this phase, we followed a retrospective cohort study design and carried out the quantitative data collection, analysis and results synthesis. Next was the Intermediate Phase**,** in which the first integration / mixing of both methods took place. In this phase, the results of the quantitative phase provided insights for the qualitative participant selection process and for identifying the issues that required follow up in the next phase. However, during this phase, our discussions with the providers determined that we add a small qualitative follow up component to our audit that included patient telephone interviews. At the end of this Phase, we were able to reach an agreement with the providers and managers on the specific objectives of Phase II. In Phase II**,** we followed a descriptive qualitative study design in which qualitative data were collected using interviews and focus groups with the providers, managers and patients at UDHS. Then, a qualitative analysis was carried out to produce the results that helped to explain the previous quantitative (audit) results. Finally, the second integration / mixing took place at the end of the study in a final Mixed Interpretation Phase that provided an overall descriptive evaluation of the oral healthcare quality provided at the UDHS. We then used the results of the complete study to discuss the ways in which quality could be improved through a knowledge transfer process called the Post-Research Phase.

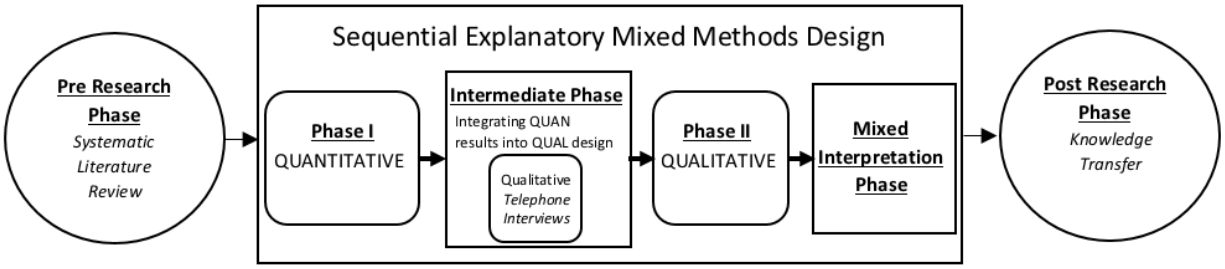

Figure 3: A schematic illustration of the study design and phase

2.11. Study Significance

The significance of this study can be described on three levels; Local, Regional and International:

2.11.1. Local significance

- We will be able to provide rich and condition-specific recommendations to manage and provide oral healthcare service in a more efficient and cost-effective manner. Quality assessment will help to identify, reinforce strengths and rectify weaknesses of provided services at UDHS, thereby maximizing oral health benefits. Moreover, millions of dollars are spent at UDHS, not only to train dental students, but also to provide the highest quality of oral healthcare in the region; therefore, this systematic quality assessment approach takes the patients' and providers' perspectives into consideration in order to enhance resource allocation and reduce expenditure. This will not only benefit the UDHS, but also benefit organizations that share similar training environments and oral healthcare services.

- It will give us insight on the feasibility and obstacles of doing further quality exploration studies.
- It will provide a baseline quality picture upon which any future quality improvement strategies can be measured.

2.11.2. Regional significance

In the Middle East, academic researchers in dental schools carry out the majority of research in oral healthcare. Therefore, carrying out this study in the UDHS, the largest and the first university dental hospital in the UAE and the Gulf Region, and the immediate implementation of our study outcomes (quality improvement reinforcements) may attract the attention of policy makers, funding agencies and researchers to inform them of:

- the benefits of using new methodologic approaches, like qualitative and mixed methods, in building the scientific literature, in general
- the importance and benefits of investigating quality in oral healthcare.

2.11.3. International significance

Add to scientific knowledge

- This will be the first systematic research initiative towards understanding the complex concept of quality of oral healthcare in the UAE and the Arab Middle East.
- The results of this study will provide some insight on the possible indicators of quality, upon which future quality studies can be designed.
- This will provide some epidemiological and descriptive data on the oral health of the adult population receiving dental care at a dental teaching setting in the UAE.

3. PRE RESEARCH PHASE - Systematic Review (Narrative Synthesis)

3.1. Introduction

Section 2 summarized evidence on quality of health care in general and oral health. It showed that, although quality can be measured and improved (92, 93), it varies substantially due to the complexity of healthcare systems (94). Despite their limitations, sets of quality indicators have been used in countries like the USA and the UK. However, since we wish to evaluate quality of oral healthcare service in the UAE, we need to know if there are any quality indicators available for use in the context of oral health delivered in dental teaching settings in the UAE (one of the 22 countries of the Arab Middle East). We need to know how providers and patients assess quality of oral healthcare in the Arab Middle East. These issues should be addressed before attempting to evaluate quality of oral healthcare service in the UAE. Because we aim to create quality improvement recommendations based on research evidence, rather than clinical experience and expert opinion, it is essential for us to carry out a systematic literature review addressing these questions before designing this research study.

Consequently, the purpose of this pre-research phase is to carry out a systematic literature review, following the PRISMA guidelines (95), to summarize the evidence on quality of oral healthcare in the Arab Middle East, specifically to answer the following questions: First, how is quality of oral healthcare defined by patients and/or providers in the Arab Middle East? Second, what are the determinants/indicators of quality of oral healthcare used in the Arab Middle East?

3.2. Methods of SLR

3.2.1. Eligibility criteria:

Study and report characteristics of the included studies:

- Study Type: Studies that use any type of quantitative and/or qualitative methods of data collection and analysis.
- Participants: All ages of patients and providers (dental practitioners, managers and assistants) of oral healthcare services.
- Outcome measures: Themes and dimensions that are thought by participants to be attributes to quality of oral healthcare.
- Geographical area: Studies conducted in any of the 22 Arab countries of the Middle East.
- Article report type: original articles and descriptive articles. Review articles were kept to be used for finding studies and interpreting results.
- Publication language: The search language included Arabic, English, French and Kurdish that covers all of the official languages used in the targeted 22 countries, except for Comorian and Somali; regardless, no studies published in Comorian or Somali were found.
- Date of report publication: A period of five to ten years has been recommended when undertaking a literature review (96). In our study the literature was searched for citations published from the year 1996 until the fourth week of January 2013, thereby providing adequate coverage for the past 16 years.

Characteristics of the excluded studies

- Articles published in languages other than Arabic, English or French.
- Animal studies.

3.2.2. Information sources:

Our approach was carried out in three steps. First, a search was carried out in different electronic databases, and the relevant articles were selected. Second, we performed a hand search of key journals. Third, we screened the citations and references of the previously identified relevant articles.

- Electronic Databases search.

A search strategy was developed, with the help of a health sciences librarian, to search the following four databases all accessed via Ovid SP: Medline (In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R), 1996 to Present), Embase (Embase 1996 to 2013 January 31), Ovid Healthstar (Ovid Healthstar 1996 to present) and Global Health (Global Health 1973 to 2013). They were last searched on January 31, 2013.

- Manual search of the selected articles.

We manually reviewed forward and backward citations for the identified relevant publications from the final screening process.

- Hand search of key journals.

We hand searched one international journal pertaining to quality (International Journal for Quality in Health Care) and two regional Middle Eastern journals (International Arab Journal of Dentistry and The Saudi Dental Journal) for relevant articles.

3.2.3. Search:

Record identification was done using the following Key words and Mesh headings in Medline:

- To identify the disease area of interest: “Oral Health”

The explode option was used with the following terms “dentistry; education; dental; stomatognathic diseases; oral health; oral hygiene”. In addition the terms “oral” and “dent*” were used.

- To identify the topic area of interest: “Quality of care”

The explode option was used with the following terms “quality of healthcare; delivery of healthcare; patient care management; quality assurance; healthcare; quality control; quality improvement”. Also to include all citations that had the text words “care” and “quality” adjacent within five words in the text the term “care adj5 quality” was used.

- To identify the population of interest: “Arab Middle East”

The 22 Arab countries namely (Egypt; Algeria; Sudan; Iraq; Morocco; Saudi Arabia; Yemen; Syria; Tunisia; Somalia; United Arab Emirates; Libya; Jordan; Palestine; Lebanon; Mauritania; Kuwait; Oman; Qatar; Bahrain; Djibouti; Comoros) were used with

the truncation option, in addition to the terms: Middle East (with the explode option); arab*; uae; middle east.

The search was limited by year of publication to records published after 1996 with no additional limits. Consequently, for each of the three databases the search strategy was modified according to the specific characteristics of each of the other three databases being searched.

Subsequently, the records identified by all databases were independently imported to EndNote X7.0.2, the reference manager software. After that we merged all the records into one database and automatically removed duplicates using EndNote X7.0.2 to create our final database.

3.2.4. Study screening and selection

The study screening and selection was done in two subsequent steps. We first screened the titles and abstracts of the final database to identify initial relevant records, then we screened the full text of the articles initially considered as relevant.

- Step 1: Title and abstract screening

All titles and abstracts of the final database were independently screened by two reviewers (NH and YO) and categorized according to their eligibility into “relevant” and “not relevant”, following the eligibility criteria described above. Next, the reviewers met to discuss the discrepancies and agreement was reached. In general, a record will be excluded from the next step only if identified as not relevant by both reviewers and will be included if identified as relevant by at least one reviewer.

- Step 2: Full text screening

We obtained full texts of the records identified as relevant from step 1 for further assessment. Similarly both reviewers independently screened the full text records for their eligibility and identified the relevant records.

After that, they met and discussed disagreements with co-supervisor (JNWL) until a consensus was reached; at this stage, only articles identified as eligible by both reviewers were considered relevant.

3.2.5. Data collection process & data items

We designed and used a data extraction form based on domains and elements described by West et al. (97) and Von Elm et al. (98) to report and evaluate observational studies. Both reviewers independently used those domains and elements to extract the data. They then met to discuss and resolve disagreements and to ensure that all important data were extracted.

3.3. Results of SLR

3.3.1. Study selection

Our extensive search of the four electronic databases yielded 4,526 articles. After the removal of duplicates the number was reduced to 2,498. The titles and abstracts of these 2,498 articles were screened for potential eligibility. This screening process identified 2,489 records as irrelevant.

- ❖ 1,658 of these were excluded due to one or more of the following reasons:
    - Records done on Non-Arab countries but were retrieved due to similarity in the wordings like, for example, “Syrian hamster” which refers to the animal not the country Syria and the word “Jordan” that refers to the Norwegian manufacturer of dental hygiene material and not to the country Jordan.
    - Animal studies
    - Records not relevant to oral health but retrieved because the word “oral” is used for purposes other than dental, like the verbal way of assessment and in referring to one of the routes of drug administration (by mouth).
- ❖ The other 831 records were found relevant to oral health and in Arab countries, however, were excluded because they do not focus on quality of oral healthcare, but rather on other oral health topics like prevalence, diagnosis, ethics, etc.

Nine records were identified as relevant, and their full texts were retrieved and further assessed for eligibility. Seven were then further excluded because they do not provide evidence on how quality of oral health care is defined by patients and/or providers of oral healthcare.

We found only two studies that fit our eligibility criteria and can help to provide some evidence to answer our research question. Figure 4 provides details on the screening and selection process.

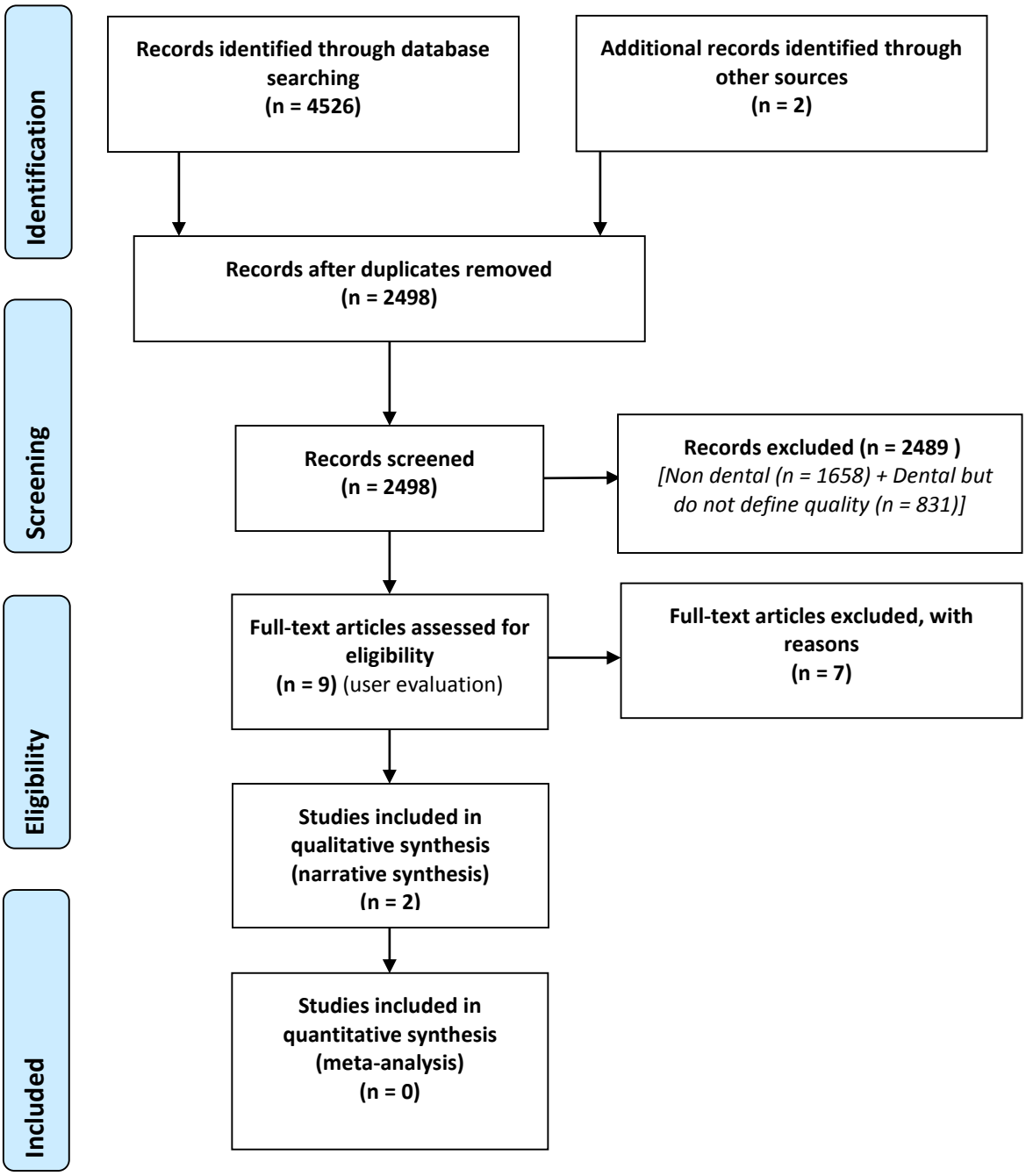

Figure 4: Flow diagram of the literature search and identification of relevant studies

3.3.2. Study characteristics

For the two relevant studies, we used the data extraction form to extract data for the following study characteristics:

- General Characteristics: study name; year of publication; publishing journal; language of publication; country where the study was done;
- Study Design and Methods: aims of the study; study design; population characteristics (age, gender, ethnicity); sampling method and size; recruitment period; participating stakeholders; instrument used; quality domains used;
- Results: domains used by stakeholders to judge quality of oral healthcare (in descending order, from most important to least important); socio-demographic factors found to significantly influence results;
- Conclusion of authors; and study limitations.

3.3.3. Results synthesis

Our search did not yield enough studies to allow us to carry out additional assessments or meta-analytics. Therefore, instead of carrying out a specialist synthesis approach, like meta-analysis, we performed a narrative descriptive synthesis of the two relevant studies, as described in the next section.

3.3.4. Results of the descriptive synthesis of the individual studies

As demonstrated in Table 1, the two studies were carried out in Saudi Arabia, focusing on private oral healthcare services and business aspects. Study A was designed to gather

dentists' opinions on the domains of quality of oral healthcare using an open-ended question (99). Their responses were summarized into 16 items and grouped into two categories; professionalism and business matters. These were then given to a convenience sample of patients to evaluate which criteria were more important to patients. Study B uses the same criteria developed and used in Study A to gather opinions of patients on factors affecting the services provided in private dental settings (100). From these studies, we could collect some scientific evidence on how patients and dentists perceive the domains of quality of oral healthcare, although the authors' aim was not primarily to define quality of oral healthcare. "Caring dentist" was the most frequently suggested quality domain by dentists from Study A, and it seems that patients agree, because it received the highest number of positive responses from patients participating in both studies. However, there were clear discrepancies between dentists and patients on many of the other quality domains. For example, "friendly staff" was the ninth most suggested by dentists from study A. Nonetheless, it received the second and third most positive responses by patients from both study A and B. Similarly "giving oral hygiene and post-operative instructions" was the fourth most suggested domain by dentists from study A, affecting quality in oral healthcare. Conversely the patients from study A and B had a different opinion, because they ranked it as ninth and tenth.

Both studies reported age, gender and education as variables that are significantly associated with one or more of the quality domains used by patients to assess quality of oral healthcare (Table 3). However, there was a discrepancy when assessing ethnicity, in which study A reported a non-significant association with patients' opinions, but study

B reported it as having significant association with one of the domains of quality of oral healthcare; “explanation of the procedure”.

Table 2: Data extracted from the two relevant studies

Data Item	**Study A**	**Study B**
Study Name	Patients’ Assessment of the Professional and Business Aspects of Dental Practice	A Survey of Patients' Opinion for Business and Professional Factors Affecting Private Dental Practices in Riyadh, Saudi Arabia
Year of publication	2004	2007
Publishing journal	Saudi Dental Journal	Journal of the Dow University of Health Sciences
Publishing language	English	English
Country of study	Saudi Arabia (Al-Ahsa region)	Saudi Arabia (Riyadh City)
Study aim(s)	1- To look for the factors that dental patients use to judge the standard of dental practice 2- How these factors could affect the balance between perceived professionalism and business aspect in our general dental practice.	1- To assess the criteria identified as important by the patients attending private dental clinics in Riyadh city.
Study design	Not mentioned by authors (*Mixed methods**; *open ended question for dentists followed by survey for patients)*	Survey questionnaire *(Cross sectional*)*
Population characteristics	Age: Not specified Gender: male & female Ethnicity: Saudi & Non-Saudi	Age: Not specified Gender: male & female Ethnicity: Saudi & Non-Saudi
Sampling method	Convenient sampling	Area based convenient sampling
Sample size	Dentists= 40 + Patients= 378	Patients= 575
Recruitment period	Three months	Not specified
Participating stakeholders	- Private dental practitioners - Patients	Patients visiting private dental clinics
Instrument used	For dentists: One open ended question For Patients: Questionnaire created by the authors	Questionnaire created and used in study A
Quality domains used	Business Criteria (n=8): Caring dentist; Pleasant decor & comfortable surroundings; Appointment system; Good practice image; Friendly staff: Good administration; Accessible location; Reasonable cost of treatment. Professional Criteria (n=8): Up to date equipment and material; High standards of cleanliness & hygienic procedures; Giving oral hygiene & post-operative instructions; Dentist qualification; Dentist skills; Pain-free dentistry; Explanation of the procedure; Readiness to see any emergency situation	Same 16 criteria as Study A (but not categorized into business and professional criteria)

Domain ranking	See Table 2	
Significant demographics (Table 3)	Age + Gender + Education	Age + Gender + Education + Ethnicity
Conclusion of authors	1. Ethnic differences between the patients did not result in significant difference concerning their perception of the studied variables. 2. Patient's assessment of professional and business criteria in the study showed significant difference in six variables. 3. The results suggested that success in general dental practice might be through a combination of business practices with ethnical professional obligations to the patients.	In general, the patients were more interested to see better communication and behavior of dentists and staff in private practices as compared to public clinics.
Study limitations	*Response rate 75.6%** *Convenient sampling, no randomization** *Limited to private clinics** *Missing data handling not mentioned**	Low response rate (28.75) Convenient sampling, no randomization *Limited to private clinics** *Missing data handling not mentioned**
*Italic text** Inferred by our reviewers and not mentioned by authors		

Table 3: Domains as suggested by dentists from Study A arranged in descending order and the patients' responses to them.

Quality Domains **n = No. of suggesting dentists (%)**	**No. of patients' Positive Responses from Study A (%)**	**No. of patients' Positive Responses from Study B (%)**
1. Caring dentist, n=40 (100)	367 (97.1)	559 (97.2)
2. Up to date equipment & material, n=30 (75)	356 (94.2)	537 (93.4)
3. High standards of cleanliness & hygienic procedures, n=27 (67.5)	363 (96.0)	534 (92.9)
4. Giving oral hygiene & post-operative instructions, n=23 (57.5)	331 (87.6)	509 (88.5)
5. Pleasant decor & comfortable surroundings, n=22 (55)	319 (84.4)	468 (81.4)
6. Dentist qualification, n=19 (47.5)	338 (89.4)	518 (90.1)
7. Dentist skills, n=19 (47.5)	358 (94.7)	525 (91.3)
8. Appointment system, n=16 (40)	349 (92.3)	517 (89.9)
9. Good practice image, 14 (35)	339 (89.7)	518 (90.1)
10. Friendly staff, n=13 (32.5)	360 (95.2)	547 (95.1)
11. Good administration, n=11 (27.5)	325 (86.0)	497 (96.4)
12. Pain-free dentistry, n=6 (15)	333 (88.1)	504 (87.1)
13. Explanation of the procedure, n=6 (15)	333 (88.1)	508 (88.3)
14. Readiness to see any emergency situation, n=5 (12.5)	352 (93.1)	573 (89.2)
15. Accessible location, n=4 (10)	304 (80.4)	462 (80.3)
16. Reasonable cost of treatment, n=3 (7.5)	244 (64.6)	501 (87.1)

Table 4: The demographic variables that showed significant results in Studies A and B

Quality Domain	Study A	Study B
Dentist qualification		Gender
High standards of cleanliness & hygienic procedures		Gender
Pain-free dentistry		Education Level + Age
Appointment system	Age	Age
Pleasant decor & comfortable surroundings		Age
Explanation of the procedure	Age	Nationality
Dentist skills	Age + Gender	
Giving oral hygiene & post-operative instructions	Education	
Friendly staff	Gender	
Good practice image	Gender	

3.4. Discussion of SLR

Our findings indicate that the available literature is insufficient to define quality of oral healthcare in the Arab Middle East. No meta-analysis could be performed, since our review found insufficient evidence. This result is not surprising since Maidment's (34) search on clinical governance in dentistry (not limited to the Middle East) found very few and mostly descriptive studies. Our search found that current available evidence is limited to private oral healthcare services in one of the Arab Middle East countries, Saudi Arabia. Despite the limitations of the two studies, their results support the understanding that quality means different things to different people, as has been reported by numerous authors (37, 38).

Needless to say, more scientific evidence is needed to assist in defining quality in oral healthcare and its domains in order to appropriately implement effective quality assurance projects that can identify and reinforce strengths and rectify weaknesses of health practitioners and health services.

The current evidence provides domains suggested by dentists and ranked by patients. However, patients may have other domains that they view as important when judging the

quality of oral healthcare provided to them. Moreover, the available research lacks critical evidence and definitions, rendering the quality of oral healthcare picture incomplete. Furthermore, even if there is some evidence that supports the domain of “caring dentist” as the one most important to patients in judging quality in oral healthcare, we still do not know what “caring dentist” really means. Does the dentist’s perception of “caring dentist” agree with the patient’s definition of “caring dentist”? When do we say that one dentist is caring and another isn’t? Likewise, what does the oral healthcare staff need to do to be considered as “friendly staff”? These and many more questions need to be researched quantitatively and qualitatively to improve our knowledge and gain deeper insights into this topic.

Quality of oral healthcare is a very complex concept. Therefore, the ideal way to approach an understanding of it is through mixed methods approaches. Unfortunately, we found no qualitative study on quality of oral healthcare; moreover, in the Arab Middle East region qualitative studies are very rare in oral health research. Our exhaustive search revealed that only four of the 831 excluded oral health studies used qualitative methods and five used simple mixed methods.

Thus, our present quality assurance attempts in dentistry and oral healthcare decisions can be considered to be based on clinical experience and expert opinion, rather than on research-grounded evidence.

We acknowledge that one limitation of this systematic review is the inapplicability of carrying out a specialist synthesis approach due to the minimal relevant evidence to answer our study question. However, our descriptive narrative synthesis did provide some

insight on the topic under study. Another limitation is that this review was carried out in January 2013 as the basis for the design and conduct of the PhD study. Therefore, it does not include any more recent studies. A rapid review of the literature since 2013 has revealed no additional relevant publications.

3.5. Conclusion of SLR & Implications on my Research

Our review research question remains unanswered, as the currently available evidence on how quality of oral healthcare is perceived in the Arab Middle East is minimal and inconclusive. However, the results of the narrative synthesis of the studies identified through this review agree with the international literature that providers and patients have different perspectives when evaluating quality in oral healthcare. Our exhaustive search revealed that, until January 2013, only two studies investigated the attributes of quality of oral healthcare as perceived by patients and/or providers. Robust, well designed quantitative, qualitative and mixed methods studies are required to provide insights on how patients and providers of oral healthcare in the Arab Middle East perceive quality, so that oral healthcare services in the region can be scientifically assessed.

4. STUDY METHODS

4.1. Introduction:

In the previous sections, I have demonstrated the multidimensional nature of quality in healthcare; the complexity of having multiple stakeholders involved in the quality of healthcare with different perspectives; the value of using multiple data sources; and the evidence in the quality literature in criticizing the use of either quantitative or qualitative data alone. Taking that into consideration has led to our decisions to (1) select a mixed methods approach, (2) use multiple information sources for gathering data on quality, (3) obtain perceptions from all stakeholders involved, and (4) invite the managers and providers of oral healthcare to participate in multiple stages of this study. In this section, I will discuss the research design and rationale for the use of each of these decisions in detail.

4.2. Overall Research Design:

This study was designed to follow a sequential explanatory mixed methods research design carried out in four phases, using multiple information sources and obtaining data from all stakeholders involved.

4.2.1. Rationale for mixed methods approach

Creswell and Plano Clark defined mixed methods research as *"a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research*

process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone." (101)

My prior understanding of the construct of quality influenced my perception of quality of oral healthcare and my choice to use a mixed methods design. This reflects a *foundational element*, a new term used by Dellinger and Leech in their validation framework for mixed methods (102). They define the *foundational element* as the prior understanding by the researcher of the construct/phenomenon under study through personal experience, theoretical understanding and the knowledge obtained from reviewing the available literature on the construct / phenomenon.

The knowledge I obtained from reviewing the available literature was demonstrated in the previous chapter in which I provide evidence for (1) The complexity and multi-dimensional nature of quality assessment in oral healthcare, and (2) the unavailability of validated quality assessment tools in oral healthcare for regional or international use. In addition to that, there is an emphasis in quality literature on using qualitative data to complement quantitative efforts. To date, there has been a predominance of quantitative methods used in the assessment of quality of care, such as those assessing patient satisfaction. However, because of the subtlety of most significant factors of quality, such as the physician-patient relationship and psychosocial issues, studies that depend on quantitative methods will be insufficient. This limitation is due to the inability of the quantitative approach to capture the interactions of the human mind with social reality and values (103). Therefore, it is recently believed that public health dentistry would

benefit more from qualitative research methods that can provide us with unique insight about peoples' beliefs, attitudes and perceptions (104).

Therefore, mixing quantitative objective findings with qualitative descriptive findings would strengthen our understanding of the complex picture of quality in oral healthcare at UDHS. Consequently, I decided that using a mixed methods design will be consistent with the foundation established in the previously described literature reviews.

Moreover, my personal experience, having used both quantitative and qualitative approaches, made me more confident that combining the strengths of both methods was not only the best choice over other research design possibilities, but it might be the only approach that can get as close as possible to capturing an accurate picture of quality of the oral healthcare provided at UDHS.

4.2.2. Selecting the type of mixed methods design

The four major types of mixed methods design, as described by Creswell and Clark are: Triangulation, Explanatory, Exploratory or Embedded. To choose a design, a researcher must decide on three procedural issues. First, the order and timing in which the data will be used, either concurrently or sequentially "Priority"; second, if the two methods will be given equal weights or one more than the other "Implementation"; and third, the process and stage of mixing the two methods "Integration" (101)

This study is a Sequential Explanatory mixed methods design. This design consists of two individual parts: a quantitative part followed by a qualitative part (105). "In this design, a researcher first collects and analyzes the quantitative (numeric) data. The qualitative

(text) data are collected and analyzed second in the sequence, and help explain, or elaborate on, the quantitative results obtained in the first phase." (106)

I selected the Sequential Explanatory Mixed Methods design because it is a straight-forward design to implement, and it best addressed my study objectives. The quantitative findings from the audit provided a general descriptive assessment of the elements of quality of oral healthcare. The qualitative findings helped complete the picture of quality of oral healthcare by (1) explaining the audit findings, (2) exploring the stakeholders' perceptions and life experiences in more depth and (3) illustrating the interpersonal components of the 'Process' of oral healthcare that could not be captured by any other means.

4.2.3. Rationale for using multiple information sources

In the previous chapter, I described the four information sources that can provide valuable information when assessing quality in healthcare (administrative billing, disease registry, medical records and qualitative data sources). Given the evidence in the literature highlighting the importance of combining more than one data source when assessing quality, I decided to use as many resources as possible. In UDHS, we do not have administrative billing data because the oral healthcare services provided by the students are free of charge. In addition to that, there are no disease registry data; therefore, we combined data from the medical records and multiple qualitative data sources.

4.2.4. Rationale for obtaining data from all stakeholders

In section (2.7.1.), I summarized the evidence in the literature that shows the presence of differences in perceptions amongst stakeholders (patients, providers and managers) when assessing quality of healthcare and oral healthcare. The unique value that each perception brings to quality in healthcare was also demonstrated. Moreover, our systematic literature review work supported the evidence that differences in perceptions between oral healthcare providers and patients also exist in the Arab Middle East. Therefore, I strongly believe that any assessment of quality oral healthcare that does not explore all the different perspectives cannot provide a complete and accurate picture of quality of oral healthcare.

The previous description of my extensive thought process and the foundation element of this study, the rationale and purpose of each step are collective evidence for the construct validity of my mixed methods study. *"The particular rationale, purpose, research question, design, measurement process, analytical choices, and so on, determine the validation evidence that is important to a study's inferences regarding the meaning of the data."* (102)

4.3. Study Setting and Population

4.3.1. Study setting:

- Location: United Arab Emirates (UAE) / Sharjah

The UAE is a small constitutional federation of seven emirates that was formally established in 1971. It occupies an area of 83,600 square kilometers and has a population

of eight million. Only 16.6% are Emirati and the other 83.4% expatriates come from more than 200 different nationalities. Abu Dhabi is the capital of the UAE. Sharjah is the third largest emirate in the UAE, covering an area of 2,600 km² with a population of 895,292 (2008 census estimate). Arabic is the official language; however, English is widely understood and is considered with Arabic as the language of commerce. It is considered a high-income country having many rich natural resources.

Healthcare in the UAE is regulated at both the Federal and Emirate level. The principal healthcare regulatory authorities in the United Arab Emirates are: (1) the Ministry of Health (MOH) at a federal level; (2) the Health Authority of Abu Dhabi (HAAD) and Abu Dhabi Health Services Company (SEHA) in Abu Dhabi; (3) the Dubai Health Authority (DHA) in Dubai; and (4) the Emirates Health Authority (EHA) in the Northern Emirates which is a new health authority (EHA) that is being developed to provide similar regulatory roles in the Northern Emirates as the HAAD does in Abu Dhabi and the DHA in Dubai as an effort to improve quality of healthcare in the Northern Emirates.

Moreover, Dubai Healthcare City (launched in 2002) and Dubai Biotechnology and Research Park, having their own regulatory bodies, are considered the healthcare free zones in Dubai. In the UAE, there are various hospitals and nursing homes providing treatment in the different fields of medicine, dentistry, psychology and many more. Healthcare services ranging from Government and private hospitals, clinics and individual doctors are available.

Before 1996, there weren’t many oral healthcare studies conducted in the UAE; however, after the establishment in 1997 of Ajman University Dental Health Teaching Institute,

there has been an increase in oral health research (24). There are currently eight schools that offer a wide range of dental programs in the UAE.

- Facility: The University Dental Hospital Sharjah (UDHS)

The UDHS is the “first and largest dental hospital in the UAE, the Gulf and the region” (107). This hospital is linked to the College of Dental Medicine, which was founded in 2004 in the compound with the Medical and Health Sciences colleges of the University of Sharjah. The UDHS is considered part of the University of Sharjah and was established in 2011, receiving the first patients in September 2011. The hospital is designed so as to accommodate all types of patients, private patients who seek private non-teaching care and patients who seek treatment in the students' training section. The hospital has 115 dental chairs, of which only 4 are dedicated to private practice where faculty members practice once a week. The rest of the dental chairs are dedicated for dental student practice.

New patients are met in the reception area and are directed to the teaching or private section, depending on their choice. In the teaching section, the patient pays 50 AED (equivalent to 14 USD) to open a file, with no further payment for one year, with all treatments free of charge. A patient can also ask to be seen in the private section for care where there is no student involvement. The private section is similar to any private practice setting, and here the patients have to pay for all procedures. The dental faculty members and clinical tutors provide the treatment at this clinic.

Patients then are directed to the "screening clinic", following which they are sent to the patient referral office, where contact information is taken. The patient is then assigned

according to the undergraduate students' clinical requirements or to interns if the work is determined to be more complex or to the private clinic, if the patient agrees.

In a case in which a patient needs urgent care, s/he is directly referred to the "Urgent care section" where s/he will receive treatment from fifth year students or interns or residents (under supervision) who have been trained to the appropriate level at which they can successfully treat the problem. If the problem is not urgent but requires a complex treatment, the patient can also be transferred to the "teaching clinics" (for oral surgery and periodontology) where the instructor can treat the case while students (who rotate to this clinic) observe.

4.3.2. Study population:

All stakeholders involved in the delivery of oral healthcare service at the UDHS were our population of interest. This included patients, providers (dental students, dental clinical faculty and supporting staff) and managers.

- Patients: There are a large number of patients who seek dental treatment at the UDHS. However, only a small percentage of them are assigned to the dental students; the rest are treated for emergencies and put on a waiting list or referred to other clinics based on their need, because the number of patients far exceeds the capability of the students. The patients are from many variable age groups, nationalities and socio economic status.
- Dental students: One hundred sixty (160) fourth and fifth year dental students treat patients, under supervision, in the last 2 years of their dental training program. The clinical assessment is requirement based; each student has a certain number of

teeth that are required to be treated before his/her graduation. In addition to that, they have to complete a full mouth rehabilitation treatment for one comprehensive case and present it at the end of their fifth year.

- Dental faculty and supporting staff: There are 20 senior clinical faculty members in all the different dental specialties who teach the students and supervise them in the dental clinics. In addition, there are another 12 clinical instructors who are general dental practitioners, and they also supervise the students in the clinics. The ratio of students to faculty in the clinics is 6:1, according to university regulations. The clinical instructors usually work closer with the students, as they spend most of their time in the clinics, while the senior clinical faculty have other duties like giving lectures, conducting research and other administrative responsibilities. There is also supporting staff constituting 14 dental nurses and 3 receptionists who work together with the students.
- Dental hospital managers: Management roles are filled by the UDHS Director, who is also the Dean of the College of Dental Medicine. The Assistant Clinical Director is responsible for student training and education, as well as activities involving the private clinic and the head of clinical support staff.

Our research team was composed of six people. I (NH) was the main researcher responsible for research coordination, data collection and analysis. Another dentist (YT) helped in the systematic literature review in the role of second reviewer and during the medical records audit to assure all the data was extracted completely and thoroughly. A third dentist (MH) assisted during the focus group qualitative data collection and its

analysis. My thesis supervisors (JF, JNWL and MA) were the other three members of the team.

4.4. Ethical Consideration and Confidentiality

The study was conducted according to ethical principles stated in the Declaration of Helsinki (2008). Ethical approval for this study has been obtained from the Research Ethics Committee at the University of Sharjah (*Appendix 3 a & b*) and the International Review Board of McGill University, Faculty of Medicine.

4.4.1. Informed consent

The UDHS patients routinely sign a consent form before receiving any treatment. In this standard form, the patients not only agree to receive treatment, but they also agree that the medical and dental information in their charts can be used for research purposes. For the quantitative (chart audit) part, we requested and received formal approval from the Director of UDHS to audit the patients' files and records.

For the qualitative component, the patients and providers selected were contacted in person or by telephone and invited to participate in the qualitative interviews. The consent form was provided to those who agree to participate during their next visit or by email, according to their preference. The informed consent takes into consideration the well-being, free-will and respect of the participants and their privacy. When they appeared for the interviews and before the interviews began, I (NH) provided a brief explanation of the study aims and objectives, as well as the purpose and use of the consent form. I responded to any concerns and questions raised by the participants. If the participants

were comfortable with participating, they then were asked to sign the consent form for the qualitative phase. In case the participants were unable to read or write, I read and explained the consent form for them; their consent was then taken orally and they were asked to make a mark on the signature line. (*See Appendix 4 a & b for English and Arabic consent forms*)

4.4.2. Confidentiality

No names or personal information were documented during the file audit, as I instead used a coding system. I also used pseudonyms for the interview discussion to protect confidentiality. Access to data was given to the research investigators (JF, MA, NH and JNWL); however, only NH had access to the information linking the codes to the identity of participants.

The data and the consent forms were stored in a safe, locked cabinet in the locked office of Co-supervisor MA at the UDHS. All soft copies of the data in possession of the study investigators were password protected to ensure security.

4.4.3. Withdrawal from the qualitative part

The participants were free to withdraw at any stage of the research without inconvenience or penalty of any kind. They were informed that they would receive the same standard care and treatment considered best for them, irrespective of their participation in the study. All information provided by them before withdrawing (including tapes) will be destroyed and omitted from the final paper.

4.5. Phase 1/ Quantitative Phase: Hospital Audit

This is the first phase of the sequential explanatory mixed methods research. We carried out an audit of the patient medical records at UDHS with the aim of collecting as much data as possible from the medical records to create a descriptive assessment of the elements of oral healthcare quality provided by the dental students at UDHS. This phase included quantitative data collection and analysis.

4.5.1. Primary objectives:

Perform an audit of patients' medical records at the University Dental Hospital Sharjah (UDHS) to:

- Describe the elements of oral healthcare quality provided, by dental students, for adult (aged 18-59 years) patients who were diagnosed with tooth decay that required a direct restoration in their treatment plan.
- Gather epidemiological data on the oral health status of adult patients that informed the recruitment criteria for Phase II.

4.5.2. Quantitative design

Retrospective cohort study: audit of hospital patient medical records

4.5.3. Quantitative study sample considerations:

The study included all new adult patients, assigned to fourth year dental students during the months of September and October 2012, who were diagnosed with tooth decay and

required a direct restoration in their treatment plan. We began the data collection in January 2014 by retrospectively following all of these patient files for a 16-month period. From September or October 2012 (the patient's first visit) to January 2014 (time of audit). We included all the patient population that fit the inclusion criteria described below. The following provide justifications for our decisions.

- *Timing and follow up period*: September and October 2012

Most patient assignments to fourth year students are done during the first two months of an academic year, September and October; therefore, we considered these two months as the most critical period to recruit a wide variety of patients.

The UDHS is a new hospital undergoing continuous change, thus, we included patients registered after September 2012 which provided us with almost 16 months of follow-up. Including patients registered prior to Sept 2012 would have increased the likelihood of variability, as new protocols in the hospital were implemented. Due to the possibility of introducing a selection bias, we decided not to restrict the data to patients who attended the clinic on certain week-days.

- *Providers: Fourth year dental students.*

Selecting the patients assigned to fourth year dental students ensured that the dental student would not graduate until after the follow up and quantitative audit times. Moreover, the fourth year dental students usually start with simple procedures that includes direct restorations, which were our cases of interest.

- *Patient category of interest:* Adult patients (18-59 years)

Our sample focused on adult patients (between the ages of 18 and 59 years) because this population constituted the majority (approximately 65%) of all patients seen at UDHS. Another reason is because our literature review revealed no data on the oral health status of this age group of patients in the UAE. Thus, it is timely to provide some information on that population.

- *Dental process of interest:* Simple decay requiring a simple direct restoration

There are many dental procedures provided by the students. Therefore, I had to think logistically and focus on one pathway of care. We decided that the best case to follow would involve simple decay (through tooth enamel and into the dentin) requiring a simple direct restoration (decay walled completely or partially in by tooth structure) for the following reasons:

- It is one of the basic treatments provided by fourth and fifth year dental students
- Because this is a common treatment, it will provide us with enough cases to extract rich data that will help in describing the quality of oral health care provided.
- The time required to complete such cases is not long (students are expected to complete these restorations in one session; two sessions is the maximum in some cases). Thus, the likelihood of losing the patient is reduced.

- The procedure does not involve lab work; therefore, a high rate of patient compliance and student adherence is expected.

4.5.4. Quantitative sample size:

A total of 187 new patients are assigned to all 80 fourth year dental students during the two months of September and October 2012. Including this total patient population in our study without sampling will ensure a high number of patients who require direct restorations.

4.5.5. Inclusion criteria

Adult patients between the ages of 18 and 59 years assigned to the fourth year dental students for routine primary dental care were included.

4.5.6. Exclusion criteria:

- Patients aged 17 years and younger or 60 years and older.
- Patients attending urgent care only.
- Patients who do not require any direct restoration.
- Patients referred to teaching clinics where treatment is provided by the faculty.
- Patients receiving care in the private clinic.

4.5.7. Quantitative variables and research instrument:

According to the data available in the patients' files at UDHS, we divided the information that can be extracted through this retrospective audit into three sets: (1) socio-demographic data, (2) oral health status-related data and (3) UDHS students' treatment

process related data. Only the variables that provided clear-cut / objective data were included. Any information that was not clear or required investigator-based interpretations were excluded.

4.5.7.1. Socio-demographic data

The following table describes the socio-demographic variables that were extracted

Table 5: The extracted socio-demographic variables

Variable	**Type**	**Data Type**	**Data**
Age	Independent	Continuous / categorical	18-29 30-44 45-54 55-59
Gender	Independent	categorical	Male Female
Occupation	Independent	categorical	Un employed Labourer (unskilled) Other employments
Location	Independent	categorical	The seven emirates (Abu-Dhabi, Dubai, Sharjah, Ajman, Um-Al-Quwain, Ras-Al-Khaimah, Fujairah)
Nationality	Independent	categorical	Arab Emirati Arab expatriate Non-Arab

4.5.7.2. Oral health status related data

The following table describes the oral health status related data (the information that describes the oral health status of the patient) that were extracted

Table 6: The extracted oral health related variables

Variable	Type	Data Type	Data
DMFT*	Independent	continuous / categorical	0-32 Moderate(1-4) and Severe (>4)
D = Decayed M = Missing F = Filled	Independent	continuous	0-32 0-32 0-32
Reason for visit / chief complaint	Independent	categorical	Pain relief Other complaint Check up
Medical History	Independent	categorical	Chronic disease Infectious disease Smoking

*DMFT is a score that expresses the extent (prevalence) of dental caries in an individual. It is a way to numerically describe caries prevalence and is calculated by counting the number of Decayed (D), Missing (M) and Filled (F) teeth (T). Therefore, it is an estimate that depicts dental health status and how much decay has affected an individual's teeth. The total of the three values (D, M and F) creates the DMFT-score which ranges between 0 and 32. This range can further be split into three categories that describe decay severity, so that '0' means no caries, 'moderate' caries ranges from 1 to 4 and more than 4 is categorized as 'severe'.

4.5.7.3. UDHS students' treatment process data

(The information documented in the patients' files describing the elements of oral healthcare quality provided by the dental students at the UDHS)

Dental disease of interest in this study: Any carious lesion involving any surface of the tooth that requires a direct restoration. Any complicated lesion requiring a complex procedure, such as indirect fillings, crowns, endodontic treatment, extraction etc., was not followed in this study.

4.5.7.4. Main outcome variable:

'Treatment completion': A treatment was considered successful and complete if all the carious teeth identified in the patient file were restored within the 16-month of follow up study period. Each simple carious lesion requiring a direct restoration should be completed within 1-2 visits, with the absence of any complications in the treatment.

A treatment is considered unsuccessful in the following situations:

a) If the restoration of a single simple carious lesion required three or more visits.
b) If the treatment was complicated due to an error in caries removal (e.g. physical pulp exposure).
c) If re-treatment is required due to an error in placement of the restoration (e.g. overhung restoration).
d) If a carious tooth is left untreated.

Therefore, the variables related to process of care that were extracted from the patient files were:

Table 7: The extracted treatment related variables

#	**Variable**	**Type**	**Data Type**	**Data**
1	Tooth treated or not	Dependent	Categorical	Yes No (reason if available)
2	Number of visits required per restoration	Dependent	Continuous	
3	Presence of complication or retreatment	Dependent	Categorical	Yes (type) No
4	Treatment completion (combination of the above three)	Dependent (Main outcome variable)	Categorical	All teeth treated + no complication All teeth treated + one or more complication Some teeth treated + no complication Some teeth treated+ one or more complication
5	Type of filling used	In dependent	Categorical	Amalgam Composite GIC
6	Type of tooth decay	In dependent	Categorical	Class I, II, III, IV or V
7	Location of decayed tooth	In dependent	Categorical	Maxillary Mandibular

4.5.8. Quantitative data collection

We began the data collection in January 2014. The patient files at UDHS are available in hard copy only; each file is assigned a recall number and stored accordingly in the file storage room. The receptionist provided us with a list of all patient files that were assigned to the fourth year students during the months of September and October 2012. The list included the file number, patient name and contact numbers. Using the information documented in the files, we excluded the files that did not fit the inclusion criteria described above. The receptionist retrieved the corresponding included files from the file storage room.

We then retrospectively followed all of these patient files for a 16-month period. From September or October 2012 (the patient's first visit) to January 2014. The data were collected from the files using a data extraction form (*Appendix 2*) that includes all of the variables mentioned above. Each file was assigned a unique code and neither the file number nor the patients' names were used to assure confidentiality. NH collected the data along with the assistance of another trained and experienced dentist (YT). MA closely monitored the data collection process. A random sample (n=70) of the files was selected for a second review to ensure reliability of the collected data. We found no errors in the extraction of the collected data.

4.5.9. Quantitative data analysis

Data were entered, cleaned, coded and analyzed using the Predictive Analytics Software (PASW 20.0). To illustrate the demographic characteristics of the patient sample,

descriptive analyses were performed. These included frequencies for categorical data, as well as means and standard deviations for continuous data.

The primary outcome variable was ‘treatment completion’. Based on the data that could be collected from the patient records, the literature and the discussions we had with the experts in restorative dentistry, we dichotomized the above-mentioned variable into

- Successful/Complete: when the patient medical record shows that all the teeth planned for direct restorations were treated without any intraoperative complication, and the number or visits per restoration is not more than two.
- Unsuccessful/Incomplete: when the patient medical record shows that one or more teeth planned for restoration were left untreated AND / OR the presence of intraoperative complication for one or more teeth AND / OR the number of visits per restoration exceeds two.

We further examined the data by carrying out bivariate associations amongst all the demographic, health status and treatment progress variables and using the patient as the unit of analysis to provide a descriptive assessment of the complete treatment provided to the patients. Second, we looked further into the specific details of the restored teeth and used the tooth as the unit of analysis to provide a descriptive assessment of the restored teeth. Finally, to examine the differences between patients who completed their treatment and those who did not, we looked into the factors associated with treatment completion. When exploring categorical variables, the following tests were used (a) *chi-square* or Fisher’s exact test with other categorical variables; (b) t-test or ANOVA with normally distributed continuous variables; (c) Wilcoxon rank-sum test or Kruskal-Wallis

one-way analysis of variance (nonparametric tests) with continuous variables with non-normal distribution. When exploring associations between continuous variables, linear regression analysis was used. Using this analysis pathway, we then specifically looked for associations between the outcome variable ‘treatment completion’ and the other independent variables.

4.6. Intermediate Integration Phase:

‘Integration’ in the research process refers to the stage(s) in which quantitative and qualitative data are mixed or integrated (108). It can take place in the beginning when formulating the research purpose and questions or at the final interpretation stage when quantitative and qualitative findings are mixed. It can also take place in the intermediate stage, like in a sequential mixed methods designs where the results from the first phase inform the process of data collection of the next phase (106). Integration in a sequential explanatory design can be done by using the quantitative results either to guide the participant selection for the qualitative phase or to inform the development of the qualitative data collection protocol (101).

In addition to using the quantitative data to provide a descriptive assessment of the elements of oral healthcare quality, we also used them to inform participant selection for Phase II and to identify the results that would require a qualitative follow up. We also used the descriptive quantitative data to formulate a list of issues that might adversely affect oral healthcare quality. However, due to restrictions in time and resources, we had to

decide which issue should be explained in Phase II. I made that decision based on the following:

- Personal Experience: From my personal experience of having worked as a dentist and a clinical instructor at UDHS for three years, I believed that the most alarming result from Phase I was the high prevalence of patients who had not completed the restorations planned in their dental charts (incomplete treatment). The aim of oral healthcare should be to change a patients' oral health to a disease free state and maintain it, rather than just treating a symptom. In my opinion, it is important for patients to receive the required treatment while the dental students obtain sufficient clinical experience before they graduate. Thus, it is critical to know why many patients did not complete their planned treatment at UDHS.
- Evidence-based: The literature strongly supports the importance of patient retention in dental school clinics for a continuum of oral healthcare and dental education (109, 110). Having patients discontinue their treatment not only affects that individual patient's oral health, but also leads to decreasing access to oral healthcare and adversely affects the dental education process (111). Dental students lose the opportunity to learn the outcome of the treatment and, potentially, fail to meet graduation requirements (109). Therefore, further investigating the high prevalence of incomplete cases at UDHS will be of great value to improve both oral healthcare quality and dental education.
- Expert opinion: We invited the dental specialists and mangers at UDHS to participate in the process of selecting the issue that we would investigate further in Phase II. We had multiple meetings and discussions with the clinical manager

of the student dental clinics at the hospital (Dr. Wael Taha), the head of the clinical department (Dr. Manal Awad) and two faculty members in the restorative department (Dr. Hatem El Damanhoury and Dr. Mariana Giantazupoulus). We shared with them the results of the quantitative phase and asked for their opinions on which issue(s) on the list they believed adversely affects quality of oral healthcare and would require further explanation. The outcome of our discussions dictated that I carry out a small qualitative investigation before setting the aims of Phase II (Qualitative Phase). This was because, even though the audit revealed a high prevalence of patients who have not completed the restorations planned in their dental charts, the managers and specialists at UDHS thought that it may have been because many people who live in the UAE are transients. We agreed that it would be worthwhile to know how many of these incomplete cases were left incomplete due to the patients leaving the UAE. Thus, I used the contact information on the patients' medical records to retrieve their telephone numbers and contacted all of the included patients. I contacted them in the morning, and those who did not reply were contacted again another day in the evening, in order to ensure that they were not at work. I asked them an open ended follow up question "briefly describe why you have not completed filling your teeth at UDHS", recorded their responses and performed a simple content analysis by taking the list of open-ended comments and grouping them into categories of possible reasons for not completing the treatment plan. I then counted the occurrences of each theme, created percentages and reported the results in a table. Finally, we used the results from the patients' telephone interviews in our final meeting with

the specialists and managers (details of the results will be described in the results section). We could then agree that the most critical issue that required further explanation in Phase II was the high prevalence of patients who had not completed the planned restorations.

4.7. Phase II / Qualitative Phase

This Phase was informed by the findings from Phase I (audit) and the integration process in the Integration Phase. We used the quantitative results when designing the objectives, recruiting participants and developing the interview guide. This Phase included qualitative data collection and analysis.

4.7.1. Primary objective:

Explain why there is a high prevalence of patients who had not completed the restorations planned in their dental charts (incomplete treatment) at UDHS, from the life experience of patients, providers (dental students and professors) and managers.

4.7.2. Secondary objective:

Seek possible solutions that can be applied to increase the likelihood of patients to complete the restorations planned in their dental charts at UDHS, from the life experience of patients, providers (dental students and faculty) and managers.

4.7.3. Qualitative design

In this Phase, we will follow a qualitative descriptive study design. When the study aim is to understand the event or phenomenon through seeking a straight description of the event, the best approach is to carry out a qualitative descriptive study. "*Qualitative descriptive studies offer a comprehensive summary of an event in the everyday terms of those events*" (112). This methodological approach is one of the mostly used in practice disciplines and provides the most appropriate method for my study aims.

4.7.4. Qualitative sample design:

Informed by the audit results we used a purposeful sampling technique. In purposeful sampling, the researcher picks a small number of cases that have the potential to produce the most information about a specific event. The power and strength of purposeful sampling comes from selecting those cases from which the researcher can learn a great deal about the core issues related to the study purpose; i.e. information-rich cases (113).

4.7.5. Recruitment:

In this mixed methods study, the sample selection for the Qualitative Phase was dependent on the findings from the Quantitative Phase.

- *Patients*: We recruited patient participants based on three levels:

- **Case completed or not:** to explore the different perspectives of patients who fall within the problem under study (incomplete cases) and those who don't (have completed their treatment)

- **Patients with high (more than 4) or low (4 or less) number of decayed teeth 'D'**: the results of the quantitative audit revealed a significant difference between the two in completing their treatment plan.
- **Gender; male or female**: the results of the audit revealed a relatively big difference between males and females in completing their planned treatments.

When recruiting patients, the participant selection was nested primarily within the quantitative sample for strengthening transferability. However, to prevent recall bias, I had to ensure that all patients had their last visit within the past two months.

- *Providers*: In this study, we focused on one type of dental treatment, i.e. direct restoration. Therefore, when recruiting providers, it was reasonable to invite those whose specialty is related to restorative dentistry (Specialists / Faculty members) and Clinical Tutors (General Dental Practitioners) who supervise the students, in the clinics, while performing the simple direct restorations.

- *Dental Students*: Fourth and fifth year dental students practiced in the clinics; therefore, the participants were recruited from both male and female groups and from both years.

- *Managers*: There were three personnel holding different managerial positions at the UDHS; the clinical manager of the dental clinics, the head of the clinical support staff and the Dean of the College of Dental Medicine. All of them were recruited to participate in this Phase.

4.7.6. Qualitative sample size:

Sample size was determined by data saturation. The following table illustrates details of the sample size of this qualitative phase.

Table 8: Characteristics of qualitative sampling and interview type

Stakeholder	Interview Type	Participant Category	Size*	Comments
Patients	Individual	Complete/Male Complete/Female Incomplete/High D/Male Incomplete/High D/Female Incomplete/Low D/Male Incomplete/Low D/Female	n=3 n=3 n=4 n=3 n=3 n=3	Total n=19
Dentists	Individual	Senior supervisors Junior supervisors	n=4 n=4	Total n = 8
Dental students	Focus group	4th year 5th year	Two focus groups	6 students for 4th year 7 students for 5th year
Managers	Individual	Clinical positions (n=2) Managerial positions (n=1)	(n=3)	Dean + hospital manager + support staff manager
Total	2 Focus group (n= 6+7 = 13) 30 Individual interviews			

4.7.7. Qualitative data collection:

- Patients, supervising dentists and managers:

Semi-structured open-ended individual interviews are appropriate for studying perceptions and beliefs of participants towards a complex phenomenon (114). Therefore, they were used for our qualitative data collection from patients, supervising dentists and managers. Moreover, the participants, being employees, might not be comfortable talking in front of their colleagues about issues affecting the quality of service. Therefore, we anticipated that participants' responses might be inhibited by peer pressure in a group discussion.

- Dental Students

When collecting data from students, we conducted focus groups. A focus group is “a qualitative research technique used to obtain data about feelings and opinions of small groups of participants about a given problem, experience, service or other phenomenon” (115). Students at UDHS are comfortable working in groups (mixed gender) not only for their assignments, but also during problem-based learning sessions in which they learn through discussions with the instructor and other students. Therefore, we anticipated that the interaction between students might initiate a discussion that might provide a richer response.

Patient participants were informed about the study by telephone and asked if they would be willing to participate. Providers and mangers were informed and recruited during a meeting at the UDHS. Similarly for the students, we informed them during one of their lectures, and those who were willing to participate were asked to approach the principle investigator (NH).

- Location and time:

I conducted all of the interviews with the help of MH who assisted me during the focus groups and took notes. The time and place of the interview was set based on the convenience of the participants. The providers and managers were more comfortable to do the interviews in their offices. Patients and students were interviewed in a comfortable meeting room at the UDHS where cookies and beverages were served.

Each individual interview was carried out at a time that was most suitable for the participants and lasted 40-45 minutes. A few (n=2) interviews with south Asian patients lasted 25 minutes, and the student focus group lasted 1 hour and 15 minutes. The student focus groups were set at the time when the students had a break between clinics and lectures. The participants were given the choice to speak in the Arabic and/or English language. All providers and managers preferred speaking in English; however, some patients preferred Arabic. There were some patients were from South Asia and their spoken English was not good. Therefore, I asked the office boy (who was from South Asia and spoke excellent English) to be present during the interview as an interpreter. With the consent of the participants, the interviews were audio recorded for the purpose of transcription and analysis. In addition, we took written notes during the individual interviews.

4.7.8. Qualitative instrument:

We developed a semi-structured interview topic guide based on the quantitative findings (Appendix 4). The interview guide provided the general outline for the interview in the form of topics and open-ended questions. The objective of the open ended questions was to guide the discussion towards certain topics that were pre-decided by the researcher, while maintaining flexibility for probing and asking spontaneous questions. The interview guide was pilot tested with two participants, not included within the study population, and further modifications were done according to the participant's feedback. I met with my co-supervisor (JNWL) through Skype after the interviews to critically reflect on the data collection process.

I followed a general-to-specific technique of focusing questions during the interview. The participants were first asked to introduce themselves to make them more comfortable. Then I asked a general question about the level of oral healthcare quality provided at the UDHS. I found this technique very helpful because the participants were not familiar with qualitative interviews and the presence of the recorder. Therefore, by the time we reached the core issue, they would be more comfortable and have forgotten about the presence of the recorder. Several probes were used throughout the interview like ‘what are the things you like/don’t like about the dental service provided here?’ If the issue of high incomplete cases was raised, I moved directly to ask them about its effect on quality and the possible causative factors. Finally, I asked how they thought we could overcome this problem and whether they had any further thoughts or suggestions. That said, the interview was flexible in terms of the order of the questions, and additional topics were sometimes discussed to allow the participants to reflect on their own perceptions.

The topic guide included the following:

1. Self-introduction (first name, origin, background and reason for choosing dentistry)
2. Describing quality at UDHS.
3. Reasons for having a high prevalence of incomplete cases.
4. Attitudes towards the effect of incomplete cases on the quality of oral healthcare.
5. Reasons the drive the students not to follow up with the patients.
6. Reasons that drive patients not to complete their treatment.
7. Suggestions and recommendations to overcome issues.
8. Missed anything and other suggestions.
9. Concluding remarks and gratitude expression.

4.7.9. Qualitative data handling and analysis

We transcribed the audio recordings of the interviews in English ‘verbatim’ and analyzed the data using qualitative thematic analysis. “Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data” (116). Patterns and themes within the data can be identified using two approaches; i.e. ‘inductive’ in which the themes identified are not theoretically driven and are closely attached to the data (117) or ‘theoretical’ in which the themes are analyst driven and closely linked to the researcher’s theoretical interest (116). Our objective was to explain the high prevalence of incomplete case by exploring perceptions of stakeholders; therefore, I used a deductive and inductive approach. I followed the six phase step-by-step guide to carrying out thematic analysis as described by Braun and Clarke (116). I started to familiarize myself with the breadth and depth of the content of the data by transcribing the interviews myself and repeatedly read the transcriptions. Next, I generated initial codes from the data. After producing a long list of codes, I sorted similar codes within potential themes, including the data extracts. I then reviewed and refined the themes by collapsing and breaking down the potential themes before delineating the final definition and naming of the themes that I presented for my analysis. I then used this set of fully worked out themes in the final stage of analysis and writing up of the report to tell the story of my data. I also created matrices and tables to illustrate and interpret the data. To ensure data validity, I relied on ‘Analyst Triangulation’ (118) for which I engaged another analyst (JNWL) to review the codes and interpretations of my findings.

4.8. Final Mixed Interpretation Phase:

The final interpretations were drawn based on the findings throughout the entire study. The quantitative and qualitative results were brought together to produce a more meaningful and robust picture of the issue affecting oral healthcare quality at UDHS. In the interpretation stage the findings from the quantitative and qualitative data sets that have been separately analyzed are triangulated to produce a further understanding of the research (119). We created two matrices in which we list findings from the audit (descriptive statistics) and their corresponding qualitative findings to do a side-by-side comparison by reflecting on where they agree (convergence), contradict each other (divergence) or provide complementary evidence (complementarity). This phase offered further evidence based on the convergence, divergence and complementarity of the findings, that helped us gain a more complete picture about the issue understudy which would have not been possible with a single method approach.

4.9. Post Research Phase - Knowledge Translation:

During this phase, we met with the providers and managers and used the evidence that was synthesized from the research phases to create recommendations for quality improvement in oral healthcare delivery and services in the UDHS specifically, as well as for oral health facilities that share similar settings. Moreover, we identified areas of future research to help better understand quality of healthcare in dentistry.

5. STUDY RESULTS

5.1. Introduction

This chapter provides a description of the results of the medical/dental records audit, starting with the sample characteristics that include the socio-demographic, general health and oral health characteristics of the patients. The dental students' treatment progress data are then reported by (a) describing the treatment progress of direct restorations done by the students during the retrospective audit period and (b) reporting the factors associated with oral health and treatment progress variables. This is followed by the results of the qualitative investigation in which we present a description of the factors that led to the problem of 'having a high prevalence of incomplete planned treatments in the patients' medical records. We compared the perspectives of the different stakeholders and, finally, we describe the recommendations suggested by the stakeholders to correct this problem.

5.2. Sample Characteristics

Data collection began in January 2014 with retrieval of the files assigned to the students during the months of September and October 2012. There were 187 patients assigned to the eighty 4th year dental students, with 1 to 3 patients per student. We excluded 24 patients for the following reasons:

- Missing files = 2
- Files appear in the system as assigned to students, but the files were actually not assigned = 6

- Incomplete files = 1
- Patients younger than 18 or older than 59 years =15

We then extracted the data from the remaining 163 patient files. Their socio-demographic, health and oral health data are reported below.

5.2.1. Socio-demographic characteristics

The quantitative sample consisted of 93 males (57.1%) and 70 females (42.9%). Their mean age was 32.1 (SD=10 years), with a range of 19 and 58 years of age. Almost half of the patients were young adults (47.9%) between the ages of 18 and 29 years (Table 1). Emirati patients composed 12.3% of this population (n=20) and 42.9% were from other Arab countries (n=70). The remaining 44.2 % were from non-Arab countries.

Most patients (62.6%) lived in the city of Sharjah, while 30% lived in the other 6 Emirates of the UAE. There were 12 patient files (7.4%) with missing address information. The occupation of the patients was not documented clearly and was inconclusive. There were many patients with ‘private job’ as their occupation that could be interpreted in different ways. In addition, many patient files had the name of the company in the occupation slot, instead of the occupation; for example ‘Dubai Municipality’ where the patient could be a manager or a customer service agent or any other employee there. Moreover, occupation status was not completed in 23 of the patient files (14.1%). However, the information in the files did provide some descriptive information about patient occupation. These were categorized into unskilled laborers (25.2%), students (19.6%), housewives (9.8%) or other jobs (31.3%).

Table 9: Socio-demographic characteristics (N=163)

Variable	N	%
Age		
18-29	78	47.9
30-39	50	30.7
40-49	23	14.1
50-59	12	7.4
Gender		
Male	93	57.1
Female	70	42.9
Nationality		
Arab (Emirati)	20	12.3
Arab (others)	70	42.9
Non-Arab	72	44.2
Missing	1	0.6
Address		
Abu-Dhabi	2	1.2
Dubai	33	20.2
Sharjah	102	62.6
Ajman	11	6.8
Other Northern Emirates	3	1.8
Missing	12	7.4
Occupation		
Unskilled Laborer	41	25.2
House wife	16	9.8
Students	32	19.6
Others	51	31.3
Missing	23	14.1

5.2.2. General health characteristics

The information documented in the patient files showed that only one patient had an infectious disease and a few patients (9.2%) suffered from chronic diseases like diabetes and hypertension (n = 15). Only 22.7 % of the patients were smokers (n=37), and the majority (77.3%) claimed to be non-smokers (Table 2).

Table 10: General health characteristics (N=163)

Variable	N	%
Chronic Disease		
Yes	15	9.2
No	148	90.8
Infectious Disease		
Yes	1	0.6
No	162	99.4
Smoking Habit		
Smoker	37	22.7
Non smoker	126	77.3

5.2.3. Oral health characteristics

The mean documented DMFT score in the patient files was 12.9 teeth (SD = 5.8) with a minimum score of 0 and a maximum of 26. The mean number of decayed teeth (D), missing teeth (M) and filled teeth (F) was 7.5 (SD = 4.3), 3.4 (SD =3.8) and 1.9 (SD = 3), respectively. Almost half of the patients (48.5%) visited the UDHS with pain as their chief complaint (n= 79), and 31.9% visited the hospital for a dental checkup (n= 52). The others (18.4%) had complaints like bleeding gums or missing teeth. The total number of decayed teeth planned for direct restorations in all 163 patients was 1,060. Out of these, 54.5% were located in the maxillary arch and the rest (45.5%) were in the mandible. Only 299 of the 1060 teeth were documented in the files as restored (28.2%) and 761 were untreated (71.8%). We could not identify the type of caries from the diagnosis or treatment plan charts; however, once the tooth was treated, a detailed description of the treatment procedure was documented in a treatment progress form, including the type of caries and cavity preparation. Therefore, we could only identify the type of caries from the treatment progress notes of the treated teeth (n=299). The majority of the completed restorations were class I fillings (61.5%) followed by class II (23.4%), class V (8%), Class III (3.7%)

and Class IV (2%). The caries type of four of the treated teeth was not documented (1.4%).

Table 11: Oral health status characteristics

DMFT description (N=163)		**Mean (SD)**
DMFT score		**12.9 (5.8)**
D: Decayed teeth		7.5 (4.3)
M: Missing teeth		3.4 (3.8)
F: Filled teeth		1.9 (3.0)
Other Oral Health Variables	**N**	**%**
Reason for dental visit (N=163)		
Pain	79	48.5
Checkup	52	31.9
Other	30	18.4
Missing	2	1.2
Caries location of all decayed teeth (N=1060)		
Maxillary (Upper arch)	578	54.5
Mandibular (Lower arch)	482	45.5
Caries class of teeth restored at UDHS (N=299)		
Class 1	184	61.5
Class 2	70	23.4
Class 3	11	3.7
Class 4	6	2
Class 5	24	8
Missing	4	1.4

5.2.3.1. Factors associated with oral health variables

There were significantly more Arabs who came for checkups (41.6%) than non-Arabs (19.7%) who mostly came with pain as their chief complaint. When comparing the reasons for this, we found nationality to be significantly associated with chief complaint (Pearson Chi-Square, p=0.003).

Moreover, the patients' ages were significantly associated with their chief complaint (Pearson Chi-Square, p=0.029). We found that young adults (18-29 years old) came mostly for checkups (41.6%) and, then, for pain (37.7%) and other complaints (20.8%).

However, all of the other age groups reported pain as their chief complaint. For example, 65.2% of patients aged 40-49 years old came for pain relief and 34.8% came for checkup or other complaints.

Patient's age was also significantly associated with the DMFT score of the patient (ANOVA, p=0.012). When cross tabulating the DMFT scores with different age groups, we found that the DMFT scores were higher in the older age groups; i.e. the young adults group had a mean DMFT score of 12.27 (SD=5.8), while the older (50 – 59 years) patients had a mean DMFT score of 16.25 (SD = 5.9).

5.3. UDHS Students' Treatment Progress Data

Before we started extracting the data that described the elements of oral healthcare quality provided by dental students at UDHS, we excluded 12 more patients from the total of 163 patients, because they had no decayed teeth planned for direct restorations in their files. Therefore, this section provides the results of extracted data from 151 patients who met the inclusion criteria and had one or more decayed teeth planned for direct restoration.

5.3.1. Describing the treatment progress of direct restorations

Over the 16-month (September 2012 – January 2014) retrospective follow up period, we found that the average number of teeth planned for direct restoration per patient was 7 (SD = 3.6) and the maximum was 17 teeth per patient. However, the average number of teeth per patient that were restored by the students was 2 (SD =2.2), and the maximum number of teeth restored per patient was 11. The average number of visits a patient made

to UDHS to restore his/her teeth was 2, and the maximum was 10 visits. When looking at the average number of visits per restoration, we found that 83.3 % of the teeth were restored within one visit (n = 249), and 14.4% were restored in two visits (n=43). Only seven teeth required more than two visits (2.4%). Most teeth (93.3%) were prepared and filled with no complication during the clinical procedure (intraoperative complication). Only 20 teeth (6.7%), in 20 different patients, were had a complication that occurred during the cavity preparation and filling placement procedures. When evaluating the 'operative treatment status' (treatment completion), we found that only 19 patients (12.6%) completed the restoration of all teeth that were planned for direct restorations at UDHS. Five of these experienced intraoperative complications but were successfully treated. Seventy-seven and a half percent (77.5%; n = 117) of patients who did not experience an intraoperative complication did not complete the treatment plan, and 15 patients (9.9%) had an incomplete treatment plan and an intraoperative complication. Therefore, the total number of patients who did not complete their planned operative treatment was 132 (87.4%).

The telephone interviews carried out with the 132 patients during the Intermediate Phase provided some insight on the possible reasons for not completing the planned treatment. Seventy-eight patients (59.1%) were contacted and asked about the reasons for having not completed the planned operative treatment. The remaining 40.9% could not be contacted after two attempts at two different times, either because they did not pick up or because their phone was switched off or no longer in use. The reasons for incomplete treatment plans were categorized into five themes (Table 12). Some reasons were that the patient was busy with work or had traveled to another country and did not return

(22%), or s/he did not have pain anymore and decided not to come back (2.3%). Other reasons were related to the service at UDHS, such as the patient was waiting for an appointment but was not able to get one (21.2%) or something happened during the patient's previous visit that made the patient dissatisfied and unwilling to come back (8.3%) or the patient was unaware that s/he required more direct restorations (5.3%).

Table 12: Variables that describe the elements of oral healthcare quality at UDHS

Variable	**Mean (SD)**	**Max.**	**Min.**
Average no. of teeth planned for direct restorative treatment per patient	7 (3.6)	17	1
Average no. of teeth restored at UDHS per patient	2 (2.2)	11	0
Average total no. of visits a patient made to do fill his teeth	2 (2)	10	0

Variable	**N**	**%**
Teeth planned for direct restorations (N=1060)		
Treated at UDHS	299	28.2
Not treated	761	71.8
No. of visits per restoration (N=299)		
1 visit	249	83.3
2 visits	43	14.4
3 visits	5	1.7
4visits	2	0.7
Teeth restored: (N =299)		
without a complication during the procedure	279	93.3
with a complication during the procedure	20	6.7
Patients (N=151)		
who suffered a complication during the procedure	20	13.2
who did not suffer a complication	131	86.8
Treatment status per patient (N=151)		
*Planned restorations completed + **no** complication*	14	9.3
Planned restorations completed + complication	5	3.3
*Planned restorations **in**complete + **no** complication*	117	77.5
*Planned restorations **in**complete + complication*	15	9.9
Reasons for incomplete treatment plan (N=132)		
Patient travelled to another place or is busy	29	22
Patient could not get an appointment from students	28	21.2
Patient is dissatisfied and chose not to come back	11	8.3
Patient not aware that s/he has decay	7	5.3
*Patient has **no** pain and chose not to come back*	3	2.3
Un known (researcher failed to get hold of patient)	54	40.9

5.3.2. Factors associated with intraoperative complications

We also considered the tooth as the unit of analysis. In general, maxillary teeth had more complications (7.4%) than mandibular teeth (6.7%). However, this difference was non-significant.

When studying the occurrence of intraoperative complications and other tooth related variables, we found significant associations with the following:

- Filling type*: Amalgam fillings had a significantly more intraoperative complications (12.7%) than composite fillings (5.3%; Fisher's Exact Test, p=0.05.
- Caries type*: Class II restorations had significantly higher intraoperative complications (21.4%) than class I restorations (1.6%; Fisher's Exact Test, p=0.00.
- Number of visits*: Six out of the seven teeth that required more than 2 visits had intraoperative complications (Fisher's Exact Test, p=0.00).

Moreover, we identified factors associated with restorations requiring more than two visits and found significant associations between teeth requiring more than two visits to be restored and the following variables:

- Intraoperative complication presence*: 85.7% of teeth requiring more than two visits were complicated (Fisher's Exact Test, p=0.00).
- Caries type*: 100% of teeth requiring more than two visits were diagnosed with class II caries (Fisher's Exact Test, p=0.00).

Seven percent were restored with amalgam restorations and 1.6% were restored with composite restorations; however, these difference were not significant. Similarly, 2.5% of maxillary teeth and 2.3% of mandibular teeth required more than two visits.

Finally, we looked at the teeth that were left untreated (n=761) and found a significant association between untreated teeth with tooth location where 78.9% of maxillary teeth were left untreated, while only 63.3% of mandibular teeth were left untreated (Pearson Chi-Square, p=0.00).

5.3.3. Identifying factors associated with 'treatment completion'

We then further studied the characteristics and the factors associated with the status of the case (treatment completion); patients who completed their planned treatment at UDHS and those who did not. The association between completing a planned treatment and the other variables did not show significance except with the DMFT score, categorized as "moderate" and "severe" (Fisher's Exact Test, p=0.027) and the number of decayed teeth 'D score' (t-test, p=0.006). Table 13 demonstrates the differences between patients who completed the planned treatment and those who did not.

Table 13: Distribution of 'case status' (complete & incomplete) within different variables

Variable (unit)	**Incomplete case**	**Complete case**
Gender (%)		
Female	84.6	15.4
Male	89.5	10.5
Nationality (%)		
Arab	87.1	12.9
Non-Arab	87.7	12.3
Occupation (%)		
Unskilled Laborer	86.5	13.5
Others	87.7	12.3
Address (%)		
Sharjah	85.4	14.6
Others	90.9	9.1
Chief complaint (%)		
Pain	88.2	11.8
Checkup	85.1	14.9
DMFT score category* (%)		
Moderate	50	50
Severe	89	11
DMFT score [mean (SD)]	13.7 (5)	11.6 (6.8)
D (Decayed) score* [mean (SD)]	8.4 (3.8)	5.8 (3.8)
Age [mean (SD)]	32.6 (10.3)	29.1 (8.2)

Our quantitative analysis revealed multiple areas that could be further explained using qualitative inquiry; i.e. the high prevalence of patients who did not complete their planned treatment, the high rate of untreated maxillary decayed teeth compared to mandibular ones, having a number of patients who are not aware that they require restorative treatment, etc.

The issue of having a high prevalence of patients who did not complete their planned restorative treatment was selected to be further investigated in this study using qualitative individual and focus group interviews (the selection process and justification was

explained in section 4.6. during the Intermediate Phase description). We carried out an in-depth investigation to provide a better understanding of the problem that enabled us to determine and recommend the most appropriate ways to improve the quality of oral healthcare at UDHS.

The qualitative sample consisted of 19 patients (individual interviews) and 24 providers (individual interviews with 3 managers and 8 clinical supervisors, as well as two focus groups with the fourth [n=6] and fifth [n=7] year dental students). The socio-demographic characteristics of the qualitative sample are illustrated in Table 14.

Table 14: Socio-demographic characteristics of the qualitative sample (N=43)

Variable	Patients N=19	Supervisors & Managers N=11	Students N=13
Age			
18-29	7	0	13
30-45	7	4	0
46-59	5	7	0
Gender			
Male	10	5	5
Female	9	5	8
Nationality			
Arab (others)	12	6	9
Non-Arab	7	5	4
Occupation		-	-
Unskilled Laborer	5		
House wife	4		
Students	4		
Others	6		
DMFT score		-	-
Moderate	10		
Severe	9		
Case status		-	-
Complete planned treatment	6		
In complete planned treatment	13		

5.4. Themes Leading to Non-completion of the Planned Restorative Treatment

We tried to explain why there is a high prevalence of patient files with incomplete planned restorative treatments. Providers and patients at UDHS seemed to be aware of the problem and agreed that they both shared the responsibility for this high prevalence of incomplete cases. As their perspectives were further explored, it appeared that the explanation for the problem was a combination of four themes: (1) weakness in the 'Structure' of oral healthcare, (2) weakness in the interpersonal aspects of the 'Process' of oral healthcare, (3) weakness in the clinical aspects of the 'Process' of oral healthcare, and (4) patient population characteristics. These four themes almost always led to either having: (a) patients who do not want to / cannot come back or (b) students who do not want to / cannot give appointments to their patients, resulting in the presence of a high prevalence of incomplete planned treatments in the patients' medical records (figure 5).

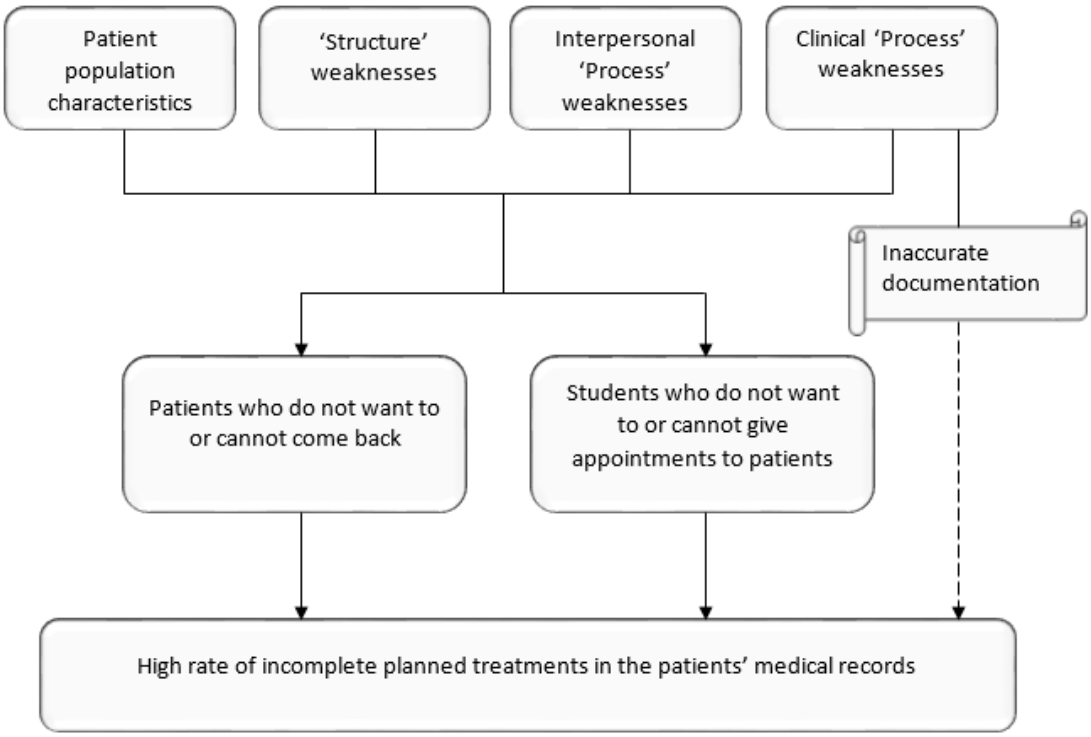

Figure 5: The identified themes and pathway leading to the high prevalence of incomplete planned treatments at UDHS

5.4.1. Weakness in the 'Structure' of oral healthcare

Patients and providers pointed out the defects in the 'Structure' element of healthcare quality provided at UDHS that were leading to the high prevalence of incomplete cases. Here, we identified five overarching pathways that lead to weakness in the 'Structure' of oral healthcare quality at UDHS: (a) Hospital setting weakness, (b) manpower shortage, (c) clinical system setup flaws, (d) financial barriers, and (e) education protocols and objectives.

- Hospital setting weakness

Participants identified multiple areas of concern with the hospital setting, resources and the way they are allocated that have contributed to the problem of having incomplete cases. The main concern that was brought up by all providers and patients was the insufficient number of clinical hours allocated for patient care: "*there is a huge difference between the time they* (UDHS students) *have in their clinics and the time we had when we were students*" (D, manager). The students expressed their strong concerns about this point, too: "*the time frame for clinical ours for us is less …. and we have a lot of breaks so actually we practice like seven months only per year, do you think this is enough to actually start on a case and finish it?"* (Sh, student). The supervising staff also thought that *"the number of clinical sessions they get is very limited"* (B, senior staff). It was not surprising that the patients were aware of this issue too*: "I get the feel that the poor students don't have time to finish the work"* (Naj, patient). Not only was the amount of clinical time thought to be causing the problem, but also the timing of clinic availability was raised by most participants: "*it's a shame we don't have evening clinics"* (TA,

student). The supervisors thought that one of the major issues the students face is *"having the clinics timing from 9 in the morning to 4 at the afternoon and that is the time patients are in their work or school, and to make things worse we are also closed in the weekend when patients are at home on Friday and Saturday too"* (Al, supervising staff). Patients were also concerned and thought that if the clinic timing does not change, then they might never be able to find a solution: "*there is no way out, how I can come in the morning? I cannot leave work, I have to do my teeth, really they must to do something about it"* (A, patient) and another patient said *"a hospital should not close during holidays because this is not ethical and will remove trust between the patient and the doctor"* (Ash, patient). Even patients who could come during the clinical hours and were free in the morning brought up the inconvenient clinical timing and expressed their concerns for other patients: *"I am house driver you know, Madam* (his boss) *not go anywhere morning time, so I come no problem, but other people what they do? Not fair for them you know"* (N, patient).

Moreover, the students, supervisors and patients thought that the hospital setting was located away from the city center, and many patients would not be able to come back multiple times due to transportation difficulties: *"It took me maybe 2 hours to come here, I don't have extra time and money to do this every time"* (Ib, patient). On the other hand, the managers were more concerned about the availability of the teaching facilities which is forcing them to decrease the students' clinical training sessions: *"we don't have enough time because of the facilities partly. We only have the facilities to teach half the class, for example the skills class we have to have two sessions to let half the class practice, which*

means the first half of the class does not get to practice when the other half is practicing" (D, manager)

- Manpower shortage

Shortage in manpower was also considered one of the flaws in the 'Structure' of oral healthcare quality. The unavailability of enough staff in multiple divisions was thought to lead to defects in organization and structure, thereby contributing to having many patients with incomplete planned treatments. For example, the insufficient number of clinical supervisors in the student clinics forces the students to wait for the busy clinical supervisors to approve a case and proceed to the next step: *"the doctor is never there when I need him, I have to wait and wait and wait, all this is from my time and the patient too, I mean he's right in front of me you know but busy with another case… we need every minute in the clinic"* (Z, student). In addition to that, it might lead to complications that could have been avoided if the supervisor was available when needed by the students: *"in my previous appointment I had bleeding from my tooth, we were waiting for 20 minutes for the bleeding to stop, it annoyed me very much, there was shortage in doctors so the doctor was busy with someone else, if the doctor had come to me earlier this would not have happened, because of that I was tired of opening my mouth and lost my time, it should not have happened, the doctors should be available more for the students"* (H, patient)

Another example is the shortage in the supporting staff, where the absence of a medical records officer leads to disorganization and misplacement of the patient files *"can you imagine how many times the students don't find the file of their patient who is waiting*

outside also if OK they found the file but half their time is gone." (R, supervisor). The distribution, transfer and follow up of patients between students was another area that lacked the rightful number of staff. This led to having some patients *"suffer from being lost in the system and never get to complete fix their teeth"* (Ab, student). This issue was very much emphasized by all students, supervisors and most patients and was considered one of the major matters: *"It is like the blood who is flowing in my body, someone like to control the flow, I will die without the control of distribution of blood, ummm this is the same if they cannot control how patient flow from student number one to student number two the hospital will dies"* (Laughs) (A, patient)

"We have somebody to you know to do it (screen the patients' oral health status) *but how to distribute properly to students is not yet. We miss it"* (A, supervisor)

"There's no one following up the patients properly, ummm well you know? that's not true, I mean there is poor Dr. X (who is in the patient transfer office) *but it's not her fault I mean common it's not fair she cannot do all that by herself, her desk is always full with files, but it gets out of control, she cannot do the job of 4 or 5 people, to be honest she tries but I mean it is just not possible of course"* (J, student)

- Clinical system setup flaws

Supervisors and patients were not only concerned about the lack of a patient follow-up system was, but they were also concerned about the general clinical rules system. The rules are thought to change frequently, leading to confusion, time loss and treatment delay, especially in patient transfer from urgent care to the student clinic for assignment to students. *"That is why I keep on telling you that they keep on changing the system. The*

control from this side is a little bit you know, ummm, I mean a mis-control from our side … till they get used to the rules we change them and sometimes students are not always able to follow … so for example the patient lost so much time to get transferred from urgent care to the students" (AQ, supervisor). Although the patients were aware that it is still considered a new hospital, they did not accept the continuous change in the rules and regulations: *"ok we can say they did not open a long time ago but it is not acceptable, I cannot come every time and they tell me no sorry, very sorry, but we don't do it this way anymore you have to do this and that … it makes me angry*" (Sm, Patient)

The patients were unhappy because a controlled appointment system and contact center were not in place and they thought that this contributed to not having appointments and being unable to contact the hospital to inquire or arrange an appointment: *"They can put anyone to at least pick up the phone, they gave me a number to call and every time I call they tell me your call is valuable but no one answers … my call is valuable how? .. this is not a way they have to do something"* (Ib, Patient). Another patient said *"I waited n waited and after months they call me in morning, I am at work, she tell me come today at 5 p.m., (*pause*) I mean seriously? … other places so organized even if they don't find me they send me message to my mobile with the details of the appointment, we are in 2014 they should use the technology"* (M, Patient).

- Financial barriers

Despite the treatment being almost free, the patients complained of the indirect cost. They considered the need for taking multiple leaves from their jobs, the time cost from the long waiting time in the hospital reception area and the transportation fees as financial barriers

that reduced or eliminated their ability to come back to complete their planned treatment: *"OK I know I don't pay for the filling but I lose money every time I leave work to come do my tooth … I cannot afford this"* (N, patient). Another patient also said *"If I take a leave for 3 hours from my boss, I lose all the time waiting in the reception, then I have to leave or my boss will cut from my salary"* (H, patient). Transportation expenses were expressed by some patients: *"patients cannot afford transportation again and again and taxi is very expensive nowadays"* (Ib, patient).

- Education protocols and objectives

Being an educational institute, the stakeholders thought that it would affect clinical patient care in three ways. First, the clinical assessment criteria in the fourth and fifth year clinics were mainly based on requirements. This requirement-based clinical assessment was considered to be the most dominant amongst all of the themes. It was brought up by all mangers, supervisors, students and some patients and was considered as the main cause of the high prevalence of incomplete planned treatments at UDHS:

- *"its mainly due to requirements"* (B, supervisor).
- "*requirements definitely"* (O, supervisor).
- *"why do I bother to complete the remaining class ones* (teeth with class I decay) *for the patients when I have other requirements to finish or I will fail … really I cannot afford to waste time with cases not required … I know it's bad but I am more concerned about my grades"* (R, student).
- *"Yes, that is because of the overall philosophy here which is of treating the tooth rather than the patient… when the student has limited time to complete certain*

number of cases and this patient may not be needed for that, this is understandable human nature that they look to complete their goal instead of the patient, this does not justify the behavior … unfortunately this is the wrong message that we give them when we ask for requirements instead of comprehensive care but we are working on changing this now" (D, manager).

- *"on top of that they have a low number of requirements so they will ignore the patient once they finish"* (W, manager)

Some patients were aware that students might not want to treat them because of the students' interest in new cases: *"and some students they don't care about the patient they want to see new cases on daily basis"* (Ib, patients), or because *"the student completed what he need from the patient and found a more useful case for him"* (Ay, patient). When asked about the reasons that make students ignore the patient's needs, one patient said *"maybe because the student completed his requirement"* (N, patient) and another patient thought that *"students want specific cases for exams, he wants to finish it, that is what's important for him"* (M, patient)

Second, the supervisors thought that they have objectives to train the students in addition to addressing the patients' needs and that, by itself, leads to delay in treatment completion, as clinical treatment time is necessarily lost while teaching and training the students: *"We are not a private practice, we have to also train our students, and you can imagine how much delay this will cause, like all dental schools it is the problem here too"* (H, supervisor). Third, the supervisors also thought that having students graduate every year led to the formation of a group of patients who need to be transferred to other students to continue their planned treatment, but that is not well controlled at UDHS:

"graduating students leave patients behind, these poor patients don't get re-assigned to other students except some lucky ones who find another student or if the graduating students was caring and gave him to his colleague" (O, supervisor). Patients were also aware of this problem of graduating students *"… and then my doctor graduated and I am waiting for someone else but no one called for seven months. I had to come back by myself to the emergency"* (JM, patient)

5.4.2. Weakness in the interpersonal aspects of the 'Process' of oral healthcare

This includes all weaknesses in the social and psychological interactions between the patients and the providers at UDHS, such as communication skills and humanism. Supervisors, managers and patients thought that sometimes students' attitude towards the patients made the patients reluctant to come back and complete their planned treatment. Patients thought that some students *"did not show respect or professional attitude"* that made them feel like *"guinea pigs"* or *"charity"* like the students are doing them *"a favor because it is free".* However, patients thought that it was a "*mutual benefit*" because they were also helping the students to *"train and practice to complete and graduate"*. Supervisors and managers thought that some students *"are not patient enough with the case"* and this showed *"lack of responsibility on the student's behalf*". The junior supervisors, having spent most of their time with the students in the clinics, showed great concern about how most students treat the South Asian workers: *"the way of talking to Bangal patients* (patients from Bangladesh)*, they* (students) *don't even know his* (the patient) *name and they say open, close, sit, do, you know like orders in non-human way*

… these patients won't come back only if they have pain and nowhere else to go" (Am, supervisor).

On the other hand, supervisors, students and patients acknowledged that, in some cases, the patient could be *"uncooperative", "apprehensive", "mean"* or *"rude"*. Therefore, the students will avoid such patients, and those patients would end up with incomplete treatment: *"Sometimes the patients just keep on screaming upon things and make noises whenever we try to practice upon them and they also do actions that avoid us from doing our work. This is when we feel that this patient should not be called again* (laughs)" (Z, student). Patients were also concerned that there were some students who might not call them for an appointment just because they *"didn't like the patient"* or *"were uncomfortable with the patient"* for many reasons like *"maybe the patient doesn't smell good"* which is not an acceptable behavior for students: *"my feeling is because maybe smell is coming out of their body or something, but you cannot tell them anything because the people are mostly coming from their work and they don't have time to home and clean themselves up … but when the student are wearing mask it shouldn't affect them and they have to not say anything to the poor patient"* (Ib, patient).

Another factor, brought up by supervisors and students, affecting the interpersonal aspect of 'Process' of oral healthcare is the communication barrier due to language differences: *"majority of our students are Arabs and they cannot talk to patients who do not speak Arabic or English, the poor students I see them suffer and patients suffer with them"* (Sh, supervisor). The students also thought that "*when you can't communicate with the patient you cannot motivate him and cannot handle his concerns and fears so you definitely are going to lose this patient"* (R, student).

The requirement-based clinical assessment and insufficient clinical hours were also considered, by supervisors and students as playing a role in the creation of a communication barrier between the student and the patient: *"we are supposed to spend time in communicating with the patients and explaining the treatment plan and stuff like motivation but I don't do that, with all this requirements we don't have time for these things"* (H, student). However, a few students disagreed and said they *"would never do that"* and that they *"make sure that the patient understands all the details of the treatment plan before anything"* (R, student)

5.4.3. Weakness in the clinical aspects of the 'Process' of oral healthcare

This theme refers to the factors that were thought to lead to weaknesses in the application of clinical dentistry to a personal dental problem at UDHS, thereby contributing to the problem of the high prevalence of incomplete planned treatments. Supervisors, students and patients thought that the type and difficulty of the case played a role in the students' tendency to avoid the patient and not completing that patient's planned treatment. For example, the case can require *"a procedure that is hard for the student to do"* (W, patient) or if *"an intraoperative complication occurs like root perforation, so the student will try to hide it under the mat"* (Sh, supervisor). The students did not deny that they sometimes avoid difficult cases. However, they blamed their supervisors and explained: *"doctors don't allow us to do any complicated case and they don't help us, if I don't practice in the hard case now then always I shall be avoiding it … you know it's like I know my doctor won't help and I going to suffer and waste clinic time so I keep postponing my patient"* (H, student). The difficulty of the case can be related to a patient's general health that made *"the clinical procedure really difficult to do"*, like if the *"patient is medically compromised*"

having medical problems like *"uncontrolled diabetes"*, *"heart problems"*, *"hepatitis C"*, *"halitosis"* and *"severe gag reflex"*.

- *"like one time a patient had angina and everyone was scared and when the patient was managed and sent home everyone was so scared to give him another appointment … the students are afraid they cannot handle him or something bad happens you know, the poor patient … it's like they run away from such patient"* (A, supervisor)

Another factor expressed by supervisors and patients was the students' poor management of clinical time and slow work**,** considered a weakness in the clinical aspect of 'Process' of oral healthcare. Many supervisors thought that the students were *"slow most of the time"* and *"don't have time management skills, they come late because they have exam, lazy, I don't know many reasons, and keep wasting time and work very slowly and suddenly the clinic time finish and they have to close and loose time"* (B, supervisor). Therefore, leading to the incompletion of the patient's planned treatment because the students *"wouldn't able to finish their patient's teeth by the time they graduate"* (H, supervisor) or *"the patient will not come again when he sees the student not punctual and all his time is lost and not much treatment done"* (Ib, patient)

Other supervisors thought that the instructors share the responsibility for the students' slow work: *"I mean they are still students, for me when I enter I always tell them come on, hurry, you don't have time, fast fast and like that so they work and can achieve something in their session, but other instructors they don't care, they don't go check the*

student only if they call him … some don't get up from their chairs all the time" (A, supervisor).

Some patients noticed other issues affecting the students' ability to manage their time, such as talking with their friends during the clinical procedure and interfering with the clinical procedures of other students:

- *"I am sitting in the chair, she is good and everything but her friend come, she go and stand say hi and chat with her about you know things not related, I tried to listen (laughs) but I could know they are talking about some new dress … she must use the time more wise so she finish more cases and all the treatment plans"* (Ash, patient)
- *"he is trying and then his friend tell him ok let me try and he starts again to try and then the other says give me let me try, you know like I am trial field* (smiles) *… they were very nice but they maybe they should work alone so he complete and not waste time only trying"* (M, patient)

Most students pointed out some flaws in the clinical supervision process that weakened the clinical aspect of 'Process' of oral healthcare at UDHS, like *"disagreement between supervisors"* which leads to a lot of confusion and treatment delays that affect the students' ability to complete a patients' planned treatment on time: "*the treatment plan keeps changing … if doctor A said to treat the tooth this way and we agreed on that, then the next session doctor A in not there, like there is another doctor, but he doesn't like what I am going to do and changes everything, I lose time doing more than one plan, I lose time explaining to the patients the plans and why we changed, I feel lost and*

confused and not confident anymore" (G, student). Also the miscommunication between doctors and students was thought to have a similar effect where the students don't understand what the supervisors want and are afraid to argue with supervisors who are not patient enough and not open to discussions: *"it's not easy for us to discuss with a doctor who is old style and not open to productive discussions… I think it is a very important problem"* (M, student).

A few managers thought that the incomplete planned treatment in the some patients' records were due to errors in the documentation of the correct information, which is a critical part of the clinical aspect of care: *"some students are careless when completing the medical records of the patient, a few not all of course, so this error might look like not complete treatment but maybe the treatment is complete but the student did not document the diagnosis, treatment plan or treatment progress in an accurate and complete way"* (W, manager).

A reason contributing to having a high prevalence of incomplete planned treatments in the patient records at UDHS, brought up uniquely by some patients, was the inequality in treating patients during the clinical Process of oral healthcare. They felt that it was inappropriate for students to treat some patients better than others just because they are their friends, and that was enough to make them not come back to complete their planned treatment at UDHS: "*I am waiting with pain since morning for 2 hours and then the student comes out and calls someone else who just came in because he is his friend, do you think this is fair, I wanted to just relief my pain and never go back … this is not human"* (I, patient)

5.4.4. Patient population characteristics

This theme describes the characteristics of the patient population at the UDHS that were thought to lead to having a high prevalence of incomplete planned treatments. All stakeholders thought that a major cause was the fact that the number of patients received was far beyond the capacity and capabilities of the students: *"We receive like 19 thousand patients, I mean seriously what do you expect?!"* (H, student). Also the patients' attitudes towards appointments and punctuality was brought up by all stakeholders and was thought to contribute to the problem in two ways. First, when patients *"show up late the students won't have enough time to work and will delay the treatment progress especially if the patients does it often"* (Ab, supervisor). Second, the students find themselves forced to avoid such patients so as not to lose the time for their clinical session: *"if the patient doesn't keep an appointment once or twice I get so mad and of course I won't call him again"* (A, student). Another common reason was the low level of patient oral health education and awareness, where half of them seek pain relief only: *"once their pain is gone they are gone too, they disappear"* (K, student). A patients also said *"I am lazy, if I don't have pain I don't feel like coming here"* (Ay, patient)

Another common reason was that a big percentage of patients were either workers or students who had either a job or classes that was more important to them than completing their planned treatments: *"I am working, I can't leave work more than once or twice … my job is more important than pain"* (K, patient). Patients who were college students complained that their classes were at the same time of their appointments and their absence from class affected their grades and exam performance: *"if I come to the*

appointment I have to miss my class and I won't do as good in my exam if I keep missing classes, it's not easy" (H, patient).

Most supervisors and few patients described the patient population mostly as a *"transit"* population in the U.A.E which is known to have a high turnover rate. Therefore a *"good percentage of patients will travel to other places in the middle of their treatment"* (O, supervisor) leaving an incomplete planned treatment in their medical record.

Some students thought that patients had unreasonable expectations regarding the length and duration of the treatment and that they weren't aware that in dental teaching hospital the treatment is longer than in private practices: *"they run away when they see the procedure takes a long time"* (Rg, student).

Moreover, a number of patients thought that a percentage of those incomplete planned treatments where those patients who choose not come back because *"they were uncomfortable with the treatment here* (at UDHS)" (Ib, patient) or *"were dissatisfied and left"* (M, patient) or *"they have money so they choose to look for other private doctors"* (H, patient).

5.5. Comparing Perspectives

In the previous section I described the reasons for having a high prevalence of incomplete planned treatments in the medical records at UDHS from the perspectives of all stakeholders. However, each stakeholder had unique perspectives and showed different prioritization in the common perspectives.

5.5.1. The patients' perspectives:

The perspectives of patients varied to a great extent. In general they were very impressed with the oral healthcare service and aware of all the details of the hospital. A few of them even explained in details the number, types and timings of the clinics and clinical procedures. However, most of them complained about the unavailability of appointments before being asked about the reasons for the problem of incomplete planned treatments. The primary and unique themes identified from the patient interviews were the **'clinical system setup flaws'** (like unavailability of contact center and appointments) and the **'financial reasons preventing patients from continuing treatment'** (like time cost and expensive transportation). Another example of a unique theme was the '**inequality in dental services provided'** which makes them discontinue their treatment at UDHS. There were also common themes and key themes with the other stakeholders like 'hospital setting weakness' and manpower shortage'. Figure 6 summarizes the common and unique themes in more details.

On the other hand, a few of the patients who have already completed their planned treatment were surprised to hear about this problem and said *"I really don't know … my doctor always gives me appointments maybe the patient doesn't want to come but I'm sure it's not from the doctor or anything like that"* (Ay, patient). Another patient who had completed his treatment was also surprised because he had completed his planned treatment and the students always ask about him: *"I haven't seen such good doctors, they are better than private, I finished and they still call and ask how I'm doing, they are very professional and made a very friendly relationship with me, so I really can't imagine why there are people who did not finish"* (M, patient)

A few patients especially the workers with low socioeconomic status don't talk much. They usually respond by *"I don't know"*. Their interview time would last for 20 - 25 minutes. Even when asked in different ways but they just smile. The reasons that we could identify were:

- They are not used to being treated with respect and no one ever told them that their ideas matter so they were surprised that I was interested in what they have to say that is why they smile. For example with the help of an interpreter I tried to find out what they feel, one said *"I thought she was just making fun or I don't know why she did that… why she left all the other people and talked to me… this is the first time someone does that"* (N, patient).
- Because of their low expectations and having many important things in their life they don't think that quality is an important issue to think about. They only aim to get pain-free and functional teeth to be able to eat and work. When asked about the quality of care at UDHS they say they have never seen anything better than this hospital before: *"it is the best…what more do I want? I get to be treated for free"*. So even if the appointments are not available very often they consider themselves to be lucky to even have an appointment to be seen.
- They feel they don't have the right to complain and they believe that doctors have a sacred position: *"Oh oh (smiles) you shouldn't say that … the doctors are gifted from God and they are giving us life… who am I to judge, they know everything, I can't ask for something better or for any improvement"*

5.5.2. The Providers' perspectives:

The themes and key themes that emerged from the interviews with the managers, dental students and their supervisors were very similar, and the primary priority was given to **'educational protocols and objectives'**, **'manpower shortage'** and **'hospital setting weakness**' such as insufficient time for the clinical sessions. However, there were some unique sub-themes within each. For example, a unique theme that emerged from the student interviews was **'the disagreement between supervisors'** that wasted their clinical time in multiple ways and led to not having enough time to complete the cases. Similarly, a unique theme that emerged from the interviews with the supervisors was the students' **'poor management of clinical time and slow clinical work'**. The themes that emerged from the interviews with the managers were more concerned with the hospital system and setting, such as the **'low number of teaching facilities'** that was exclusively brought up by managers. Figure 6 summarizes the common and unique themes in more details.

To illustrate the unique value of including the perspectives of managers, supervisors, students and patient, I created Table 15. It shows that including all stakeholders provided us with an exceptional richness of data that wouldn't have been possible otherwise. All themes are reported and grouped into the four key themes; (1) weakness in the 'Structure' of oral healthcare, (2) weakness in the interpersonal aspects of the 'Process' of oral healthcare, (3) weakness in the clinical aspects of the 'Process' of oral healthcare, and (4) patient population characteristics. Moreover, figure 6 summarizes the unique and common perspectives between the stakeholders.

Table 15: The themes and codes that were brought up by the different stakeholders, thought to be possible factors leading to a high prevalence of incomplete planned treatments in the patients' records at UDHS
*(**J**=Junior Staff, **F**= Senior Faculty, **M**=Management, **5**= 5th year students, **4**= 4th year students, **P**=Patients)*

THEME 1 Weakness in the 'Structure' of oral healthcare						
Hospital setting weakness						
Low number of student clinical session/hours/time/study weeks per year (a lot of breaks and exam periods)	J	F	M	5	4	P
Clinic timings is bad/ during the patients working time		F		5		P
Hospital is closed Friday and Saturday						P
Not enough teaching facilities			M			
Distance to UDHS and transportation difficulties	J	F			4	P
Manpower shortage						
Extreme shortage in staff / manpower / wastes clinical time	J	F	M	5	4	P
Supervisor shortage lead to complications that take longer time						P
No medical records officer (students take files as they like)	J					
No one in charge of patient distribution / transfer between students / follow-up / referral	J	F		5	4	P
Clinical system setup flaws						
No patient follow up system by UOS/ system and rules keep changing	J	F				P
Patient transfer from urgent care to student clinic is too long / late assignment to students	J			5	4	
No advertising / people think its training facility not quality care						P
Students loose patient's number						P
No contact center / patients don't get contact details of UOS						P
No appointments / don't inform in advance						P
Financial Reasons preventing patients from continuing treatment						
Financial barrier (cost of high no. of appointments and work leave)						P
Expensive transportation to the hospital						P
Long waiting time in reception so patients leave /don't come back						P
Educational protocols and objectives						
Graduating students	J					P
Educational institute with educational objectives is to train students	J					
Requirement based clinical evaluation (instead of comprehensive care) makes students ignore patient after requirements/ exams are met	J	F	M	5	4	P
Students ignore patients when they're busy with other requirements / exams / classes	J					P
Students want to see new/useful cases and IGNORE other patients						P
Low number of requirements			M			
THEME 2 Weakness in the Interpersonal aspects of the 'Process' of oral healthcare						
Students' attitude towards the patient makes them not come back						
Students treat patients in a bad way so they don't come back / doing a favor / without respect (especially workers)	J					P
Students don't show professional attitude / patients feel like guinea pig						P
Students treat the tooth not the patient (non-human way)		F	M			
Students ignore the case if patient has bad smell/not clean/old						P
Students lack the sense of responsibility			M			

Students are not patient enough with the case to complete it		F				
Patients' attitude toward the students make students ignore patients						
Students ignore the patient if un-cooperative /apprehensive/ rude	J	F		5	4	P
Students didn't like the patient / uncomfortable						P
Communication barriers						
Language differences between the patients and the students	J	F			4	
Students care about requirements and don't have time to communicate and explain the treatment plan to the patients		F		5		
THEME 3 Weakness in the Clinical aspects of the 'Process' of oral healthcare						
Difficulty of a patient case						
Students ignore difficult and complicated cases (students are busy & scared so they postpone them + J&F don't help & don't allow)	J	F		5	4	P
Students ignore the case if a complication happens		F				
Students ignore the case if patients is medically compromised (uncontrolled diabetes / Heart problems / Hepatitis C/halitosis-4)	J			5	4	P
Students ignore the case if it's hard to handle (Gag reflex)		F				
Poor management of clinical time and slow clinical work						
Students are slow / don't have time management / /treatment takes many visits	J	F				P
Students come late because they have exams or classes	J					P
Students chat with their friends/ interfere with each other's work						P
Instructors don't encourage / teach students to work fast	J					
Students don't keep appointments so patients don't come back to complete their treatment / not punctual		F				P
Faulty clinical supervision						
Students are careless in completing the medical records (incomplete files)			M			
Changing treatment plans due to disagreement between J&F wastes clinical time				5		
Bad communication between J&F and students decrease their confidence / confuses students and wastes time				5		
The inequality of the provided dental service / students bring their friends and ignore the waiting patients						**P**
THEME 4 Patient population characteristics related issues						
Patients have unreasonable expectations (the treatment duration and number of visits)					4	
No. of patients exceed the capability / no. of students		F	M	5		P
Patients are mostly workers and students: • Most patients are laborers / factory workers nearby • Many patients are students and have schools, classes , exams • Employed patients can't take leave / cut from their salary • Job is more important that pain	J	F		5		P
Patients are transit population and always travelling	J	F				P
Patients education and awareness: • Patients are not educated + have bad oral health awareness so they don't care to complete / Lazy /Patients seek pain relief only	J	F		5	4	P
Patients attitude: • Patients show up so late so no time • Patients don't keep appointment/ forget once or twice so students ignore	J		M	5	4	P
Patients not comfortable / dissatisfied / Patients who have money find other doctors						P

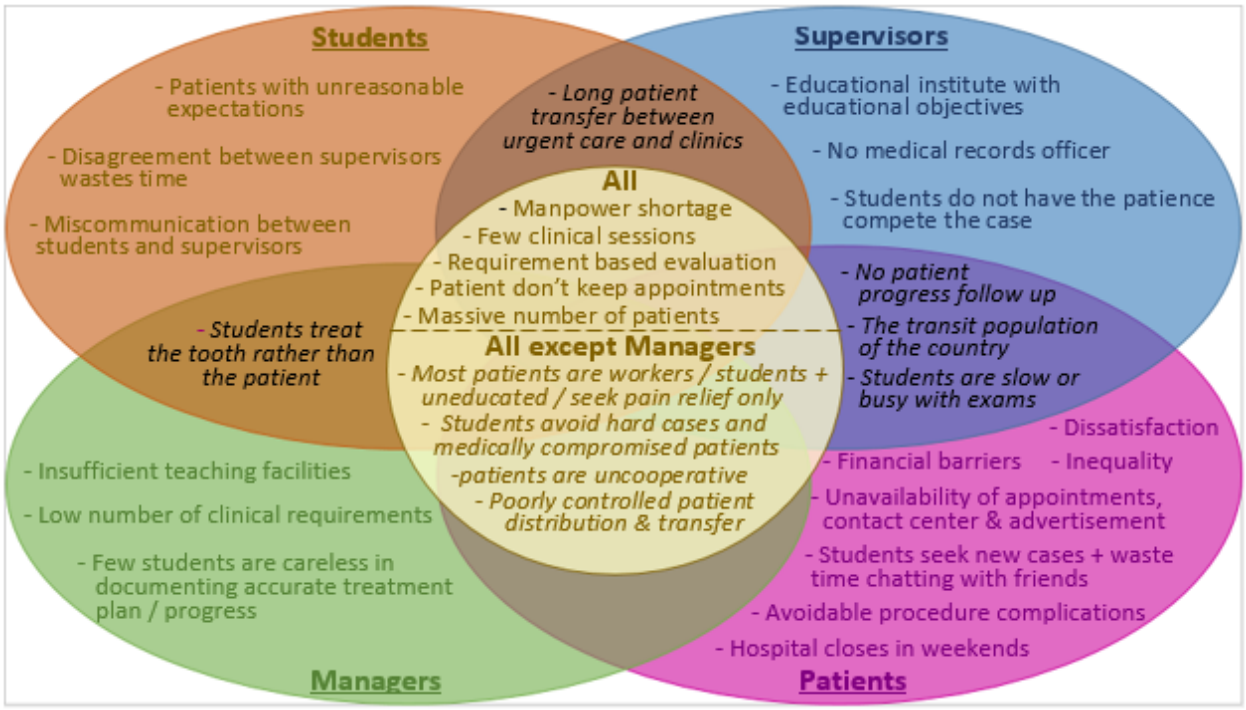

Figure 6: The common and unique perspectives of the different stakeholders

5.6. Suggestions to Solve the Problem

The themes and codes that emerged from the stakeholders' responses when asked to provide us with suggestions to decrease the prevalence of incomplete planned treatment in the medical records of patients at UDHS are provided in Table 16.

Table 16: Stakeholders' suggestions that could be employed to the Structure and Process components of OHC at UDHS, to reduce the high prevalence of incomplete cases categorized into the four themes.
*(**J**=Junior Staff, **F**= Senior Faculty, **M**=Management, **5**= 5th year students, **4**= 4th year students, **P**=Patients*

THEME 1 Weakness in the 'Structure' of oral healthcare						
Increase dental clinics and clinics time						
Increase the no. of student clinical hours / sessions /curriculum time	J	F	M	5	4	P
Increase clinics and dental chairs						
Introduce evening sessions	J	F	M	5	4	P
Introduce Thursday clinical sessions		F	M			
Introduce Saturday clinics				5		P
Increase the summer clinics for 4th year dental student and internship		F				
Open clinics during most holidays						
Increase number of appointments for patients (weekly)						P
Increase manpower						
Increase supervising faculty and staff	J	F	M	5	4	P
Have multi-specialty supervision in the student clinics	J					P
Hire a person to follow incomplete files		F		5		
Improve providers' awareness						
Continuous presentation and workshops to students and staff emphasizing the importance of quality and comprehensive care / emphasize it in curriculum with dedicated lectures	J	F				
Change the clinical evaluation process:						
All cases should be comprehensive based and requirements should be dedicated by patients' needs / Get rid of the word requirement / teach students to complete the patient needs first	J	F	M	5		P
Have a penalty system for student leaving incomplete cases	J					
Students should be evaluated on competency not requirements			M			
Have grading & scoring for explaining the treatment plan to patients				5		
S&F should encourage students to do extra work and complete the patient case by giving them extra credit						P
Increase requirements	J		M			
Improve medical records						
Complete and incomplete files should be marked and stamped		F				
Medical records should be improved / followed by someone or software controlled to reduce error and improve follow up		F		5	4	
Have grading and scoring of patient file quality and treatment record	J					
Improve patients handling and allocation						
Have a standardized system by UDHS staff to distribute and follow up patients (not students)	J			5	4	
Make appointments formalized and centralized (managed by UDHS receptionists and not students)		F				P
Create a well-controlled smooth referral system of patients between students done by staff / referral form with faculty approval		F		5	4	P
Provide patients with contact number of staff / receptionist						P
Adjustments to patient population						

Advertisement to attract middle class patients who are willing to complete their treatment plan at UDHS		F			4	P
Limit the no. of patients in the hospital			M			
Additional services						
Interpreters are needed					4	
Provide transportation						P
THEME 2 Weakness in the Interpersonal aspects of the 'Process' of oral healthcare						
Changing the students' attitudes towards the patients						
Drs should treat patients as humans not cases so students learn		F				
Students should show caring/respectful attitude to all patients equally		F				P
Build trust between the students and patients						
Teach students to show confidence / like private practice / trust						P
Have grading and scoring for the way students handle/treat patients						**P**
THEME 3 Weakness in the Clinical aspects of the 'Process' of oral healthcare						
Information provision to patients						
Educate the patients about oral health and the importance of completing the discussed treatment plan / awareness programs (S)	J			5	4	P
Adjust patient expectations before assigning to students (Treatment duration, etc.)					4	
Students should explain the treatment plan to patients and discuss the expected time and no. of visits						P
Incomplete cases have to be managed						
Graduating students should submit a report of all their cases progress and not only of their completed requirements	J					
Assign cases to Interns and attachment dentists to complete	J	F	M			
Patients who have intraoperative complications should be referred to more experienced providers		F				
Allow the students to do complicated cases under supervision				5		
Improve supervision role in the clinics						
Train students to work quickly and without chatting with each other						P
Students should be followed by faculty assigned to track their cases (their patients should be able to reach the faculty they are assigned to)	J	F		5		P
A patient should be assigned to the responsibility of a student and a faculty				5		
Supervisors should also talk to the patients and reassure them not only check the student's work						P
Standardize the instructions from S&F to students				5	4	
Improve the communication between S&F and students				5		
Clinical flow changes						
Hard cases should be assigned in beginning of semester						P
Patients should be seen by alternative S&F if student is absent / shouldn't be dismissed						P
Transfer of patient from urgent care should be faster	J	F				
Patients should be treated equally / students shouldn't bring their friends in first and ignore the waiting patients						**P**

5.7. Final Mixed Interpretation:

In this study, the qualitative findings helped to explain the high prevalence of incomplete planned treatments that was identified through the quantitative audit. On the other hand, the audit provided a general description of the patients who did not complete their treatment plan (87.4%), compared to those who did (12.6%). Although not significant, the findings showed that there were more males who did not complete their planned treatment. It also demonstrated that those patients who did not complete their planned treatment lived outside the Emirate of Sharjah and that their chief complaint was pain. Most importantly, they had significantly higher pretreatment decay scores than those who completed. The in-depth interviews revealed more information about these two groups of patients, as illustrated in Table 17.

Table 17: Prevalence of incomplete planned treatments in the patient records at UDHS (Problem under study)

Quantitative Audit finding	%	Corresponding Qualitative findings
Treatment plan status:		
Complete Mean D score = 5.8 +/- 3.8	12.6	**Patients:** All those interviewed were satisfied and happy with the service. Some considered it better than in a private practice. A few were surprised to hear that there are patients who did not complete their planned treatment. They offered comments and suggestions to improve the oral healthcare at the clinic.
Incomplete Mean D score = 8.4 +/- 3.8	87.4	**Patients:** Almost all of those interviewed complained of unavailability of appointments in addition to many other concerns that were thought to be possible explanations to the problem under study. **Providers & Managers:** In-depth interviews with providers and managers showed that most of them were aware of the presence of incomplete planned treatments but did not expect the figures to be that high. However, they provided many common and unique insights to help explain this high prevalence.

Furthermore, the results of the auditing follow up survey of patients who did not complete their planned treatment showed that those patients were either busy, travelled (22%), waiting for appointments (21.2%), dissatisfied (8.3%), unaware of their treatment plan

(5.3%) or no longer complain of pain (2.3%). Next, the qualitative phase results not only confirmed and explained these audit results, but also provided new reasons and richer explanations, particularly, because the perspectives and life experiences of all those involved in the oral healthcare delivery process at UDHS were also explored. Each stakeholder group added new ideas that helped answer our research question by enriching our explanation of the problem; this enabled us to identify many factors that could have possibly been part of the creation of the problem. That process enhanced our understanding and helped in making more appropriate and effective changes and future recommendations aimed towards improving quality of oral healthcare provision and management at UDHS. Table 18 shows the convergence, divergence and complementarity between the quantitative and qualitative data.

Table 18: Reasons for incomplete treatment plans in patient records

Audit finding	%	Corresponding Qualitative findings
1) Patient travelled to another place or is busy	22.0	This was one of the major concerns raised by all stakeholders thought to be causing a big part of the problem: (1) Patients who were workers or students were always busy **(All); and (**2) Many patients travel a lot because the UAE has a transit population **(Supervisors, Patients)**
2) Patient could not get an appointment from students	21.2	All stakeholders considered this to be another major issue and thought to be due to: (1) Students cannot give appointments because of limited clinical sessions, working hours & facilities and a large number of patients or because of graduating students who do not transfer their patients; and (2) Students choose not to give appointments because they look for other requirements in other patients, or the case is complicated or hard, or the patient is rude or medically compromised, or he/she failed to show up to previous appointments.
3) Patient is dissatisfied and chose not to come back	8.3	This reason was uniquely raised by patients: "*Maybe if I am not happy with their treatment I will go to other clinics outside"*. However, data from all stakeholders helped identify multiple possible sources of dissatisfaction that appear in the themes and sub themes describing the weaknesses in the 'Structure' and Clinical and Interpersonal 'Process' of oral healthcare at UDHS.
4) Patient not aware that s/he has decay	5.3	This did not appear in the qualitative interviews with any stakeholder, possibly because we did not happen to interview any patient who was unaware of his decayed teeth; however, the interviews helped provide three possible explanations: (1) Documentation errors in the patient records **(Managers)**, (2) Communication barriers like language differences, and (3) Students stressed with requirements and insufficient time tend not to spend time explaining the planned treatment to their patients **(Supervisors, Students)**.
5) Patient has no pain & chose not to come back	2.3	This was a very common concern brought up by Supervisors, Students and Patients and was thought to be one cause of the problem: *"Once the pain disappears, the patient disappears"*.
6) Unknown	40.9	The patient couldn't be contacted by researcher after 2 attempts at 2 different times & days of the week
		The qualitative findings not only helped explain the results & reasons identified from patients in the audit but also revealed richer & new ideas brought up uniquely by different stakeholders e.g. Patients had unreasonable expectations concerning the treatment duration **(Students)**, documentation errors in dental records **(Managers)**, educational objectives occupy considerable clinical time **(Supervisors),** financial barriers due to the indirect cost of the treatment **(Patients)** & many others as described in Table x

5.8. Post Research Phase / Knowledge Translation

In this phase, we had multiple meetings with the managers and providers at UDHS in which we shared the results of our study. We discussed together the ways in which changes can be implemented based on the results of our study. Fortunately, they were in the process of purchasing and installing a new electronic medical records software for their system. Accordingly, they were specifically able to make improvements in that based on the results and recommendations of our study. We offered them information about:

- ✓ The strengths and positive aspect of the oral healthcare quality provided,

When we discussed the areas of strengths brought up by the different stakeholders, we emphasized the importance of reinforcing them. For example, some patients were extremely satisfied with the dental students' communication skills; accordingly, the providers thought that they should inform the students about the importance of this skill and share with them the positive responses they received from the patients. This will reinforce the interpersonal aspect of oral healthcare quality and will encourage students to improve. Other examples are the clean and pleasantly organized setting and the smiling receptionists.

- ✓ Our personal observations on the quality of the patients' medical record keeping

During the retrospective audit we made notes about the flaws in the medical records and the documented data. During our meeting, they came up with ways to redesign the new software to overcome and prevent such flaws in the future. For example, there was missing information in the records, but the new software will not allow that. A second

example is the problem of having contradicting information in the diagnosis, treatment plan and progress. Similarly, the software was redesigned to better control this issue through the presentation of a systematic follow up of the diagnosis with its treatment plan and progress. A third example is with the inconsistencies in the records caused by using different coding systems to mark the files and the presence of many erasures and changes that affected the clarity of the recorded data. Accordingly, the new software has a single coding system that everyone is obliged to use, and it does not allow the data to be changed without authorization.

- ✓ Weaknesses and recommendations from the audit and in-depth interviews.

In our meeting, we first divided the interview comments into problems that could be solved by the new electronic records software (examples shown in Table 19) and those that require the implementation of other interventions. Table 19 shows a few examples of the problems and suggestions that were discussed during one of our meetings and the relevant recommendations that we developed together based on our data.

The problems that cannot be resolved by the implementation of the new electronic medical records are still being discussed with the providers and managers. Examples of such problems, which were highly raised by most participants, are the requirement based clinical evaluation and the shortage in staff. We have arranged meetings in which we can present and discuss such problems and their solutions as proposed by the different stakeholders from our study. Our discussions aim to help plan the most appropriate changes and interventions directed to overcome the identified weaknesses and improve the provided oral healthcare quality. Following the methods described in our study

enabled us to successfully transfer the knowledge from our results immediately into changes and plans for changes to improve oral healthcare quality in the community in which we are interested (UDHS).

Table 19: Examples of the products of our meeting with the providers at UDHS

Problem/Suggestion discussed	**Proposed Intervention**	**Intervention status** (May 2015)
1. Communication difficulty (Patients education level is not documented in files)	**Document the patient education level in their electronic records** will help providers choose the appropriate terms with the patient to improve communication	Implemented
2. Language barrier between students and patients	**Record the patients' spoken languages in their electronic record** to: facilitate patient allocation to students who speak same languages, help students to arrange for help in advance and provide useful data for tracking the effects of language barriers on quality.	To be discussed further in future meetings
3. Employment and contact details is not documented correctly	**Set the software to record these details clearly & should be frequently updated.** Provide data for future quality studies assessing patient retention and factors associated with it.	Implemented
4.The frequent change in the treatment plan; wastes clinic time and confuses students	**Set the software to not allow changes in the approved treatment plan without authorization. All changes should be recorded in the software** for future investigations. This will solve one of the weaknesses thought to cause incomplete planned treatments.	Implemented
5. There are patients (5.3%) not aware that they have remaining decay to be restored. Some students do not spend enough time to explain the treatment plan to patients	**Redesign the software to require the supervisors to make sure the patient is fully aware** of his planned treatment before approving the case for the student in the software.	Implemented
6. The high prevalence of incomplete planned treatments in the patient records without recording the reasons for not completing the case.	**Redesign the software to require the dental student to record reasons for not completing the case** and missed appointments (like the patients traveled or the case got complicated and require referral, etc.)	To be discussed further in future meetings

6. DISCUSSION

In addition to providing descriptive data on the adult patient population and the treatment they received at UDHS, our study revealed a critical issue that was affecting the quality of oral healthcare services at UDHS; a high prevalence of incomplete planned treatments in the patient medical records (87.4%). This problem was then explained in the second part of the study by identifying the many factors that were thought to cause weaknesses in the 'Structure' and 'Process' of oral health care quality. These weaknesses lead to either having patients who cannot/do not want to come back to finish their planned treatment or students who cannot/do not want to give anymore appointments to these patients. Based on the findings, we were able to design immediate changes for the new medical records software at UDHS and recommendations for future improvements to continuously improve the quality of oral healthcare provided.

6.1. Describing Quality through an Audit

During the retrospective audit we not only collected the above described data, but we also made notes about the quality of the medical records. We provided a detailed list of missing, inconsistent or unclear information in the patient medical records to the person in charge of the medical records at UDHS. That was used by the UDHS to make immediate changes to improve the quality of medical records.

Furthermore, we believe that understanding the patient population can help an organization to tailor its services to best address their patients' needs. Therefore, before assessing the treatment process progress, we used socio-demographic, general and oral

health descriptive statistics to provide insight for the mangers and providers at UDHS about their patient population. For example, the audit results showed that 30% of the assigned patients lived outside the Emirate of Sharjah, information that can be useful when designing and studying interventions like the effectiveness of providing transportation for the patients.

Moreover, concerning the oral health needs of the adult patient population at UDHS, we found that they had a mean DMFT score of 12.9 (SD=5.8). This score is similar to DMFT scores of adult patients in nearby countries like in the Al-Ahsa region in Saudi Arabia where the mean DMFT score for adults was 13.24 (120) and in Riyadh 14.53 (121). However, we are aware that our sample was from patients who came to the UDHS requesting oral healthcare and were assigned to dental students; therefore, our cohort represented the assigned adult patient population at UDHS and not the total population of Sharjah.

Having a large number of patients and a long waiting list that is above the capability of the dental clinics is common in many dental schools (122). The existing hospital statistics at the UDHS reported that only 15% of the total potential patient population are usually assigned to students. We also found that 13.7% (n=190) of the total 1389 patients who were registered in the two months of September and October 2012 were assigned to dental students. This was discussed with the mangers at the UDHS and was considered consistent and representative of the assigned patient population. These figures are similar to other schools. In the USA, it was reported that, over a 5-year follow up period, only 26% of patients were assigned to the undergraduate comprehensive dental care clinics at the University of Texas School of Dentistry and the others were referred to other

specialized clinics within the university or to outside clinics (110). However, the referral system at UDHS is not well developed, and this was one of the common issues contributing to the problem understudy, as raised by most students, supervisors and patients.

We then used the treatment progress variables to provide a descriptive assessment of the oral healthcare quality when simple direct restorations are provided to patients at UDHS since valid quality measures and indicators are currently unavailable. We found that the percentage of patients who came with pain as their chief complaint was higher (48.5%) than for those seeking checkups (31.9%) and other complaints (18.4%). This trend is not surprising, as a study in another dental school in the UAE reported that pain relief (80%) was the major reason for patient admission (123).

Our study focus was on simple direct restorations done by dental students to restore non-complicated carious lesions; therefore, we extracted as much data as possible from the medical records that could help to describe the carious lesions planned for direct restorations and the progress of their treatment. The caries distribution could be extracted from the records when categorized by location in maxillary (54.5%) and mandibular (45.5%) arches. However, we could not identify the total percentages of carious lesions by type of caries. That was because the caries type was not clearly documented in the diagnosis or the treatment plan in the patient records. Nonetheless, the type of lesion of treated carious teeth was reported in the treatment progress section in the records, thus allowing us to report the type of caries of only the treated teeth. The major type of restoration carried out was Class I (61.5%) and composite (81.6%) was the mostly used restorative material. This was consistent with the UDHS clinical requirements that

stipulate that students are required to do more class I and composite fillings than the other filling classes and materials; these requirements are similar to other dental schools in the region (124). However, other studies that assessed quality of oral healthcare reported the types of dental procedures done in the student clinics by reporting the percentages of restorative treatments done without classifying the types of restorations (110, 125).

A total of 1060 teeth were planned for direct restorations, and 299 were successfully restored during the 16-month retrospective follow up period. There are many possible reasons for having 71.8% untreated teeth, like those identified from our qualitative interviews that explained the high prevalence of records with incomplete planned treatments. In addition to that, some of these teeth might require a more complex procedure not within the capabilities of the dental students, and we could not distinguish them due to the inconsistency of the information documented in the patient records.

The records showed that most teeth were restored successfully without intraoperative complications (93.3%), demonstrating some evidence on the quality of the clinical operative procedures done by the students. This figure suggests that the clinical skills of the dental students are good, because the clinical supervisor is usually present through the procedure and, if any intraoperative complication occurs (e.g. improper cavity preparation, traumatic exposure, overhung filling), it would be noted in the patient's record. We also followed the patients who returned for re-treatment during the 16-month audit follow up period (e.g. broken filling or any discomfort due to the restoration). Since 93.3% of the restorations were successfully done and the supervisors and managers thought that a 6.7% prevalence of intraoperative complications was reassuring; nonetheless, they aim to reduce it further. Similarly, another study assessing the quality

of posterior composite fillings done by Kuwait University dental students demonstrated a 95.1% success rate over a three-year follow up. We acknowledge it could be worthwhile to recall those patients and reassess the filling clinically and radiographically and measure the survival rate for fillings done at UDHS; however, this was not the aim of our study.

Our study aims to provide a descriptive assessment of the elements of oral healthcare quality and does not focus on the technical procedures that were the base of the traditional quality criteria. This is because it has been demonstrated that these technical procedures do not always lead to ideal oral health, and placing the highest standard restoration is not a cure for caries, but rather a symptomatic treatment of this infectious disease process. Therefore, a true quality assessment should look into the entire care program provided to the patient and how well that care reduces caries activity and improves oral health status (126).

Therefore, we did not consider treatment success to be based on each tooth, but rather on the patients' needs, and we investigated whether or not these were addressed. From the patients' records, we identified the treatment plan for every patient and followed the treatment progress after that for 16 months. A restorative treatment was not considered successful unless all of the teeth planned for simple direct restorations were successfully completed for the patient. Based on that, we found that the success rate dropped from 93.3% for the treated teeth to 9.3% for the assigned patients. This was caused by the high prevalence of patient records with incomplete planned treatments (87.4%). The providers and managers expected that there were many patients with incomplete planned restorative treatments, but not that high. In other words, only 12.6% of the patients completed their planned treatments within the 16-month period; however, this is a

common problem for dental schools. Another study from the USA also reported that only 29% of patients completed their comprehensive care procedures over a 5-year follow up period (110).

Patient retention is a critical problem in a dental educational environment because it negatively affects quality of dental education in addition to the oral health of patients. Regardless, patient retention has received limited attention in the dental literature (109). Patient retention is fairly low in dental school clinics, and that is a common problem in regional and international dental schools (109, 111, 122). The problem identified in our audit (incomplete planned treatments) included patients who do not come back (non-retention) in addition to patients who are waiting to be treated but cannot get appointments to do so. At the end of our audit, we carried out a follow-up telephone survey with patients who did not complete their planned treatments to find out the reasons for that. Our results showed that the contacted patients were either busy/traveling (22%), waiting for appointments (21.2%), dissatisfied (8.3%), unaware of their treatment plan (5.3%) or no longer complain of pain (2.3%). However, a recent study used extracted data from electronic health records of the dental school clinics to identify factors that lead to patient non-retention and reported two categories; (1) patient driven reasons like financial matters and (2) provider driven reasons like the schools decision that the patient does not meet the required criteria (109).

One limitation of our study was that we could not contact 40.9% of the patients with incomplete planned treatments after two attempts at two different times and on two different days of the week. That could be because the patients' contact information is not up to date in their records or because the patients chose not to respond to our calls. In

the same way, other studies investigating reasons for patient non-retention also reported that “not being able to establish contact with the patient” was the highest percentage (36%) amongst their identified reasons. They suggested that dental schools should periodically update their patients’ contact information, and they should have as much information as possible; telephone numbers, emails and mailing address (109). Therefore, our qualitative phase was designed to capture as much in-depth information as possible that could help explain this problem in order to be able to recommend effective intervention(s) and improve oral healthcare management and provision at UDHS.

6.2. Explaining the Problem Affecting Oral Healthcare Quality Qualitatively

Despite the emergence of many qualitative studies in the field of Dentistry in recent decades, there are still very few qualitative studies investigating quality of dental services in dental schools (88). Through our systematic literature review, we were unable to find any in the UAE or the region of the Arab Middle East. Therefore, the results from this study could not be wholly compared with studies done by other dental schools.

At first we need to recognize the positive comments and the patients’ expressions that described their satisfaction with the “high quality of service” that is being provided by the dental students at the UDHS. The facilities, the quality of clinical work, the interpersonal relationship and the friendly receptionists “who are always smiling” were the major reasons that impressed the patients. Some of them stated that they would never go to any other place to receive dental treatment. However, because our study objectives

aimed to explain the problem under study, our results focused on the defects in quality of oral healthcare service.

Our data suggests two pathways that led to having a high prevalence of incomplete planned treatments in the patients' records; (1) Patients who do not want / cannot get appointments and (2) students who do not want to / cannot give appointments to their patients to complete their planned treatments. Many factors contributed to that, and these were categorized into four themes.

6.2.1. Weakness in the 'Structure' of oral healthcare

Through the interviews, we were able to identify multiple issues that were affecting the 'Structure' element of oral healthcare quality. For example, the shortage in staff was a common theme across all stakeholders. This issue is not uncommon in dental schools worldwide, in which the need for more staff and supervising dentists have been reported; some of these include the Dental School of Kerman, Iran (88) and the University of Texas, School of Dentistry (UTSD) at Houston (110). Moreover, transportation difficulty brought up by patients at UDHS was considered as a barrier that prevented them from completing their planned treatment. Similarly, another study in the USA reported that lack of transportation was considered as a common weakness raised by patients receiving dental care at UTSD at Houston (110). We think that the management at the UDHS could study the applicability of their patients' suggestion to provide transportation to them "possibly just from and to the borders of the city of Sharjah" (Ib, patient).

Concerning the facilities, hospital building, design, patient waiting area and clinic setting, the patients at UDHS were very impressed, calling it "the state of the art" while other

studies have reported having inadequate comfortable facilities for patients at dental schools (88). However, the managers at UDHS brought up a unique issue about the facilities that they believed was indirectly contributing to the problem under study. They thought that they did not have sufficient teaching facilities (like the preclinical skills labs) and that forced them to split the students into two groups and run the session twice, thus wasting resources and manpower that could have been used for other tasks. However, being aware of the problem, the management had already started renovations to increase the capacity of their teaching facilities. This is expected not only to reduce the problem under study but also to improve many other aspects of quality of care.

6.2.2. Weakness in the interpersonal aspects of the 'Process' of oral healthcare

Flaws in the interpersonal interactions between the providers and patients at the UDHS was also thought to play a role in increasing the prevalence of the incomplete planned treatments. One example of flaws in this theme is the "students' attitude" towards their patients and the level of professionalism demonstrated by the students during the process of oral healthcare delivery. Understandably, this issue was raised by the patients, supervisors and managers, as they are the ones who observe and judge the students' behavior. This weakness was also reported in other studies assessing quality of comprehensive patient care. "Student manners" was a common weakness brought up by faculty who thought that "student-patient relationship building" was an area that required improvement (110).

Based on our interviews with the patients, we must acknowledge that this flaw cannot be generalized to all dental students. There are many students providing oral healthcare at the UDHS. Therefore, student attitudes and manners would vary widely because many patients also reported that the students at UDHS were “very polite”, “professional” and “friendly”. Some were even surprised to hear that there is a problem in the quality of oral healthcare because they strongly believed that the quality of oral healthcare provided by the students is “the best and is so much better than (at) private clinics.”

Nonetheless, any defect in the student-patient relationship would increase the possibility that the patients would not want to complete their planned treatments at UDHS, thereby negatively affecting oral healthcare quality. We believe that it is important to improve patient satisfaction and dental experience by reinforcing the students’ positive chairside manners and building their patient communication skills through formal courses. The patients also suggested that the students should be evaluated on how efficiently they communicate with their patients in the clinics. Perhaps this evaluation might encourage students to adopt a more professional attitude.

6.2.3. Weakness in the clinical aspects of the ‘Process’ of oral healthcare

This theme included multiple flaws in the process of provision of clinical dentistry by the supervised dental students; this was thought to lead to the high prevalence of incomplete planned treatments in the patients’ records. We describe here the clinical aspects that could be judged by input from our interviews. Many patients were impressed by the students’ clinical work: “she cleaned my teeth so much better and quicker than all my previous dentists” (AM, patient). This is contrary to other studies that reported on

“inadequately trained students”, one of the main causes of dissatisfaction among providers at another dental school (88).

The students’ skills in clinical time management at UDHS were considered a weakness by the patients and supervisors. The students were not aware of this problem and, instead, complained of the short clinical time that did not allow them to complete their cases. Similarly, managers having less clinical contact with students did not identify this problem and were more concerned about increasing the clinical hours for the students. Therefore, bringing the patients’ and supervisors’ perspectives to the attention of the managers’ is important, as it is more practical and less costly to improve students’ time management skills before increasing the clinical hours / sessions.

Another flaw thought to be contributing to the problem under study was a defect in the supervision process, as described by the students at UDHS. Students thought that the inconsistency in their supervisors’ instructions and, in some cases, their inability to understand their supervisors, wasted a lot of clinical time and affected their confidence. This is not a surprising issue in a dental school because there are many supervisors with different dental backgrounds and training. In the same way, this was a common complain / weakness at the UTSD in Houston as described by students who complained about “faculty not on same page” (110). We believe that more time spent on teamwork and collaboration amongst the dental faculty members to reach an agreement on the way to supervise and the type of instructions would help to resolve this issue. In addition, including the students’ opinion and allowing the students to be a part of the supervisory team would help provide the faculty with important feedback that can lead to continuous positive improvements.

When patients are waiting for their dental treatment in the waiting area, they notice many details, keep track of who arrived first and, subsequently, who is admitted first; this is a major concern for them. The patients at the UDHS noticed that some students call in their friends first and ignore the other patients who have been waiting for a long time; this was so important to them that they decided to just get help to relieve their pain and not come back to complete their treatment in a place with “inequality”. In a dental school clinic, there are many students (providers) and, based on their availability, patients assigned to more available students will be seen quicker. Thus, it is not a “first come, first served” situation. Perhaps patients in the waiting area at the UDHS could be informed about this process so that they do not relate it to inequality in treatment. When patients were asked to rate their priority in oral healthcare in a study by Burke and Croucher, explanation of the procedure was one of their top priorities (71). Therefore, it might be wise to consider providing the patients who arrive for treatment at UDHS with some brief information about the purpose and flow at the hospital clinics, the process of care that is delivered and the duration of the treatments. This was also suggested by the students at the UDHS who thought that “if the patients had more reasonable expectations they will not misjudge the service and will be more satisfied”. Students at other universities also thought that explaining the length of visits to the patients was one of the areas of opportunity to improve the delivery of comprehensive dental care at their dental school (110). That being said, we acknowledge that in some departments, like the emergency department, inequality issues apply more and should, therefore, be investigated and interventions implemented to prevent this from occurring.

6.2.4. Patient population characteristics

In this theme, we described the characteristics of the patient population at the UDHS that were thought to lead to the high prevalence of incomplete planned treatments. The most common and very obvious problem was the high number of patients that exceeded the capability of the dental hospital. This has led to the presence of many patients who wait a long time for an appointment because patient allocation and referral systems at UDHS are not well controlled and considered to be an area requiring improvement in managing the number and flow of patients. This problem was also reported by patients and providers at a dental school in Kerman, where “difficulty in making appointments” and “keeping patients waiting” were among the main causes of dissatisfaction (88).

Another example of this theme is the low level of patients’ oral health education and awareness such that most seek pain relief only; this was expressed by students, supervisors and patients at UDHS. The results of the audit also demonstrated that 48.5% of the patients’ records showed pain as the chief complaint. Consequently, it was a common suggestion amongst students, supervisors and patients at UDHS to design patient awareness programs to educate the patients about oral health and the importance of completing the discussed treatment plan. It is considered necessary for dental schools to increase the knowledge of their patients about oral health, dental diseases and methods of preventing them (88).

A distinctive suggestion to improve oral healthcare quality brought up by patients and all the stakeholder groups was to increase advertisement about the dental school and the type of the high quality services provided. Apparently, patients at the UTSD in Houston

also believed that increasing advertisement was an area that required improvement (110). Therefore, this was one of the many suggestions that were provided to the managers at the UDHS and will be discussed in our future knowledge translation meetings with them.

6.3. Strengths and Original Research Contribution

The major strength of our study is in its design. To our knowledge, this is the first study that provides a descriptive assessment of quality of oral healthcare in a dental school setting using a sequential mixed methods design and involving all stakeholders' lived experiences. Using the theoretical framework of quality of healthcare proposed by Campbell et al. to guide the research adds to its strength by providing structure for the entire study and basing it on the existing literature, in addition to personal experience. It also guided our research by providing the components/elements of quality of oral healthcare to be investigated in order to achieve our research aim. Using mixed methods in the field of oral healthcare quality has many strengths and advantages (described in section 4.2.1.). Moreover, this is one of the very few studies in the field of dentistry in the Arab Middle East that use a qualitative approach. In this study, we not only report the opinions of stakeholders, as in the other studies, but we also reported our results based on the life experience of stakeholders. This study provided an explanation for the identified problem and also enabled suggestions and recommendations to rectify the issues in order to improve the oral healthcare quality at the UDHS. These recommendations were based on the opinions and expertise of all stakeholders together and not only from the researchers' perspectives, as done in other similar studies (88, 110).

Furthermore, another aspect that adds to the richness of our data is our sampling technique and size during the qualitative phase. We used purposive sampling informed by the audit results. Also we interviewed 43 participants, and interviews lasted between 40 – 45 minutes for most individual interviews and 75 minutes for focus groups; data saturation was attained. This is more than the sample size used in the other studies with similar objectives. For example, Adibi et al. interviewed 24 participants for 5 – 10 minutes to evaluate the degree to which comprehensive oral healthcare was delivered (110). Also Rad et al. assessed the quality of oral healthcare services and reported attaining data saturation after conducting 41 interviews (88).

Another unique feature adding strength to our study is that the participation of the providers and managers during the mixed interpretation phase adds to the uniqueness of this study design. In an effort to overcome the challenges of knowledge translation, the providers and managers at UDHS were not only participants in this study, but they also contributed to the different study phases.

The literature points out that accomplishments achieved in improving quality of healthcare fall far beyond the enormous advances made in the healthcare industry. *"…. there is no evidence that we are better today at applying what we know than we were 30 years ago. Indeed, we may be worse because the complexity of medicine has increased so greatly."* (13). The data resulting from quality studies in oral healthcare can be put to use in various ways. For example, the information can be made available to the public and used for quality assurance and accreditation or for provider incentive programs. It can also be used as direct feedback to the providers who produced the data to help improve the quality of their oral healthcare service (13, 16). Most people instinctively react defensively or

aggressively to criticism (127, 128). Similarly, providers act defensively if flaws and weakness are pointed out in their quality of health service. They can either refuse to accept the data or suggest that the data and the methods used to produce the results are not correct (13). Therefore, as a change to past research carried out in quality improvement, we wanted our study to not only create scientific knowledge but also to translate this knowledge into immediate actions that could improve the quality of oral healthcare provided at UDHS. Therefore, we decided to invite the managers and providers of oral healthcare at UDHS to participate at multiple stages of the research process. They participated first during the intermediate phase (after the audit results) in defining the problems that required qualitative explanations. Second, they participated during the qualitative data collection by providing their own perceptions of the problem under study. Third, they contributed in the final interpretive stage in which quality improvement recommendations were created. This decision was in appreciation of the unique strengths that their expertise could bring to the research process. Moreover, we felt that this would give them a sense of sharing in the investigation process, rather than their having a sense of being under evaluation and criticism. Thus, managers and providers would better accept our study findings, and the likelihood increased of their putting the study recommendations into immediate actions towards improving the quality of oral healthcare at UDHS.

To assess quality, efficiency and satisfaction, other dental schools have used different approaches like patient satisfaction questionnaires (87), retrospective audit of medical records (110, 125) and qualitative interviews with patients, students, faculty and staff (88, 110). However, as described earlier, we used more than one data source to achieve our

study aims. We started by carrying out a medical records audit, which is considered to be one of the best measurement methods for quality and patient health status (4). Data on quality of healthcare from medical records are available and contain richer information than administrative data; however, these data may be expensive to obtain or may not be sufficient (59). Second, we used qualitative interviews that have the ability to provide in-depth information to offer an in depth understanding. Data on quality of healthcare from interviews are also expensive to obtain and not readily available; however, they provide data on what is important to patients (59).

Finally, another unique addition in our study was the inclusion of the managers' life experience and perspectives; this enriched our data and provided another unique level of interpretation. Managers are not only the highest authority whose directions are of utmost importance for the success of the organization, but they also add the factor of commitment (77). Therefore, including the managers' perspectives helped to bridge the gap between the different stakeholders' perceptions (84).

Another strength of this study is the transferability of our results to similar healthcare settings. It enables the reader to set up the foundations for naturalistic generalization by identifying important similarities to issues of particular interest to them and their settings. Naturalistic generalization is a relatively intuitive process in situations where there is a need for generalizations from a single study/case to a similar one rather than to a population and it is "arrived at by recognizing the similarities of objects and issues in and out of context and by sensing the natural co-variations of happenings". Therefore, other dental schools and healthcare settings that share a similar environment can benefit from the applications of this study. Applying the recommendations from our study can be

constructive to other dental schools in the region because not only do they share similar cultural and school settings but they also have patient populations that share similar socio-demographic characteristics. Moreover, dental settings in the region and globally can carry out similar investigations, tailored to address their needs, in order to improve quality of dental care provided to patients in their settings.

6.4. Implications for Future Work

We acknowledge that our qualitative data provides rich information about the 'Structure' and 'Process' elements of quality of oral healthcare. This can, in turn, offer useful information upon which future qualitative research can be built to explore what quality in the context of oral healthcare means and to identify its attributes. Based on that, quantitative surveys can be developed to evaluate quality in oral healthcare.

Moreover, further studies can be designed based on our audit results. Other areas of weakness could be explored and explained qualitatively, and similarly interventions could be designed to rectify any weakness and reinforce areas of strengths. It is important to realize that improving quality of oral healthcare is a continuous process, and our study can be considered as a baseline measurement for quality at UDHS upon which future quality improvements could be measured. For example, the effectiveness of implementing the electronic medical records software and applying the changes designed based on our results can be assessed in the future, after which appropriate changes could be made to further improve quality of oral healthcare.

6.5. Study Limitations and Challenges

When interpreting the results of our study, there several limitations that should be considered. First, limited by resources and time, we had to focus our study to include only simple direct restorations; however, there are many other procedures provided by dental students for adult patients. Therefore, our data provides a descriptive assessment for the quality of care during the provision of simple direct restorations. Regardless, even if the audit results would differ for other procedures, we acknowledge that our qualitative results provide a more general insight to any procedures that may be left untreated. Future studies can include other, if not all, procedures because the installation of electronic records software makes data extraction easier, more efficient and faster.

The other limitation concerns the data collection process from the patient medical records. For our study, the only available records were paper-based files, and the information was not very clear and consistent, a common occurrence with any retrospective audit of paper-based medical records. Therefore, the reliability of the data extracted through the audit is not assured even though we selected a random sample of the files for a second review to ensure better reliability of the data. This will not be a problem in future studies at UDHS because of the installation of electronic records software.

A third limitation was with our inability to reach all potential participants during our audit follow up survey in order to determine the reasons for not completing the planned treatment. On the other hand, we included all the participants in our audit sample for the telephone follow up survey, and we attempted to call them twice at two different times and on two different days of the week to increase the response rate to 59.1%.

The fourth limitation was due to the cultural challenges we faced during our qualitative interviews; (a) qualitative research is not common in that region. Therefore, I had to spend more time talking to the participants about their perceptions of quality in general as an ice breaker, especially with shy participants before asking the more specific questions addressing the problem under study; (2) we thought that the presence of the audio recorder could make the participants uncomfortable despite giving them the choice to switch it off; however, we realized that, once we introduced the study and asked the initial general questions, the participants had already forgotten about the presence of the recorder and were talking freely and comfortably; (3) some participants were shy, and I realized that they felt overwhelmed when I asked them the questions so they would give a short answer. Based on my interviewing experience I decided to adjust my interviewing style. Therefore, when I asked the probe questions to know if there was anything else they could remember, I would give them a few seconds. However, this time, I did not look at them directly and acted as if I was busy writing something or looking into the papers; this made them feel less stressed and they then expressed their thoughts more easily; (4) I anticipated that male interviews will not go as smoothly as female interviews because, in the Emirati culture, males and females usually are separate and socialize more with the same gender group. Therefore, being a female interviewer, I noticed that sometimes the male participants felt less comfortable. However, there were other male participants who were outspoken and were very comfortable and excited to share their ideas. These challenges applied to only some of the patient participants and, less frequently, to the students, supervisors and managers; this is because, at UDHS, males and females are not separate and they socialize and function together.

Finally, the language barrier between the interviewer and the participants during the qualitative interviews is also considered a limitation because a few Non-Arab patients from South Asia spoke only a little Arabic and/or English. Nonetheless, we interviewed them with the help of an interpreter and did not exclude those patients from our study because the audit results showed that the percentage of Non-Arab patients was 44.2%. In fact, we tried to get as much information as possible from them concerning the problem under study. However, while the presence of an interpreter was helpful, it might have restricted the participants' ability to freely express their opinions.

7. CONCLUSION

This chapter concludes my thesis by providing a discussion of the study results, strengths, future implications and limitations. The data collected from the audit provided descriptive information on the sample characteristics that include the socio-demographic, general health and oral health characteristics of the patients. The audit also provided a descriptive assessment of the elements of oral healthcare quality reported by describing the treatment progress of direct restorations done by the students during the 16 month retrospective audit. One problem identified was the high prevalence of incomplete planned treatments in the patients' dental records (87.4%) and this was explained using in-depth individual and focus group interviews with all stakeholders. The different stakeholders showed many unique and common perspectives. Analysis across the multiple stakeholders' perspectives provided an explanation for the problem by the emergence of four integrating key themes: (1) weakness in the 'Structure' of oral healthcare, (2) weakness in the interpersonal aspects of the 'Process' of oral healthcare, (3) weakness in the clinical aspects of the 'Process' of oral healthcare, and (4) patient population characteristics. These themes were thought to lead to either having patients who do not want to / cannot get appointments or having students who do not want to / cannot give appointments to their patients, therefore leading to the problem understudy. Including all stakeholders life experiences provided an exceptional richness of the data that wouldn't have been possible otherwise. The results of this investigation were shared with the providers at UDHS and recommendations for improvements were discussed, some of which were directly implemented and others are being further reviewed, as they require time and planning. Therefore, showing that applying a mixed quantitative and

qualitative methodological approach with all stakeholders in a system can provide information to enrich understanding, leading to appropriate and effective change.

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9. APPENDICES

9.1. Appendix 1: Informed Consent (Qualitative Component) - English

TOWARDS EFFECTIVE ORAL HEALTHCARE MANAGEMENT AND PROVISION: QUALITY IN ACADEMIC DENTISTRY IN THE UAE

Principal Investigators: Dr. Manal Awad & Dr. Jocelyne Feine

Research team members: Dr. Nuha Hawas, Dr. Jennifer NW Lim, Dr. Belinda Nicolau and Dr. Pierre Pluye

Version Date:

1. PURPOSE OF THIS CONSENT FORM:

We would like you to consider participating in a research study designed to measure the quality of dental care that is provided to you at the University Dental Hospital Sharjah (UDHS). The results of the research will give us more knowledge about quality in dental care. This consent form serves to:

a. inform you, as completely as possible, of the nature, purpose and risks involved in the study;

b. provide you with the necessary information you require to decide if you will participate or not, according to your personal goals;

c. help us to talk with you about your oral health experience at the UDHS.

Please read this consent form carefully and ask any questions that you may have before deciding whether or not to participate in this study. The researchers are here to help you understand completely, so please feel free to ask anything you may want to know about the study. Please take as much time as you wish and feel free to discuss this with your family or friends before deciding. Your participation is entirely voluntary, and if you decide not to participate, there will be no penalties or loss of benefits to which you are entitled.

2. INTRODUCTION

Examining and improving quality of dental care is important for the success of any health care organization. By measuring quality, we can support the strengths and improve the weaknesses

of our health providers and services. We want to improve healthcare and increase health benefits for patients.

There is scientific evidence that dental disease in the UAE is high. Therefore, it is important to keep the quality of dental care high, which will improve dental health for the population. There are no studies on the quality of dental care in a teaching dental hospital in the UAE. For that reason, we are carrying out this study

The purpose is to explain the causes and results of _____ (the problem will be identified from the audit, e.g. *a very high number of visits to complete a simple filling*), from the point of view of patients, providers (dental students, professors and staff) and managers.

3. OBJECTIVES

The primary objectives are:

- To understand and measure the quality of dental care in a dental hospital in Sharjah, United Arab Emirates.

- To explain ____ (the identified problem-as above)____ with the aim to recommend effective intervention(s) to improve dental care management.

4. CONDITIONS FOR PARTICIPATION

4a. *Starting Conditions*

You will be invited to participate if you:

- are an adult patient 18 - 59 years old and have had one or more of your teeth filled by fourth year dental students at the UDHS.

- are a fourth year dental student practicing at the UDHS

- are a clinical dental supervisor/assistant at the UDHS for the fourth and/or fifth year dental students

- are a manager at the UDHS

If you accept to participate, you will be invited to meet the research investigator at the UDHS where you will need to sign this informed consent. The day and time of the meeting will be set with you at your convenience. During this visit we will interview you on a one on one basis, and ask a series of questions about quality of dental care and your experience at the UDHS.

For consent forms signed by participating students the previous statement will be substituted by the following statement:

During this visit, we will interview you with other students like yourself; this is called a 'focus group'. We will ask a series of questions about quality of dental care and your experience at the UDHS.

You are not required to answer the questions. You may pass on any question that makes you feel uncomfortable. Our discussion will be audio taped to help us accurately capture your ideas in your own words. The tapes will be heard only by the research investigators for the purpose of this study. If you feel uncomfortable with the recorder, you may ask that it be turned off at any time.

4b. ***Follow-up***

We will also ask if you would be willing to be contacted at a later date by telephone in case we need to clarify any of the responses given in the interview. This would involve providing your name, phone number and the name of another contact person in case you move or your phone number changes. All personal information you provide will be kept strictly confidential, separate from the interview data.

5. NUMBER AND DURATION OF APPOINTMENTS

Your participation will include one appointment for the interview that will last 45 – 60 minutes.

6. COSTS

6a. Financial Compensation

Participants will not be paid for their participation in the interview /focus groups. The study procedures are conducted at no cost to you.

7. RISKS AND COMPLICATIONS

We will make every effort to make certain that there will be no way that you can be identified in the study. Furthermore, there is no risk involved in this study except your valuable time.

8. EXPECTED BENEFITS FOR PARTICIPANT

There is no guarantee that you will benefit directly from participating in this study. However, the results of the study may help us create dental care guidelines and recommendations for the UDHS to improve the quality of dental care provided to you and other patients.

9. CONFIDENTIALITY

Your participation in this research study is completely confidential. Code numbers, not names, will be used in all files. The list of names that match to the code numbers and the consent forms will only be accessible to only one of the researchers (Dr. Nuha Hawas) and will be kept under lock and key at UOS, where all the data will be stored for a period of ten years. The results of this study may be published in medical journals or reported at medical meetings. If this happens, no information that can identify you will be released or published. Members from the research may inspect the study records to ensure the proper management of this study and for analyzing the study data.

10. QUESTIONS AND COMMENTS

For all questions regarding the research study and the way the project is done or your rights and the conditions for your participation in this project, contact the principal investigator Dr. Manal Awad at +971506373718.

11. PARTICIPATION IS VOLUNTARY

Your participation in this research study is completely voluntary. You may refuse to participate without any loss of benefit to which you are otherwise entitled to. You will receive the same standard care and treatment that is considered best for you, irrespective of your participation in the study.

12. RISKS ASSOCIATED WITH WITHDRAWING DURING TREATMENT

There is no risk in withdrawing from the study. You are entirely free to withdraw from the project at any time without inconvenience or penalty of any kind. In the event you choose to withdraw from the study all information you provide (including tapes) will be destroyed and omitted from the final paper.

13. INFORMED CONSENT

You will be given a signed copy of this consent form and the research summary.

14. DECLARATION OF CONSENT

I have read the above information in this consent form. I have been given the opportunity to ask questions and I have had my questions answered to my satisfaction.

I certify that I have signed this form voluntarily, without being pressured in any way. I consent to be a participant in the study described in the attached document, a copy of which I have received. I declare that I understand the nature of the study, as well as the associated risks and drawbacks.

I do not waive any of my legal rights by signing this consent form.

15. SIGNATURES

15a. *Participant*

Signature of Participant _____

Name of Participant _____
(block letters)

15b. *Principal Investigator /Representative*

Signature of Principal Investigator _____

Name of Principal Investigator _____
(block letters)

15c. *Person who Obtained Consent*

Signature of Person who Obtained Consent _____

Name of Person who Obtained Consent (block letters) _____

Signed at Sharjah on _____

9.2. Appendix 2: Informed Consent (Qualitative Component) - Arabic

نموذج موافقة مسبقة على المشاركة في الدراسة

نحو الإدارة الفعالة وجودة العناية الصحية بالفم والأسنان في مستشفى كلية طب الأسنان في جامعة الشارقة في الإمارات العربية المتحدة

الباحث الرئيسي : د. منال عوض ود. جوسلين فاين

أعضاء فريق البحث :د. نهى حواس، د. جينيفر ليم ، د. بليندا نيكولاو ود. بيار بلو

تاريخ النسخة:

1. الغرض من هذا النموذج:
نود منك النظر في المشاركة في دراسة بحثية مصممة لقياس نوعية الرعاية الصحية بالفم والأسنان التي يتم توفيرها لك في مستشفى كلية طب الأسنان في جامعة الشارقة. فإن نتائج البحث ستعطينا المزيد من المعرفة حول وجودة العناية الصحية بالفم والأسنان في المستشفى. فالغاية من هذا النموذج:
أ .إبلاغك، بأكثر قدر عن طبيعة وغرض والمخاطر التي تنطوي عليها هذه الدراسة؛
ب . توفير لك المعلومات الضرورية التي تحتاجها لتقرر ما إذا كنت ستشارك أم لا، وفقا لأهدافك الشخصية ؛
ج . مساعدتنا للحديث معك حول تجربتك مع الرعاية الصحية بالفم والأسنان في المستشفى

يرجى قراءة هذا النموذج بعناية وطرح أي أسئلة قد تكون لديك قبل تقرير ما إذا كانت ستشارك أم لا في هذه الدراسة .
ويتواجد الباحث هنا لمساعدتك على فهما تماما ، لذا يرجى ألا تتردد في طلب أي شيء قد تريد أن تعرف عن الدراس.. يجى اتخاذ قدر من الوقت كما يحلو لك ، ولا تتردد في مناقشة هذا الأمر مع عائلتك أو الأصدقاء قبل اتخاذ قرار .مشاركتك هو تطوعي تماما، و إذا قررت عدم المشاركة ، لن يكون هناك أي عقوبات أو فقدان المزايا المستحقة لك.

2. المقدمة
فحص و تحسين جودة العناية بالأسنان أمر مهم لنجاح أي مؤسسة للرعاية الصحية. عن طريق قياس الجودة، يمكننا دعم نقاط القوة وتحسين الضعف في أداء مقدمي الرعاية وفي الخدمات الصحية المقدمة. نحن نريد تحسين الرعاية الصحية وزيادة الفوائد الصحية للمرضى.
هناك أدلة علمية على أن نسبة أمراض الأسنان في دولة الإمارات العربية المتحدة مرتفعة . وبالتالي، فمن المهم الحفاظ على جودة عالية للعناية بالأسنان، و التي من شأنها تحسين صحة الأسنان للسكان .لا توجد دراسات على جودة الرعاية الصحية للأسنان في مستشفى تعليمي لطب الأسنان في دولة الإمارات العربية المتحدة . لهذا السبب، نحن تقوم بإجراء هذه الدراسة.

الغرض من ذلك هو شرح أسباب و نتائج _____ (هنا سيتم ادراج المشكلة التي سيتم تحديدها خلال الجزءالأول من البحث والتي سوف تحتاج إلى تفسير نوعي)____، (على سبيل المثال تتطلب عددا كبيرا من الزيارات لإكمال حشوة سنية بسيطة)، من وجهة نظر المرضى ، ومقدمي الرعاية (طلاب طب الأسنان والأساتذة و الموظفين) والمدراء.

3. الأهداف

الأهداف الأولية هي:
•فهم و قياس نوعية الرعاية الصحية للأسنان في مستشفى الجامعة.
•شرح _ (المشكلة المحددة) _ بهدف انشاء التوصيات الأفضل لتحسين جودة إدارة وتقديم الرعاية الصحية بالأسنان في المستشفى الجامعة.

4. شروط المشاركة

- شروط البدء

سيتم دعوتك للمشاركة إذا كنت:
-مراجع في المستشفى وعمرك ما بين 18-59 سنة وقد تلقيت حشوة سنية أو أكثر من قبل طلاب طب الأسنان في المستشفى.
-طالب/ة الأسنان في السنة الرابعة أو الخامسة وتمارس/ين في مستشفى الجامعة
- أستاذ أو مساعد مشرف على طلاب طب الأسنان في السنة الرابعة أو الخامسة في عيادات طب الأسنان في المستشفى
-مدير في مستشفى الجامعة

إذا قبلت المشاركة، سيتم دعوتك لمقابلة الباحث المسؤول في المستشفى حيث سوف يطلب منك التوقيع على هذا النموذج. سيتم تعيين اليوم والوقت الذي يناسبك للمقابلة. وخلال هذه الزيارة سوف يتم مقابلتك لوحدك ،وسيتم طرح سلسلة من الأسئلة حول جودة الرعاية الصحية بالفم والأسنان وتجربتك في المستشفى.
(وسوف يتم استبدال العبارة السابقة في النموذج المقدم للطلاب بالعبارة التالية:
وخلال هذه الزيارة سوف يتم مقابلتك مع زملاء لك في مجموعة ،وسيتم طرح سلسلة من الأسئلة حول جودة الرعاية الصحية بالفم والأسنان وتجربتك في المستشفى).
ليس مطلوبا منك أن تجيب على الأسئلة . تستطيع إلغاء أي سؤال إن جعلك تشعر بعدم الراحة. سيتم تسجيل صوتي للمقابلة لمساعدتنا في التقاط أفكارك بدقة بالكلمات الخاصة بك . سيتم الاستماع إلى الأشرطة فقط من قبل الباحثين لغرض هذه الدراسة. إذا كنت تشعر بعدم الارتياح مع المسجل، يمكنك أن تطلب أن يتم إيقاف تشغيله في أي وقت.

- المتابعة

سنطلب منك أيضا إذا كنت على استعداد بأن يتم الاتصال في وقت لاحق عبر الهاتف في حال كنا بحاجة إلى توضيح أي من ردودك الواردة في المقابلة . وينطوي ذلك على توفير اسمك ورقم الهاتف واسم شخص آخر يمكن الاتصال به في حالة قمت بالانقال أو تغيير رقم هاتفك. وستبقى جميع المعلومات الشخصية التي تقدمها في سرية تامة، ومنفصلة عن بيانات المقابلة.

5. عدد ومدة المقابلات

وسوف تشمل مشاركتكم على موعد واحد للمقابلة والتي تستمر من 45 إلى 60 دقيقة.

6. التكاليف

التعويضات المالية:
لن تكون هناك أي تكلفة عليك للمشاركة في الدراسة.

7. المخاطر والمضاعفات

سوف نبذل كل جهد ممكن للتأكد من أنه لن يكون هناك أي طريقة يمكن بها التعرف علي معلومات الشخصية من خلال الدراسة وغير ذلك لا يوجد أي خطر على المشاركين في هذه الدراسة ما عدا وقتكم الثمين.

8. الفوائد المتوقعة للمشاركين

ليس هناك ما يضمن أنك سوف تستفيد مباشرة من المشاركة في هذه الدراسة. مع ذلك، قد تساعدنا نتائج هذه الدراسة على وضع توصيات وتوجيهات لمستشفى الجامعة لتحسين نوعية الرعاية الصحية للفم والأسنان المقدمة لك وللمرضى الآخرين.

9. السرية

مشاركتكم في هذه الدراسة البحثية هي سرية تماما. سيتم استخدام أرقام رمزية وليس الأسماء في جميع الملفات. لائحة الأسماء التي تطابق إلى الأرقام الرمزية ونماذج الموافقة سوف تكون فقط في متناول الباحثين من هذه الدراسة، و سيتم الاحتفاظ بها تحت القفل والمفتاح في جامعة الشارقة. يمكن نشر نتائج هذه الدراسة في المجلات الطبية أو ذكرها في الاجتماعات الطبية . إذا حدث هذا، فلن يتم الإفصاح عن أي معلومات التي يمكن بها التعرف عليك.

10. الأسئلة والتعليقات

لجميع الأسئلة بخصوص الدراسة والطريقة التي يتم بها إجراء المشروع أو حقوقك وظروف مشاركتك في هذه الدراسة، يمكنك الاتصال بالدكتورة منال عوض على 00971506373718.

11. المشاركة بالطوع

مشاركتكم في هذه الدراسة البحثية طوعية تماما. تستطيع أن ترفض المشاركة في البحث دون أن تخسر المنافع التي يحق لك الحصول عليها. وفوق ذلك سوف تتلقى نفس الرعاية النموذجية والعلاج الذي يعتبر الأفضل بالنسبة لك، بغض النظر عن مشاركتك أو عدم مشاركتك في هذه الدراسة.

12. المخاطر المترتبة علىالانسحاب من الدراسة

لا يوجد أي خطر من الانسحاب من الدراسة. أنت حر تماما إن أردت الانسحاب من الدراسة في أي وقت دون إزعاج أو عقوبة من أي نوع. في حال اخترت الانسحاب من الدراسة سيتم التخلص من جميع المعلومات التي قدمتها (بما في ذلك الأشرطة) وستحذف أيضا من الورقة النهائية.

13. نموذج الموافقة المسبقة

سيتم إعطاؤك نسخة موقعة من نموذج الموافقة هذا وملخص البحث.

14. إعلان الموافقة

لقد قرأت المعلومات الواردة أعلاه في نموذج الموافقة هذا. أعطيت لي الفرصة لطرح الأسئلة، ولقد تمت الإجابة على أسئلتي لرضاتي.

وأشهد بأنني وقعت على هذا النموذج طواعية ، دون التعرض لضغوط في أي شكل من الأشكال .أوافق على أن أكون أحد المشاركين في الدراسة الموضحة في هذه الوثيقة، والتي استلمت نسخة منها. وأقر بأنني فهمت طبيعة الدراسة، و المخاطر والسلبيات المرتبطة بها.

أنا لا أتنازل عن أي من حقوقي القانونية من خلال التوقيع على نموذج الموافقة هذا.

15. التوقيعات

-المشارك

توقيع مشارك

_____

اسم المشارك

_____

- الباحث الرئيسي / ممثل

توقيع الباحث الرئيسي

_____

اسم الباحث الرئيسي

_____

- الشخص الذي قام بأخذ الموافقة

توقيع الشخص الذي حصل على الموافقة

_____

اسم الشخص الذي حصل على الموافقة

_____

- وقعت في الشارقة في تاريخ _____

9.3. Appendix 3: Data Extraction Sheet

DATA EXTRACTION SHEET

A. <u>Socio-demographics</u>

1. **Age** _____ years

2. **Gender** ☐Male ☐Female

3. **Occupation** ☐Unemployed
   ☐Laborer (unskilled)
   ☐Other employment (specify_____)

4. **Location** ☐Abu Dhabi ☐Dubai ☐Sharjah ☐Ajman ☐RAK ☐Fujairah ☐UAQ

5. **Marital Status** ☐Single ☐Married ☐Divorced ☐Widowed

6. **Nationality** ☐Arab Emirati ☐Arab Expatriate ☐Non Arab

B. <u>Oral Health Related Data</u>

1. **DMFT** = _____
2. **D** = _____%
3. **M** = _____%
4. **F** = _____%

5. **Reason for visit:** ☐Pain relief ☐Check up ☐Other (specify _____)
6. **Medical History**: Chronic Disease ☐No ☐Yes (specify_____)
   Infectious Disease ☐No ☐Yes (specify_____)

C. Treatment Progress Data

Tooth#	Treated:		No. of visits	Duration(D) between visits in weeks					Complication		Type of Filling
	Yes=Y No=N	Reason if N		D1*	D 2	D 3	D 4	D Total	Yes=Y No=N	Specify if Y	
(e.g.)15	y		3	2	4	4		10	y	Over hang	Class 2 Amalgum
Comments											

*D1 = from day treatment approved – first visit for that tooth, D2 = form day if first visit for that tooth – day of second visit, same applies for D3 & 4
D total = From day treatment approved for that tooth – day treatment completed for that tooth (D total = D1+D2+D3+D4)

9.4. Appendix 4: Interview Guide

1. Can you please introduce yourselves? Your first name, where you are from, your background. Why did you become a dentist? (for providers and managers)
2. How do you describe the quality of dental service here at UDHS?

   What are the good things about the quality of dental service the students provide to the patients?

   What are the things that you would like to change in the quality of dental service provided by the students?
3. If the issue of high rate of incomplete cases is brought up here the moderator will encourage the discussion, otherwise we will bring it up by saying

   "When going through the hospital patient files we noticed there is a high number of incomplete patient cases (specifically talking about fillings).

   (a) How much do you think that affects the quality of oral healthcare provided here?

   (b) How?
4. Do you have any possible explanation(s) to why there are many case left incomplete?

   Probes: Can you explain further? Can you give me an example? Is there anything else? Please describe what you mean.
5. Some patients say that they are waiting to be given appointments by the students but they never call. Why do you think the some students do that?
6. What do you think can be done to reduce the high rate of incomplete cases?
7. (a) Have we missed anything? (b) Do you have any other general suggestion(s) you would like to share with us that can improve the quality of dental care provided here?