Factors that influence therapeutic decisions in Orthodontics: a literature review

Therapeutic decisions in Orthodontics.

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Abstract: There is an immense variety of orthodontic techniques. Each of them has specific uses and indications from which to select the most appropriate options for each clinical situation. The aim of this article is to review the recent literature on the factors that influence or explain the therapeutic decisions made in dentistry with a focus on orthodontics. It has been found that the education received, individual preferences and the mastery of different techniques, features and personal values, as well as the clinical and economic situation of the patient, the health system and the dentist-patient relationship take on a major role in the treatment selected. Ethical and social principles, such as behavioral theories, are applicable to these professional aspects. It is important to understand the decision-making process and the selection of treatments because of the impact they have on patient care and satisfaction, on reaching the therapeutic objectives, on how public health services work, and on the quality of services. There are currently few studies that focus on the process of clinical decision-making. Therefore, it is necessary to expand the scope of research, including qualitative research, in order to better understand decision-making.

Keywords: therapeutics, decision-making, orthodontics, clinical decision-making, treatment planning.

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Introduction

The introduction of the first dental cement in 1871 allowed clinicians to use a multiplicity of fixed appliances in orthodontics as it made it possible to temporarily attach appliances to teeth. However, the true revolution took place in 1916, when Edward Angle created the first brackets that allowed orthodontists to apply three-dimensional forces to teeth, allowing for more complex movements[1]. Since then, technology has allowed orthodontic appliances to permanently evolve, creating a huge number of therapeutic options, each one with its specific indications and uses. The appliance has to be selected with care and used correctly, as misuse can make the initial malocclusion worse [2].

There are many factors that influence the choice of therapeutic treatment. These include the education received in graduate and postgraduate school[3-11], personal preferences [12] and the mastery of different techniques [13,14], personal characteristics and values [15], the patient's clinical and financial situation [16], and the dentist-patient relationship [17], among others.

Therapeutic decisions have major consequences, not only on the effectiveness of treatments but also on public health and the evolution of orthodontics. The aim of this article is to review the recent literature on the factors that influence or explain the therapeutic decisions made in dentistry with a focus on orthodontics.

Indication for orthodontic treatment

To understand the choice of one orthodontic appliance over another, first we need to consider the factors that indicate the need for treatment. Proffit, Field and Sarver state six general reasons to implement an orthodontic treatment plan, which are listed below according to frequency:

1. to eliminate or at least reduce the social obstacles caused by an unfavorable dental or facial appearance;

2. to improve the dental and facial appearance of people that are already socially accepted but that wish to improve their quality of life;
3. to have a development process that is as normal as possible;
4. to improve maxillary function and to correct problems caused by functional alterations;
5. to reduce the impact of trauma or diseases on teeth; and
6. to facilitate other dental treatments, as a complement to restorative, prosthodontic or periodontal therapy [18].

Given these reasons, we have a wide variety of appliances that would help us reach the relevant objectives, where only clinical criteria would support the choice made. However, there are other factors that influence this decision.

Therapeutic decisions in Orthodontics

The field of therapeutic choices has been widely studied by researchers from several areas of psychology [19], who have defined clinical decision-making as a comprehensive organizational process that includes multiple factors [20]. However, dentists often make routine choices from the different treatments available [16], decisions which are usually fast and for which the clinician tends to lack the necessary knowledge and skills [20].

This process has become even more critical with the advance of technology [20], as there is a large number of products, techniques and treatments with different effects. We must determine which is the best one for each specific case [21].This decision must be professionally ethical.

Nowadays, decisions must be made based on scientific evidence: the therapeutic modality must be chosen according to irrefutable evidence that the method selected is the best option for a given patient [18]. To do that, treatment selection must include clinical reasoning, which has been described as an essential pillar in the education of health professionals. It is also a significant aspect of medical and dentistry skills [22]. However, the factors that influence this process go beyond clinical or scientific considerations.

Despite recognizing the importance of the clinical decision-making process, it is complex to determine how dentists make treatment-related decisions [22] because a number of professional and patient-related factors come into play, which might influence the therapeutic choice [16]. Likewise, orthodontic treatment may be influenced both by the social and cultural environment [23].

Below we describe the main influencing factors relative to clinicians, patients, and to their social environment.

- **Clinician-related factors**

It is generally believed that clinical decision-making involves a significant influence of the professional's unconscious [19], in turn influenced by the following factors:

Education received

A direct link has been found between the dentist's educational and professional experience and the perception of orthodontic treatment need (OTN). This was shown by Murakami et al, who assessed the treatment need perceived by dental students and orthodontists when there is mandibular protrusion. Results indicate that there were no significant differences between students and specialists in low OTN cases. However, in high OTN cases, orthodontists perceived a significantly higher need than students. It was also observed that the students that had undergone orthodontic treatment tended to perceive a higher OTN. Therefore, the level of orthodontic knowledge influences the perception of the need for treatment in cases of mandibular protrusion [14].

International studies conducted on other dental specialties have also shown that the use of different techniques is mainly related to the graduate and postgraduate education received [11]. The main obstacle in the implementation of specific techniques and procedures is the lack of the necessary knowledge for their application. This is clear in periodontics, where it has been shown that demonstration and teaching activities conducted by teachers in dental schools are key to create a good impression and a positive opinion on the use of

different techniques [4]. The same applies to pathology, where the importance of graduate education is highlighted when it comes to adopting check-up patterns when examining patients to prevent cancer [7, 9]. General dentistry describes the link between the education received and the attitude towards pregnant patients [8] and smoker patients [3, 6]. The same association has been described in pediatric dentistry [10] and dental traumatology [5].

Just as theoretical knowledge is essential in clinical decision-making, practical and technical skills can be as important when planning treatments [24]. Dentists favor treatments they are better prepared for. For instance, if an endodontic treatment fails, endodontists prefer to retreat, while the specialists will probably choose tooth extraction [24].

It can then be concluded that dentists have higher chances of making the right clinical decision if they train on a permanent basis and have greater experience in different techniques [13].

Personal characteristics

It has been said that personal characteristics significantly influence treatment planning. Here we find the capacity to reflect and exchange ideas with other professionals, which might lead clinicians to reconsider their initial treatment decisions [24]. This is one of the most frequently used methods to clarify doubts regarding ethical issues [25]. However, sometimes clinicians choose not to include colleagues from other fields, as found by Tariman, whose study states that only 14% of oncologists believe that primary care physicians should be more involved with therapeutic decisions [15].

Other aspects that influence treatment decisions are personal beliefs and values, which determine the clinician's attitude to the alternatives available and a method of choice to select treatments. This entails allowing for more or less patient participation when selecting a given therapy [15]. Likewise, personal beliefs have a direct impact on the decision. For instance, Tariman states that oncologists tend to value survival, as opposed to their patients, who value quality of life more. This has led to women with cancer being undertreated because physicians believe that they have a low life expectancy [15].

Psychological characteristics also have their influence. For instance, obsessive personality patterns, which typically present perfectionism, rigorousness and excessive attention to detail, tend to make decision-making a more complex process. Additionally, impulsive people tend to make decisions more easily, but they are not always the right decisions, given the lack of analysis [26].

Age

The clinician's age has also been linked to decision-making. There are major differences between younger dentists and older dentists when choosing between therapeutic options in use for decades (chosen by older clinicians) or techniques being developed (favored by younger clinicians) [27].

Furthermore, a direct link has been found between the benefits of orthodontic treatment and the time they took to complete their degree: older practitioners value these benefits more compared to younger practitioners [28].

Sex

Female dentists tend to take more into consideration financial aspects and their patients' requests than their male colleagues: they usually allow their patients higher participation in clinical decision-making [27]. Zitzmann describes a further difference between male and female dentists. The researcher assessed a group of practitioners facing complex cases of periodontally involved teeth and implant therapy with sinus grafting. It was found that more female clinicians tend to refer patients to specialists while their male colleagues usually administer complex treatments themselves [29]. Furthermore, women tend to be more interested in the aesthetic result than their male colleagues [27].

- **Patient-related factors**

When making a diagnosis and suggesting a treatment, the orthodontist must recognize the characteristics of the malocclusion and of the dentofacial deformity, identify the

nature of the problem as well as the related etiopathogenic factors, and asses the patient's individual and personal characteristics. Once the need for treatment is determined, and with the patient's interest in mind [16], the best therapeutic option must be found [30] by considering the following factors:

Clinical conditions

The treatment must be selected according to the severity of the malocclusion: the more serious the clinical condition, the longer and more complex the treatment will be [31]. The following clinical parameters, among others, must be considered: facial pattern, sagittal canine relationship [32], molar relationship, anterior crowding, overbite, the Bolton index [33], incisor angulations [34]. The best treatment must be selected according to the degree of alteration [35].

In this way, both the duration and complexity of the orthodontic treatment will largely vary depending on the severity of the occlusal alterations. For instance, the treatment will be longer if an extraction protocol is necessary [36]. Likewise, extraoral forces can be used in more complex situations such as significantly increased overjet, or when it is necessary to retract all the teeth in the arch, to limit mesial tooth displacement caused by premature extraction of temporary teeth, to redirect the growth pattern or to correct intermaxillary relationships [31]. In cases that are even more complex, such as facial dimorphism, orthognathic surgical procedures are necessary, as it is impossible to solve the problem with conventional orthodontics or by modifying the growth pattern [38].

Psychological factors

The patient's psychological profile has a major role, as it determines the extent to which results can be achieved [16]. This is because certain personality traits or the patients' psychological condition might affect how they adapt to the treatment [39]. There is ample evidence that the patient's cooperation, compliance and motivation has a significant role in the final result of orthodontic treatments: the lack of one of these aspects might endanger the

treatment, extend its duration and lead the clinician and the patient to frustration. Therefore, by assessing personality traits, orthodontists can predict how a patient will react to different treatments [40], which is useful when selecting a therapeutic modality [16].

It has also been found that patients with a greater awareness of the severity of their malocclusion seem to adapt more quickly and have less discomfort [31]. Therefore, they respond better to the treatment.

Decision-making capacity

Having decision-making capacity means possessing a number of psychological skills—cognitive, volitional and affective— that enable the individual to know, assess and adequately manage the information necessary to make a decision and express it [41].

It is necessary to understand the patients' preferences regarding their role in decision-making when selecting a therapy in order to optimize patient satisfaction and compliance with the treatment plan [17, 42], However, as patients tend to lack the relevant knowledge, many times they entrust their physicians with this decision [43].

- **Sociological factors**

Four main types of sociological factors influence the clinician's judgment: the characteristics of the patient; the characteristics of the clinician; the clinician's interaction with the healthcare system, and the clinician's relationship with the patient [44]. The first two have been described above, therefore they will not be dealt with below.

The clinician's interaction with the healthcare system

It has been shown that socioeconomic status, which is closely linked to the healthcare system, also influences treatment selection [45]. The healthcare system includes public and private care, with a wide range of processes and results achieved in both systems [46]. The public healthcare system usually provides basic care, whose quality depends on each

program and the resources allocated, as dentists recommend fewer treatment alternatives to lower-income patients, even when their pathologies have the same degree of severity or progress as those of patients in the private system, where the patient's capacity to pay is a negotiation factor [45].

Dentist-patient relationship

A favorable relationship, based on respect for the patient's autonomy, allows for joint decision-making, where the clinician helps the patient decide, and is also willing to accept help from the patient and to consider their opinion regarding possible diagnostic or therapeutic options [47].

It is also clinically important for orthodontists to understand how patients perceive their need for orthodontic treatment to select the best therapeutic approach, considering treatment preference and setting personalized objectives [14].

Ethical considerations in treatment selection

When assessing risks and benefits for the patient, we must follow an ethical decision process before deciding on a treatment plan [17]. The four basic principles must be considered: non-maleficence, justice, beneficence and autonomy [48].

Non-maleficence

Non-maleficence requires professionals not to intentionally cause harm; in Hippocrates words, *Primum non nocere: First do no harm*. That is to say, if in any voluntary or involuntary situation no good can be done, the minimum obligation is not to do any harm [48]. In other words, dentists must always avoid doing anything that might harm patients or cause them pain [49]. They must assess the risks and benefits of the treatment: when drawbacks outweigh benefits, the treatment must not be followed [48].

Likewise, the clinician should not see patients whose ailments correspond to a different specialization, except in urgent cases. These patients must be referred to the corresponding specialist without delay [49].

Therefore, the non-maleficence principle means that it is necessary to be an orthodontist to perform orthodontic treatments so as not to harm the patient. Likewise, orthodontists must only implement the treatments they have been trained for.

Justice

The concept of justice presupposes the equality of all human beings [48]; therefore, medical (and dental) care must be provided to patients according to their health needs, without distinction, privileges or preferences [49].

This principle states that all the therapeutic alternatives available must be offered to patients in order to solve their problem and meet their expectations, regardless of aspects beyond the patient's clinical condition. In orthodontics, this means that clinicians must have the necessary equipment to meet the needs of all their patients, without limiting the application of certain techniques on account of external situations.

Beneficence

Beneficence refers to acting to benefit the patient and society [49]. There can be no beneficence if the patient does not perceive it as such, or if the general beneficence of society is not respected [48]. This entails always considering the patient's needs and preferences when selecting the equipment or therapy to implement.

To do this, treating dentists must be up to date with knowledge, that is to say, be part of a continuous education process that will enable them to be familiar with state-of-the-art knowledge [49]. This will enable clinicians to provide patients with the best alternatives available to improve their situation.

Autonomy

Autonomy is the right of adult patients, or of legal guardians in the case of minors, to use their mental faculties to decide which healthcare procedures are implemented on them [49]. This includes self-determination, confidentiality and the right to select and/or reject the

treatment. The dentist must inform the patient about all the reasonable and appropriate treatment options, so that the patient can actively participate in treatment decision-making [17]. Autonomy is expressed through informed consent, which in orthodontics must provide information about the nature of the treatment, explain the need for treatment, benefits, prognosis, duration, complexity and alternatives to the treatment proposed, including the option not to implement such treatment [50].

Behavioral theories

Besides the above considerations, some theories try to explain human behavior, which might be applied to understanding therapeutic decision-making in orthodontics. Among the most widely used theories to predict behavior and behavioral intention in health, the following three stand out: the theory of reasoned action (TRA), the theory of planned behavior (TPB) and the social cognitive theory (SCT) [51-53].

Theory of reasoned action

TRA, proposed by Fishbein and Ajzen in 1975 [54], relates attitudes, intentions and behavior. It specifically states that behavioral intention is the best way to predict behavior, and that intention is predicted by the intention to perform such behavior [52,55].

This theory might explain the selection of orthodontic treatment based on the clinician's personal attitude towards different pieces of equipment, that is to say, if they consider them positive or negative. In this way, orthodontists would select the treatment they considered to be the best one.

Theory of planned behavior

TPB, proposed by Ajzen in 1991, is an extension of the theory of reasoned action [54]. It is one of the most widely used psychosocial theoretical models and the one that has the greatest empirical support in a variety of behaviors [56]. This theory states that human behavior is influenced by three main factors: attitude (extent to which an individual evaluates a

relevant personal behavior as positive or negative), subjective norm (individuals' perception about the degree of approval or disapproval from relevant social groups) and perceived behavior control (degree of difficulty perceived by the individual regarding the performance of a specific action) [52, 54, 56, 57].

Based on TPB, besides considering their personal assessment of different therapeutic options, orthodontists would also consider the opinion of other professionals, that is to say, they will be more inclined to select a treatment that is better perceived by their peers or the therapy that seems to be the most popular one. Additionally, the degree of control over a given clinical decision is included, that is to say, the extent to which the success of the treatment can be guaranteed. For instance, the clinician might choose fixed appliances that do not depend on the patient's behavior but exclusively on their action.

Social cognitive theory

SCT, proposed by Albert Bandura, considers first of all personal attributes such as affective, cognitive, physical or biological internal states. It then includes external or environmental factors, and finally it considers a characteristic trait: explicit behavior. The theory highlights the dynamic interaction between the individual's development and the changing context, which gives rise to observable behavior. Regarding thought, beliefs and expectations, SCT proposes three social cognitive mechanisms that are relevant when selecting a behavior: self-efficacy (the extent to which an individual believes that they can succeed in a given task), outcome expectancies (personal beliefs on the probable response) and objectives (they help organize and guide behavior and also increase the chances of achieving the results proposed) [51].

When applied to orthodontics, this theory suggests that when selecting treatments, clinicians consider their perception on how prepared they are to implement such treatments, which is directly linked to their training and experience. Another factor that would influence clinical decision-making is how the outcomes of using each orthodontic appliance are valued,

jointly with the treatment objectives, which guide the selection according to clinical aims and what each alternative can achieve.

Discussion

It is now accepted that therapeutic decisions must be made based on scientific evidence [18], and that patients must actively participate in this process [17, 49]. However, this review has focused on a wide range of factors relative to the clinical decision-making process in orthodontics, which go well beyond the aspects mentioned.

Professional training is the main factor [11], as it determines the preference for specific treatment options. This is closely linked to the control they feel they have on therapeutic options, that is to say, how comfortable they feel when implementing them [52,54,56,57], and how confident they are about achieving the expected results [51]. The above description corresponds to the sociological factors mentioned above; therefore we can state that these aspects become very important in the clinical decision-making process.

In the daily practice of medicine (and dentistry) it is usual to have different doubts or questions [58]. This is where professional ethics becomes essential, as besides considering patient autonomy, it must allow professionals to make a personal judgement to determine if they have the skills needed to make a specific diagnosis or to implement certain treatments in given clinical situations [59]. This will enable them to implement the therapy safely and correctly, or to decide that the patient must be referred to a colleague that is better equipped to address the patient's condition, thus protecting their well-being.

Despite what has been presented above, we have found a small number of studies that focus on the clinical decision-making process both in medicine and dentistry. This makes the lack of knowledge in the area apparent, though it is extremely important to know how treatments are selected, as this process has a strong impact on patient care and satisfaction, achieving objectives, how public health services work and the quality of services.

It is therefore necessary to widen the scope of qualitative research so as to understand the decision-making process. This would enable us to determine which aspects are relevant for orthodontists when selecting a treatment and developing assessment scales that make it possible to establish the attitude they have towards the various therapeutic alternatives, and in this way simultaneously assess the application of behavioral theories (TRA, TPB, SCT) in this domain.

A similar study might be made into other areas of dentistry and medicine, as it is important to assess which clinician-related or healthcare system aspects influence treatment selection, other than the clinical situation or the psychological traits of patients, which should always be the starting point.

We also believe that there should be further studies into patient autonomy as provided by dentists, as this is an important factor nowadays and one which is sometimes neglected.

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