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Title Page

Title: Scoping review of the role of shared decision-making in dental implant consultations?

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Knowledge Transfer Statement

The findings of this scoping review can be used by all dentists when deciding which decision making model they wish to use when planning implant therapy. The article places special emphasis on the role of shared decision making in improving healthcare quality and increasing patients and clinicians satisfactions.

Abstract

Research Questions: To what extent does dental research on implant consultations focus on the use of shared decision making?

Objectives: There has been an explosion in the use of implant therapies in dentistry but very little is known about the decision making processes involved in the provision of dental implants. The use of shared decision making (SDM) has been found to reduce undesirable outcomes and increase patient and clinician satisfaction in other healthcare fields. This scoping review reports on the current status of SDM in research on implant therapies.

Methods: A scoping review methodology was used. Web of Knowledge, MEDLINE via OvidSP, MEDLINE via PubMed, Embase, Scopus, Cochrane, DARE and CINAHL databases were reviewed between 1900 and the first of December 2017. The search strategy resulted in 2805 eligible articles, 1766 duplicated articles were deleted resulting in a hand search of 276 titles and abstracts. These were subsequently evaluated whilst applying the inclusion and exclusion criteria resulting in 43 articles for full text evaluation. After full text evaluation of these 43 studies a further 22 were eliminated as not being relevant leading to the inclusion of 21 studies for the review.

Results: No studies to date have examined how patients and dentists engage in decisions to place dental implants. Aspects that were discussed in the literature related to the decision making process included a discussion about patients' values and discussing possible treatment options. How patients and dentists interacted during implant consultations was poorly explored.

Conclusions: Shared decision making has been shown to improve healthcare quality and increase clinician and patient satisfaction. Further research concerning dental implant decisions is warranted with emphasis on evaluating the patients' contributions to treatment which is currently poorly understood. Exploring existed methods for examining the SDM process in implant consultations should facilitate improve care and consent.

Introduction

Evidence has shown that the cost of implant therapy in dentistry is high and that frequently the placement of implants it is neither affordable nor accessible to many patients (Barrowman et al. 2010). For example, in the Netherlands, the cost of implant supported removable partial dentures has been shown to be about 2480 Euros; while the cost of removable partial denture has been shown to be about 981 Euros (Jensen et al. 2017). The use of dental implants has grown significantly in the last two decades. In the United States, from 2000 to 2005, a fivefold growth in implant care was recognized. More than one million dental implants are used annually in the United States and this amount is likely to increase by 14% annually in the next few years. Likewise current findings from some European countries including Germany, Italy, France and Spain uncover that more than one million implants were placed (Jokstad 2009). The high cost of implant care alongside the huge growth in the number of implants placed over recent years means that it is more important than ever to explore how clinicians and patients are arriving at decisions to have implants.

Dental implants were developed to replace alternative dental treatments such as complete and removable partial dentures (Henry 2000). Reasons given for the increased use of implant care tend to focus on increasing patient and clinician satisfaction, long lasting survival when related to alternative dental therapies (Pjetursson et al. 2004), and improvements in oral health related quality of life (Heydecke et al. 2003). In contrast some debates about the provision of dental implants have highlighted the potential for serious aesthetic and social disadvantages. Some of the challenges of implant care include the relationship between the failure of implant therapies with patients' gender, age, smoking habits, and social class (Jang et

al. 2011). Additionally, there is a relationship between the failure of dental implant therapy and the site of insertion, bone density, and the possibility of injuring the inferior alveolar nerve (Kushnerev and Yates 2015; Moy et al. 2005). These challenges underscore the need to explore the decision making processes that have been employed in clinical consultations.

There is a burgeoning literature on decision making in medical care worldwide. This literature highlights several important models of decision making that are apparent in medical care. These models include paternalistic, interpretative, informed, and shared decision making models (Charles et al. 1999). The shared decision making (SDM) in particular has quickly become the central goal of clinical practice in general (Coulter et al. 2011). The SDM model is defined as the involvement of patient and clinician in the process of treatment decision-making. They share treatment information and possible choices and then both decide on which treatment to undertake (Frosch and Kaplan 1999). The SDM model aims to assist patients to have an active role in the decision-making process. In this respect, shared decision making involves highlighting patients' understandings, preferences and values associated with possible treatment options to the decision making process. It seeks to establish quality interactions with clinicians, addressing health issues, priorities and preferences, looking for supportive information and lastly making joint decisions with clinicians (Coulter et al. 2011; Elwyn et al. 2012).

Evidence has demonstrated that engaging patients in treatment decisions enables clinicians to show patients more respect. It also enhances patients' health and wellbeing (Edwards et al. 2009). The medical literature has also revealed that utilizing

the SDM model in clinical practice open up various advantages including developing patients' self-esteem, improving the quality of healthcare, increasing the satisfaction of both clinician and patient (Crawford et al. 2002), increasing a patient's confidence, reducing a patient's anxiety and developing a patient's ability to deliberate about their health problems through more positive interactions (Thornton et al. 2003). The significant advantages of the SDM model have guided healthcare policy makers and researchers to support employing this model in medical consultations. As a consequence, and with respect to the worldwide expansion in the use of dental implants over the last two decades (Jokstad 2009), this study aims to review research on shared decision making in relation to dental implants with an emphasis on research that focuses on how patients and dentists are engaged in the decision making process concerning implant therapy.

Materials and methods

Scoping review methodologies have emerged as a well thought through methodology for defining, exploring, and tracking the nature and scope of any research activity (Arksey and O'Malley 2005; Davis et al. 2009). Scoping studies can be used to examine a broader area, to identify gaps in the research knowledge base, refine key concepts, and report on the types of evidence that inform practice in the field (de Chavez et al. 2005; Peters et al. 2015). Our scoping review examines the area of decision making in the dental literature with respect to dental implant consultations, it seeks to explore the key models of decision making that have been employed in consultations, detect gaps in the literature in relation to the use of shared decision making in dental implant consultations and finally to report findings on types of studies conducted on decision making in relation to implant care. Scoping reviews can

be conducted to determine not only the range of research that exists concerning a particular topic but also how the research has been conducted (Pham et al. 2014). This scoping review determines the range of studies conducted on decision making in relation to dental implant consultations and how those studies have been carried out.

The purpose of scoping studies is to offer a map of what evidence exists in relation to a specific question related to practice and policy regardless of quality. It is for this reason that appraising the quality of evidence is commonly not implemented in scoping studies (Arksey and O'Malley 2005; Peters et al. 2015). Although it is still possible to explore the implications of the findings of such studies for research (Arksey and O'Malley 2005; Peters et al. 2015). Another reason for not appraising the quality of the studies included in this review is, as we shall see, the fact that no studies address decision making directly.

This scoping study employed (Arksey and O'Malley 2005) strategy of conducting a scoping review in healthcare. This strategy consists of six steps: 1) Identifying the research question, 2) Identifying relevant work, 3) Study selection, 4) Charting data, 5) Collating, summarizing and reporting the results, and lastly 6) Consultation with stakeholders.

1) Identifying the research question

The explosion in the use of dental implants worldwide (Jokstad 2009), the use of dissimilar models of decision making in the medical consultations, and the trend toward employing shared decision making in clinical practice (Wirtz et al. 2006); underlines the importance of exploring the position of research on decision making in relation to implant care. As the aim of this study was to review research on shared

decision making in relation to dental implants with an emphasis on how patients and dentists are engaged in the decision making process concerning implant therapy. This review therefore focuses on the territory of research on decision making in relation to implant therapies with an emphasis on how research has examined if patients and dentists are engaged in shared decision making.

2) Identifying relevant work

This scoping study used comprehensive search through multiple resources including the Web of Knowledge, MEDLINE via OvidSP, MEDLINE via PubMED, Embase, Scopus, Cochrane, DARE and CINAHL databases. The process of searching and elimination of studies is summarized in (**Figure 1**). The search terms employed were "dental implant", "implant*", “fixed prosthes?s”, “endosteal”, “overdent*” and ("shared decision making" or "shared decision-making" or "decision making" or "decision-making" or "patient preference*”). All articles were considered regardless of geographical background, age group or gender. Likewise, this study covered any dental settings whether these settings were governmental or private and within any country in the world. After using these search terms we established an Endnote library for systematizing, classifying, and organizing relevant articles. Following this, all duplicated studies (n=1766) were removed. The authors subsequently evaluated the titles and abstracts according to the study inclusion and exclusion criteria (see next step).

3) Study selection

Two key inclusion criteria were generated: 1) studies had to be published between 1900 and the first of December 2017, and 2) studies also had to be based on humans including clinical randomized and non-randomized control trials, case-control studies,

case reports, cohort research and systematic reviews. Three exclusion criteria were applied: 1) research conducted on animals, 2) articles that were not written in English, and 3) articles focused on purely clinical decisions of dental implants. This included the exclusion of studies that centered on clinical indications and contraindications of implant therapy, likewise those centering on the relationship between the bisphosphonate with failure of implant therapy (Lo et al. 2010), and studies that focused on the influence of radiography on making suitable implant decisions (Lecomber et al. 2001). These types of articles were excluded because they were not focused on the decision making process or how and why the implant decisions were made. In order to reduce bias, all sources were searched independently. The two reviewers screened the titles and abstracts of papers obtained through the search to evaluate their eligibility. They then conferred and after discussion papers were selected to be included. It should be highlighted that there were no disagreements between the two reviewers about the studies to be included. After evaluating the titles and abstracts a further 276 studies were excluded (see **Figure 1**) before moving onto the next step of our analysis. At this stage we explored the 43 studies that were to be included in our full text evaluation. Both authors explored the full text of these articles whilst deciding on which studies were relevant for the full review. At this stage a further 22 studies were excluded because they did not meet the inclusion criteria. The remaining 21 studies were analyzed for the full review (see next section).

4) Charting data

Data charting was carried out in two key stages. First, we reviewed the literature on decision-making in medical research to explore existing frameworks on decision making in healthcare in general (**Table 1**). These models would form the basis of our exploration of decision making in relation to dental implants.

In the second stage, the authors independently read the first six studies and met to discuss the relevance of the studies to this review. The main reviewer went on to evaluate the relevance of all extracted articles through the applicability of the inclusion and exclusion criteria. The second reviewer independently assessed and confirmed the applicability of these articles.

5) Collating, summarizing and reporting the results

This scoping review reports findings in two key sections. Section one narratively describes the key models of decision making that have been used in dentistry alongside key differences between those models. The second section employs a qualitative content analysis to summarize and report the results. The reviewers also assessed the typical methodological approaches that have been used to explore how patients and dentists are engaged in the decision making process about implant care. The results of this section were grouped into four sub-sections to describe the variations between the findings on the basis of similarity of types and aims of included studies.

6) Consultation with stakeholders

As we shall see this stage of the scoping review process was not applicable to this study.

Results

A) Results from stage one of the review

A narrative review of the medical literature concerning clinical decision making models revealed four key models have been commonly been explored. These were: 1)

Paternalistic, 2) Interpretative, 3) Informed, and 4) shared decision making models (Charles et al. 1999; Wirtz et al. 2006). As we can see from **Table 1** these models differ on two central properties. First, the scope of patient's independence in the process of the decision-making is important. For example, the 'shared' decision making model (SDM) intends that patients can reach a state of 'decision-independence' based on an atmosphere of deliberation (Emanuel and Emanuel 1992). The 'interpretative' and 'informed' decision making models tend to adopt a 'dichotomous appearance', where independence is either absent or present (Banning 2008). The second property of decision making models is that they tend to focus on how far clinicians encourage or attain shared decision making. The 'shared' decision making model places greater emphasis on the clinician's responsibility to involve patients, and to *actively* conceive how these aspects may be used to make suitable clinical decisions (Frosch and Kaplan 1999). We can see from **Table 1** however that the 'informed', 'interpretative' and 'paternalistic' models do not see this responsibility as a duty for consultations (Emanuel and Emanuel 1992).

B) Results from stage two of the review

The review revealed that no studies to date have examined how patients and dentists were engaged in 'shared' decision making when it comes to the provision of implant care. Published work does not assess the patient-dentist interactions, patients' preferences, values, needs and expectations. Such studies tended to focus on the clinical aspects of the decision making process. Even though social factors may significantly influence the implant decision making process. Social factors were poorly investigated in the literature. **Table 2** summaries studies on decision making in relation to dental implant therapies and their key purposes and findings. In what

remains we highlight the key themes that are discussed in the current research literature in relation to the provision of dental implant therapies.

Preserving natural teeth or extraction and replacing with implants

The first seven articles explored the challenges around maintaining natural teeth versus the removal and replacement of these with implants. These studies uncovered conflicts between clinicians around keeping teeth or restoring them with implants. Some clinicians argued that implant therapy aims to prevent tooth loss (Cosyn et al. 2012; Henry 2000; John et al. 2007), while others believed that different factors were critical in making suitable treatment decisions. These included the dentist's competence, clinical experience (Tsesis et al. 2010), and the patient's ability to pay the cost of implant therapy (Bar On et al. 2014). Although implant therapy has shown a level of predictability similar to or better than endodontic therapy and complete dentures (Thomas and Beagle 2006), evidence has demonstrated that the process of planning proper dental therapy should combine periodontal, prosthodontics, biological, functional and aesthetic features of dental care. Significantly there is some indication of an acknowledgement that patients should be actively involved in acceding to care. The importance of useful strategies for planning dental treatment involving internal and external root resorption using a comprehensive evidence-based approach has also been emphasized (Derhalli and Mounce 2011).

Studies on patient and dentist related factors in decision making

One project consisted of four studies investigating patient and dentist related aspects in decision-making. This project aimed to explore how understandings of need and consequent decisions regarding dental implants were enabled by psychological and social concerns, with emphasis being given to financial perceptions associated with

the decision (Exley et al. 2009). Paying for implant therapy was not easy and considerable personal energy on the part of patients was expended in weighing up the costs associated with treatment. The consequences of the expenditure on the patient and their family formed a central aspect of the decision making process. It was found that some patients believed that paying for dental implants was a selfish act. In such instances the wealth they had was owned by all the family, and so they felt they ought to 'prioritise' how they would spend their money without disappointing other family members (Exley et al. 2012).

Field et al. (2009); Vernazza et al. (2015) concluded that decision making in the United Kingdom was constructed on the basis of commercial influences, professional and legal obligations, patients desire to have implants, including their ability to pay. This study uncovered that the patient's oral hygiene; appearance and demographic details such as socioeconomic status influenced dentists' decisions to offer implant therapy (Field et al. 2009; Vernazza et al. 2015). This project examined how individuals were offered implants with a focus on the financial aspects of the decision. It did not examine how individuals were involved in the process of decision-making concerning their care.

In other work, Kalsi and Hemmings (2013) explored patient factors related restorative dental treatments (including implant therapy) that lead to less ideal, clinically acceptable, treatment plans. They concluded that patients' decisions were commonly influenced by their relationship with the dentist and this relationship was more important than other factors such as time, access and cost. The study emphasised that an agreed treatment plan between the patient and the dentist before making the decision to have implants was important, in order to avoid possible patient dissatisfaction with the treatment received (Kalsi and Hemmings 2013). Moreover,

Beikler and Flemmig (2015) explored the literature whilst economically evaluating the efficiency of implant care alongside different dental therapies to provide valuable information for decision-making. They found that the cost of dental therapy, quality-adjusted tooth years, survival rates, and oral health-related quality of life outcomes were related to the economic evaluation for replacing single or multiple lost teeth. It was advised that further economic evaluations following well-established methodological approaches in health economics are required (Beikler and Flemmig 2015).

Factors influencing patients' decisions to go for implants or re-implants

Three other studies have examined the factors affecting patient decisions to undertake implants or re-implants. Mardinger et al. (2008) conducted a retrospective cohort study on 194 individuals to examine features that can impact patients' decisions to restore failed implants. Patients' fear of another implant failure; anxiety, pain and extra cost of the therapy were the main reasons of declining the second placing of implants (Mardinger et al. 2008). Further work by Koele and Hoogstraten (1999) found that individuals' preferences and good oral hygiene were significant factors in shaping the dentists' decision to go for implant therapy (Koele and Hoogstraten 1999). Finally it was found that patients who were treated with implant therapy demonstrated a real improvement in their oral health related quality of life. This study also uncovered patients' dental anxiety and the cost of therapy influenced their decision avoid dental implants (Narby et al. 2012).

Studies on patients experiences of dental implants

Five studies were centered on evaluating patients' experiences of implant care. These studies did not directly evaluate how patients and dentist were engaged in decisions to

place implants. Although some of the findings do relate to decision making, Cronin et al. (2009) conducted qualitative interviews to explore what factors influenced the thoughts of partially dentate patients towards implant care. The study concluded that patients had increasing expectations in relation to their rights to actively participate in the process of implant decision making. Younger participants aged 45 to 64 years old had higher expectations for their implant care than elderly participants (Cronin et al. 2009). Most of the research in this field has tended to assess patients experience with implants. This research has tended to involve samples of elderly people who had extensive tooth loss, and centered on evaluating experiences before and after receiving implants rather than on the decision making itself. The rarity of qualitative research conducted on patients' experience in relation to implant therapy has been emphasized (Kashbour et al. 2015). Wang et al. (2015) used qualitative interviews to assess patients perceptions of implant therapy alongside the influences of these on care seeking and decision making. Patients commonly expected implants to restore their oral function, appearance and quality of life. They considered implant care a panacea for all instances of lost teeth, tended to overvalue their functions and longevity, and underrated the expertise required to conduct the surgery. The high costs of dental implants, invasive procedures, risks, and complications were key factors related to not undertaking this therapy (Wang et al. 2015).

Discussion

No studies in the literature have directly examined how patients and dentists are involved in decision making with respect to consultations about dental implants. While some studies evaluated patients satisfaction and experiences in relation to implant therapy (Kashbour et al. 2015; Wang et al. 2015), these have not explored the decision making process itself in any detail. Nonetheless this research highlights that

the decision to either go with implant treatments or not is a complex decision that should be taken with care. The decision involves evaluating the suitability of a range of aspects of implant therapy for patients (Cooper 2010). This underscores the importance of building a much more shared decision making approach towards implant treatments in dentistry, especially given the extensive costs of the treatment.

In the medical literature the shared decision making (SDM) model has gained increasing acceptance as the most appropriate model for decision-making. The General Medical Council in the United Kingdom, for example, substituted its 1998 booklet entitled 'Seeking patients' consent: the ethical considerations' to 'Consent: patients and doctors making decisions together' in 2008 indicating a change from 'seeking patients' consent' to 'making decisions together'(Edwards et al. 2009). This reflects a change in emphasis away from paternalistic decision making towards shared decision making. Paternalistic models do not consider the patient's legal rights or their autonomy (Icheku 2011). They fail to evaluate patients' preferred treatment options and tend to support practitioners' authority in making the final decision. This potentially results in a disregard of the risks of treatment for patients. Following such models, especially in relation to treatments that are extremely expensive, may increase the possibility of undesirable results (Holmes-Rovner et al. 1996).

The majority of research on dental implants tends to focus purely on the clinical and biological aspects of this therapy (Heinikainen et al. 2002; Kushnerev and Yates 2015). Social factors in relation to dental implant have received little or no attention (van der Wijk et al. 1998). Yet these social factors may significantly impact on the decision making process. Evidence has demonstrated that SES and social costs were

related to several oral diseases including, dental decay and periodontitis (Buchwald et al. 2013; Reisine and Psoter 2001). In this respect, while no studies have evaluated the association of the SES and social costs in relation to dental implants, it might be the case that SES and social costs of implant care influences patients and dentists decisions to undertake this therapy.

The use of shared decision making in medical consultations can lead to several advantages for clinical care including improving the quality of healthcare and increasing satisfaction (Crawford et al. 2002; Thornton et al. 2003). This model has received rare consideration in dentistry, particularly in relation to implant therapy. Nevertheless, there have been some positive developments in dental research, for example, Johnson et al. (2006) have developed a decision aid to support patients and dentists when they are considering possible treatment choices in order to facilitate shared decision making in dentistry. Perhaps such aids might be used in relation to the provision of dental implant therapies? Johnson et al. (2006) concluded that using decision aids in dental consultations may enable greater shared decisions. Evidence has also demonstrated that the majority of the patients preferred making joint dental decisions with their dentists (Chapple et al. 2003). Yet these studies do not examine in detail the process of shared decision making between patients and dentists nor do they assess the social and economic dimensions of these decisions. These studies were also not focussed on shared decision making in relation to implant consultations, tending to be focused on dental treatments in general. On the plus side they do support making shared decisions in dental consultations.

Scoping reviews, like any other types of reviews, have some limitations. The probability of omitting some related studies when searching the literature due to

database selection issues such as (exploring other databases may have recognized further related studies or the exclusion of studies published in a language other than English). A further limitation of scoping review is the absence of a critical appraisal of involved studies (Pham et al. 2014). The emphasis of this scoping review is on seeking to provide an account that provides a comprehensive coverage of studies that have been conducted on decision making process in relation to dental implant consultations. Since no articles were found that specifically sought to evaluate this we have not conducted an evaluation of the quality of the papers we have included here.

This scoping review has highlighted the importance of considering employing shared decision making in dentistry. It has been found that whilst some research has explored the factors influencing decisions few studies have examined how shared decision making might be promoted in this therapy. This is despite the extensive economic costs of such treatments. Shared decision making might help reduce conflict and blame between dentists and patients, promote greater levels of satisfaction with treatment and better outcomes. More research in the field of decision-making in relation to dental implant treatments is therefore warranted. It is suggested that this research should explore the social aspects of such decisions, including the social cost of implant therapy and the interaction between patients and dentists in the decision making process.

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Declaration of conflicting interests

The authors declare that there is no conflict of interest regarding the authorship and/or publication of this scoping review.

Tables and figures

Tables and figures are attached separately in the appendix file.

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