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Shared decision-making and choice for elective surgical care: A systematic review

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Abstract

Objective—Shared Decision-Making (SDM), an integrative patient-provider communication process emphasizing discussion of scientific evidence and patient/family values, may improve quality care delivery, promote evidence-based practice, and reduce overuse of surgical care. Little is known however regarding SDM in elective surgical practice. The purpose of this systematic review is to synthesize findings of studies evaluating use and outcomes of SDM in elective surgery.

Data Sources—Pubmed, CochraneCENTRAL, EMBASE, CINAHL, and SCOPUS electronic databases

Review Methods—We searched for English-language studies (1/1/1990 to 8/9/2015) evaluating use of SDM in elective surgical care. Identified studies were independently screened by two reviewers in stages of title/abstract and full-text review. We abstracted data related to population, study design, clinical dilemma, use of SDM, outcomes, treatment choice, and bias.

Results—Of 10,929 identified articles, 24 met inclusion criteria. The most common area studied was spine (7/24) followed by joint (5/24) and gynecological surgery (4/24). Twenty studies used decision aids/support tools, including modalities that were multimedia/video (13/20), written (3/20), or personal coaching (4/20). Effect of SDM on preference for surgery were mixed across

studies, showing a decrease in surgery (9/24), no difference (8/24), or increase (1/24). SDM tended to improve decision quality (3/3) as well as knowledge/preparation (4/6), while decreasing decision conflict (4/6).

Conclusion—SDM reduces decision conflict and improves decision quality for patients making choices about elective surgery. While net findings show that SDM may influence patients to choose surgery less often, the impact of SDM on surgical utilization cannot be clearly ascertained.

Keywords

Shared Decision-Making; preference-sensitive surgery; overuse; Informed Decision-Making; Elective Surgery; Decision Aid; Decision Support Tool; Elective Surgery; Systematic Review; appropriate use

INTRODUCTION

Shared decision-making is a collaborative process in which patients and providers work together to find a mutually agreed upon treatment plan.¹ SDM may reduce indiscriminate use of medical interventions and unwanted variation of care by promoting patients' involvement in their own treatment¹. Key components of the SDM process include patients' developing and expressing their personal values as well as treatment goals and preferences, the provider sharing information about clinical context and medical evidence, and a collaborative conversation to make a joint decision that is evidence-based and consistent with best practices. The practice can be standardized through use of a decision aid, which is a tool (e.g., videodisc, booklet) that educates the patient, improves their knowledge of the risks and benefits of treatment options, and provides them with evidence regarding factors of their condition. Many decision aids also include some sort of patient values clarification, which is one of the characteristics that distinguish these tools from typical educational materials.²

Although the goals of SDM are broadly applicable across health conditions, SDM may be a particularly key strategy for elective, or "preference-sensitive," treatment decisions³. A preference-sensitive decision is one in which there is a lack of clear scientific evidence showing superiority of one treatment, and treatment choices vary in ways that may matter to patients^{2, 3}. In such cases, surgery may be recommended according to local norms or practice patterns, rather than patient preferences, leading to overuse or inappropriate surgical utilization.^{4, 5} SDM has been shown to ameliorate these patient reactions.⁶ In essence, by applying SDM and actively including the patient in the decision through elicitation of their preferences and values, contributors to unwarranted variation, such as surgeon preference, financial incentives and local practice patterns, may be overcome, and quality of care may be increased. SDM is considered to be a potential solution for improving quality of care⁷ and guideline-based practice in surgical care.

SDM has also been lauded and incorporated into health policy and clinical practice initiatives worldwide.⁸ Within the U.S. alone, the Patient Protection and Affordable Care Act (PPACA) defines and proposes SDM as one method to reform healthcare delivery and payment by the newly established Center for Medicare and Medicaid Innovation.⁹ Moreover,

several states have implemented SDM and decision support tools into policy via legislation, demonstration projects, or incorporation into standards set by alternative payment systems (e.g. accountable care organizations).¹⁰

Despite the emphasis on SDM to improve quality of treatment decisions and reduce overuse and unwarranted care variation, little is known about how SDM actually influences patients' choice for elective surgery in everyday practice. The aim of this paper is to systematically review the published literature evaluating the impact of SDM on patient choice for elective surgery. We further seek to evaluate how SDM and decision aids are applied in elective surgical practice, and what outcome measures are used to assess the impact of SDM.

METHODS

Data sources and searches

The protocol for the study has been registered with PROSPERO, an international prospective registry of systematic reviews.¹¹ We based our study methodology upon the Preferred Reporting Items for Systemic Reviews and Meta-Analysis (PRISMA) checklist and statement recommendations¹² and the Cochrane Handbook for Systematic Reviews and Meta-Analysis¹³. Because this systematic review evaluated previously published studies, it was exempt from approval by our institutional review board.

We searched the Pubmed, Cochrane CENTRAL, EMBASE, CINAHL, and SCOPUS databases. The initial search was conducted on August 9, 2014, and updated on August 10, 2015. The search strategy, initially crafted for use in Pubmed and subsequently modified for the remaining databases, was created in conjunction with a medical librarian using controlled vocabulary and related synonyms/keywords for each database (Appendix 1). The search was conducted to identify studies that used SDM among patients making a decision about elective surgery.

Study selection

We reviewed articles that addressed use of SDM when elective surgical care was an option for treatment. Using two common definitions, we defined SDM as: 1. "a collaborative process that allows patients and their providers to make health care decisions together, taking into account the best scientific evidence available, as well as the patient's values and preferences;"¹⁴ 2. "an approach where clinicians and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options, to achieve informed preferences."^{15, 16}

Articles were included if they: addressed an actual decision for an elective, or preference-sensitive, surgical procedure; used methods which incorporated, addressed, or measured SDM; included a minimum of 7 patients; and were published in English. Articles were excluded if they were classified as commentary, opinion, review, consensus statement, or committee report; if decision about surgical care could not be ascertained; if SDM was measured in a cohort of patients who all had undergone surgery; if surgical care applied to a life-threatening condition, such as cancer, organ transplant, or aneurysm; or if the article addressed pregnancy, such as surgical mode of delivery or termination.

Two or more investigators independently reviewed all identified titles, abstracts, and full-text articles to determine if they met inclusion criteria (Figure 1). The investigative team of reviewers included 4 faculty researchers who are content experts in shared decision-making and patient-provider communication, 3 post-doctoral and/or surgical fellows who are content experts in conduct of systematic review and surgical care, and 2 research coordinators who had led and co-authored numerous prior systematic reviews. In the event of disagreement regarding study inclusion for full text and then final review, reviewer teams reached a consensus via discussion.

Data extraction and quality assessment

For each included article, we abstracted the following information: authors, year of publication, surgical discipline, number of patients, study design, clinical dilemma, surgical treatment option, alternate treatment options, background reason for analysis, study location and setting, baseline patient assessment, how SDM was used, description of decision aids when used, timing of outcome assessment, outcome measures used, percentage of patients choosing surgery, additional key findings, and notable study limitations.

We determined the level of evidence for each study according to the guidelines outlined by the Center for Evidence-Based Medicine (CEBM, <http://www.cebm.net/index>). For randomized control trials, the Cochrane Handbook Version 5.0.1 assessment of risk of bias checklist was utilized¹³. The Newcastle-Ottawa Scale (NOS) for assessment of quality of observational studies was used to evaluate each cohort or case-control study¹⁷. This scale assigns ratings based on three categories: (1) selection of cases and controls; (2) comparability of controls on basis of design/analysis; and (3) methods of ascertaining exposure.

Data synthesis

In view of the paucity of studies, diverse areas of focus and study designs in identified articles, and data heterogeneity, we did not perform a quantitative meta-analysis. We analyzed articles using qualitative synthesis methods by first grouping them into categories by study design, clinical content area, decision aid use, and outcome measures. We subsequently identified common themes across articles and performed subgroup analyses.

RESULTS

Study selection

The initial data search was conducted on August 9, 2014, and updated on August 10, 2015. Figure 1, the PRISMA flow diagram, reflects the number of records identified, included, and excluded with reasons. Our initial search yielded 16,063 papers. Analysis identified 5,134 duplicates, which were excluded from review. 10,929 papers were identified for abstract review. 142 papers underwent full-text review, and 41 were considered for data abstraction. Of those, 24 studies yielded assessments of surgical outcomes, and were included in the final analysis (Figure 1).

Description of included studies

Table 1 shows general demographics of the final included studies. Notably, 17/24 papers reported on patient cohorts comprised of both male and female participants, and all but 2 of the papers were based on adult patient cohorts, as opposed to pediatric. 20 out of 24 studies were conducted in North America. The clinical dilemma most commonly studied was spinal surgery (7/24), followed by orthopedic surgery, including joint surgery for osteoarthritis (5/24), and gynecological surgery (4/24). The majority of studies (20/24) featured use or evaluation of a decision aid. Only 7 papers directly evaluated communication between the doctor and client in the context of SDM. Only 4 studies assessed perspectives of both doctor and patient, as opposed to measuring only patient outcomes.

The primary outcome assessed in this review was preference for surgery, along with secondary outcomes of decision conflict and quality. Decision quality, a primary focus in several studies, is an overarching measure which incorporates adequate knowledge and information provision to the patient, overall satisfaction with the decision and decision-making process, and congruence with the patient's needs and values.¹⁸ As knowledge/preparation is an individually important factor for decision-making that is often reported as an isolated outcome measure, results regarding both improvements in decision quality overall (n = 3) and preparation and knowledge (n = 6) were noted, along with improvements in decision conflict (n = 6). Decision conflict describes a patient's level of uncertainty in choosing treatment options.¹⁹ Definitions for shared decision-making, decision conflict, and decision quality are presented in Table 2.

Preference for surgery

Pooled results of this analysis indicate an ambiguity of the effect of SDM on treatment preference. Some studies (n = 9) show a decrease in choice for surgery with the use of SDM (e.g. 26 – 38 % reduction of patients choosing joint-replacement surgery; 22% reduction of patients choosing discectomy surgery)^{20, 21}. However, a comparable number of studies (n = 7) indicate a lack of significant difference in treatment choice with use of SDM. It is also noted that 1 study found an increase in surgeries after implementation of SDM.

There were few significant differentiations based on study design: all randomized studies (n = 11) assessed treatment preference as a primary outcome. 6 found no difference in patients' treatment choice for or against surgery based on application of SDM, while 5 showed a decrease in choice for surgery. 7 non-randomized studies directly assessed preference for surgery: 4 found that preference for surgery decreased with SDM, 2 found that preference for surgeries remained the same, and 1 found that preference for surgeries increased, although the authors noted that external factors, such as variations in personal values or overall decision certainty within their particular dataset, might account for these results.²²

Decision Outcomes

Overall, decision conflict tended to decrease with SDM, while decision quality tended to increase. Of the 6 studies considered to directly assess decision conflict, 4 found that decision conflict decreased and 2 found no difference. Results from all studies directly assessing decision quality overall (n = 3) found that decision quality increased with use of

SDM. 4 studies assessing knowledge and preparation in isolation found an increase in decision preparation with SDM, and 2 studies showed no difference. There were no studies that found that decision quality or knowledge decreased with use of SDM.

There were slight differentiations between randomized and nonrandomized studies in assessments of decision conflict. It is noted that 2 randomized studies focused on decision conflict showed no difference,^{18, 23} and the remainder indicated that conflict decreased with use of SDM. However, all non-randomized studies that focused on decision conflict as a primary outcome found that decision conflict decreased with the introduction of SDM. In terms of decision quality, all randomized and nonrandomized studies that focused on decision quality overall as a primary area of interest found that the use of SDM was related to an increase in decision quality. The majority of studies specifically focused on knowledge and preparation were randomized. 2 out of 5 randomized studies assessing decision preparation found no difference in participant knowledge based on SDM intervention, while 3 randomized trials and one non-randomized trial found a significant improvement in knowledge with use of SDM. Figure 2 shows the cumulative impact of SDM on each outcome measure. Tables 3 and 4 summarize all studies included in this review.

Assessment of risk of bias

Observational and RCT studies included in this review were assessed for bias. Results of these assessments can be seen in Tables 5 and 6, and Appendix 2. Overall, reviewers found a low risk of selection bias, attrition bias, and other biases, although performance and detection biases in SDM research were potentially problematic. Specific results of bias elements are elaborated on in Appendix 2.

DISCUSSION

In recent years there has been increased attention devoted to patient and family-centered outcomes and reduction of waste in healthcare.²⁴ Although in certain clinical dilemmas scientific evidence has distinguished a clearly optimal treatment pathway, the majority of health problems may be managed in more than one way. As such, SDM has been heavily emphasized as a strategy to improve treatment decisions and ensure the most ideal choice for each individual patient. Use of SDM has been broadly studied across health decisions including palliative care, cancer screening, trial inclusion, and medication use in the settings of chronic conditions. SDM is touted as a potential solution for improving quality of care⁷ and guideline-based practice.

The topic of this review was derived from an interest of the primary team surrounding potential overuse of tonsillectomy in children. Given that rates of pediatric tonsillectomy are known to vary nearly five-fold across U.S. geographical regions,²⁵ experts have suggested that SDM could potentially mitigate this unexplained variation in such a common surgical procedure,⁵ however little research exists to support this claim. Unfortunately, the current review included only 2 studies that evaluated choice for elective surgery in a pediatric patient population, and only 1 study evaluated use of SDM in otolaryngic practice. Indeed, as measuring patient centeredness becomes integral with delivery of quality healthcare, more pediatric disciplines including pediatric otolaryngology will need to evaluate effects of how

we communicate, provide information, and share decisions with patients. Furthermore, larger prospective or population-based data on tonsillectomy surgical rates will be needed to truly understand whether use of SDM will reduce variation in this procedure.

The primary outcome addressed in this systematic review was patient choice for an elective surgical procedure. Secondary outcomes of interest include decision conflict and decision quality. Overall, despite growing awareness of the potential benefits of SDM, there is a lack of research on its effectiveness, in this area that seems well suited for SDM. Furthermore, research studies tend to focus more on patient experiences with decision-making than treatment preferences,²⁶ such as decision conflict or preparation, with a somewhat lower percentage of studies measuring decisions for elective surgery.²

The focus and findings of this review are particularly pertinent to the current climate in the United States, as many policy-makers and healthcare reform advocates are predicting a transformational impact of SDM on clinical practice, utilization, quality of care, and costs.²⁷ As previously stated, PPACA section 3506 includes a provision for a “Program to Facilitate SDM,” including language describing patient decision aids and preference-sensitive care, although this authorized initiative has been yet unfunded.²⁸ One objective stated within the Healthy People 2020 health communication initiatives is to increase the proportion of people involved in decisions as much as they wanted to be.²⁹ Individual states including Maine, Oregon, Washington, Minnesota, and Vermont have begun to incorporate SDM into legislation, public-private partnerships, and state standards and expectations.¹⁰

However despite the high energy and optimism surrounding use of SDM, this review shows that there may not be enough concrete data to support its official incorporation into health policy. While the Institute of Medicine has prioritized application of SDM in comparative effectiveness research related to chronic conditions in children and adults, and organizations including the Agency for Healthcare Research and Quality and the Patient-Centered Outcomes Research Institute are following suit by increasing funding for projects which develop support tools and test SDM implementation, more research and resources will be required before definitive conclusions can be made about the impact of SDM on choice for elective surgery.

Studies in this review showed that decision conflict over choosing elective surgery is alleviated with application of SDM. This finding is consistent with prior literature evaluating the effect of decision aids.^{1, 2} Indeed, the use of SDM and decision aids (i.e., decision support and information about treatment options) allows patients to become more confident in their choice to have, or not have, surgery^{30, 31} which then promotes health and well-being both during and following the decision-making process and operation.^{32, 33}

Decision quality has focused on factors relating to the extent to which a decision is based on appropriate knowledge and is congruent with the values and needs of the patient.³⁴ Based on the reviewed studies, decision quality has been considered both inclusively, and in terms of the related factor of participants’ information and knowledge. The use of SDM has been shown to increase the quality of decisions. In this review, while some papers measured “quality” as a central concept, others measured the individual component of patient

knowledge, with a majority showing improved decision quality regardless of whether choice for surgery was made. This suggests that the decision process, rather than the decision made, is key to improving outcomes and a potential focus for future interventions.

Most studies in this review utilized decision aids for application of SDM. Decision aids, by definition, are “tools used to inform patients about available treatments, along with potential benefits, risks and costs, during clinical encounters.”³⁵ These tools, in varying degrees, present information on each treatment option and aim to engage the patient and help them make an informed decision.³⁶ A decision aid strives to make patients informed, and patients who are informed might be more likely to collaborate with their doctors.³⁷ However, despite how thorough the content is in a decision aid, its use does not guarantee direct involvement of the surgeon or explicit elicitation of patient values and preferences. SDM by definition involves a collaborative process that creates a partnership between the doctor and patient.^{1, 38} Kennedy et al³⁹ found that surgery rates were lowest when patients received both a decision aid and an interview, as opposed to a decision aid in isolation. As such, perhaps a distinction between *information-based* decision-making (i.e. informed decision-making through use of decision aids) and *shared* decision-making should be more transparent. Of the 24 studies evaluated in this review, the majority (n = 17) focused measured outcomes on the effectiveness of a decision aid without directly assessing doctor-patient interactions or distinct collaboration. It is not clear if through evaluation of the effect of decision aids, we may fairly say we have evaluated SDM.

There were some general deficiencies in the body of research included in this systematic review. Among the papers reviewed, no noteworthy differences were found within subgroups. This may be due to a limited number of papers and populations available for analysis, and the relative distribution of those studies included in this review. Further, included studies largely measure use of decision aids without addressing communication between the doctor and patient. As the very definition of SDM establishes it as a collaborative process between the doctor and patient in order to reach a satisfactory decision,⁴⁰ it is unclear whether researchers have illustrated the effect of SDM, or the effect of information-giving. It is further noted that one study reviewed in this paper did indicate that while doctors favor SDM in decision-making, patients actually prefer the provision of information and advice, without collaboration⁴¹. Although further research is needed in order to generalize these findings, results do indicate the importance of assessing the interplay between doctors and patients with use of SDM. An additional concern is that several studies used invalidated tools to measure outcomes, or based findings on constructs with more ambiguous definitions (e.g., decision quality), limiting our ability to generalize their findings.

Most studies included in this review assessed the effectiveness of SDM but did not explore potential confounding variables inherent to patient populations. Prior research has shown that gender, age, socioeconomic status, literacy, race, and ethnicity may impact preference for SDM or related factors which contribute to the process, such as risk-taking,⁴² assertiveness,⁴³ and additional factors influencing decision-making (e.g., uncertainty, information provision).^{44,45} However, with few exceptions,^{44, 46, 47} the reviewed papers did not typically assess for differences based on demographic features, or include these factors

in statistical analysis to control for confounding. In general, SDM research demonstrates a lack of focus on particular important demographic categories (e.g., pediatrics⁴⁸).

In addition to limitations in the available SDM research, it is important to note potential limitations of this review. This review is the first to evaluate the effect of SDM on patient choice for surgery. The robust methodology and highly inclusive search strategy attribute merit to the findings. However there were some limitations in the conduct of this review that should be noted. In trying to ensure that no studies were missed, we employed a very broad search strategy, requiring each member of the study team to review thousands of titles. As such, reviewer fatigue may have led to errors in categorizing articles for inclusion. We attempted to minimize this risk by having each title reviewed by a minimum of 2 individuals. Unfortunately, the heterogeneity of clinical focus, study design and outcome measures limits definitive pooled conclusions. Finally, there is always the possibility for bias in qualitative analysis, inclusive of systematic reviews. This includes bias that may affect both selection of studies to review, as well as classification of studies within particular categories (e.g., primary outcome categorizations). We have taken measures to address study and reviewer bias, by systematically assessing the bias of observational studies, and also by double-coding each paper and performing meticulous consensus meetings.

Despite these limitations, this review provides an evaluation and synthesis of research assessing the impact of SDM on choice for elective surgery. As the first study to do so, it establishes a framework for considering potential effects of use of SDM on surgical treatment preference as well as means to improving overall decision quality.

Conclusion

In today's healthcare environment, SDM and decision aids are being touted as a forthcoming and essential practice on the basis that they reduce surgical utilization and healthcare costs. This systematic review shows that the effect of SDM on preference-sensitive surgery choice is less clear cut. Our findings suggest that the use of SDM may reduce or have no impact on patient choice for elective surgery. SDM may also promote a more positive healthcare experience and decision-making process for patients, regardless of their ultimate surgical decision. We have considered SDM and decision aids inclusively, however there may be more of a differentiation between "informed" and "shared" decision-making worthy of study. Furthermore, future population-based research is needed to determine whether broader dissemination of SDM tools for conditions where elective surgery is one treatment option may ultimately impact care utilization, including unnecessary geographical variation and overuse.

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Appendix 1: Original Pubmed Search Strategy

“Shared decision-making” [TW] OR “Shared decision-makings” [TW] OR “Shared decision making” [TW] OR “Shared decision makings” [TW]
 “Patient Participation”[Mesh] OR “Patient participation” [TW] OR “Rate of patient participation” [TW] OR “Rates of patient participation” [TW] OR “Patient participation rate” [TW] OR “Patient participation rates” [TW] OR “Patient Preference”[Mesh] OR “Patient Preference”[TW]
 “Patient physician communication” [TW] OR “Patient-physician communication” [TW] OR “Physician patient communication” [TW] OR “Physician-patient communication” [TW]

AND

“General Surgery”[Mesh] OR “Surgical Procedures, Operative”[Mesh] OR “surgery” [Subheading] OR “Second-Look Surgery”[Mesh] OR “Surgery, Computer-Assisted”[Mesh] OR “Corneal Surgery, Laser”[Mesh] OR “Bariatric Surgery” [Mesh] OR “Natural Orifice Endoscopic Surgery”[Mesh] OR “Orthognathic Surgery”[Mesh] OR “Thoracic Surgery, Video-Assisted”[Mesh] OR “Video-Assisted Surgery”[Mesh] OR “Thoracic Surgery”[Mesh] OR “Surgery, Plastic” [Mesh] OR “Surgery, Oral”[Mesh] OR “Surgery Department, Hospital”[Mesh] OR “Stapes Surgery”[Mesh] OR “Colorectal Surgery”[Mesh] OR “Ambulatory Surgical Procedures”[Mesh] OR “Dermatologic Surgical Procedures” [Mesh] OR “Urologic Surgical Procedures”[Mesh] OR “Fetoscopy”[Mesh] OR “Nasal Surgical Procedures”[Mesh] OR “Mastectomy, Segmental”[Mesh] OR “Obstetric Surgical Procedures”[Mesh] OR “Gynecologic Surgical Procedures” [Mesh] OR “Mandibular Reconstruction”[Mesh] OR “Endoscopy, Gastrointestinal”[Mesh] OR “Refractive Surgical Procedures”[Mesh] OR “Ultrasonic Surgical Procedures”[Mesh] OR “Cervicoplasty”[Mesh] OR “Surgical Procedures, Minimally Invasive”[Mesh] OR “Ureteroscopy”[Mesh] OR “Hysteroscopy”[Mesh] OR “Thoracoscopy”[Mesh] OR “Surgical Procedures, Minor”[Mesh] OR “Sigmoidoscopy”[Mesh] OR “Reoperation”[Mesh] OR “Proctoscopy”[Mesh] OR “Laparoscopy”[Mesh] OR “Orthopedics”[Mesh] OR “Gastroscopy”[Mesh] OR “Laryngoscopy”[Mesh] OR “Mediastinoscopy”[Mesh] OR “Esophagoscopy”[Mesh] OR “Duodenoscopy”[Mesh] OR “Cystoscopy”[Mesh] OR “Culdoscopy”[Mesh] OR “Colposcopy”[Mesh] OR “Colonoscopy”[Mesh] OR “Bronchoscopy”[Mesh] OR “Arthroscopy”[Mesh] OR “Coronary Artery Bypass”[Mesh] OR “Hand-Assisted Laparoscopy”[Mesh] OR “otolaryngology”[MeSH] OR “ophthalmology”[MeSH] OR “surgical procedures, elective”[MeSH] OR “Urogenital Surgical Procedures”[Mesh] OR “Pulmonary Surgical Procedures”[Mesh] OR “Ophthalmologic Surgical Procedures” [Mesh] OR “Otolologic Surgical Procedures”[Mesh] OR “Digestive System Surgical Procedures”[Mesh] OR “Cardiovascular Surgical Procedures”[Mesh] OR “Splenorenal Shunt, Surgical”[Mesh] OR “Specialties, Surgical” [Mesh] OR “Cardiac Surgical Procedures”[Mesh] OR “Biliary Tract Surgical Procedures”[Mesh] OR “Neurosurgical Procedures”[Mesh] OR “Reoperation”[Mesh] OR “Colorectal Surgery”[Mesh] OR “General Surgery”[Mesh] OR “Neurosurgery”[Mesh] OR “Gynecology”[Mesh] OR “Obstetrics”[Mesh] OR “Neurotology”[Mesh] OR “Traumatology”[Mesh] OR “Urology”[Mesh]

OR

“Pediatric surgery” [TW] OR “Peadiatric surgery” [TW] OR
 “General Surgery”[TW] OR “Operative Surgical Procedures”[TW] OR “surgery” [TW] OR “Second-Look Surgery” [TW] OR “Computer-Assisted surgery”[TW] OR “Laser Corneal Surgery”[TW] OR “Bariatric Surgery”[TW] OR “Natural Orifice Endoscopic Surgery”[TW] OR “Orthognathic Surgery”[TW] OR “ Video-Assisted Thoracic Surgery” [TW] OR “Video-Assisted Surgery”[TW] OR “Thoracic Surgery”[TW] OR “Plastic Surgery”[TW] OR “Oral Surgery” [TW] OR “Surgery Department”[TW] OR “Stapes Surgery”[TW] OR “Colorectal Surgery”[TW] OR “Ambulatory Surgical Procedures”[TW] OR “Dermatologic Surgical Procedures”[TW] OR “Urologic Surgical Procedures”[TW] OR “Fetoscopy”[TW] OR “Nasal Surgical Procedures”[TW] OR “Mastectomy”[TW] OR “Obstetric Surgical Procedures” [TW] OR “Gynecologic Surgical Procedures”[TW] OR “Mandibular Reconstruction”[TW] OR “Endoscopy, Gastrointestinal”[TW] OR “Refractive Surgical Procedures”[TW] OR “Ultrasonic Surgical Procedures”[TW] OR “Cervicoplasty”[TW] OR “Minimally-invasive Surgical Procedures”[TW] OR “Ureteroscopy”[TW] OR “Hysteroscopy”[TW] OR “Thoracoscopy”[TW] OR “Minor Surgical Procedures”[TW] OR “Sigmoidoscopy”[TW] OR “Reoperation”[TW] OR “Proctoscopy”[TW] OR “Laparoscopy”[TW] OR “Orthopedics”[TW] OR “Gastroscopy”[TW] OR “Laryngoscopy”[TW] OR “Mediastinoscopy”[TW] OR “Esophagoscopy”[TW] OR “Duodenoscopy”[TW] OR “Cystoscopy”[TW] OR “Culdoscopy”[TW] OR “Colposcopy”[TW] OR “Colonoscopy”[TW] OR “Bronchoscopy” [TW] OR “Arthroscopy”[TW] OR “Coronary Artery Bypass”[TW] OR “Hand-Assisted Laparoscopy”[TW] OR “otolaryngology”[TW] OR “ophthalmology”[TW] OR “Elective surgical procedures” [TW] OR “Urogenital Surgical Procedures”[TW] OR “Pulmonary Surgical Procedures”[TW] OR “Ophthalmologic Surgical Procedures”[TW] OR “Otolologic Surgical Procedures”[TW] OR “Digestive System Surgical Procedures”[TW] OR “Cardiovascular Surgical Procedures”[TW] OR “Splenorenal Shunt, Surgical”[TW] OR “Specialties, Surgical”[TW] OR “Cardiac Surgical Procedures”[TW] OR “Biliary Tract Surgical Procedures”[TW] OR “Neurosurgical Procedures”[TW] OR “Reoperation”[TW] OR “Colorectal Surgery”[TW] OR “General Surgery”[TW] OR “Neurosurgery”[TW] OR “Gynecology”[TW] OR “Obstetrics”[TW] OR “Neurotology”[TW] OR “Traumatology”[TW] OR “Urology”[TW]

Appendix 2: Assessment of Bias in Reviewed Studies

Among the included studies, 12 were observational studies assessed by the NOS (Table 6). There was heterogeneity among the studies in their risk of bias with studies scoring between 3⁴¹ to 7²⁰ on the scale out of 9 stars. For selection bias, on a maximum of 4 stars, four studies had 2 stars,^{31, 41, 55, 59} and eight studies had 3 stars^{6, 20, 22, 30, 46, 56, 57, 60}. Only one study scored 2 stars²⁰, and one scored one star³⁰ for comparability, as most of the studies did not have a comparison group. For outcome assessment, out of a maximum of 3 stars, two studies scored 3 stars^{46, 59}, eight studies scored 2 stars^{6, 20, 22, 30, 31, 55–57, 60} and one study scored just 1 star⁴¹. One paper⁵⁸ was not assessed, as it was qualitative in design and did not fit in either observational or RCT categorizations.

The Cochrane Handbook Checklist¹³ was used to assess the risk of bias for the 11 RCTs, which revealed low to moderate risk of bias in the studies (Table 5). Ten studies^{18, 20, 21, 23, 34, 39, 47, 50, 52, 54} were low risk of bias for random sequence allocation with one⁵¹ having unknown risk of bias. For allocation concealment bias, 3 studies had unknown risk of bias^{18, 23, 39}, with the remaining 8 having low risk of bias^{20, 21, 34, 47, 50–54}. There was high risk of bias for blinding of participants and personnel in 8 studies which were not double-blinded^{18, 20, 21, 23, 39, 47, 51, 53, 54}, with only 3 studies being blinded for either^{2, 50, 52}. Similarly for blinding of outcome assessment, 7 studies were not blinded^{2, 18, 20, 23, 39, 47, 52–54}, 3 studies did not provide information on blinding^{21, 51, 52} with only 1 study having blinding for outcome assessment⁵⁰. Attrition bias was low across 10 of the included studies^{18, 20, 21, 34, 39, 47, 50–54} with only 1 study having unknown dropout from the RCT²³. For selective reporting, as most of the studies did not have a protocol, there was unknown risk of bias in 10 studies^{18, 20, 21, 23, 34, 39, 47, 50, 51, 53, 54}, with only 1 study, which had a protocol and did not selectively report outcomes⁵². Ten of the studies did not have any other obvious sources of bias^{18, 21, 23, 34, 39, 47, 50–52, 54} with one study⁵³ having unknown risk of bias as the study was conducted by a for-profit company and mainly focused on cost and we are unable to ascertain if this introduces a source of bias.

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Figure 1.

Flow chart based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹².

Figure 2. Cumulative trends of key outcome measures across included studies

* Lower levels of decision conflict indicate a reduction in the conflict, which would be regarded as improved outcome, experienced by patients when facing treatment decisions

** Greater decision quality indicates a decision based on increased knowledge and information which is congruent with the patient's needs and values. The related factor of patient knowledge is also represented in this figure, as it is often measured in isolation.

Table 1

Characteristics of studies included in systematic review (N = 24)

Domain	Study n (%)
<i>Study Design</i>	
Randomization	11 (45%)
<i>Sample Size</i>	
N < 100	7 (29.2%)
N 100 – 500	11 (45%)
N > 500	6 (25%)
<i>Population Gender</i>	
Male only	3 (12.5%)
Female only	4 (16.7%)
Both genders	17 (70.8%)
<i>Population Age</i>	
Adult (no children evaluated)	22 (91.6%)
<i>Continent of Origin</i>	20 (83%)
North America	3 (12.5%)
Europe	1 (4.2%)
Asia	
<i>Surgical Specialty (clinical dilemma)</i>	
Neurosurgery/Orthopedic Surgery (spine)	7 (29.2%)
Orthopedic Surgery (osteoarthritis, Trigger Finger)	5 (20.8%)
Urology (benign prostatic hypertrophy)	3 (12.5%)
Gynecology (menorrhagia, incontinence)	4 (16.7%)
General Surgery (obesity)	1 (4.2%)
Plastic Surgery (wounds, reconstruction)	2 (8.3%)
Otolaryngology (otitis media, tonsillitis, sinusitis; sleep apnea)	1 (4.2%)
Mixed	1 (4.2%)
<i>Format of Decision Aid Used in Analysis</i>	
Multimedia Program (video & interactive)	13 (54.2%)
Written Material	3 (12.5%)
Consult, Counselor or Coach	4 (16.7 %)
None used	4 (16.7 %)

Table 2

Definitions: Shared decision-making, decision conflict, and decision quality

Shared decision-making	Collaborative process in which patients and providers work together to find a mutually agreed upon treatment plan. ¹ Includes elements such as information-sharing, decision support, and collaborative communication, in order to reach a joint decision in line with a patient's preferences ⁴⁹
Decision conflict	A state of uncertainty regarding treatment options, or which action to take, when patients are faced with a particular decision (e.g., surgical intervention) ¹⁹
Decision quality	The extent to which patients' decisions are based on evidence-based knowledge, and are congruent with their values ³⁴

Typical definitions of the process of shared decision-making, and the concepts of decision conflict and decision quality.

Table 3

Description of included studies with randomization in study design

First Author, Year	N	Surgical Treatment	SDM ² description	Outcome(s)	% patients choosing surgery	Key findings
Arterburn et al, 2011 ¹⁸	152	Bariatric surgery	Video decision aid or educational booklet with information on bariatric surgery, treatment options, and potential complications and costs.	Knowledge Treatment preference Decision conflict Decision self-efficacy Outcome expectations	Video: 42%; Booklet: 59%	No significant difference in choice for surgery All showed improved knowledge, decision conflict, and outcome expectations.
Barry et al, 1997 ⁵⁰	227	Prostatectomy	30 minute tailored video explaining importance of SDM and information about BPH, ² treatment alternatives, followed by interactive module for learning about specific areas of interest for BPH and treatment options	Knowledge Satisfaction Distribution of treatments	Treatments selected at 3 months: DA ⁴ : 4.8%; Control group: 6.5%	Better knowledge and satisfaction with SDM process, general health perceptions and physical functioning with SDM Distribution of treatment and decision satisfaction did not vary.
Brazell et al, 2015 ²³	104	Surgery for pelvic organ prolapse	DA available in paper format or online, consisting of information regarding condition definitions, treatment options, risk of surgery, post-surgical expectations, and testimonials from former patients.	Decision conflict Treatment plan	52%	No relation to decision conflict No difference in choice for surgery
Deyo et al, 2000 ²¹	393	Discectomy	Booklet with information on lumbar spine anatomy, treatment options, expected outcomes, self-test. SDM group also viewed interactive videodisc, tailored to patients' characteristics: animated anatomical graphics, information on causes of back pain, and expected treatment outcomes and testimonials.	Decision for surgery	26% of those who viewed interactive DA	Overall decision for surgery 22% lower videodisc group (26%) than control (33%). Videodisc group with herniated discs chose significantly less surgery (32%) than the non-intervention group (47%). Video group with spinal stenosis chose surgery more often (39%) than the non-intervention group (29%).
Dobke et al, 2008 ⁵¹	30	Varied ⁵ (wound)	Telenurse consult held with wound nurse prior to a face-to-face appointment with surgeon. Included assessment of wound, discussion of rationale for management (emphasizing risk projection), and benefits of surgery.	Duration of first appointment Satisfaction with future care decisions Decision conflict	Recommended surgery by doctor: 67% Accepted recommendation after DA: 93%	Patients in intervention group had shorter face-to-face appointments Greater decisional satisfaction, and lower decision conflict.
Kennedy et al, 2002 ³⁹	894	Hysterectomy	Informational book and videotape given to both groups. Women in intervention group also had an interview before their appointment, to discuss their options.	Health status treatments received for menorrhagia Cost effectiveness	Interview group: 38%	No consistent relation to health status Hysterectomy rates lowest in women who received both DA and interview. Costs lowest for women who received both DA and interview

First Author, Year	N	Surgical Treatment	SDM ² description	Outcome(s)	% patients choosing surgery	Key findings
Phelan et al, 2001 ⁴⁷	100	Lumbar spine surgery	One group received videodisc and booklet, one group received booklet. Booklet contained illustrations, information on treatment options, general descriptions of expected outcomes for each treatment, and self-test. Interactive videodisc included computer graphics, a presentation of potential causes of low back and leg pain, risks and benefits of treatment options, and interviews from previous patients.	Knowledge Treatment preference Evaluation of DA	Videodisc: 23% Booklet: 42%	Materials easy to understand, adequate in assisting decision-making. Showed lower preference for surgical intervention Both groups showed improved knowledge Combination of the videodisc and booklet was more helpful for decision-making than the booklet alone.
Stacey et al, 2014 ³⁴	142	Total knee arthroplasty	50 minute video and accompanying booklet, providing information on different treatments, potential benefits and harms, and patient testimonials.	Feasibility, decision quality wait for surgery	79.7% SDM group; 70.6% control group	No relation to wait for surgery SDM group reported higher decision quality and knowledge
Stacey et al, 2015 ⁵²	343	Total joint arthroplasty (hip-knee osteoarthritis)	50 minute video and booklet, providing information on treatment options, benefits and risks of treatment, and testimonials from former patients.	Wait time for total joint arthroplasty Effectiveness of DA	73% SDM group; 80% control group	Patients in the intervention group had less wait time for surgery. Decision quality higher in intervention group (56%) than the control (44%). DA group had fewer surgeries, higher decision quality (not significant)
Veroff et al, 2013 ⁵³	60185	Varied ⁶	SDM-trained health coaches (nurses, therapists, pharmacists) provided SDM to participants, including readings, encouragements to actively participate in treatment decisions, and various decision aid materials (videos, leaflets, software).	Costs Hospital admissions Rates of preference-sensitive surgeries Imaging rates	Overall: Enhanced support 9.9% fewer surgeries Heart-specific: Enhanced support 20.9% fewer surgeries	Enhanced support related to lower medical costs, fewer hospital admissions, and fewer preference-sensitive surgeries. Enhanced support group had fewer imaging studies (nonsignificant)
Vuorma et al, 2003 ⁵⁴	569	Hysterectomy	Informational booklet given to participants prior to gynecological appointment. Contained information about heavy menstruation, different treatment options, and benefits and risks of treatment.	Distribution of treatment modalities Knowledge about treatment options Satisfaction with communication Anxiety	DA: 53% Control: 49%	New treatments less common in intervention group. Intervention group had increase in specific treatment decisions within first 3 months. Additional information did not affect surgery frequency

² Shared Decision-Making³ Benign Prostatic Hyperplasia⁴ Decision Aid⁵ amputation, wound debridement, reconstructive surgery⁶ heart conditions, benign uterine conditions, benign prostatic hyperplasia, hip pain, knee pain, back pain

Table 4

Description of included studies without randomization

First Author, Date	N	Surgical Treatment	SDM description	Outcome(s)	% patients choosing surgery	Key findings
Arterburn et al, 2012 ²⁰	9515	Joint Replacement	SDM through use of a DA comprised of a booklet, DVD and/or online module.	Rate of surgery Health care costs	DA: Hip: 26% fewer Knee: 38% fewer	26% fewer hip replacements 38% fewer knee replacements 12–21% lower costs
Barrett et al, 2002 ²²	232	Laminectomy	Interactive videodisc with information about back pain and sciatica, benefits and risks of treatment options, and testimonials. Additional modules included information about transfusions, disabilities, alternative procedures.	Treatment preference	36%	Increase in number of patients who preferred surgery after being exposed to videodisc
Barry et al, 1995 ⁵⁵	373	Prostatectomy	Interactive videodisc tailored to patient's characteristics (demographics, health, history of acute retention, and level of symptoms) with information on treatment choices, benefits and risks, expected outcomes, examples (patient-doctor), and an interactive elective section.	Treatment choice Symptoms Concerns about potential complications Program evaluation	11.7%	Participants felt that DA was useful, clear, informative, and balanced. Patients more likely to elect surgery because of negative symptoms they were experiencing, as opposed to the DA.
Bradbury et al, 1994 ⁵⁶	34 families	Microvascular toe transfer	Counselor met with families and assessed the emotional needs of the parents, provided them with information about treatment options, and gave families the opportunity to produce informed questions prior to meeting with a doctor.	Decision participation Factors influencing decisions made	79.4%	Parents and children viewed themselves, surgeons, and counselors as all having important roles in decision-making process. Parents most likely to be influenced by counseling and surgeon communication
Chorney et al, 2015 ⁶	65 (parent and child)	Tonsillectomy, adenoidectomy, tympanostomy tube insertion	SDM assessed by the Shared Decision-Making Questionnaire–Patient Version (SDM-Q-9), and the Shared Decision Making Questionnaire–Physician Version (SDM-Q-Doc).	Decisional Conflict	78%	SDM related to decisional conflict, such that parents who perceived greater levels of SDM reported lower levels of decisional conflict.
Doring et al, 2014 ⁴¹	105 surgeons; 84 patients	Hand surgery	Assessment of perceptions of patients and physicians regarding involvement in the decision-making process, manner in which a decision should be reached, and use of DAs.	Control Preferences Preferred way to make final decision Who involved in decision-making process ⁷	Likelihood to choose surgery: M = 72%	Patients desired surgery less than physicians Physicians preferred SDM; patients preferred making their own decisions separately from physicians (with their advice) Patient/physician differences in opinions of benefits and disadvantages of treatment options.

First Author, Date	N	Surgical Treatment	SDM description	Outcome(s)	% patients choosing surgery	Key findings
Geller et al, 1997 ⁵⁷	52	Hysterectomy	Extent to which patients perceived themselves as being involved in the health care/decision-making process.	Patient participation in treatment decisions Satisfaction with care Treatment plan	21%	Patients wanted to be involved in their treatment decisions. When educated, many did not choose hysterectomy surgery
Gooberman-Hill et al, 2010 ⁵⁸	26	Total joint replacement	Patients and physicians asked to evaluate their decision-making process following appointments.	Factors associated with treatment decisions	76%	Clinical and lifestyle factors essential for decision-making Roles assigned to clinicians may be key component of manner in which SDM is employed; when patients viewed clinicians as "experts," they were more likely to heed their opinions Patients modeled their own communication and behavior on their physicians.
Kim et al, 2015 ⁴⁶	555	Discectomy	Consultation with information-sharing and participatory decision-making. Included booklet with information on health status and treatment options, being shown MRI scans, verbalization of advantages/disadvantages of treatment.	Decision for surgery	31%	Use of SDM with being male, having leg pain, back-specific function, morphological stenotic grades, motor weakness, physical function and role, body pain, social function, and emotional role were all associated with choice for surgery.
Lurie et al, 2011 ³⁰	2505	Lumbar spine surgery	Video including information about condition, testimonials of patients who had chosen each treatment option, benefits/risks of each treatment option.	Choice for surgery Decision certainty	55% who were unsure shifted towards surgery	DA increased likelihood of change in preference and degree of certainty. Did not relate to a particular decision regarding surgery (solely the strength of that decision).
Shirley et al, 2014 ⁵⁹	11	Surgical treatment for Neuromuscular Scoliosis (spinal surgery)	A written DA informed patients about treatment for neuromuscular scoliosis, including evidence-based information and treatment options for the condition.	Program evaluation: knowledge, SDM satisfaction decision conflict	82%	Related to increased knowledge, satisfaction, and reduced decisional conflict. Clinicians reported satisfaction with the DA
Spunt et al, 1996 ³¹	239	Neurosurgery/orthopaedic surgery (herniated disc; spinal stenosis)	Interactive videodisc, tailored to patient characteristics (e.g., age and diagnosis). Included narratives, animated graphics, information about risks and benefits.	DA evaluation Decision certainty	70% intervention group, 79% control group	DA improved decision certainty Patients rated DA favorably in terms of understandability, interest, information provided
Wagner et al, 1995 ⁶⁰	406	TURP ⁸	Interactive videodisc designed to assist in making informed decisions, regarding choice to have TURP or choice to employ "watchful waiting."	Rate of preference for TURP	21%	Reduction in rate of choosing to have TURP with use of the DA.

⁷ Ottawa Decision Framework

⁸ Transurethral Resection of the Prostate

Table 5Assessment of bias for RCT studies (n = 11) by the Cochrane Handbook Checklist¹³

Study	Selection Bias		Blinding		Other Biases		Miscellaneous bias	
	Random sequence generation	Allocation Concealment	Performance Bias: Blinding of participants and personnel	Detection Bias: Blinding of outcome assessment	Attrition bias: Incomplete outcome data	Reporting bias: Selective reporting	Other biases	
Arterburn 2011		?	X	X		?		
Barry 1997						?		
Brazell 2015		?	X	X	?	?		
Deyo 2000			X	?		?		
Dobke 2008	?		X	?		?		
Kennedy 2002		?	X	X		?		
Phelan 2000			X	X		?		
Stacey 2014				X		?		
Stacey 2015				?				
Veroff 2013			X	X		?	?	
Vuorma 2013			X	X		?		

* low risk of bias; clear risk of bias; X = high risk of bias. Review Manager (RevMan)⁶¹ software was used to perform assessment of risk of bias

Table 6

Assessment of risk of bias for observational studies (n=12) by the Newcastle-Ottawa Scale (NOS)¹⁷.

Study	Selection				Comparability	Outcome		
	Representativeness of the exposed cohorts	Selection of the non-exposed cohorts	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of study design or analysis	Assessment of outcome	Was follow-up long enough for the outcome to occur	Adequacy of follow-up of cohorts
Spunt 1996	*			*			*	*
Bradbury 1994	*		*	*			*	*
Lurie 2010	*	*		*	*		*	*
Kim 2014	*		*	*		*	*	*
Arterburn 2012	*	*		*	***	*	*	
Barry 1995	*			*			*	*
Geller 1997	*		*	*			*	*
Wagner 1995	*		*	*		*	*	
Barrett 2002	*		*	*		*	*	
Chorney 2015	*		*	*			*	*
Doring 2014	*			*			*	
Shirley 2014	*			*		*	*	*

* Review Manager (RevMan)⁶¹ software was used to perform assessment of risk of bias