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Review

Effect of shared decision-making in patients with breast cancer undergoing breast reconstruction surgery: A systematic review and meta-analysis

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ABSTRACT

Objective: Patients with breast cancer who must undergo breast mastectomy are offered different types of breast reconstruction surgeries. Shared decision-making (SDM) is an important emerging intervention in the decision-making process of patients. This study aimed to evaluate the effects of SDM in patients with breast cancer undergoing breast reconstruction surgery.

Methods: Databases, including China National Knowledge Infrastructure, Wanfang, Chinese Biomedical Database, VIP, PubMed, Cochrane Library, Web of Science, Cumulative Index to Nursing and Allied Health Literature, and Embase, were searched for articles on the application of SDM in patients undergoing breast reconstruction. The literature search retrieval time limit was from inception to February 29, 2024, with Chinese and English language restrictions. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist was used for reporting this work. The randomized controlled trial (RCT) quality was assessed using The Cochrane Collaboration's tool for assessing risk of bias and quasi-randomized trials using Joanna Briggs Institute's critical appraisal tools. The SDM effects on decisional conflict, regret, knowledge, participation, and satisfaction, anxiety, and depression were assessed. Revman5.4 software was used for the meta-analysis.

Results: In total, 18 papers out of 854 records identified from the database search met the eligibility criteria, including 16 articles in English and two articles in Chinese. There were 12 RCTs and six quasi-randomized trials. The meta-analysis results revealed that SDM could reduce decisional conflict [mean difference (MD), −4.49; 95% confidence interval (CI) (−6.70, −2.27); $P < 0.001$], decisional regret [MD, −6.06; 95% CI (−9.51, −2.61); $P < 0.001$], and depression [standardized mean difference (SMD), −0.67; 95% CI (−0.99, −0.35); $P < 0.001$] in patients who underwent breast reconstruction surgery. In addition, SDM can improve decisional participation [SMD, 0.30; 95% CI (0.11, 0.49); $P = 0.002$] and decisional knowledge [SMD, 0.43; 95% CI (0.11, 0.75); $P = 0.009$], but with no significant improvement in decisional satisfaction [SMD, 0.30; 95% CI (−0.35, 0.94); $P = 0.37$] and anxiety [SMD, −0.09; 95% CI (−0.22, 0.04); $P = 0.17$]. The subgroup analysis of country/region showed that the interventional effect of SDM in Western countries [MD, −3.84; 95% CI (−4.16, −3.52); $P < 0.001$] was stronger than that in Eastern countries [MD, −1.81; 95% CI (−2.32, −1.30); $P < 0.001$], and the interventional effect of Booklet group [MD, −6.92; 95% CI (−8.90, −4.94); $P < 0.001$] was stronger than that of Computer-based group [MD, −3.23; 95% CI (−3.50, −2.96); $P < 0.001$].

Conclusions: SDM shows positive effects in many aspects in patients with breast reconstruction, including reducing decisional conflict, decisional regret, and depression, whilst improving decisional participation and decisional knowledge. Moreover, SDM seems has better effectiveness in Western countries than that in Eastern countries and the implement of Booklet has better effectiveness than that of Computer-based modality. However, our study shows that SDM has no benefit in terms of decisional satisfaction and anxiety.

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Introduction

According to the latest report published by the International Agency for Research on Cancer of the World Health Organization in 2024, breast cancer has become the second most common cancer in the world with 2.3 million new cases every year, and it is still the leading cancer among females globally in terms of incidence and mortality.[1] With more patients being diagnosed at an early stage and the improvements in comprehensive treatment, patients with breast cancer have more surgical alternatives to choose, including breast mastectomy, breast-conserving surgery, and breast reconstruction.[2] Among the mentioned surgeries, breast reconstruction surgery is significantly enhancing patient well-being because it prioritizes minimizing donor site morbidity while providing an optimal oncological outcomes and achieving a more natural breast appearance.[3,4]

Although the advantages of breast reconstruction have been widely recognized, there are still some differences in breast reconstruction worldwide. Taking the rate of breast reconstruction for instance, according to a national wide investigation, the amount of the breast reconstruction has steadily increased in the past two decades in the America[5] and up to nearly 70%.[6] Another national wide survey conducted at the same time showed that despite nearly 90% hospitals can perform the breast reconstruction, it only accounted for 10.7% of all breast cancer operations in China.[7] To some extent, a latest research published in April 2024 may explain this difference, i.e., culture and belief have a very important impact on decision making process for patient with breast cancer.[8]

Before choosing the surgical alternative, physicians communicate with patients on the possible plans, risks, and benefits of treatments and understand the preferences and consciousness of the patient, which is called shared decision-making (SDM).[9] SDM provides a method for sharing professional knowledge between medical staff and patients, which can help patients understand the detailed information of breast reconstruction in the complex decision-making process. Advantages and disadvantages of SDM can be evaluated using objective indicators, however, decision making for breast reconstruction in patients with breast cancer is a highly individual preference-sensitive issue. In addition, decision-making is further complicated by its urgency that patients only have a short period of time between diagnosis and the surgery to make a final choice.[10] All these factors may lead to a discount on SDM's originally recognized effectiveness and result in a heterogeneity in the outcomes of SDM.

In this context, some systematic reviews on SDM for breast reconstruction have emerged. There have been about 5 systematic reviews related to SDM for breast reconstruction in the past 10 years.[11–15] These systematic reviews came from different countries, were retrieved from various data bases and analyzed different indicators. Roughly speaking, previously published researches on SDM for breast reconstruction have reached to some consistent results, including reduction in decisional conflict and decisional regret, improvement in patient satisfaction and involvement in decision making as well as promotion in health knowledge.[11–15] As expected, these researches still presented some unsound integration results, among which the most concerns involve anxiety and depression.

As stated before, SDM is individual preference-sensitive and whilst can be impacted by social culture and belief. There are significant cultural and religious differences between Eastern and Western countries. Considering the large number of patients with breast cancer in Eastern countries, and the gaps in the level of medical advancements between the Eastern and Western countries, this study aimed at conducting a more comprehensive sub-analysis. For instance, to our knowledge, this is the first research analyzing the differences in SDM for breast reconstruction between patients in Eastern and Western countries, and the effectiveness between different modalities when performing SDM. Besides, there was another reason that prompted us to conduct this study, which was the deadline of article retrieval of the most recent systematic review on SDM for breast reconstruction was in October 2022. Thereafter, three new related original studies successively published. We believe that the new Meta integration of these latest studies combined with previous researches is expected to supplement new evidence on this topic.

Methods

Study design

The study protocol was registered in the International Prospective Register of Systematic Reviews (CRD42024525662). This work was reported in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Guidelines.

Literature search

The China National Knowledge Infrastructure (CNKI), Wanfang, Chinese Biomedical Database (CBM), VIP, PubMed, Cochrane Library, Web of Science, Cumulative Index to Nursing and Allied Health Literature (CINAHL-EBSCO), and Embase (Ovid) databases were searched for literature on the application of SDM in breast reconstruction surgical decision-making in patients with breast cancer. The publication period was from inception to February 29, 2024, with Chinese and English language restrictions. We conducted a retrospective literature review, including browsing the literature mentioned in the relevant topic articles and their references to obtain more relevant literature. The search strategy is summarized in Supplementary Table 1.

Study inclusion and exclusion criteria

According to the patient/population, intervention, comparison, and outcomes (PICOS) model, the following inclusion criteria were used: (1) population: adult female patients (aged $\geq$ 18 years) diagnosed with breast cancer and considered for breast reconstruction after mastectomy; (2) intervention: SDM was used in the intervention, including auxiliary manuals and application software, to help patients understand the relevant information of their treatment plan; (3) control: routine health care; (4) primary outcomes: decisional conflict, decisional regret, decisional participation, decisional knowledge, and satisfaction; secondary outcomes: anxiety and depression; and (5) study design: randomized controlled trial (RCT) or quasi-randomized trials.

The exclusion criteria were: (1) full texts that could not be obtained even after contacting the authors; (2) duplicate publications; (3) conference papers; and (4) papers published in languages other than Chinese and English.

Literature screening and data extraction

Two researchers (Chen and Lu) independently screened the literature, extracted data according to the inclusion and exclusion criteria, and negotiated with a third researcher (Zhang) in cases of disagreement. Two researchers independently extracted data, including authors, years of publication, countries, sample sizes, interventions, and measures of outcome, according to the information form set by the research team in advance. Studies were excluded if they had incomplete data or incomplete records after contacting the authors by email.

Assessment of the literature quality

The literature quality was independently assessed by two researchers (Chen and Lu). A third researcher (Zhang) was consulted in cases of disagreement. RCTs were assessed using the Cochrane Risk of Bias tool.[16] The results of each item were divided into “low risk of bias”, “high risk of bias”, and “unclear”. Quasi-randomized trials were analyzed using the assessment tool for quasi-randomized trials from the Australian Joanna Briggs Institute (JBI) Centre for Evidence-based Health Care.[17] In addition, we delimited the evidence level of the included literature according to the JBI levels of Evidence and Grades of Recommendation.

Data analysis

If no significant heterogeneity was present among the studies ($P > 0.1$, or $I^2 < 50\%$), a fixed-effect model was used to analyze the combined effect size. If a significant heterogeneity was present among the studies ($P \leq 0.1$, $I^2 \geq 50\%$), a random-effects model was used for the analysis, and subgroup analysis was performed when necessary. Continuous variables were described by the mean difference (MD) and 95% confidence interval (CI) when the same research data unit was used, and by the standardized mean difference (SMD) and 95% CI when the research data unit was different. Statistical significance was set at a *P*-value < 0.05. RevMan 5.4 software was used for data analysis. Sensitivity analysis was performed to test the robustness of the pooled results. Begg's funnel plot was used to test publication bias. The analyzed outcomes were decisional conflict, regret, participation, and satisfaction, anxiety and depression.

Results

Literature retrieval and the baseline of included studies

A total of 854 literatures were identified through preliminary retrieval, and 467 literatures were included after eliminating duplicates. Next, 51 literatures were obtained after screening the titles and abstracts, and 18 literatures were included in the analysis after reading the full texts; these literatures included 1662 patients in total.[18–35] The literature retrieval process is illustrated in Fig. 1. The characteristics of each included literature are shown in Table 1, and the detailed interventions of each literature are shown in Supplementary Table 2.

Results of the literature quality assessment

The evaluation of the risk of bias showed that all included studies had a low-to-medium risk of bias due to selection and attrition biases. Due to the failure to blind the interventions to participants and implementers, 12 RCTs were evaluated as "high risk of bias" in term of performance bias. The remaining evaluation results are shown in Fig. 2, and the results of the quasi-randomized trials are listed in Table 2. According to the JBI levels of Evidence and Grades of Recommendation, 12 RCT studies showed evidence level of 1c and 6 quasi-randomized trials showed evidence level 2d (Table 3).

Results of the meta-analysis

Table 4 summarizes all the retrieved meta-analysis results.

The impact of SDM on decisional conflict of breast reconstruction in patients with breast cancer

Fifteen studies[18–25,27–30,33–35] reported the impact of SDM on decisional conflict of breast reconstruction surgical decision-making in patients with breast cancer. A total of 19 data sets which assessed by DRS were extracted. A significant heterogeneity was observed among the studies ($I^2 = 97\%$; $P < 0.001$;); therefore, a random-effect model was used for the analysis. The decisional conflict in the experimental group was significantly lower than that in the control group [MD, −4.49; 95% CI (−6.70, −2.27); $P < 0.001$; Fig. 3].

Subgroup analyses were performed as follows:

1) Country/region

A subgroup analysis was conducted for the country/region based on the groups of the Eastern and Western countries. The decisional conflict in experimental group were significantly lower than those in the control group; however, the total effects in the Western group [MD, −3.84; 95% CI (−4.16, −3.52); $P < 0.001$] were greater than that in the Eastern group [MD, −1.81; 95% CI (−2.32, −1.30); $P < 0.001$; Fig. 4].

2) Intervention type

A subgroup analysis was conducted for the intervention types. In the Booklet and Computer-based groups, the decisional conflict in the

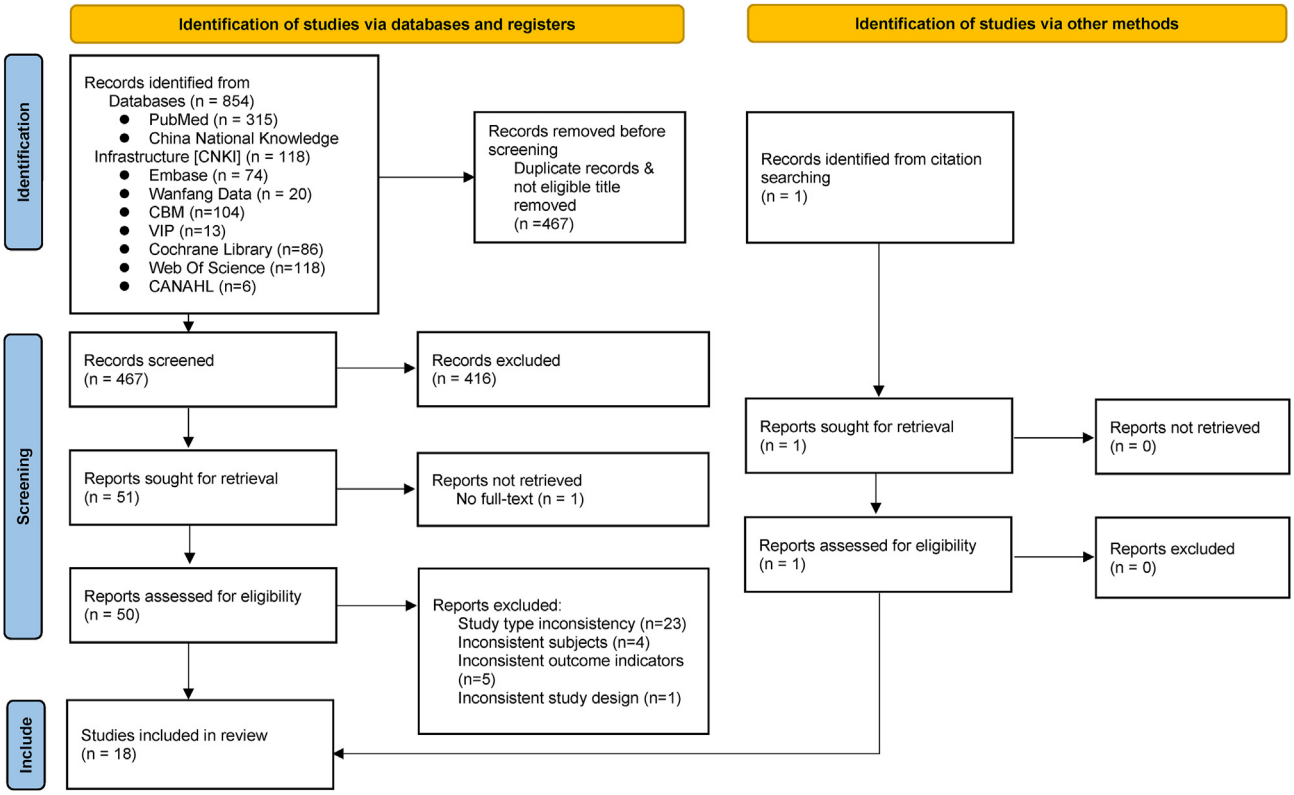
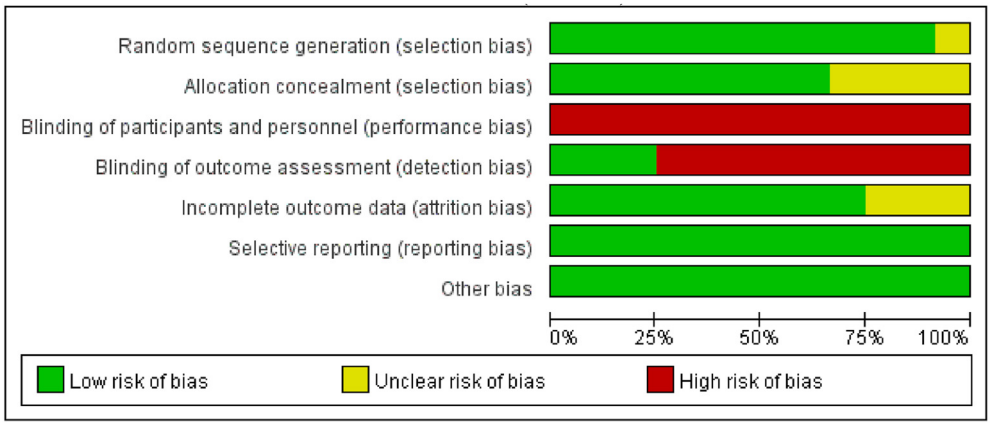


Fig. 1. Flow diagram illustrating the original process of screening and identification of studies.

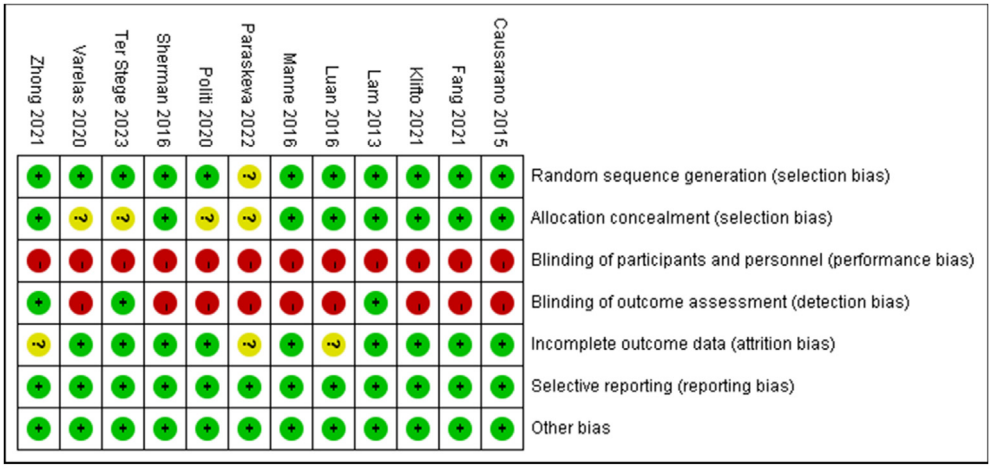
Table 1
Basic characteristics of the included literature.

No.	Author	Date of publication	Country/ region	Design	Sample size (control/contrast)	Intervention		Tools used to assess outcomes
						Experiment	Control	
1	Lam et al.[18]	2013	Hong Kong, China	RCT	113/112	Decision aid	Standard information booklet	①②⑥⑩⑫
2	Causarano et al.[19]	2015	Canada	RCT	20/19	Pre-consultation educational group and routine education	Routine education	①③⑧
3	Manne et al.[20]	2016	America	RCT	31/24	Web-based breast Reconstruction decision support aid	Pamphlet	①⑥⑪
4	Luan et al.[21]	2016	America	RCT	8/8	Decision aid	Standard preconsultation material	①②⑧
5	Sherman et al.[22]	2016	Australia	RCT	116/106	Online decision aid [Breast RECONstruction decision aid (BRECONDA)]	Online access to information from an excerpt of a publicly available booklet	①②⑥
6	Metcalfe et al.[33]	2018	Canada	Quasi-randomized trial	26/26	Decision aid	Consultation with the plastic surgeon	①
7	Wang et al.[23]	2020	China	Quasi-randomized trial	38/38	Decision aid and routine health education	Routine health education	①②⑩⑫
8	Politi et al.[24]	2020	America	RCT	60/60	Decision aid, BREASTChoice	Enhanced usual care	①④⑦
9	Varelas et al.[25]	2020	America	RCT	13/13	Virtual decisional aid and a traditional consultation	Traditional consultation	①⑥⑧⑪
10	Henn et al.[26]	2020	America	Quasi-randomized trial	13/15	Standardized patient education class	Routine care	⑤⑧
11	Zhong et al.[34]	2021	Canada	RCT	67/70	Preconsultation educational group intervention (PEGI)	Routine education	①⑥⑨⑪
12	Guan et al.[27]	2021	China	Quasi-randomized trial	54/52	Preoperative decision aid and routine care	Routine care	①②⑧
13	Lin et al.[28]	2021	Taiwan, China	Quasi-randomized trial	11/11	Decision support app	Routine care	①
14	Klifto et al.[29]	2021	America	RCT	10/10	Decision aid brochure and standard educational protocol	Standard educational protocol	①
15	Fang et al.[30]	2021	Taiwan, China	RCT	48/48	Decision support app	Routine care	①②⑩⑫
16	Paraskeva et al.[31]	2022	England	RCT	56/91	Patients' expectations and goals: Assisting shared understanding of surgery (PEGASUS)	Usual care	②⑧
17	Sowa et al.[32]	2023	Japan	Quasi-randomized trial	12/13	Decision aid	Standard information	②⑤
18	Ter Stege et al.[35]	2023	Netherlands	RCT	126/124	Care-as-usual (CAU) with access to an online decision aid	Care-as-usual (CAU)	①②⑤⑥⑧⑪

Note: ① Decisional Conflict Scale (DCS); ② Decision Regret Scale (DRS); ③ Two subscales from the Modified-Perceived Involvement in Care Scale (M-PICS); ④ The decision process subscale of the Decision Quality Index (DPS-DQI); ⑤ The 9-item Shared Decision-Making Questionnaire (SDM-Q9); ⑥ Self-designed scale; ⑦ The developed vision of the knowledge subscale of the validated Decision Quality Index (KS-DQI); ⑧ The BREAST-Q; ⑨ The Functional Assessment of Chronic Illness Therapy - Treatment Satisfaction - Patient Satisfaction (FACIT-TS-PS); ⑩ Hospital Anxiety and Depression Scale - anxiety subscale (HADS-A); ⑪ The State–Trait Anxiety Inventory (STAI); ⑫ Hospital Anxiety and Depression Scale - depression subscale (HADS-D). RCT, Randomized Controlled Trial.



(1) *Risk of bias graph*



(2) *Risk of bias summary*

Fig. 2. Results of literature quality evaluation.

Table 2
Results of Joanna Briggs Institute's critical appraisal tools for quasi-randomized trials' literature quality evaluation.

Included literature	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Metcalfe et al.[33]	√	√	√	√	NR	√	√	√	√
Wang et al.[23]	√	√	√	√	√	√	√	√	√
Henn et al.[26]	√	√	√	√	×	NR	√	√	√
Guan et al.[27]	√	√	√	√	√	NR	√	√	√
Lin et al.[28]	√	√	√	√	×	√	√	√	√
Sowa et al.[32]	√	√	√	√	√	√	√	√	√

Note: √ = Yes, × = No, NR = not reported. ① Is it clear in the study what is the cause and what is the effect? ② Were the participants included in any similar comparisons? ③ Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest? ④ Was there a control group? ⑤ Were there multiple measurements of the outcomes both pre and post the intervention/exposure? ⑥ Was follow-up complete and if not, were differences between groups in terms of their follow-up adequately described and analyzed? ⑦ Were the outcomes of participants included in any comparisons measured in the same way? ⑧ Were outcomes measured in a reliable way? ⑨ Was appropriate statistical analysis used?

experimental group was significantly lower than that in the control group, and the combined effect size of the Booklet group [MD, −6.92; 95% CI (−8.90, −4.94); $P < 0.001$] was larger than that of the Computer-based group [MD, −3.23; 95% CI (−3.50, −2.96); $P < 0.001$]. However, no statistically significant difference was observed in the decisional conflict between the two groups in the Education group [MD, −0.46; 95% CI (−3.53, 2.62); $P = 0.77$; Fig. 5].

Table 3
Evidence level of the included literature.

Evidence	Level of evidence
Lam et al.[18], Causarano et al.[19], Manne et al.[20], Luan et al.[21], Sherman et al.[22], Politi et al.[24], Varelas et al.[25], Zhong et al.[34], Klifto et al.[29], Fang et al.[30], Paraskeva et al.[31], Ter Stege et al.[35]	Level 1c
Metcalfe et al.[33], Wang et al.[23], Henn et al.[26], Guan et al.[27], Lin et al.[28], Sowa et al.[32]	Level 2d

The impact of SDM on decisional regret of breast reconstruction surgical decision-making in patients with breast cancer

Nine studies[18,21–23,27,30–32,35] reported the effect of SDM on decisional regret of breast reconstruction surgical decision-making in patients with breast cancer. A total of 19 data sets which assessed by DRS were extracted. The heterogeneity between studies was significant ($P < 0.001$; $I^2 = 94\%$); therefore, a random-effect model was used for analysis. The decisional regret in the experimental group was significantly lower than that in the control group [MD, −6.06; 95% CI (−9.51, −2.61); $P < 0.001$; Fig. 6].

The impact of SDM on decisional participation of breast reconstruction surgical decision-making in patients with breast cancer

Five studies[19,24,26,32,35] reported the effects of SDM on decisional

Table 4
A summary table of meta results.

Indicators	MD/SMD	95% CI	*P*	Heterogeneity (I^2)
Decisional conflict	−4.49	−6.70, −2.27	< 0.001	97%
Subgroup-country/region				
Eastern	−1.81	−2.32, −1.30	< 0.001	67%
Western	−3.84	−4.16, −3.52	< 0.001	98%
Subgroup-intervention				
Booklet	−6.92	−8.90, −4.94	< 0.001	46%
Education group	−0.46	−3.53, 2.62	0.770	0%
Computer-based	−3.23	−3.50, −2.96	< 0.001	99%
Decisional regret	−6.06	−9.51, −2.61	< 0.001	94%
Decisional participation	0.30	0.11, 0.49	0.002	36%
Decisional knowledge	0.43	0.11, 0.75	0.009	86%
Decisional satisfaction	0.30	−0.35, 0.94	0.370	96%
Anxiety	−0.09	−0.22, 0.04	0.170	54%
Depression	−0.67	−0.99, −0.35	< 0.001	38%

MD, mean difference; SMD, standardized mean difference; CI, confidence interval.

participation of breast reconstruction surgical decision-making in patients with breast cancer. M-PICS, DPS-DQI, and SDM-Q9 were used for assessments. The heterogeneity between the studies was acceptable ($I^2 = 36\%$; $P = 0.18$), and a fixed-effects model was used for the analysis. The decisional participation in the experimental group was significantly higher than that in the control group [SMD, 0.30; 95% CI (0.11, 0.49); $P = 0.002$; Fig. 7].

The impact of SDM on decisional knowledge of breast reconstruction surgical decision-making in patients with breast cancer

Six studies[18,20,24,25,34,35] reported the effect of SDM on the decisional knowledge of breast reconstruction surgical decision-making in patients with breast cancer. The self-designed scale and KS-DQI were used for assessments. Eight data sets were extracted, and a significant heterogeneity was observed among the studies ($I^2 = 86\%$; $P < 0.001$). Thus, a random-effect model was used for analysis. The difference in decisional knowledge between the two groups was statistically significant [SMD, 0.43; 95% CI (0.11, 0.75); $P = 0.009$; Fig. 8].

The impact of SDM on decisional satisfaction of breast reconstruction surgical decision-making in patients with breast cancer

Ten studies[19–22,25–27,31,34,35] reported the effect of SDM on decisional satisfaction of breast reconstruction surgical decision-making in patients with breast cancer. Fourteen data sets were extracted and the BREAST-Q, self-designed scale, and FACIT-TS-PS were used for assessments. The heterogeneity between the studies was significant ($I^2 = 96\%$; $P < 0.001$); therefore, a random-effect model was used for the analysis. No significant difference was observed in the decisional satisfaction between the two groups [SMD, 0.30; 95% CI (−0.35, 0.94); $P = 0.370$; Fig. 9].

The impact of SDM on anxiety and depression of breast reconstruction surgical decision-making in patients with breast cancer

Seven studies[18,20,23,25,30,34,35] reported the effect of SDM on anxiety of breast reconstruction surgical decision-making in patients with breast cancer. Seventeen data sets were extracted for analysis and HADS-A, STAI were used for assessments. The heterogeneity between the studies was significant ($I^2 = 54\%$; $P = 0.004$); therefore, a random-effect model was used for the analysis. No statistically significant difference was observed in the anxiety levels between the two groups [SMD, −0.09; 95% CI (−0.22, 0.04); $P = 0.170$; Fig. 10].

Moreover, three studies[18,23,30] reported the effect of SDM on depression of breast reconstruction surgical decision-making in patients with breast cancer. Eleven data sets were extracted and HADS-D was used for assessments. The heterogeneity between the studies was small, but no statistically significant difference was observed ($I^2 = 38\%$; $P = 0.090$); therefore, a fixed-effect model was used for the analysis. The depression level of the experimental group was significantly lower than that of the control group [SMD, −0.67; 95% CI (−0.99, −0.35); $P < 0.001$; Fig. 10].

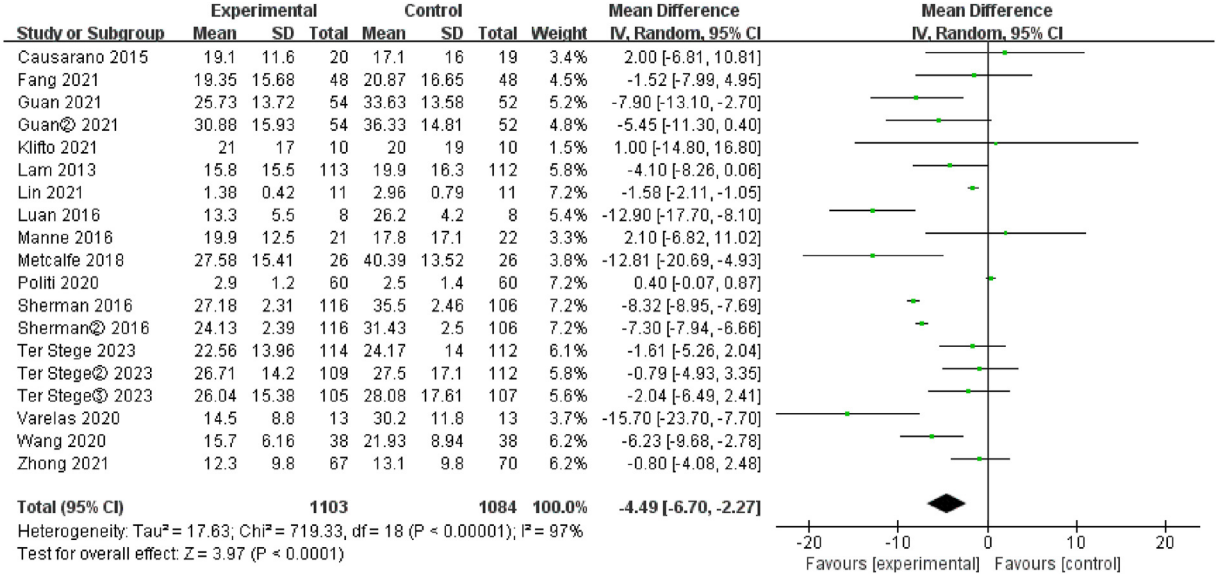


Fig. 3. Decisional conflict.

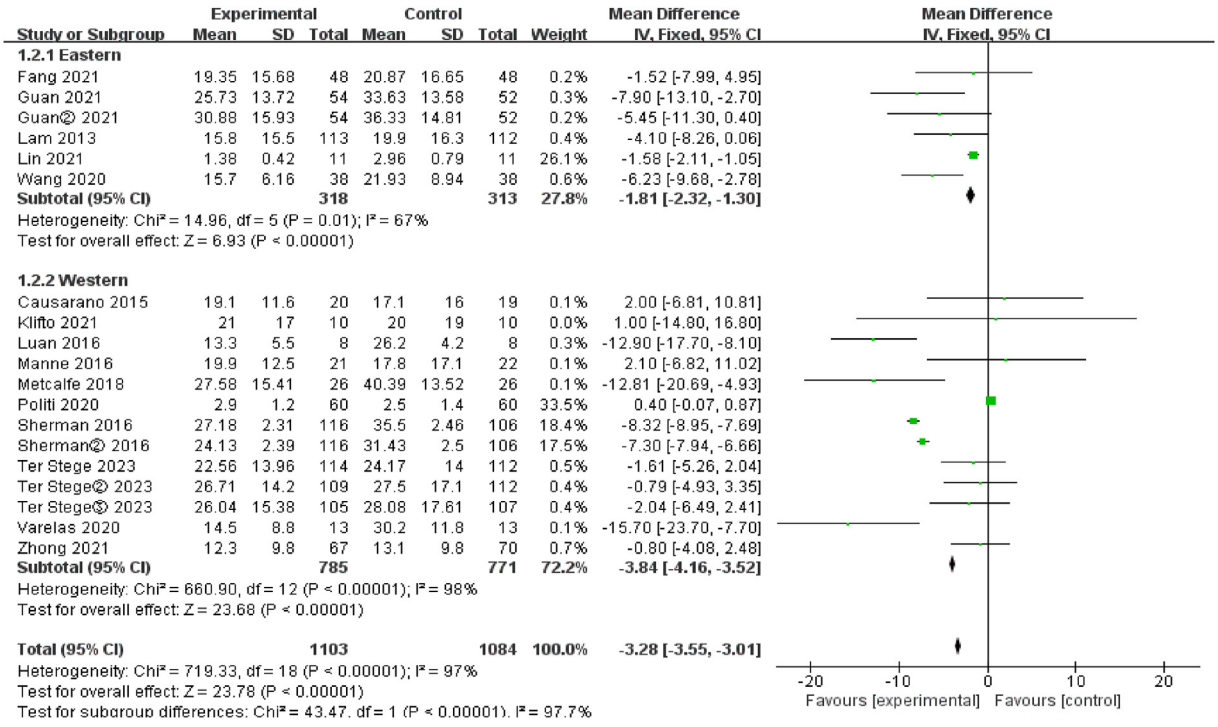


Fig. 4. Decisional conflict (subgroup analysis-country/region).

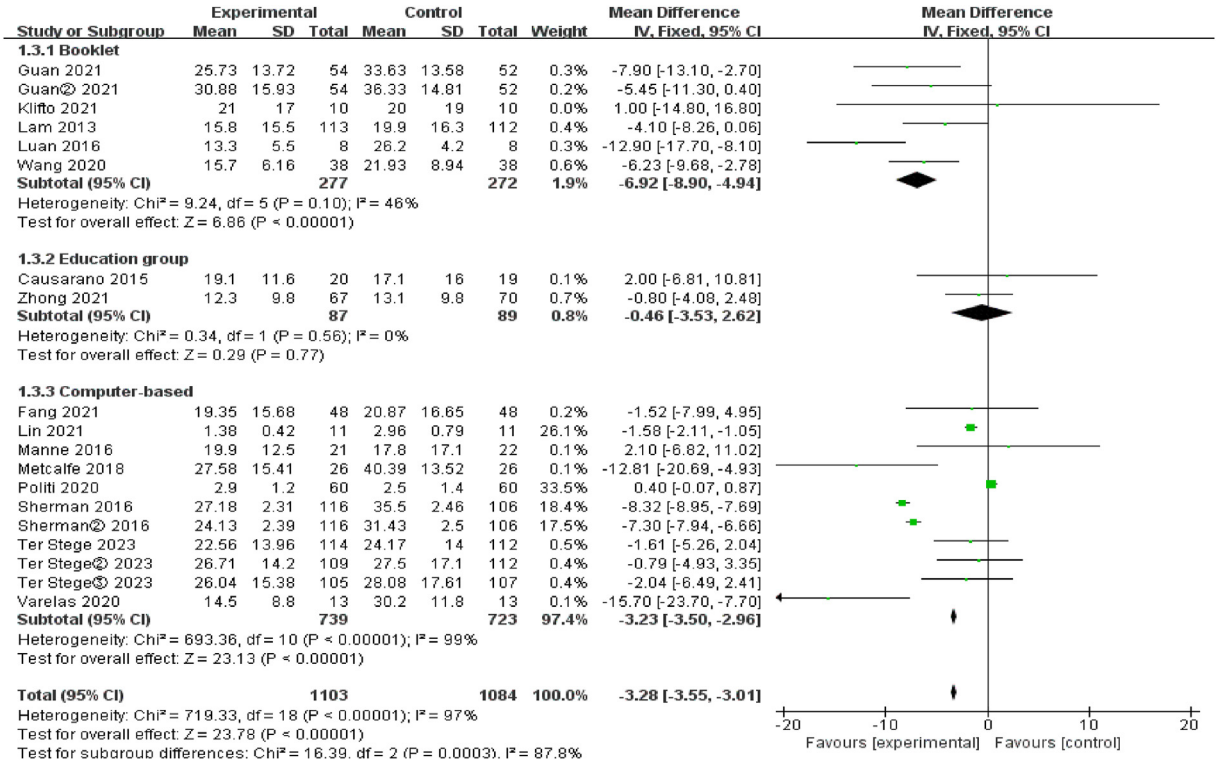


Fig. 5. Decisional conflict (subgroup analysis- type of intervention).

Bias of publications

The sensitivity analysis showed robust results. The funnel plot analysis of the decisional conflict (where the number of studies was equal to or greater than 10) exhibited an inverted funnel shape, which could be considered as a small level of publication bias.

Discussion

We conducted a systematic review of 18 RCTs and quasi-randomized trials, which involving 1662 patients. The SDM had a positive impact on decisional conflicts, decisional regret, decisional participation, decisional knowledge, and depressive mood in patients with breast cancer in

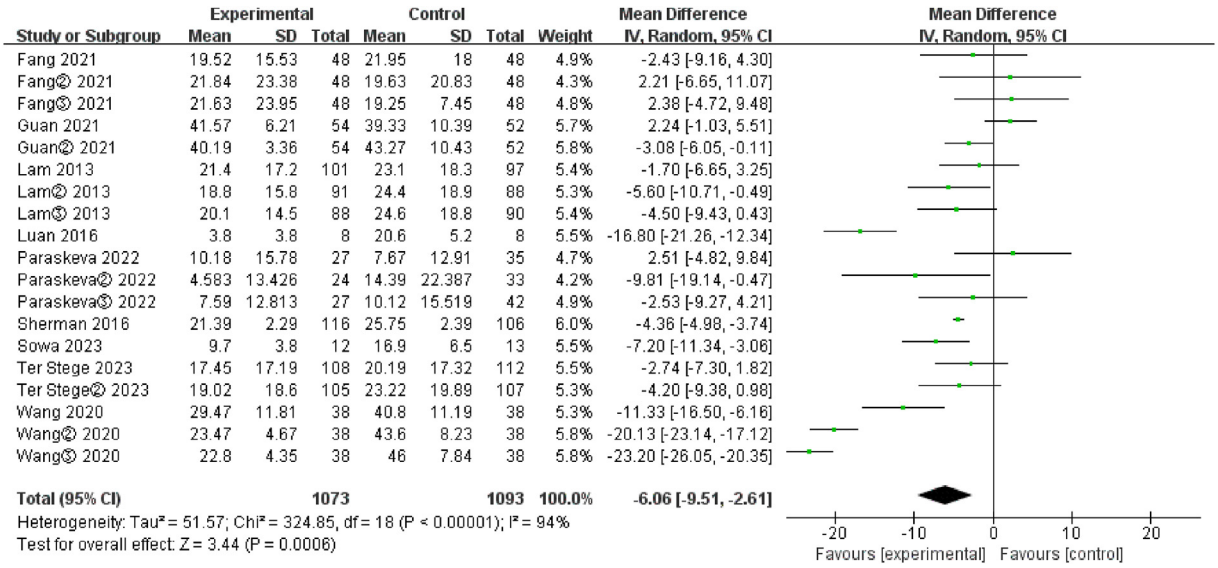


Fig. 6. Decisional regret.

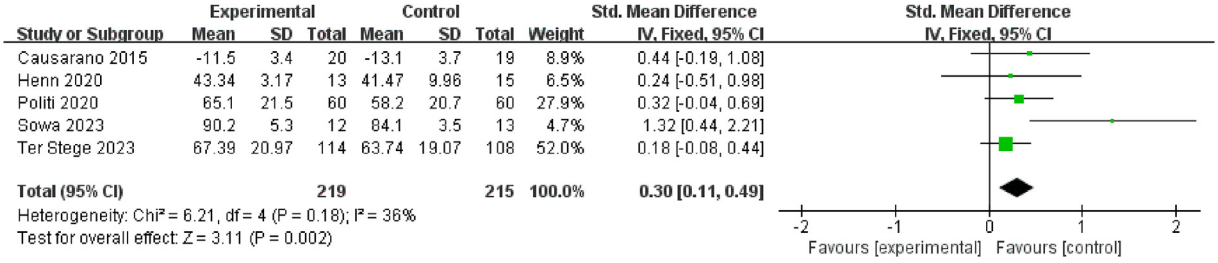


Fig. 7. Decisional participation.

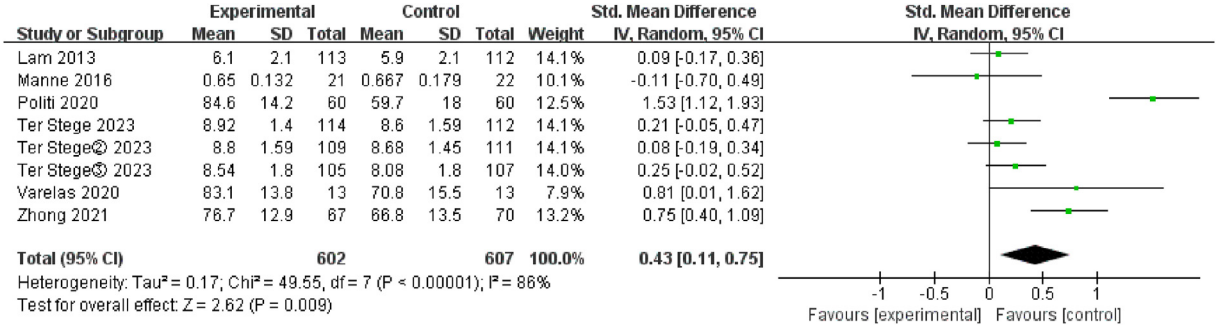


Fig. 8. Decisional knowledge.

making decisions about breast reconstruction surgery; however, the decisional satisfaction or anxiety of the patients did not show improvement.

Application and effects of SDM for breast reconstruction surgical decision-making in patients with breast cancer

Our study findings indicate that SDM can reduce decisional conflict in patients with breast cancer undergoing breast reconstruction surgery. Similar to our study findings, the study by Paraskeva *et al.*,[12] which included eight papers involving 1212 patients, revealed that the decisional conflict level in the intervention group was lower than that in the control group at 1 week, 1 month, and 6 months. High level of decisional conflict may lead to anxiety and stress, which in turn reduces the quality of life of patients; however, patients may hesitate about their treatment decisions, potentially delaying the optimal treatment time and affecting therapeutic outcomes.[36,37] Therefore, it is necessary to reduce the decisional conflict by means of decision sharing. Decisional conflicts among patients are primarily caused by the lack of relevant information for decisions.[36] When faced with the decision of breast reconstruction, insufficient information may exacerbate difficulties in decision-making for patients with breast cancer.[38] The SDM model can help patients understand the advantages and disadvantages of breast reconstruction options and reduce decisional conflict by providing more detailed information.

We conducted two subgroup analyses in the decisional conflict group (included studies > 10). Although the current progress level of SDM research in Eastern is relatively lower than that in the Western countries, the intervention effect was still confirmed. However, the pooled effect size in the Eastern group (−1.81) was smaller than that in the Western group (−3.84). These analysis results contradict with those obtained

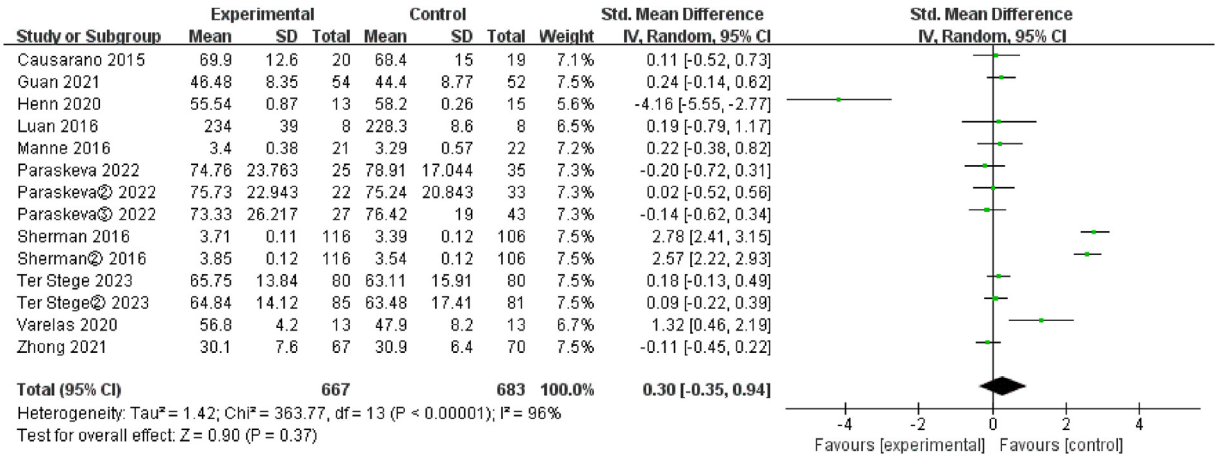
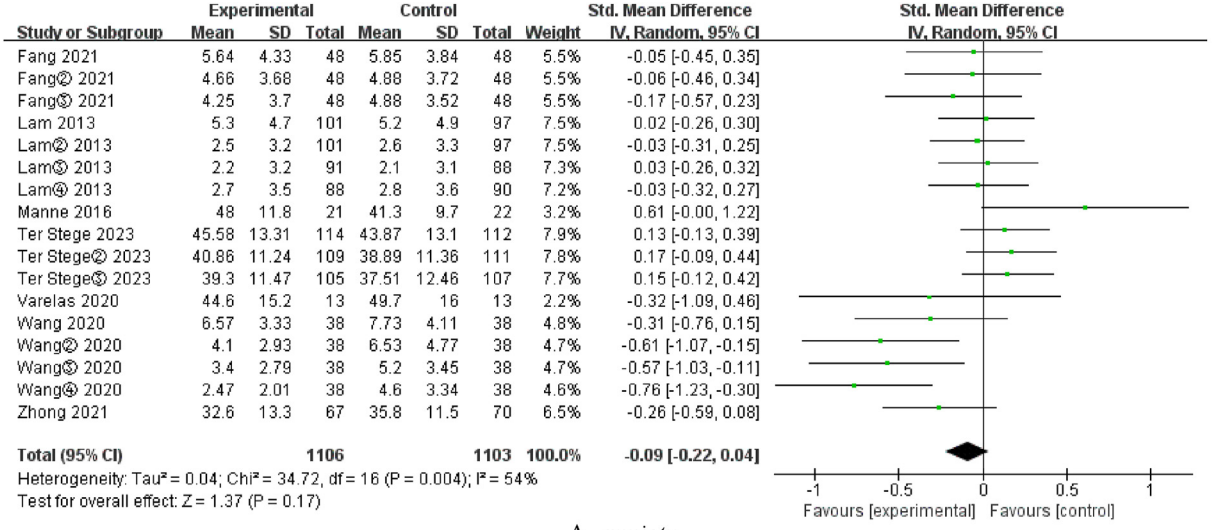
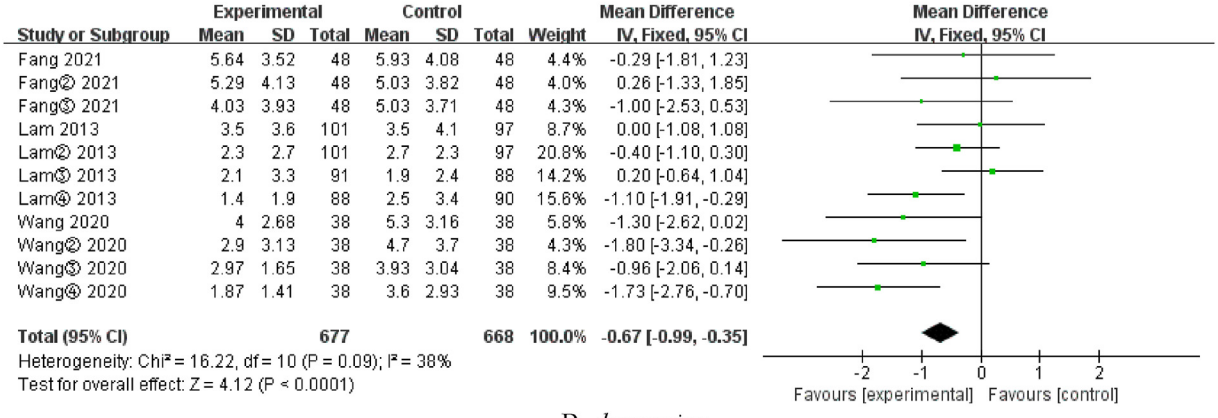


Fig. 9. Decisional satisfaction.



A. *anxiety*



B. *depression*

Fig. 10. Psychological state.

from similar previous studies.[15] In the intervention type, the SDM intervention in the Booklet and Computer-based group was significantly decreased with respect to the decisional conflict of the patients. The Booklet group (−6.92) intervention effect was better than that in the Computer-based group (−3.23). Our findings are similar to those of previous similar studies.[13] This may be attributed to the good visual and audio experience provided by the Computer in the computer-based system. However, the age of most patients was over 45 years. Although the medical staff may have taught the use of computer, patients may not proficient enough in operating computers. However, the materials used in the Booklet group could be repeatedly viewed by patients, and were easy to use and learn; this lowered the learning threshold for patients so that the patients could have a deeper understanding of breast reconstruction-related knowledge and make better decisions. The

education group did not significantly reduce decision conflict. This may because interventions cannot be stored in the education group, and patient cannot achieve the educational materials, resulting in reduced quality of learning effects.

SDM can reduce decisional regret in patients with breast cancer who decided to undergo breast reconstruction surgery. Decisional regret may be associated with a patient's refusal to accept follow-up treatment, leading to delayed recovery, poor mental health, and reduced quality of life.[39] The study by Tyner *et al.*[40] included a summary of 25 studies and suggested that decisional regret, which includes regret about the outcome, process, and choice of options, could lead to psychological distress and a decrease in the quality of life for patients with breast cancer. The more medical information the patients received, the less decisional regret they experienced.[41] Through SDM, medical staff can help patients prepare for decision-making and reduce decisional regret by providing detailed information on various breast reconstruction methods, possible outcomes, alternative surgical methods, and related complications.

Furthermore, our study revealed that SDM can significantly improve decision-making in breast reconstruction surgery. Decisional participation can represent the level of perception and participation of the patients in SDM. The key point of SDM is to enable patients to make decisions after fully understanding the relevant decision-making information; thus, this is an important indicator to evaluate the effectiveness of medical staff to carry out SDM. When patients have a higher level of decisional participation, SDM tools can more effectively assist them in making decisions, which will more likely reduce decisional regret.[32]

The decisional knowledge level can indicate the degree of acceptance of medical knowledge by the patients in the SDM process, and can represent the effect of SDM to a certain extent. Diverse forms of SDM were included in this study, including brochures, educational teams, and computer-based interventions, which encompass traditional paper text, images,[28] videos,[20] tables,[24] and peer support.[19] These various methods can increase the perception and understanding of patients with breast cancer regarding the relevant information on breast reconstruction surgeries and improve their decisional knowledge.

Drinane et al.[42] suggested that depression is associated with worse treatment outcomes in patients undergoing breast reconstruction, including increased length of hospital stay, nursing costs, and complications. SDM can improve the depression level for breast reconstruction surgical decision-making in patients with breast cancer to improve their prognosis. Depression in patients with breast cancer before breast reconstruction may be related to factors such as insufficient access to information and worrying about the reconstruction outcomes. SDM interventions may reduce anxiety and depression of the patients by providing sufficient information.

Although this study showed that SDM had a positive effect on most of the analyzed indicators, SDM did not significantly improve the decisional satisfaction of patients with breast reconstruction surgery. Similar findings were shown in the study by Liu et al.,[15] which included 10 articles involving 950 patients and used different evaluation tools for the analysis of the decisional satisfaction group. This may be attributed to the fact that decisional satisfaction involves many aspects, such as postoperative breast shape,[15] which cannot be completely observed and evaluated in a relatively short follow-up time. It may also be due to the fact that the included studies did not adjust other confounding factors that have a great impact on patient satisfaction, such as coping skills[31] and social factors.[21,31] Moreover, decisional satisfaction included patient satisfaction with decision-making information; an inadequate understanding of decision-making information could lead to reduced patient satisfaction. However, some of the patients included in this study had a low education level, similar to the study by Ter Stege et al.,[35] with nearly 50% of them at the low to medium education level, which may also lead to the negative results of the analysis in decisional satisfaction.

This study confirmed another non-positive indicator of SDM anxiety. Orr et al. revealed that preoperative anxiety was the only significant predictor of the number of reconstructive surgeries after breast reconstruction[43]; however, we speculated that there may be other environmental factors, such as social support, that can predict postoperative anxiety in patients with breast cancer after breast reconstruction. Although SDM interventions can alleviate anxiety caused by a lack of reconstruction knowledge to some extent, anxiety levels may be affected by other confounders. This may also be attributed to the fact that the anxiety analysis group in this study showed significant heterogeneity (54%), which was greater than that of the depression analysis group (38%); thus, no statistical differences were observed in the anxiety indicators. Alternatively, the included studies had a short follow-up period, which was insufficient to observe a significant improvement in the results of our analysis. Some studies suggested that the SDM tools may inadvertently increase patient anxiety[44]; however, this was not reflected in the pooled effect sizes in this study.

SDM intervention characteristics in the included literature

Through the summary and analysis of SDM interventions in the included literature, the main forms of intervention can be divided into education, computer-based intervention, and manuals; among which, the most popular form was computer-based intervention.

In terms of developers and interveners, most of them were breast surgeons and nurses; but referring technical term of nurse, it was relatively vague. For example, many studies have not clarified whether these nurses are breast specialist nurses. Zhong *et al.*[34] mentioned "breast reconstruction nurse" in their study, Lam *et al.*[18] also mentioned "breast nurse specialists", while others simply referred to "nurses". This phenomenon may be due to the unclear explanation by the authors or the fact that there is still much room for standardization in the specialty refinement of nurses compared with physicians, which needs to be addressed by the management department in the future.

In terms of the intervention content, different studies have high levels of similarity, such as the selection of breast reconstruction method (prosthesis or autologous reconstruction) and comparing the benefits and disadvantages of various surgical methods (in the form of tables). However, it is crucial to clarify the patient's own value, which has been mentioned to a lower extent in previous studies. Value clarification is designed to help women assess, explore, and identify their personal values and encourage thinking about how these values affect their decisions,[45] which can help patients with breast cancer make ideal decisions in their breast reconstruction surgical decision-making process. In addition, some studies have developed their own unique intervention content. For example, Politi *et al.*[24] designed a personal complication risk assessment tool to inform patients about the risk of complications after immediate reconstruction. Another novel intervention is the use of breast reconstruction peer support for experience sharing and answering questions.[19,34] Peer support increases the organizational capacity of health care for patients with breast cancer.[46] In addition, evidence-based research is a popular scientific research method that requires more investigations to be applied and popularized to strengthen the scientific nature of the content of SDM intervention and is also more conducive to the subsequent promotion and popularization of the schemes' content. Among the 18 included articles, only one study[35] mentioned the evidence-based nature of information related to breast reconstruction programs in the intervention content. From the analysis of the included literature, the intervention content of RCT and quasi-randomized trials is subjectively biased. Since the evidence provided by RCTs is regarded as the highest evidence level in a single study, we are hopeful that future research can strengthen the use of evidence-based methods and improve the intervention to the content standardization.

Implications of this study for current clinical practice and future research

The current SDM research areas are more focused in Europe and the United States, while the relatively few studies in Eastern are still in their initial stages. This suggests that Eastern countries need to accelerate the

application and popularization of SDM in breast reconstruction surgical decision-making for patients with breast cancer. As for the specific interventions of SDM, our study revealed that there are many forms and contents of SDM interventions in breast reconstruction surgical decision-making for patients with breast cancer in the RCTs and quasi-randomized trials that need to be further standardized through evidence-based medicine.

In addition, the analysis of the intervention content suggests that medical staff should promote the dominance of nurses when conducting SDM interventions. Nurses are medical staff with whom patients have the closest contact in the hospital. Compared with physicians and technicians, nurses have more advantages to understand and perceive the thoughts and emotional changes of patients and provide them with the care they need. Therefore, enhancing the dominance of nurses may play a positive role in SDM. In addition, the hospital management department cannot ignore the emphasis on the nurse specialty. More specialized "breast surgery nurses" or "breast reconstruction nurses" are expected to be involved in the SDM intervention.

Limitations

Although most of the single literature evaluations were medium-to-high in quality, one-third of the included studies were quasi-randomized, which may have led to a certain bias in some analytical results. Future studies should conduct additional RCTs to provide high-quality evidence for future systematic reviews. In addition, owing to the limitations of the included study data, this study did not conduct a subgroup analysis of outcome indicators that were not statistically significant, such as decisional satisfaction and anxiety. In the future, systematic reviews with more detailed study data should be conducted to further evaluate the application of SDM, including the influence of the intervention form, intervention time, and follow-up time on outcomes.

Conclusions

SDM reduced decisional conflict and regret, improved decisional participation and decisional knowledge, and relieved depression in patients with breast cancer; however, it had no significant effect on decisional satisfaction and anxiety. Moreover, SDM seems has better effectiveness in Western countries than that in Eastern countries and the implement of Booklet has better effectiveness than that of Computer-based modality. In the future, multicenter, large-scale, and high-quality RCTs need to be conducted to provide further high-quality evidence on this topic, including developing the culture impact on and effectiveness in different interventional approaches of SDM for breast reconstruction in patients with breast cancer.

Ethics statement

Not required.

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Credit authorship contribution statement

Lixia Chen: Conceptualization, Data curation, Formal Analysis, Writing – original draft. **Jia Lu:** Data curation, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Bo Chen:** Writing – review & editing, **Xiaoxia Zhang:** Conceptualization, Formal Analysis, Supervision, Writing – review & editing. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

The authors declare no conflict of interest. The corresponding author, Prof. Xiaoxia Zhang is an editorial board member of *Asia–Pacific Journal of Oncology Nursing*. The article was subject to the journal's standard procedures, with peer review handled independently of Prof. Xiaoxia Zhang and their research groups.

Data availability statement

The data that support the findings of this study are available from the corresponding author, Xiaoxia Zhang, upon reasonable request.

Declaration of generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.apjon.2024.100596.

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