

REVIEW ARTICLE

Communication tools and patient satisfaction: A scoping review

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Abstract

Objective: This scoping review aimed to present an overview of the literature on communication tools in esthetic dentistry. A variety of communication tools have been proposed to include patients in the shared decision-making (SDM) workflow. Only little is known about implementing communication tools in dentistry and their impact on patient communication and patient satisfaction. A systematic literature search was performed in Medline, Embase, Cochrane, and World of Science to identify if communication tools have an impact on patient satisfaction.

Material and Methods: The search included studies from January 1, 2000 to March 3, 2020 published in English, focusing on patient communication tools and patient satisfaction in esthetic dentistry.

Results: Out of 6678 records, 53 full-texts were examined. Ten studies were included. Data of the included studies were extracted systematically and subsequently analyzed. All studies found that patient communication utilizing specific communication tools positively impacted either patient satisfaction, patient-dentist relationship, information retention, treatment acceptance, quality of care or treatment outcome.

Conclusions: Additional communication tools besides conventional verbal communication are able to enhance patient satisfaction, improve quality of care and establish a better patient-dentist relationship. It seems essential to further develop standardized communication tools for SDM in dental medicine, which will allow the comparison of research on this topic.

Clinical significance: This scoping review shows the importance of patient involvement in the decision-making process for improved patient satisfaction with esthetic dental treatments. With an increased implementation of communication tools, patient satisfaction and SDM may further improve in the future.

KEYWORDS

esthetic dentistry, patient communication tools, patient satisfaction, scoping review, shared decision making

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1 | INTRODUCTION

Patients desiring to improve their dental esthetics often face difficulties imagining potential treatment outcomes, as they cannot oversee all available possibilities regarding their final dental appearance.¹ Therefore, the diagnostic phase is of great importance for the patient, dentist and, dental technician to understand the patients' desires and expectations.^{2,3}

Within the last years, patient behavior evolved towards a more inclusive attitude regarding the decision-making process.^{4,5} This innovative patient-dentist relationship, in contrast to the previously established paternalistic model, is characterized by a shared involvement of the patient and the clinician in the process of treatment decision-making, known as shared decision-making (SDM).^{6,7} The two main goals of SDM are to inform patients comprehensively about different treatment possibilities and to understand patients' preferences and demands related to proposed options.⁷ Integrating the patient into the decision-making process demonstrates respect towards the patient and was reported to increase the patient's overall health, well-being, self-esteem, quality of health care, and satisfaction.⁸⁻¹⁰

A variety of communication tools were proposed to include patients in the SDM workflow.¹¹ In a conventional workflow, tools such as a manual wax-up of the desired dental shapes and sizes onto a stone cast can be used for communication. This proposition by the dental technician may subsequently be visualized by performing a clinical mock-up try-in.¹²

Recently, technological developments were proposed for the digital workflow, such as 2D/3D smile design or augmented reality (AR) software.^{11,13,14} In 2016, the first international Delphi Consensus Process was performed to develop a quality criteria framework for patient decision aids.¹⁵ Based on the work of the Cochrane Collaboration's systematic review group, the scope was to define quality standards for the development and evaluation of decision aids. A need for improved management of clinical decision-making and measurable quality improvement was stated to achieve patient-centered and efficient health care. However, only little is known about implementing

communication tools in dentistry and their impact on information and communication with the patient.^{13,16}

This scoping review aimed to present an overview of the literature regarding the impact of communication tools in esthetic dentistry. A selection of studies evaluating patients' satisfaction was performed to identify if communication tools applied before/during the treatment could bring medical benefits.

2 | MATERIALS AND METHODS

For the present review, PRISMA extension for scoping reviews was followed.¹⁷

(1) Identification of the research question, (2) Identification of relevant studies (database and keywords), (3) Determination of inclusion and exclusion criteria, (4) Data extraction, (5) Summary of the results.

3 | IDENTIFICATION OF THE RESEARCH QUESTION

This review aimed to analyze studies published in the field of esthetic dentistry which examined the use of communication strategies/tools (verbal/visual/device) for patient information and treatment planning and its' influence on patient satisfaction with the final treatment outcome.

4 | IDENTIFICATION OF RELEVANT WORK

Two main fields were identified: "communication of a certain treatment plan or SDM" and "esthetic dentistry." A derivative sequence of keywords and free terms was developed thereafter (Figure 1).

To identify potentially relevant studies, the following bibliographic databases were searched: Medline, Embase, Cochrane, and World of Science from January 1, 2000 to March 3, 2020. The search strategies were drafted by an experienced librarian (MVB) and further

FIGURE 1 Derivative sequence of key words

Communication/Shared decision making	Dentistry/Aesthetics
"verbal communication"[Title,Abstract] "medical decision making" [Title,Abstract] "treatment information"[Title,Abstract] "treatment information" [Title,Abstract] "treatment options" [Title,Abstract] "shared decision-making"[Title/Abstract] "dentist-patient relation"[Title/Abstract] "dentist-patient communication"[Title/Abstract] "patient decision-making"[Title/Abstract] "patient willingness"[Title/Abstract] "decision making, shared"[Mesh] "dentist-patient relations"[Mesh] "patient preference"[Mesh] "patient participation"[Mesh] "decision support, clinical"[Mesh] "consumer health information"[Mesh]	"face surgery"[Title,Abstract] "restorative dentistry"[Title,Abstract] "prosthodontics"[Mesh] "orthodontics"[Mesh] "periodontics"[Mesh] "tooth-bleaching agent »[Mesh] "opalescence"[Supplementary Concept] "oral surgical procedures"[Mesh]

- (A) ("Nonverbal Communication"[MeSH Terms] OR "decision making, shared"[MeSH Terms] OR "dentist-patient relations"[MeSH Terms] OR "clinical decision-making"[MeSH Terms] OR "Patient Preference"[MeSH Terms] OR "Patient Participation"[MeSH Terms] OR "Patient-Centered Care"[Mesh] OR "Nonverbal Communication" [Title/Abstract] OR "Verbal Communication"[Title/Abstract] OR "Patient-Centered Care"[Title/Abstract] OR "Treatment Options"[Title/Abstract] OR "Therapeutic Decision Making"[Title/Abstract] OR "Shared decision-making"[Title/Abstract] OR "Treatment Information"[Title/Abstract] OR "Dentist-patient relation*" [Title/Abstract] OR "Dentist-patient communication"[Title/Abstract] OR "Patient Decision-Making"[Title/Abstract]) AND ("Prosthodontics"[MeSH Terms] OR "Orthodontics"[MeSH Terms] OR "Periodontics"[MeSH Terms] OR "tooth bleaching agent opalescence"[Supplementary Concept] OR "surgery, oral"[MeSH Terms] OR "oral surgical procedures"[MeSH Terms] OR "maxillofacial surgery"[Title/Abstract] OR "face surgery"[Title/Abstract] OR "Facial Surgery"[Title/Abstract] OR "Restorative Dentistry"[Title/Abstract] OR "Prosthodontics"[Title/Abstract] OR "Orthodontics"[Title/Abstract] OR "Periodontics"[Title/Abstract])
- (B) ("Nonverbal Communication"[MeSH Terms] OR "decision making, shared"[MeSH Terms] OR "dentist-patient relations"[MeSH Terms] OR "clinical decision-making"[MeSH Terms] OR "Patient Preference"[MeSH Terms] OR "Patient Participation"[MeSH Terms] OR "Patient-Centered Care"[Mesh] OR "Nonverbal Communication" [Title/Abstract] OR "Verbal Communication"[Title/Abstract] OR "Patient-Centered Care"[Title/Abstract] OR "Treatment Options"[Title/Abstract] OR "Therapeutic Decision Making"[Title/Abstract] OR "Shared decision-making"[Title/Abstract] OR "Treatment Information"[Title/Abstract] OR "Dentist-patient relation*" [Title/Abstract] OR "Dentist-patient communication"[Title/Abstract] OR "Patient Decision-Making"[Title/Abstract]) AND ("Prosthodontics"[MeSH Terms] OR "Orthodontics"[MeSH Terms] OR "Periodontics"[MeSH Terms] OR "tooth bleaching agent opalescence"[Supplementary Concept] OR "surgery, oral"[MeSH Terms] OR "oral surgical procedures"[MeSH Terms] OR "maxillofacial surgery"[Title/Abstract] OR "face surgery"[Title/Abstract] OR "Facial Surgery"[Title/Abstract] OR "Restorative Dentistry"[Title/Abstract] OR "Prosthodontics"[Title/Abstract] OR "Orthodontics"[Title/Abstract] OR "Periodontics"[Title/Abstract])
- (C) (((nonverbal OR verbal) NEXT/1 communication):ab,ti OR 'patient-centered care':ab,ti OR 'treatment options':ab,ti OR ((therapeutic OR shared OR patient) NEXT/1 'decision making'):ab,ti OR 'treatment information':ab,ti OR ('dentist-patient' NEXT/1 ('relation*' OR communication)):ab,ti) AND (('maxillofacial' OR 'face' OR 'facial') NEXT/1 surgery):ab,ti OR 'restorative dentistry':ab,ti OR 'prosthodontics':ab,ti OR 'orthodontic':ab,ti OR 'periodontics':ab,ti)
- (D) (TS=(((nonverbal OR verbal) NEAR/1 communication) OR "patient-centered care" OR "treatment options" OR ((therapeutic OR shared OR patient) NEAR/1 "decision making") OR "treatment information" OR ("dentist-patient" NEAR/1 ("relation*" OR communication))) AND TS=(((("maxillofacial" OR "face" OR "facial") NEAR/1 surgery) OR "restorative dentistry" OR "prosthodontics" OR "orthodontic" OR "periodontics")))

FIGURE 2 (A) Search strategy developed for Pubmed. (B) Search strategy developed for Embase. (C) Search strategy developed for Cochrane. (D) Search strategy developed for Web of Science

refined through team discussions (Figure 2A–D). The final search results were exported into EndNote (Clarivate Analytics, London, UK), and duplicates were removed using Covidence (Covidence, Melbourne, Australia).

5 | DETERMINATION OF INCLUSION AND EXCLUSION CRITERIA

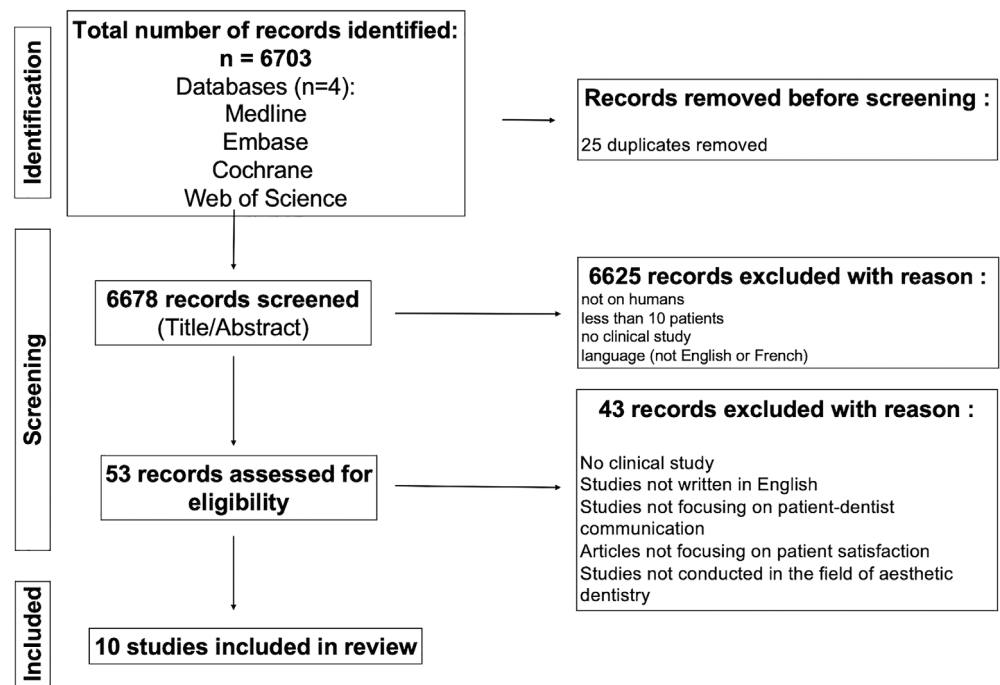
The inclusion criteria were: clinical studies in English language, involving human subjects published between January 1, 2000 and March 3, 2020. Only peer-reviewed studies were included. The exclusion

criteria were: (1) Not a clinical study (excluding case reports); studies involving less than 10 participants; (2) studies not conducted in the field of esthetic dentistry; (3) studies not focusing on patient-dentist communication; (4) studies not focusing on patient satisfaction; (5) studies not written in English.

6 | DATA CHARTING

To ensure consistency of the reviewing process, all authors first screened the first 50 publications, randomly selected, through a systematic review management software (Covidence, Melbourne,

FIGURE 3 Identification of relevant studies



Australia), discussed the results, and extracted data manually. Two reviewers (Malin Strasding and Romane Touati) sequentially evaluated the titles and thereafter the abstracts using the software as mentioned earlier. Afterward, three reviewers (Malin Strasding, Romane Touati, and Laurent Marchand) evaluated the full texts for potentially relevant studies. Disagreements on study selection were resolved by consensus and discussion with another author (Irena Sailer). (See Figure 3).

7 | DATA EXTRACTION

A data-extraction form was jointly developed by the authors (Malin Strasding (MS), Romane Touati (RT), and Laurent Marchand (LM) to determine which variables to extract. The three authors independently extracted the data, discussed the results, and continuously updated the data-extraction form in an iterative process.

Studies were classified in a table into 13 different categories (see Table 1 and Table 2): Study design; Field of specialization; Country; Study settings (university/private dental clinic/public health sector); Study period; Patient age; Gender distribution; Number of patients enrolled; Purpose of the study; Main findings; Tools used for patient-dentist communication (verbal, written, visual, digital); Methodology for assessment of patient satisfaction; Details of the assessment method. The studies were divided into two groups regarding the satisfaction assessment method. The first group included structured questionnaires using yes/no questions or Lickert's scale and the second group included semistructured questionnaires (SSQ) as defined for qualitative studies.^{18,19} According to this definition, structured questionnaires were using close-ended questions where the patient can only choose between the different possibilities given by the

interviewer, whereas SSQ gave the respondent the possibility to answer in his/her own words.^{18,19}

8 | RESULTS

The search of Medline, Embase, Cochrane, and Web of Science provided 6703 titles, yielding a total of 6678 titles upon duplicates removal. Of these, 6625 studies were excluded after reviewing the titles and abstracts, as they did not meet the inclusion criteria. The full texts of the remaining 53 studies were examined in detail. Forty-three studies did not meet the inclusion criteria (see Table 3 for the reasons for exclusion). Finally, 10 studies were included in this scoping review (Figure 3). All information retrieved from the included studies is given in Table 1 and Table 2.

All 10 studies were published between 2002 and 2018 and focused either on orthodontics ($n = 6$),^{20–25} prosthodontics ($n = 3$)^{26–28} or restorative dental treatment ($n = 1$).²⁹ Two of the six orthodontic studies included orthognathic surgery.^{20,25} Most studies were of Scandinavian origin.^{20,22,24,26,27} Six studies were conducted in a university setting,^{20,21,23,25,28,29} two in the public dental health sector,^{22,24} while two studies were conducted in a private clinic setting.^{26,27} The number of patients enrolled varied between a minimum of $n = 24$ patients²⁹ and a maximum of $n = 151$ patients.²² Patients of all age groups were included (for details, see Table 1 and Table 2).

The aims of the included studies were to investigate patient satisfaction with treatment outcomes, patient satisfaction with patient-dentist communication and preferred communication tools, and the evaluation/investigation of factors influencing patient satisfaction. Patient satisfaction was evaluated in one study with a SSQ,²¹ while the other nine studies used a structured questionnaire (quantitative

TABLE 1 Extracted data of included articles 1–5

Article number	1	2	3	4	5
General information					
Title	Introduction and assessment of orthognathic information clinic	The dentist's communicative role in prosthodontic treatment	Dentist-patient communication and patient satisfaction in prosthetic dentistry	Factors influencing satisfaction with the process of orthodontic treatment in adult patients	Orthognathic surgery: Pretreatment information and patient satisfaction
Authors	Bergkulla, N.; Hanninen, H.; Alanko, O.; Tuomisto, M.; Kurimo, J.; Miettinen, A.; Svedstrom-Oristo, A. L.; Cunningham, S.; Peltomaki, T.	Sondell, K.; Palmqvist, S.; Soderfeldt, B.	Sondell, K.; Soderfeldt, B.; Palmqvist, S.	Wong, L.; Ryan, F. S.; Christensen, L. R.; Cunningham, S. J.	Alkharafi, L.; AlHajery, D.; Andersson, L.
Journal	European Journal of Orthodontics	International Journal of Prosthodontics	International Journal of Prosthodontics	American Journal of Orthodontics and Dentofacial Orthopedics	Medical Principles and Practice
Year of publication	2017	2004	2002	2018	2014
Reference	Eur J Orthod. 2017 Nov 30;39(6):660–664	Int J Prosthodont. 2004 Nov-Dec;17(6):666–71	Int J Prosthodont. 2002 Jan-Feb;15(1):28–37	Am J Orthod Dentofacial Orthop. 2018 Mar;153(3):362–370	Med Princ Pract. 2014;23(3):218–24
Study information					
Study design	Cohort study	Cohort study	Cohort study	Cross-sectional study	Cohort study
Field of specialization	Orthognathic Surgery and Orthodontics	Prosthodontics	Prosthodontics	Orthodontics	Orthognathic Surgery and Orthodontics
Country	Finland	Sweden	Sweden	England	Kuwait
University/private setting	University	Three specialist clinics	Three specialist clinics	University and Private practice	Four specialist clinics
Study period	2013–2014	1998–1999	1998–1999	n.a.	n.a.
Patient age	15–67 years	mean: 53 years (male)-54 years (female)	mean: 53 years (male)-54 years (female)	40–57 years	mean: 21,1 years
Gender distribution	32% male, 68% female	51% male, 49% female	51% male, 49% female	15% male, 85% female	29.7% male, 70.3% female
Number of patients enrolled	85	61	61	26	74
Specific information					
Purpose of the study	Assessment of patients opinion and satisfaction on a new information clinic and statistic analysis of this new information clinic.	Investigation of the dentist's role in the provider-patient relationship as to verbal communication and patient satisfaction with the treatment outcome in prosthetic dentistry.	To investigate the patient-dentist communication dimensions on patient satisfaction. 2 satisfaction concepts were specified: satisfaction with single visit (care) and	Investigating factors influencing patient satisfaction with the process of orthodontic treatment.	The influence of pre-treatment information on over all posttreatment satisfaction after orthognathic surgery.

TABLE 1 (Continued)

Specific information					
				satisfaction with the overall treatment outcome.	
Main findings	Patients gave positive feedback for “information clinic” - this system got implemented into clinical routine. The provided information was to help in the decision-making process to proceed; not proceed with orthognatic treatment in general.	Patient evaluation of the care during an encounter is dependent on the dentist's verbal communication activity during the encounter (short term). This communication has no impact on the satisfaction with the overall prosthetic treatment outcome in the intermediate time perspective.	The study showed the importance of the opportunity for patients to ask and talk about their dental health situation. Dentists generally should listen more and talk less during a treatment intervention. The study shows the feasibility to examine the communication process in dentistry.	In general, patients were satisfied with the process of treatment. Out of several factors (themes), quality of communication has a major impact on patient satisfaction. Making patients feel involved in their own care showed a benefit for satisfaction. Communication skills training for staff should be provided.	Participants were more likely to be satisfied when they were provided with more information about discomfort and surgical risks.
Tools used for patient communication/shared decision-making	Interdisciplinary Information clinic, prior to taking the patient records and prior to treatment begin. Present specialists: orthodontist, oral hygienist, oral and maxillofacial surgeon, psychologist as well as a previous patient. 15–20 min talks with each specialist were undertaken. In addition to verbal and written explanation, a digital &\$\$\$;	Verbal communication was used. Communication was recorded and analyzed and seven dimensions of verbal communication were found.	Verbal communication was used. Communication was recorded and analyzed and seven dimensions of verbal communication were found.	No tools specifically described, verbal communication only	Verbal communication was used.
Assessment method	Questionnaire	Two Questionnaires	Two Questionnaires	Semistructured interview	Telephone interview with a structured questionnaire
Details of the assessment method	An existing questionnaire was translated, adapted, and expanded to suit the needs of this study.	First questionnaire for assessment of patient satisfaction with care (during treatment). 11 questions total; eight questions based on Dental Visit Satisfaction Scale. Second questionnaire: patient satisfaction with treatment outcome (end of	The “patient satisfaction with treatment outcome” questionnaire was distributed twice during the treatment period: once before treatment begin and once 3 months after completion of treatment. The “patient satisfaction with care” questionnaire	Qualitative interview: large amount of data were analyzed to generate themes and subthemes regarding patient satisfaction. Communication strategy was one of the four themes extracted.	The questions aimed at exploring if the patients were sufficiently informed about risks, discomforts, functional problems (among others) before and during treatment. Questions about the overall satisfaction with

(Continues)

TABLE 1 (Continued)

Specific information		
treatment). Questionnaire given at baseline and 3 months after completing treatment.	analyzed the satisfaction from a short-term perspective (11 questions derivate from the Dental Visit Satisfaction Scale).	treatment were also included.

TABLE 2 Extracted data of included articles 6–10

Article number General information	6	7	8	9	10
Title	Adolescents' perception of the quality of orthodontic treatment	Satisfaction with orthodontic treatment	Patient self-reported satisfaction with maxillary anterior dental implant treatment	Satisfaction with orthodontic treatment outcome	The effect of esthetic consultation methods on acceptance of diastema-closure treatment plan: a pilot study
Authors	Larsson, B. W.; Bergstrom, K.	Keles, F.; Bos, A.	Levi, A.; Psoter, W. J.; Agar, J. R.; Reisine, S. T.; Taylor, T. D.	Feldmann, I.	Almog, D.; Sanchez Marin, C; Proskin, H. M.; Cohen, M. J.; Kyrkanides, S.; Malmstrom, H.
Journal	Scandinavian Journal of Caring Sciences	The Angle Orthodontist	International Journal of Oral & Maxillofacial Implants	The Angle Orthodontist	Journal of the American Dental Association
Year of publication	2005	2013	2003	2014	2004
References	Scand J Caring Sci. 2005 Jun;19(2):95–101	Angle Orthod. 2013 May;83(3):507–11	Int J Oral Maxillofac Implants. 2003 Jan-Feb; 18(1):113–20	Angle Orthod. 2014 Jul;84 (4):581–7	J Am Dent Assoc. 2004 Jul;135 (7):875–81
Study information					
Study design	Cross-sectional study	Trend study	Observational study	Observational study	Pilot study
Field of specialization	Orthodontics	Orthodontics	Prosthodontics	Orthodontics	Restorative dentistry
Country	Sweden	Netherlands	USA	Sweden	USA
University/private setting	Public dental service - orthodontic clinic	University	University	Public dental service - orthodontic clinic	University
Study period	2001	2008–2009	2000	n.a.	n.a.
Patient age	mean: 17, 1 years	<30 years	18–80 years, mean: 56 years	mean: 14.3 years	18–60 years, mean: 34.9 years
Gender distribution	47% male, 53% female	34.8% male, 65.2% female	47.4% male; 52.5% female	male: $n = 54$; female: $n = 56$	20.8% male, 79.2% female
Number of patients enrolled	151	115	78	110	24
Specific information					
Purpose of the study	(1) Description of adolescent's perception	The examination of patients'	The assessment of the overall patient	The evaluation of the factors associated	The assessment of preferred

TABLE 2 (Continued)

Specific information	of quality of care receiving orthodontic treatment. (2) Assessment of relationship between patient's perception of quality of orthodontic care and their self-reported experiences of various outcome-related aspects on the other.	satisfaction with the received orthodontic treatment.	satisfaction with the treatment outcome.	with treatment outcome satisfaction.	communication tools to help the patients best understand and visualize the treatment plan and esthetic changes.
Main findings	The implication of the patient in the decision-making process enhanced the perception of quality of care. The possibility to participate in the SDM process contributed to an overall higher satisfaction rating. More active involvement of patients in the decision-making process is suggested.	The dentist-patient relationship was the most important factor contributing to patient satisfaction.	Communication between dentist and patient is important to achieve an optimal esthetic result that will be satisfactory to both parties, since their perceptions of esthetics do not necessarily coincide.	In order to improve orthodontic treatment outcome, a more active involvement of patients in the decision-making process is suggested.	Digital computer-imaging simulation is more effective in achieving treatment plan acceptance than the three other methods.
Tools used for patient communication/shared decision-making	No tools specifically described, verbal communication only	No tools specifically described, verbal communication only	No tools specifically described, verbal communication only	No tools specifically described, verbal communication only	(1) Before/after photos of other patients; (2) Wax-up on model of patient; (3) Intraoral mock-up; (4) Digital computer-imaging simulation. Every patient received every tool.
Assessment method	Quality from the Patient's perspective Questionnaire (QPP)	Questionnaire	Self-administered questionnaire	Two Questionnaires	Two Questionnaires
Details of the assessment method	The QPP questionnaire was modified and adapted to fit this study. The quality of care as well as the outcome-related aspects were included in this questionnaire.	58 items questionnaires with 11 items on satisfaction with doctor-patient relationship. Questions about patient satisfaction and patient perspective on treatment outcome.	The 24 items, self-administered, structured questionnaire was developed specifically for this project. Questions include satisfaction with information prior to treatment and satisfaction with the dentist.	First questionnaire prior to treatment: 11 items concerning treatment motivations and expectations. Second questionnaire: after active treatment at first visit in retention phase. Questions about satisfaction with treatment outcome, general quality of care, perceived pain, and discomfort during active treatment.	First questionnaire: given to patient directly after each consultation method with questions to determine the subject's perceptions regarding treatment plan acceptance. Second questionnaire: to compare the four methods and to determine the preferred method.

TABLE 3 List of excluded articles with reasons for exclusion

Title	Reason for exclusion
Barber, S.; Pavitt, S.; Meads, D.; Khambay, B.; Bekker, H. Can the current hypodontia care pathway promote shared decision-making? <i>Journal of Orthodontics</i> Jun 2019;46 (2): 126–136 2019 Jun	Not addressing patient satisfaction with treatment outcome
de Souza, R. A.; de Oliveira, A. F.; Pinheiro, S. M.; Cardoso, J. P.; Magnani, M. B. Expectations of orthodontic treatment in adults: the conduct in orthodontist/patient relationship <i>Dental Press J Orthod</i> Mar-Apr 2013;18(2):88–94 2013 Mar-Apr	Not addressing SDM or satisfaction with information prior to treatment
Dunbar, A. C.; Bearn, D.; McIntyre, G. The Influence of Using Digital Diagnostic Information on Orthodontic Treatment Planning - A Pilot Study <i>Journal of Healthcare Engineering</i> Dec 2014;5 (4):411–427 2014 Dec	No link to SDM and patient information prior to treatment
Knobel, A.; Haßfeld, S. Preoperative information. Development of a multimedia-based system on CD-ROM to give preoperative information to patients acceptance of the system <i>Mund-, Kiefer- und Gesichtschirurgie</i> 2005;9(2):109–115 2005	No information on treatment outcome
Ben Gasseem, A.; Foxton, R.; Bister, D.; Newton, J. T. Patients' Acceptability of Computer-Based Information on Hypodontia: a Randomized Controlled Trial <i>JDR clinical and translational research</i> 2018;3(3):246–255 2018	No information on treatment outcome
Bradley, E.; Shelton, A.; Hodge, T.; Morris, D.; Bekker, H.; Fletcher, S.; Barber, S. Patient-reported experience and outcomes from orthodontic treatment <i>Journal of Orthodontics</i> 2020;():1465312520904377 2020	Not about patient satisfaction with communication/information given
Carr, K. M.; Fields, H. W.; Beck, F. M.; Kang, E. Y.; Kiyak, H. A.; Pawlak, C. E.; Firestone, A. R. Impact of verbal explanation and modified consent materials on orthodontic informed consent <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Feb 2012;141(2): 174–186 2012 Feb	Not addressing patient satisfaction with treatment outcome
Barkhordar, A.; Pollard, D.; Hobkirk, J. A. A comparison of written and multimedia material for informing patients about dental implants <i>Dent Update</i> Mar 2000;27(2):80–42 2000 Mar	Poster, no article
Othman, S.; Lyons, T.; Cohn, J. E.; Shokri, T.; Bloom, J. D. The Influence of Photo Editing Applications on Patients Seeking Facial Plastic Surgery Services <i>Esthetic Surgery Journal</i> 2020;():2020	Not in dentistry
Patel, J. H.; Moles, D. R.; Cunningham, S. J. Factors affecting information retention in orthodontic patients <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Apr 2008;133(4): S61–S67 2008 Apr	Not addressing patient satisfaction with treatment outcome
Patel, A. M.; Richards, P. S.; Wang, H. L.; Inglehart, M. R. Surgical or non-surgical periodontal treatment: Factors affecting patient decision making <i>Journal of Periodontology</i> 2006;77(4): 678–683 2006	Not in esthetic dentistry
Reissmann, D. R.; Bellows, J. C.; Kasper, J. Patient Preferred and Perceived Control in Dental Care Decision Making <i>Jdr Clinical & Translational Research</i> Apr 2019;4(2):151–159 2019 Apr	Not addressing patient satisfaction with treatment outcome
Parker, K.; Cunningham, S. J.; Petrie, A.; Ryan, F. S. Randomized controlled trial of a patient decision-making aid for orthodontics <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Aug 2017;152(2):154–160 2017 Aug	No treatment conducted
Miller, J. R.; Larson, B. E.; Satin, D.; Schuster, L. Information-seeking and decision-making preferences among adult orthodontic patients: an elective health care model <i>Community Dentistry and Oral Epidemiology</i> Feb 2011;39(1):79–86 2011 Feb	Not addressing patient satisfaction with communication/information given
Anderson, M. A.; Freer, T. J. An orthodontic information package designed to increase patient awareness <i>Australian Orthodontic Journal</i> 2005;21(1):11–18 2005	Not addressing patient satisfaction with treatment outcome
Barber, S. Shared decision-making in orthodontics: Are we there yet? <i>J Orthod</i> Jun 2019;46 (1_suppl):21–25 2019 Jun	Not a clinical study
Thomson, A. M.; Cunningham, S. J.; Hunt, N. P. A comparison of information retention at an initial orthodontic consultation <i>European Journal of Orthodontics</i> Apr 2001;23(2):169–178 2001 Apr	Not addressing patient satisfaction with communication/information given
Rivas Ruiz, F. Variability in Therapeutic Decision Making: Evaluation of the Validity of an Information and Communication Technology Tool <i>Actas Dermo-Sifiliograficas</i> 2017;108 (7):607 2017	Not a clinical study
Sousa Dias, N.; Tsingene, F. SAEF - Smile's Esthetic Evaluation form: a useful tool to improve communications between clinicians and patients during multidisciplinary treatment <i>The European journal of esthetic dentistry: official journal of the European Academy of Esthetic Dentistry</i> 2011;6(2):160–176 2011	Not a clinical study
Srai, J. P. K.; Petrie, A.; Ryan, F. S.; Cunningham, S. J. Assessment of the effect of combined multimedia and verbal information vs verbal information alone on anxiety levels before bond-up	Not addressing patient satisfaction with treatment outcome

TABLE 3 (Continued)

Title	Reason for exclusion
in adolescent orthodontic patients: A single-center randomized controlled trial <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Oct 2013;144(4):505–511 2013 Oct	
Rozier, R. G.; Horowitz, A. M.; Podschun, G. Dentist-patient communication techniques used in the United States: The results of a national survey <i>Journal of the American Dental Association</i> 2011;142(5):518–530 2011	Not addressing patient satisfaction with treatment outcome
Al-Silwadi, F. M.; Gill, D. S.; Petrie, A.; Cunningham, S. J. Effect of social media in improving knowledge among patients having fixed appliance orthodontic treatment: A single-center randomized controlled trial <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Aug 2015;148(2):231–237 2015 Aug	Not addressing patient satisfaction with treatment outcome
Alagesan, A.; Vaswani, V.; Vaswani, R.; Kulkarni, U. Knowledge and awareness of informed consent among orthodontists and patients: A pilot study <i>Contemp Clin Dent</i> Sep 2015;6(Suppl 1):S242–7 2015 Sep	Not addressing patient satisfaction with treatment outcome
Ahn, J. H. B.; Power, S.; Thickett, E.; Andiappan, M.; Newton, T. Information retention of orthodontic patients and parents: A randomized controlled trial <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Aug 2019;156(2):169 – +2019 Aug	Not addressing patient satisfaction with treatment outcome
Kupke, J.; Wicht, M. J.; Stutzer, H.; Derman, S. H. M.; Lichtenstein, N. V.; Noack, M. J. Does the use of a visualized decision board by undergraduate students during shared decision-making enhance patients' knowledge and satisfaction? - A randomized controlled trial <i>European Journal of Dental Education</i> Feb 2013;17(1):19–25 2013 Feb	Not addressing patient satisfaction with treatment outcome
Levine, T. P. The effects of a humorous video on memory for orthodontic treatment consent information <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> Feb 2020;157(2):240–244 2020 Feb	Not addressing patient satisfaction with treatment outcome
Chi, J. J. Reflections on Shared Decision Making <i>Otolaryngology-Head and Neck Surgery</i> Nov 2018;159(5):809–810 2018 Nov	Not in dentistry
Gebhard-Achilles, W. PEP: patient-supported esthetic protocol <i>Eur J Esthet Dent</i> Winter 2013;8(4):492–505 2013 Winter	Not a clinical study
Ersoz, M.; Uz, Z.; Malkoc, S.; Karatas, M. A Patient- and Family-Centered Care Approach to Orthodontics: Assessment of Feedbacks from Orthodontic Patients and Their Families <i>Turkish Journal of Orthodontics</i> Jun 2016;29(2):38–43 2016 Jun	No assessment of communication
Chen, J. H.; Huang, H. L.; Lin, Y. C.; Chou, T. M.; Ebinger, J.; Lee, H. E. Dentist-Patient Communication and Denture Quality Associated with Complete Denture Satisfaction Among Taiwanese Elderly Wearers <i>Int J Prosthodont</i> Sep-Oct 2015;28(5):531–7 2015 Sep-Oct	Not in esthetic dentistry
Kafantaris, S. N.; Tortopidis, D.; Pissiotis, A. L.; Kafantaris, N. M. Factors Affecting Decision-Making For Congenitally Missing Permanent Maxillary Lateral Incisors: A Retrospective Study <i>The European journal of prosthodontics and restorative dentistry</i> 2020;28(1):43–52 2020	Not addressing patient satisfaction with treatment outcome
Bassi, F.; Carr, A. B.; Chang, T. L.; Estafanous, E.; Garrett, N. R.; Happonen, R. P.; Koka, S.; Laine, J.; Osswald, M.; Reintsema, H.; Rieger, J.; Roumanas, E.; Estafanous, E.; Salinas, T. J.; Stanford, C. M.; Wolfaardt, J. Oral Rehabilitation Outcomes Network-ORONet <i>The International journal of prosthodontics</i> 2013;26(4):319–322 2013	Not a clinical study
Shahrani, I.; Tikare, S.; Togoo, R. A.; Qahtani, F.; Assiri, K.; Meshari, A. Patient's satisfaction with orthodontic treatment at King Khalid University, College Of Dentistry, Saudi Arabia <i>Bangladesh Journal of Medical Science</i> Apr 2015;14(2):146–150 2015 Apr	Not in esthetic dentistry
Delivery of information to orthodontic patients using social media <i>Evidence-based dentistry</i> 2017;18(2):59–60 2017	Not addressing patient satisfaction with treatment outcome
Wright, N. S.; Fleming, P. S.; Sharma, P. K.; Battagel, J. Influence of Supplemental Written Information on Adolescent Anxiety, Motivation and Compliance in Early Orthodontic Treatment <i>Angle Orthodontist</i> Mar 2010;80(2):329–335 2010 Mar	Not addressing patient satisfaction with treatment outcome
Marshman, Z.; Eddaiki, A.; Bekker, H. L.; Benson, P. E. Development and evaluation of a patient decision aid for young people and parents considering fixed orthodontic appliances <i>Journal of Orthodontics</i> 2016;43(4):276–287 2016	Not addressing patient satisfaction with treatment outcome
Yu, M. S.; Jang, Y. J. Preoperative computer simulation for asian rhinoplasty patients: Analysis of accuracy and patient preference <i>Esthetic Surgery Journal</i> 2014;34(8):1162–1171 2014	Not in dentistry
Abualfaraj, R. J.; McDonald, F.; Daly, B.; Scambler, S. Patients with cleft: Experiences, understanding and information provision during treatment <i>Orthodontics & Craniofacial Research</i> Nov 2019;22(4):289–295 2019 Nov	Not in dentistry

(Continues)

TABLE 3 (Continued)

Title	Reason for exclusion
Guest, W.; Forbes, D.; Schlosser, C.; Yip, S.; Coope, R.; Chew, J. aspects of elective surgery patients' decision-making experiences <i>Nursing Ethics</i> Sep 2013;20(6):672–683 + B502013 Sep	Not a clinical study
Lin, M. L.; Huang, C. T.; Chiang, H. H.; Chen, C. H. Exploring ethical aspects of elective surgery patients' decision-making experiences <i>Nursing Ethics</i> Sep 2013;20(6):672–683 2013 Sep	Not addressing patient satisfaction with treatment outcome
Kufta, K.; Peacock, Z. S.; Chuang, S. K.; Inverso, G.; Levin, L. M. Components of Patient Satisfaction After Orthognathic Surgery <i>J Craniofac Surg</i> Jan 2016;27(1):e102-52016 Jan	Not in esthetic dentistry
Herrero Antón De Vez, H.; Herrero Jover, J.; Comas, R. Personalized medicine: Technological bridge between patient and surgeon by 3D printed surgical guide in rhinoplasty <i>International Journal of Computer Assisted Radiology and Surgery</i> 2018;13():S228-S2302018	Not in dentistry
Chikaher, A.; Stagnell, S.; Morton, A.; Sherry, M. The role of 3D printing in a district general hospital oral and maxillofacial department <i>British Journal of Oral and Maxillofacial Surgery</i> 2016;54(10):e712016	Poster, no article

method). The following communication strategies/tools were applied: verbal ($n = 4$),^{21,25–27} verbal and visual ($n = 2$).^{20,29} Four studies did not mention additional tools for communication, and followed the conventional, verbal approach.^{21–24,28}

The tools applied in the two studies that used verbal and visual communication methods were: (a) A PowerPoint presentation for patient information before orthognathic/orthodontic treatment²⁰; (b) A comparative analysis of four visual tools: (1) Before and after photos of other patients; (2) Wax-up on the model of the patient; (3) Intraoral Mock-up; (4) Digital computer-imaging simulation. Every patient received four information sessions, each with a different tool. To determine patients' perceptions regarding treatment plan acceptance, they were given a questionnaire after each information session. Subsequently, patients were asked to compare the four communication tool methods and to determine their preferred method. The computer-imaging was significantly more effective in achieving treatment plan acceptance than the other three methods and was best ranked by patients. Additionally, patients liked taking home photos to share with their families.

All studies found that patient communication utilizing specific communication tools (verbal, visual, and advice) positively impacted either patient satisfaction, patient-dentist relationship, information retention, treatment acceptance, quality of care or treatment outcome (Table 1 and Table 2).

9 | DISCUSSION

The present scoping review identified studies that investigated communication tools for patients and their impact on patient satisfaction in the field of esthetics in dentistry. During the review process, a considerable amount of case reports presenting different available tools were found.

Even though case reports and studies with less than 10 participants were excluded to elevate the evidence level, 10 clinical observational studies met the inclusion criteria. This indicates the general lack of high-quality evidence in this field of research, which is remarkable, considering the rapid development of digital tools in dentistry during recent years.^{30–33}

Today, approximately 15 smile design software are available for dental professionals.³⁰ In particular, AR has gained access to healthcare and gradually plays a role in dentistry, too.^{11,34–38} AR technology is used for medical and dental purposes with the aim, among others, to simulate specific treatment goals.^{11,38}

Most studies included in this review were published by Scandinavian research groups, such as Sweden and Finland. One potential explanation for the leading role of these countries in respect to patient involvement in healthcare may be the Nordic leadership style, which comes along with a flat hierarchical structure in Scandinavian countries, and might promote a less paternalistic patient-dentist relation.³⁹ Additionally, the Nordic health care system aims to increase patients' involvement in treatment planning and decision-making.⁴⁰ The primary aim of several health care reforms in the Nordic countries during the last years was to improve responsiveness to patients.⁴⁰ In this sense, all Nordic countries have taken measures to strengthen the role of patients.⁴⁰

Another key finding of the present review is that most of the included studies were published in the field of orthodontics,^{20–25} followed by prosthodontics.^{26–28} As orthodontic and orthognathic treatments often result in substantial changes of dental and facial esthetics, it is comprehensible that research on improvement of patient communication, patient involvement, and SDM has its focus in this dental field.^{41–44} Nevertheless, with an increasing interest in improving facial esthetics not only in respect to tooth position but also in color and shape, the importance of patient communication and SDM is rapidly increasing in other disciplines, including prosthodontics.⁵

In general, in the health sector, a trend to use new, digital tools for patient information, patient-doctor communication, and treatment planning can be observed.^{45,46} Core specialization fields are esthetic and reconstructive surgery, as well as cancer therapy. In cancer therapy, patient involvement by SDM is very well established, and rapidly increasing with the use of new patient-doctor communication technologies.^{47,48}

Whereas, in dental medicine, the implementation of communication tools in esthetics remains limited chiefly to conventional verbal communication. However, two studies used additional tools for

patient-dentist communication and patient involvement in the decision-making process.^{20,29} Only one clinical study compared different tools,²⁹ which demonstrates the lack of clinical evidence regarding the use of modern communication tools for patient involvement. This stands in contrast to developments mentioned above in the field of SDM and digital technologies, especially considering AR to gain importance in improving communication and supporting decision aids for patients.^{11,35,38}

Regarding the evaluation of patient satisfaction with communication and treatment outcome, a large variety of evaluation methods was found to be applied. Multiple different questionnaires were used by the different research groups, making the comparison among studies difficult. One research group used a SSQ,²¹ while all other groups used structured questionnaires. SSQs are effective when the study's purpose is to collect qualitative information and to explore patients' thoughts, feelings and beliefs.^{18,19} Within the structured questionnaires, a great variance of scales and questions (VAS scale, Lickert scale, and others) were applied. Not all of them were validated before usage.

Therefore, it seems essential to further develop standardized communication tools for SDM in dental medicine, which will allow the comparison of research on this topic. Additionally, these tools and methods should underly a scientific validation. Secondly, there is a need for standardized questionnaires to assess the impact of communication tools on patient satisfaction. The variety of questionnaires may be reduced to less, significant questionnaires, facilitating comparability among studies. Ultimately, more clinical evidence through controlled clinical trials is needed to prove the additional benefit of communication tools in dentistry for the involvement of patients in the decision-making process.

The results of this study must be carefully interpreted. One limitation is that the 10 included studies are heterogeneous in terms of sample size and rigor in the description of the methodology. Despite a rigorous and transparent methodology, some potentially includable studies may have been missed. Furthermore, some studies were possibly not included because of the authors' choice of key-words and terms.

10 | CONCLUSIONS

This scoping review shows the importance of patient involvement in the decision-making process for improved patient satisfaction with esthetic dental treatments. Additional communication tools besides conventional verbal communication enhances patient satisfaction with the treatment outcome, improve quality of care and establish a better patient-dentist relationship. With an increased implementation of digital tools in esthetic dentistry, patient communication and SDM may further improve in the future.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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