Systematic review

Systematic review of shared decision-making in surgery

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Background: **Multiple treatment options are generally available for most diseases. Shared decision-making (SDM) helps patients and physicians choose the treatment option that best fits a patient's preferences. This review aimed to assess the extent to which SDM is applied during surgical consultations, and the metrics used to measure SDM and SDM-related outcomes.**

Methods: **This was a systematic review of observational studies and clinical trials that measured SDM during consultations in which surgery was a treatment option. Embase, MEDLINE and CENTRAL were searched. Study selection, quality assessment and data extraction were conducted by two investigators independently.**

Results: **Thirty-two articles were included. SDM was measured using nine different metrics. Thirty-six per cent of 13 176 patients and surgeons perceived their consultation as SDM, as opposed to patient- or surgeon-driven. Surgeons more often perceived the decision-making process as SDM than patients (43·6 *versus* 29·3 per cent respectively). SDM levels scored objectively using the OPTION and Decision Analysis System for Oncology instruments ranged from 7 to 39 per cent. Subjective SDM levels as perceived by surgeons and patients ranged from 54 to 93 per cent. Patients experienced a higher level of SDM during consultations than surgeons (93 *versus* 84 per cent). Twenty-five different SDM-related outcomes were reported.**

Conclusion: **At present, SDM in surgery is still in its infancy, although surgeons and patients both think of it favourably. Future studies should evaluate the effect of new interventions to improve SDM during surgical consultations, and its assessment using available standardized and validated metrics.**

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Introduction

More than one treatment option is usually available to treat a patient's disease. If none of these treatments is superior when weighing the benefits and possible harms, a treatment dilemma exists. In this case the best treatment option is the one that best fits the patient's preferences[1].

Shared decision-making (SDM) is a process that, on the one hand, helps patients to consider and share their preferences regarding the pros and cons of the treatment options. On the other hand, SDM helps physicians explicitly to evoke these preferences and incorporate them into the final decision[2,3]. SDM has been shown to improve patient satisfaction and adherence to therapy, and may also reduce undesired care[4–7]. Therefore, it is important to involve patients in the decision-making process. This is particularly relevant within surgical practice, when decisions have to be made between different types of surgery or surgery *versus* no surgery[8]. Surgical interventions are typically irreversible and patients have to deal with potential harmful consequences. Moreover, surgical complications do not resolve as easily as side-effects from some medications.

Because of the importance and increasing recognition of SDM in improving quality of (surgical) care[8], the extent to which it has currently been implemented in surgeon–patient encounters and the metrics used to measure SDM were reviewed systematically. This review aimed to answer the following questions: what are the objective and subjective measurements of SDM during surgeon–patient encounters; and which metrics are used to measure SDM and SDM-related outcomes?

Methods

Protocol and registration

This systematic review is reported in accordance with the guidelines of the PRISMA statement[9]. The review protocol was registered in PROSPERO, the international prospective register of systematic reviews database (http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42017073406).

Eligibility criteria

Studies were eligible if they reported on SDM during the consultation between patient and physician in which a treatment decision was made. Surgery had to be at least one of the possible treatment options. In addition, studies needed to measure and report the extent to which SDM was applied with any type of metric. The following specialties were included: vascular surgery, trauma surgery, gastrointestinal surgery, hepatopancreatobiliary surgery, orthopaedic surgery, urological surgery, plastic surgery and cardiothoracic surgery. Cross-sectional studies and RCTs were eligible. Cross-referencing was performed to identify additional eligible studies.

Studies were excluded if not written in English or Dutch, if the study evaluated the effectiveness of decision-making support tools, and if the study focused only on informed decision-making. The publication interval was not restricted.

Search

The Embase, MEDLINE and CENTRAL electronic databases were searched. The final search was undertaken on 14 June 2017. The Population, Intervention, Comparison and Outcome (PICO) framework was used to construct the search strategy with the assistance of a clinical librarian. The full search strategy is shown in *Appendix S1* (supporting information).

Study selection

Titles and abstracts of the studies identified by the search strategy were screened independently for eligibility by two review authors. Eligibility was based on the aforementioned inclusion and exclusion criteria. Full-text screening was also performed independently. Disagreements were resolved by discussion. If necessary, a third review author acted as arbitrator.

Data collection

Data extraction was carried out independently and in duplicate by two review authors using a predefined data extraction form. Disagreements, if any, were once again resolved by discussion.

The following study characteristics were extracted: first author, publication year, country or countries in which the study was performed, study design, number of participating patients and/or surgeons, patient diagnosis and available treatment options.

Recorded outcomes were the extent to which SDM was applied, irrespective of the metric used. SDM can be scored subjectively by patients and/or physicians[10–13], or objectively by independent observers using checklists[14,15].

In addition, information was collected about other questionnaires or instruments that measured outcomes associated with SDM, for example quality of life[16] or decisional conflict[17].

Risk of bias in individual studies

Risk of bias was evaluated independently by two investigators using checklists. Cross-sectional studies were evaluated using the critical appraisal tool for analytical cross-sectional studies from the Joanna Briggs Institute[18]. RCTs were evaluated by means of the critical appraisal checklist issued by the Dutch Cochrane collaboration[19].

Summary measures

SDM and SDM-related outcomes were expressed in the metrics used by the authors.

Synthesis of results

Meta-analysis was performed if the metric used to measure SDM was reported in more than two studies using a similar questionnaire or instrument. If statistical heterogeneity was limited (I^2 value 50 per cent or less), a fixed-effect model was used. If statistical heterogeneity was present (I^2 value over 50 per cent), a random-effects model was used.

Additional analyses

SDM measured among patients was compared with that measured among surgeons in studies that provided data from both groups. In addition, SDM scored subjectively (by patients or physicians) was compared with SDM scored objectively, if these were measured in the same study.

Results

Study selection

A total of 2365 articles was identified. After removing duplicates, 1814 articles were screened based on title and abstract. Full-text screening of 174 articles was undertaken.

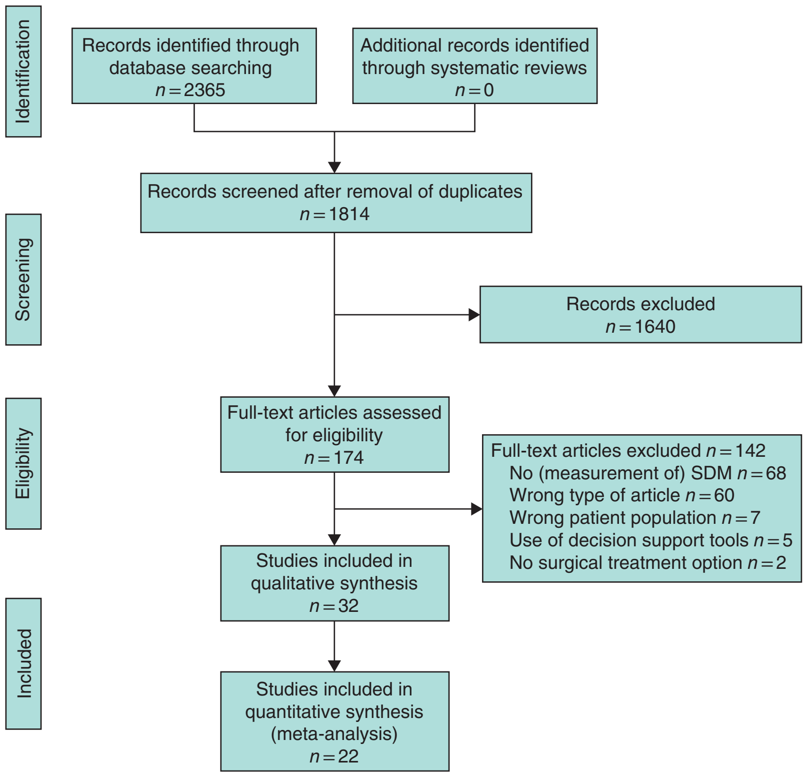

Fig. 1 PRISMA diagram showing selection of articles for review. SDM, shared decision-making

Cross-referencing did not provide any additional eligible articles. Sixty-eight articles were excluded as they did not measure SDM. Thirty-two articles were included for data extraction and 22 articles were eligible for meta-analysis (*Fig. 1*).

Study characteristics

All 32 included publications[20–51] had a cross-sectional study design, 11 of which derived their patient population from previous cohort studies, or from the control group of a randomized trial[33]. Twenty of the 32 studies were published after 2010, 11 between 2000 and 2010, and one in 1989[38].

These 32 studies had a median of 130 participants (range 20–4825). Participants were studied across North America, Europe, Asia and Australia. Twenty-six studies scored SDM from the patient's perspective, three from the surgeon's perspective, and another three scored both perspectives. Seventeen studies focused on treatment decisions in women with breast cancer. Colorectal cancer and lung cancer were each studied three times and carpal tunnel syndrome twice. Four studies included patients with various diagnoses who needed to decide between surgery or no surgery (*Table 1*).

Risk of bias in included studies

Overall, the methodological quality of the included studies was good. Inclusion criteria were defined clearly in 31 studies. The validity of the measures used was unclear in 15 of the 32 studies. Thirty studies described at least two of three items: demographics, location and time interval. Eight studies did not include participants based on a specified diagnosis or definition. Twenty-four studies identified confounders and all but one of these studies stated how they dealt with them. Sixteen studies reported the use of at least one validated questionnaire to study outcomes. Thirty-one studies stated the statistical analysis used clearly (*Table S1*, supporting information).

Results of individual studies

Shared decision-making scored by patients and/or surgeons (subjectively)

Table 2 provides an overview of the metrics used to measure SDM and their results. The Control Perception Scale (CPS) questionnaire[13] uses a five-item Likert scale to measure whether the decision-making process was perceived as more patient-driven, shared or physician-driven. The CPS questionnaire, or adapted versions, were used in 22

Table 1 Characteristics of included studies

Reference	Country	Diagnosis	Treatment options	No. of participants
Agrawal *et al.*[20]	India	Breast cancer	Breast-conserving surgery Mastectomy	47
Ananian *et al.*[21]	France	Breast cancer	Direct breast reconstruction Delayed breast reconstruction No breast reconstruction	181
Ankuda *et al.*[22]	USA	Various	Surgery No surgery	1034
Aravind *et al.*[23]	USA	Severe lower leg trauma	Primary amputation Reconstruction	20
Bleicher *et al.*[24]	USA	Breast cancer	Breast-conserving surgery Mastectomy	1131
Budden *et al.*[25]	Australia	Breast cancer	Breast-conserving surgery Mastectomy	104
Burton *et al.*[26]	UK	Breast cancer	Surgery + endocrine therapy Endocrine therapy alone	93
Cyran *et al.*[27]	USA	Breast cancer	Breast-conserving surgery Mastectomy	198
Garcia-Retamero *et al.*[28]	Switzerland	Various	Surgery No surgery	292*
Gong *et al.*[29]	South Korea	Carpal tunnel syndrome	One-sided surgery Two-sided surgery No surgery	78
Hawley *et al.*[30]	USA	Breast cancer	Breast-conserving surgery + radiation Mastectomy	925
Hawley *et al.*[31]	USA	Breast cancer	Breast-conserving surgery + radiation Mastectomy	1038
Hou *et al.*[32]	China	Colorectal cancer	Defunctioning stoma No defunctioning stoma	113
Janz *et al.*[33]	USA	Breast cancer	Breast-conserving surgery Mastectomy	99 8*
Katz *et al.*[34]	USA	Breast cancer	Breast-conserving surgery Mastectomy	1422
Keating *et al.*[35]	USA	Breast cancer	Breast-conserving surgery Mastectomy	1081
Kehl *et al.*[36]	USA	Colorectal cancer and lung cancer	Surgery Chemotherapy Radiation	4825
Lam *et al.*[37]	Hong Kong	Breast cancer	Breast-conserving surgery Mastectomy	283
Larsson *et al.*[38]	Sweden	Various	Surgery No surgery	666
Mandelblatt *et al.*[39]	USA	Breast cancer	Breast-conserving surgery Mastectomy	613
Mokhles *et al.*[40]	Netherlands	Lung cancer	Surgery Radiation	46*
Morgan *et al.*[41]	UK	Breast cancer	Surgery Endocrine therapy	729
Nam *et al.*[42]	South Korea	Carpal tunnel syndrome	Surgery Orthosis Corticosteroid injections	85
Nguyen *et al.*[43]	Canada and France	Breast cancer	Breast-conserving surgery Mastectomy	121
O'Connor *et al.*[44]	Canada	Various	Surgery No surgery	122
Orom *et al.*[45]	USA	Prostate cancer	Active surveillance Cryotherapy Brachytherapy External beam radiation Surgery	120
Santema *et al.*[46]	Netherlands	Abdominal aortic aneurysm and peripheral artery disease	Conservative treatment Endovascular surgery Open surgery	54 12*

Table 1 Continued

Reference	Country	Diagnosis	Treatment options	No. of participants
Seror *et al.*[47]	France	Breast cancer	Breast-conserving surgery Mastectomy	415
Snijders *et al.*[48]	Netherlands	Colorectal cancer	Anastomosis − defunctioning stoma Anastomosis + defunctioning stoma End colostomy	32*
Vogel *et al.*[49]	Germany	Breast cancer	Breast-conserving surgery Mastectomy Neoadjuvant treatment	137
Winner *et al.*[50]	USA	Gastrointestinal and lung cancer	Surgery No surgery	106 10*
Woltz *et al.*[51]	Netherlands	Mid-shaft clavicle fracture	Sling Open reduction and plate fixation	50

*Surgeons.

Table 2 Overview of questionnaires or instruments to measure shared decision-making and their results

	Use of SDM
Shared decision-making scored by patients and/or surgeons (subjectively)	
Control Perception Scale questionnaire	Meta-analysis: 36 (95% c.i. 32 to 40, range 0–100)%[20–24,26–34,36,41,42,44,47,49–51]
Description of 4 decision-making strategies	33·0% of patients (357 of 1081) matched with SDM (range 0–100%)[35] 9·8% of patients (18 of 184) matched with SDM (range 0–100%)[43] 23% of surgeons (16 of 70) matched with SDM (range 0–100%)[43]
Asking surgeons if they always use SDM	36·9% of surgeons (38 of 103) always use SDM (range 0–100%)[48]
SDM-Q-9 questionnaire	93 (i.q.r. 79–100, range 0–100)%[46] 74 (s.d. 23, range 0–100)%[51]
Perceived Involvement in Care Scale	Patients aged 67–74 years: 62 (s.d. 25·0, range 0–100)%[39] Patients aged >75 years: 54% (s.d. 27·4, range 0–100)%[39]
SDM-Q-Doc questionnaire	84 (i.q.r. 73–92, range 0–100)%[46]
Physicians' participatory decision-making style	65 (s.d. 29·89, range 0–100)%[45]
Shared decision-making scored by independent observers (objectively)	
12-item OPTION instrument	31 (s.d. 11, range 0–100)%[46] 7 (range 0–100)%[48]
Decision Analysis System for Oncology	39 (s.d. 6·4, range 0–100)%[37]

SDM, shared decision-making.

studies to study the number of patients and/or surgeons who perceived the decision-making process as SDM. The adapted versions either used a three-item rather than a five-item Likert scale, or asked the same question without actually calling it the CPS questionnaire, or without referring to the original publication of this questionnaire. Two other questionnaires were also used to measure whether the decision-making process was perceived as SDM. This was accomplished by deciding between four decision-making strategies (paternalistic; some shared accepting or declining suggested treatment; shared; informed) and by asking which strategy best matched the consultation[35,43]. Overall, between 10 and 37 per cent of patients and surgeons perceived the decision-making process as SDM.

Other metrics used to measure SDM subjectively were questionnaires that ask patients or physicians to score several statements related to the (shared) decision-making process. For example, 'My doctor and I thoroughly weighed the different treatment options' is one of nine statements used in the SDM-Q-9 questionnaire. This questionnaire was used in two studies[46,51]. Other questionnaires used, in which statements related to the decision-making process are scored, were the SDM-Q-Doc questionnaire[46], the Perceived Involvement in Care Scale (PICS) questionnaire[39] and the physicians' participatory decision-making style questionnaire[45]. Each of these three instruments was used in a single study. The SDM-Q-9 and PICS questionnaires are to be used by patients. The SDM-Q-Doc and physicians' participatory decision-making style questionnaires are meant for physicians. Overall, levels of SDM as measured by the different metrics ranged from 54 to 93 per cent (*Table 2*).

Shared decision-making scored by independent observers (objectively)

SDM was measured objectively in two studies[46,48] using the 12-item OPTION instrument and in one study[37] using the Decision Analysis System for Oncology (DAS-O). The

Table 3 Overview of additional outcomes associated with shared decision-making

	Effect of SDM
Decisional conflict	Decisional Conflict Scale =[37]
Quality of life	WHO Quality of Life short form =[47*]
	Impact of breast cancer on life ↑[39]
Treatment decision	Breast-conserving surgery > mastectomy[20,26]
	Breast-conserving surgery < mastectomy[24*,34*]
	Breast-conserving surgery = mastectomy[39,47*]
	Mastectomy < mastectomy + breast reconstruction[21]
	Surgery ↓ *versus* surgeon-driven and ↑ *versus* patient-driven[41]
	Endocrine therapy ↓ *versus* patient-driven and ↓ *versus* surgeon-driven[41]
Depression	Center for Epidemiologic Studies – Depression Scale =[47*]
	Brief Symptom Inventory-18 ↓[25*]
Anxiety or distress	Brief Symptom Inventory-18 ↓[25*]
	Global Severity Index ↓[25*]
	Unsure about surgery ↓[22*]
Decision regret	Decision regret scale ↑ (SDM framework present)[37]
	Decision regret scale ↓ (SDM clear unbiased information present)[37]
Satisfaction with	Amount of discussion ↑[22*]
	Amount of information ↑ *versus* surgeon-driven and ↓ *versus* patient-driven[35]
	Information provided ↑[47*]
	Treatment decision process ↓[25*]
	Decision Scale ↑[33*]
	Treatment choice =[35]
	Quality of care ↑ *versus* surgeon-driven and = *versus* patient-driven[36]
	Communication ↑ *versus* surgeon-driven and = *versus* patient-driven[36]
	Medical consultation ↑ (SDM framework present)[37]
	Medical consultation ↓ (SDM clear unbiased information present)[37]
	Overall breast cancer surgery ↑[39]
	Decision-making process =[49]
Functional outcome measures	Disabilities of the arm, shoulder and hand questionnaire =[29,42]
Effect on treatment	Adhering to active surveillance ↑[45]
	Antidepressant consumption ↑[47*]
	Tranquilizer/sedative consumption =[*47]
Effect on consultation	Duration =[33*]

Increase (↑), decrease (↓) or no effect (=) resulting from shared decision-making (SDM). *Combined effect of SDM and patient-driven decision *versus* surgeon-driven decision.

12-item OPTION and DAS-O instruments are scored by two observers independently using audio and audiovisual recordings respectively. Overall, SDM levels as measured by these two metrics ranged from 7 to 39 per cent (*Table 2*).

Outcomes related to shared decision-making

The 32 included studies reported on 25 different outcomes, which are summarized in *Table 3*. Meta-analysis was not possible owing to clinical heterogeneity. Nine of 25 SDM-related outcomes were measured using validated questionnaires. The disabilities of the arm, shoulder and hand questionnaire was used and the effect of SDM on the treatment decision was measured in multiple studies. Six studies presented SDM-related outcomes as the combined effect of SDM and patient-driven decision-making compared with the effect of surgeon-driven decision-making.

Synthesis of results

Data from the CPS questionnaire reported in 22 studies (patients and surgeons) were pooled to estimate the overall proportion of patients and surgeons who perceived the decision-making process as SDM. Nineteen of these studies reported patient data alone, one reported only surgeon data, and two studies reported data from both patients and surgeons. A random-effects model was used for meta-analysis as the I^2 value was 94 per cent. Some 36 (95 per cent c.i. 32 to 40) per cent of 13 176 patients and surgeons perceived their consultations as SDM, 34 (30 to 38) per cent as patient-driven and 25 (19 to 31) per cent as surgeon-driven.

Additional analyses

Two studies[33,50] compared SDM among patients and among surgeons using the CPS questionnaire. Eighty-nine of 204 surgeons (43·6 per cent) perceived the decision-making process as SDM. In comparison, 60 of 205 patients (29·3 per cent) perceived the decision-making process as SDM.

In addition, one study[46] compared the 12-item OPTION instrument with the SDM-Q-9 and SDM-Q-DOC questionnaires, showing that the level of SDM scored objectively was much lower (31 per cent) than that scored subjectively by patients (93 per cent) and surgeons (84 per cent).

Discussion

A substantial number of studies have addressed SDM in surgeon–patient encounters, indicating growing interest in SDM in surgery. Despite this interest, the present review shows that use of SDM within surgical practice, interpreted subjectively by patients and surgeons as well as the objectively scored level, is infrequent. Subjectively, however, patients and surgeons appear to have a more optimistic view than the objective measurements show. Surgeons report using SDM more often than their patients, whereas patients report a higher level of SDM during the consultation than surgeons. The large number of metrics used to measure SDM and SDM-related outcomes makes comparison between studies difficult.

Based on the overall results of the CPS questionnaire, the decision-making process scored subjectively during surgeon–patient encounters was most commonly perceived as shared or patient-driven. The prevalence of SDM among surgeon–patient encounters reviewed here is slightly higher than in the usual-care group in the review on decision aids by Stacey and colleagues[7]. They also reported a high level of patient-driven decision-making. This may be related to the predominance of studies on breast cancer, an area in which patient-driven decision-making has become common. Another explanation may be that patients perceived the decision-making process as patient-driven, just because they were asked whether they agreed with the proposed treatment (gave informed consent)[46]. Nevertheless, the CPS questionnaire appears useful for comparing the preferred decision-making approach before the encounter with the perceived level of involvement in the treatment decision after the encounter.

Other subjective metrics, such as the SDM-Q-9 and SDM-Q-Doc questionnaires, showed slightly higher levels of SDM in surgery than in other medical specialties. For example, Doherr and co-workers[52] reported mean total SDM-Q-9 and SDM-Q-Doc scores ranging from 42 to 75 per cent. These high subjective SDM levels in surgical studies may also be caused by a misinterpretation of the informed consent procedure for SDM.

Data obtained using the objective instruments OPTION and DAS-O showed low SDM levels in surgical settings. Similar scores were seen in patient encounters with other medical specialties[14], showing an overall mean(s.d.) of 23 (14) per cent using the OPTION instrument.

The large difference between objective and subjective SDM scores has been explained previously by the inability of the OPTION instrument to account for non-verbal communication[53]. However, the DAS-O instrument, as used by Lam and colleagues[37], was adjusted to include non-verbal communication using audiovisual recordings. These audiovisual recordings also showed low SDM scores, but this instrument was not compared with subjective questionnaires.

This difference between objectively and subjectively scored SDM levels may be due to insufficient knowledge of what SDM really means. This was confirmed in a recent study among trauma surgeons[51]. Under these circumstances, the subjectively scored metrics suffer from a ceiling effect when users express their satisfaction with the consultation or informed consent procedure, rather than the level of SDM if unaware of what SDM entails.

The use and scoring of SDM may be improved by educating both surgeons and patients about it[54]. Programmes have been initiated to make physicians aware of the benefits of SDM, and to make patients mindful that they are allowed and even encouraged to give their opinion. These initiatives comprise, for instance, national campaigns, training sessions and the development of decision support tools[55].

Nevertheless, it remains unclear whether the focus should be on improving objectively scored SDM levels. Perhaps subjective high SDM scores by patients might also bring forth beneficial SDM-related outcomes. Unfortunately, none of the included studies evaluated the correlation of both objective instruments and subjective questionnaires with SDM-related outcomes.

In addition to the wide range of instruments and questionnaires available to study the level of SDM, the list of metrics used to measure outcomes associated with SDM was also extensive. None of these outcomes could be compared with each other, because the questionnaires used were either non-validated, used in only one study, disease-specific, combined SDM and patient-driven decision-making, or provided outcomes for different subscales of SDM. In addition, very few studies reported absolute data, making comparison with other studies even more difficult.

As advised by both the Core Outcome Measures in Effectiveness Trial (COMET) initiative[56] and the International Consortium for Health Outcomes Measurement (ICHOM)[57], the use of standard instruments or questionnaires is particularly valuable as it permits pooling of results to determine, for instance, the effectiveness of new interventions to improve SDM, such as the development of decision support tools. In addition, being able to compare levels of SDM and SDM-related outcomes may provide insight into which medical specialties are SDM frontrunners, or, in contrast, which low-performing specialties require additional support.

From the perspective of SDM, the authors advocate the use of currently available standardized, validated and preferably generic instruments and questionnaires. To measure the level of SDM in a surgeon–patients encounter in which treatment decisions are made, the CPS questionnaire, the OPTION instrument, and SDM-Q-9 and SDM-Q-DOC questionnaires are recommended. More research is needed on whether subjectively or objectively scored metrics for SDM correlate best with SDM-related outcomes, such as decisional conflict and satisfaction with treatment. In addition, studies should find out which SDM metrics can be used to evaluate new interventions for improving SDM.

Limitations of this study include the heterogeneity of the outcome measures used. This made it difficult to compare studies and to perform meta-analyses. Despite this heterogeneity, a decision was made to continue pooling the CPS questionnaire data, to provide an overall sense of the extent to which patients and surgeons currently perceive SDM. Exploring this heterogeneity by selecting only articles that used the CPS questionnaire with the five-item Likert scales, articles published since 2010, or articles focusing on breast cancer or no breast cancer, did not yield valuable information. Furthermore, all studies were observational. Although SDM can effectively be measured outside a trial setting, there may have been some limitations owing to the observational design. It was often unclear how much time had passed between the consultation and the moment patients and surgeons were asked to evaluate the consultation. Perhaps, over time, patients and surgeons may not exactly remember how the decision was made. The observational design also makes it difficult to know the extent to which patients and surgeons were informed about SDM before both the consultation and the evaluation. Finally, only three studies compared the level of SDM between patients and surgeons in the same investigation, using two different questionnaires. Thus, no clear statements could be made about whether there is a true difference between patients and surgeons in how they view the decision-making process.

The difference between the present systematic review and other reviews regarding SDM in surgery is that previous studies focused mostly on the availability or effectiveness of tools developed to improve SDM[58,59]. This review concludes that, before focusing on ways to improve SDM, it is first necessary to evaluate the current use of SDM and, even more importantly, how to measure SDM uniformly.

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Supporting information

Additional supporting information can be found online in the Supporting Information section at the end of the article.