Shared decision making in cardiology – a systematic review and meta-analysis

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Abstract

Objectives To evaluate the effectiveness of interventions to improve shared decision making (SDM) in cardiology with particular focus on patient centred outcomes such as decisional conflict.

Methods We searched Embase (OVID), the Cochrane library, PubMed and Web of Science electronic databases from inception to January 2021 for randomised controlled trials that investigated the effects of interventions to increase SDM in cardiology. The primary outcomes were decisional conflict, decisional anxiety, decisional satisfaction, or decisional regret; a secondary outcome was knowledge gained by the patients.

Results Eighteen studies which reported on at least one outcome measure were identified, including a total of 4419 patients. Interventions to increase SDM had a significant effect on reducing decisional conflict (standardised mean difference: -0.211; 95% CI -0.316 to -0.107) and increasing patient knowledge (0.476; 95% CI 0.351 to 0.600) compared to standard care.

Conclusions Interventions to increase SDM are effective in reducing decisional conflict and increasing patient knowledge in the field of cardiology. Such interventions are helpful in supporting patient centred health care and should be implemented in wider cardiology practice.

Key questions

What is already known about this subject?

Shared decision making is a joint process in which a healthcare professional works together with a person to reach a decision about care. The effectiveness of interventions to increase shared decision making in various specialties has been demonstrated. Shared decision making has been applied in cardiology, and there are a number of randomised controlled trials testing its effects on a variety of clinical situations.

What does this study add?

We perfomed a systematic review and meta-analysis of the randomised controlled trials that examine the application of shared decision making in cardiology, and more specifically its effects on decisional conflict, decisional anxiety, decisional regret, decisional satisfaction and knowledge. This is the first meta-analysis to address this question. Overall, we showed that interventions which aim to increase shared decision making are effective in cardiology.

How might this impact on clinical practice?

Evidence for the effectiveness of shared decision making in cardiology may help change attitudes towards this patient centred framework and facilitate its recommendation in clinical guidelines.

Introduction

Shared decision making (SDM) has been defined as ‘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 preference’ (1).

SDM is considered desirable and effective as a policy choice to facilitate the right of involvement for patients, to allow patients to take an active role in decisions regarding their health, to reduce overuse of treatment options without clear benefit, to reduce healthcare practice variations, as well as to improve sustainability of the healthcare system by supporting patient ownership of their care (2).

Although shared decision making is specifically recommended for certain clinical scenarios in cardiology, such as implantable cardioverter defibrillator (ICD) insertion (3), the uptake in cardiac clinical guidelines is uneven (4, 5), presumably at least partly due to lack of evidence of its effect across the spectrum of cardiology.

We conducted this systematic review and meta-analysis of randomised controlled clinical trials to investigate the effectiveness of interventions to facilitate shared decision making in cardiology. Accumulating evidence on the effectiveness of SDM in cardiology may help inform clinical guidelines in cardiology and thereby help changing attitudes towards this patient centred approach.

Methods

Protocol

A protocol for this study explicitly stating defined objectives, criteria for study selection, assessment criteria for included studies and data extraction was developed. The protocol was prospectively registered with PROSPERO, the International Prospective Register of Systematic Reviews and has been allocated the registration number CRD42021290164 (www.crd.york.ac.uk/prospero). We present our findings according to the reporting guidelines for meta-analyses and systematic reviews of randomised controlled trials as outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (supplement).

Database search

We searched Embase (OVID), the Cochrane library, Pubmed, and Web of Science from Inception to January 2021. Search strategies were adapted from Legare et al (2) for the SDM aspect of the search, modified to make the search cardiology specific, and adjusted according to requirements of each database (supplement). The search strategy for Embase, as a representative example is shown below:

1 (shared decision or sharing decision or informed decision or informed choice or decision aid).ti,ab. or ((share* or sharing* or informed*) and (decision* or deciding* or choice*)).ti. (22530)
2 exp clinical decision making/ or exp decision making/ or exp decision support system/ or exp ethical decision making/ or exp family decision making/ or exp medical decision making/ or exp patient decision making/ or (decision making or decision support or choice behaviour).ti,ab. or ((decision* or choice*) and (making* or support* or behaviour*)).ti. (477532)
3 exp patient participation/ or (patient participation or consumer participation or patient involvement or consumer involvement).ti,ab. or ((patient* or consumer*) and (involvement* or involving* or participation* or participating*)).ti. (43913)
4 exp doctor patient relation/ or exp nurse patient relationship/ or exp nurse/ or exp physician/ or (nurse* or physician* or clinician* or doctor* or general practitioners or gps or health care professionals or healthcare professionals or health care providers or healthcare providers or resident*).ti,ab. (2129607)
5 exp patient/ or (patient* or consumer* or people*).ti. (4653143)
6 4 and 5 (587332)
7 1 or (2 and 3) or (2 and 6) or (3 and 6) (66880)
8 "random*".ab,kw,ti. (1632000)
9 (Myocard* or Arrhythm* or Valv* or Fibrill* or Tachycard* or Bradycard* or Heart or Angin* or Coronar* or Ischaemi* or Ischemi* or Card* or Aort* or Mitral or Vascular or Infarct* or Conduction or Channelopathy or "Diastolic dysfunction" or "Systolic dysfunction" or Atri* or Ventric* or Palpitatio* or Arter* or Hypertensi* or Cardiac pac* or Pacemaker or Endocarditis or electrocardiogra* or electrophysiolog*).ab,kw,ti. (4990709)
10 7 and 8 and 9 (1300)

Study Selection and data extraction

Two reviewers (P.M. and N.G.-H.) independently screened titles and abstracts. Relevant studies were retrieved in full text and assessed for eligibility. Studies which were only available as abstract were excluded. Discrepancies between the two reviewers were resolved by discussion or through involvement of up to two further reviewers (J.R. and C.P.). Only randomised controlled trials (RCTs) assessing the effects of an intervention to increase SDM in cardiology were included.

Two reviewers used a data collection form to extract available data (P.M. and N.G.-H.) including clinical setting, study population and geographical location, clinical condition, details on intervention under investigation, as well as endpoints and their associated collection time points. Study methodological quality was assessed independently by two reviewers (P.M. and N.G.-H.) using a standardised tool (6). Potential bias was classed as high, low or unclear and discrepancies were resolved through discussion between reviewers.

The primary outcomes of decisional conflict, decisional anxiety, decisional regret, and decisional satisfaction were chosen as patient centred outcome measures as preliminary searches showed these to be the most coherently reported. A summary of the instruments used to assess these outcomes is provided in the supplement

(Tables S6 and S7). If primary outcomes were reported at multiple follow-ups, data from the last follow up was used for the meta-analysis. A pre-defined secondary outcome was knowledge gained by the patient, assessed at the earliest opportunity following intervention. Studies that only reported on the secondary outcome without investigating effects on the primary outcomes were excluded.

Data analysis

Data was analysed in OpenMeta[Analyst] software version 10.12 (developed by the Centre for Evidence Synthesis, Brown University, School of Public Health, Rhode Island State, USA) and Meta-Essentials tool for Microsoft excel (7) and plotted using Graphpad Prism. A continuous random effect model was used to calculate summary estimates and data was presented as standardised mean differences (SMD) with 95% confidence intervals (CIs). Only data available from published studies was used. If studies reported on means with confidence intervals, corresponding standard deviations were calculated to generate standardised mean differences. Where studies only reported on means and estimation of standard deviations was not possible, data was excluded. Inter-study heterogeneity was assessed using the I^2 statistics, where values above 50% were considered significant. We planned to assess publication bias visually and by funnel plot if at least ten studies reported on any outcome measure.

The following pre-defined subgroup analyses were planned on the primary outcome decisional conflict if sufficient data was available: 1) Different cardiac condition or subspecialty, for example atrial fibrillation, cardiac device implantation, chest pain/intervention; 2) different strategies to improve shared decision making, for example video format, computer/online information sheets, printed patient information. We planned to conduct sensitivity analyses to test the robustness of the data.

Patients and the public have not been involved in the design and conduct of this systematic review and meta-analysis.

Results

Our search identified 9,245 titles and abstracts for screening, of which 159 articles were assessed in full text (Figure 1). Eighteen RCTs reporting on 4419 patients were included in this systematic review and meta-analysis (Table 1, Table 2, Table S5). The included trials were modest in size with the exception of Hess et al 2016 (8) and Kunneman 2020 (9), reporting on 898 and 922 patients, respectively. Trials were conducted exclusively in high-income countries, including the USA [Allen 2018 (10), Case 2019 (11), Coylewright 2016 (12), Doll 2019 (13), Fraenkel 2012 (14), Hess 2012 (15), Hess 2016 (8), Kostick 2018 (16), Kunneman 2020 (9), Thomas 2013 (17)], United Kingdom [Thomson 2007 (18)], and Canada [Carroll 2017 (19), Holbrook 2007 (20), Lewis 2020 (21), Man-Son-Hing 1999 (22), McAlister 2005 (23), Morgan 2000 (24), Schwalm 2012 (25)]. No trials were conducted in low- or middle-income countries.

A broad range of clinical conditions in cardiology were covered, including atrial fibrillation and anticoagulation [Fraenkel 2012 (14), Hoolbrook 2007 (20), Kunneman 2020 (9), Man-Son-Hing 1999 (22), McAlister 2005 (23), Thomson 2007 (18)], chest pain and coronary artery disease [Case 2019 (11), Coylewright 2016 (12), Doll 2019 (13), Hess 2012 (15), Hess 2016 (8), Morgan 2000 (24)], cardiac devices and pacemakers [Carroll 2017 (19), Lewis 2020 (21), Thomas 2013 (17)], as well as advanced treatment options including left ventricular assist devices (LVAD) [Allen 2018 (10), Kostick 2018 (16)]. Included trials used a variety of formats in patient decision aids to improve SDM, including printed aids [Allen 2018 (10), Carroll 2017 (19), Coylewright 2016 (12), Hess 2012 (15), Hess 2016 (8), Holbrook 2007 (20), Kostick 2018 (16), Lewis 2020 (21), McAlister 2005 (23), Man-Son-Hing 1999 (22), Morgan 2000 (24), Schwalm 2012 (25)], audiotapes [Holbrook 2007 (20), McAlister 2005 (23), Man-Son-Hing 1999 (22)], video [Allen 2018 (10), Morgan 2000 (24), Thomas 2013 (17)], coaching [Lewis 2020 (21)] and online/computer programmes [Case 2019 (11), Doll 2019 (13), Fraenkel 2012 (14), Holbrook 2007 (20), Kunneman 2020 (9), Thomson 2007 (18)]. Details of reviewers' structured assessment of methodologic quality of included studies (6) are shown in Table 3.

Thirteen RCTs reported data from 3738 patients on decisional conflict using a decision conflict scale that could be included in the meta-analysis. None of the included studies was considered as having low risk of bias across the domains assessed (Table 3). Interventions to increase shared decision making had a significant effect on reducing decisional conflict (SMD -0.211; 95% CI -0.316 to -0.107) compared to standard care (Figure 2). A moderate degree of heterogeneity was observed (I^2 = 49.02%) which in part may be explained by the wide range of cardiac conditions and interventions to improve SDM that were included. The largest effects were observed in studies reported by Hess 2012 (15) and Carroll 2017 (19) reporting on the use of decision aids in decision making concerning chest pain and ICD insertion, respectively, driving the degree of overall heterogeneity. However, no single clinical condition or intervention to improve SDM was identified that could explain the heterogeneity across studies. Pre-specified subgroup analysis, stratified based on clinical condition, and examining different formats of patient decision aids suggest effectiveness of SDM across the broad spectrum of cardiology and through the use of various modalities (supplement). Leave-one-out sensitivity analysis confirmed the robustness of the reported data (supplement). Funnel plot analysis did not suggest significant publication bias (Figure 4).

Eleven RCTs reported data on 2210 patients on patient knowledge assessed through use of various questionnaires with relevance to the cardiology condition under investigation. There was modest heterogeneity (I^2 = 37.61%) in the included studies and a significant increase of knowledge was reported (SMD 0.476, 95% CI 0.351 to 0.600, Figure 3; Funnel plot, Figure 4).

Decisional regret was quantitatively reported in only two RCTs and decisional satisfaction in three RCTs (Table 2 and Table S5) and meta-analysis was therefore not performed.

Discussion

We found considerable evidence to support the use of interventions to improve shared decision making in cardiology (Figure 5). Use of such interventions reduced decisional conflict and increased patient knowledge. There was not enough evidence to conclude on the effects of such interventions on patient satisfaction or decisional regret.

In this protocol driven, prospectively registered systematic review we conducted a comprehensive search strategy and only included randomised controlled clinical trials allowing us to report on the highest level of evidence. A broad range of cardiology topics was included in the clinical trials assessed and we aimed to analyse multiple outcomes with relevance to shared decision making, thus making the findings of our study relevant to the full clinical spectrum in cardiology. We have analysed and reported our finding according to the PRISMA guidelines.

Despite the methodological design, this systematic review and meta-analysis is not without limitations. Most of the eighteen studies included in this systematic review and meta-analysis were modest in size, underpowered to detect potentially small differences between groups, and often included only one or two outcome measures. There was significant heterogeneity in the trials included in this study, which could partly be explained by different cardiac conditions under study. However, no singular cardiac condition or strategy to improve SDM emerged that could explain the heterogeneity alone. Furthermore, despite this heterogeneity, the effect of interventions to increase SDM on one of the main outcome measures (decisional conflict) was consistent across cardiac conditions studied. Leave-one-out sensitivity analysis supports this conclusion.

The robustness of the present study is supported by the pre-specified subgroup analysis, stratified according to clinical condition demonstrated the effectiveness of SDM across various domains such as chest pain/coronary artery disease/coronary intervention, arrhythmias/atrial fibrillation, and cardiac device implantation. The robustness of the effects of the interventions on SDM underscores the generalisability of our findings to the wider field of cardiology and is consistent with findings of similar analyses in other medical and surgical specialties (27-29). It is also noteworthy that the findings of this meta-analysis were robust in a subgroup analysis investigating various formats to support SDM such as printed media, computer aids and other formats. It is, however, less clear whether the findings of our study are also applicable to lower and mid-income countries as all included studies were conducted in high-income countries (see Table 1). Furthermore, there may also be important effects of culture and language affecting the effectiveness of interventions to improve SDM. Since all our included studies were conducted in the USA, Canada and the UK, our findings may not necessarily be applicable to other high-income countries for example in Asia or Europe.

Despite the effectiveness of SDM in improving patient outcomes in general (2), several challenges have been encountered during implementation (30). Major barriers to implementation, both from patients and clinicians, were found to be 1)

lack of knowledge and skills, 2) lack of tools, and most importantly 3) opposing attitudes. Nevertheless, the Making Good Decisions in Collaboration (MAGIC) programme also identified possible solutions that may also help implementation of SDM in cardiovascular care (30). For example, dedicated interactive skills workshops may be used to challenge clinicians attitude and highlighting the gap between current practice and SDM. Tools to aid decision-making could be developed locally, making appropriate information available with relevance to local management pathways and further engaging clinicians with SDM. Similarly, preparing patients to participate in SDM through raising awareness of this method may increase their engagement in this process. Through measurement of decision quality, an improvement in care may be demonstrated following implementation of SDM. Importantly, success of implementation depends on both a collaborative and facilitated approach in each clinical team as well as senior level support demonstrating this to be an organisational priority.

Evidence for the effectiveness of SDM in cardiology may help change attitudes towards this patient centred framework and facilitate its recommendation in clinical guidelines. Whilst this systematic review and meta-analysis adds to the growing evidence of the effectiveness of interventions to increase SDM on patient centred outcomes, further research on strategies for implementation is urgently needed.

Contributorship statement

PM: Conceptualisation, Methodology, Validation, Investigation, Writing- review & editing.
NGH: Conceptualisation, Methodology, Validation, Investigation, Writing- review & editing.
JR: Conceptualisation, Methodology, Validation, Investigation, Writing- original draft, Project administration, Guarantor
CP: Conceptualisation, Methodology, Validation, Investigation, Writing- review & editing, Project administration, Supervision

PM and NGH contributed equally to this paper

JR and CP contributed equally to this paper

Figure Legends:

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

Figure 2 Effect of interventions to increase shared decision making on decisional conflict. Standardised mean difference of decisional conflict score is shown. Weights are derived from random-effects model.

Figure 3 Effect of interventions to increase shared decision making on patient knowledge. Standardised mean difference of knowledge score is shown. Weights are derived from random-effects model.

Figure 4 Funnel plots for decisional conflict and knowledge.

Figure 5 Graphical summary

Table 1 Characteristics of included studies

Reference		Clinical setting	No. of Participants	Location	Length of follow up	Intervention	Condition / Therapy
Allen (10)	2018	Hospital, multicenter (total 6)	248	USA	6 months	Clinician education, printed decision aid and video decision aid	LVAD
Carroll (19)	2017	Hospital, single center	82	Canada	3 months	Printed decision aid	ICD
Case (11)	2019	Hospital, single center	99	USA	Not stated	Web-based application decision aid	CAD
Coylewright (12)	2016	Hospital, single center	124	USA	3 months	Printed decision aid	CAD
Doll (13)	2019	Hospital, single center	203	USA	3 months	Web-based application decision aid	CAD
Fraenkel (14)	2012	Primary Care Clinics	135	USA	Not stated	Computer-based application decision aid	AF
Hess (15)	2012	Hospital, single center	204	USA	30 days	Printed decision aid	CAD
Hess (8)	2016	Hospital, multicenter (total 6)	898	USA	45 days	Printed decision aid	CAD
Holbrook (20)	2007	Family Practices (total 4) and Geriatric Day Clinic (total 1)	98	Canada	Not stated	Assessed impact of decision aid format: (1) printed, (2) printed + audiotape, (3) interactive computer program	AF
Kostick (16)	2018	Hospital, multicenter	98	USA	1 month	Printed decision aid	LVAD
Kunneman (9)	2020	Hospital, multicenter	922	USA	Not stated	Web-based application decision aid	AF
Lewis (21)	2020	Cardiac device clinic	29	Canada	12 months	Printed decision aid and nurse-led coaching	ICD
McAlister (23)	2005	Primary care practices (total 102)	434	Canada	12 months	Printed and audiotape decision aid	AF

Man-Son-Hing (22)	1999	Hospital, multicenter (total 14)	287	Canada	6 months	Printed and audiotape decision aid	AF
Morgan (24)	2000	Hospital, single center	240	Canada	6 months	Printed and video decision aid	CAD
Schwalm (25)	2012	Hospital, single center	150	Canada	No follow-up	Printed decision aid	CAD
Thomas (17)	2013	Hospital, multicenter (total 3)	59	USA	3 months	Video decision aid	ICD
Thomson (18)	2007	General Practice	109	UK	3 months	Computer-based application decision aid	AF

Table 2: Outcomes of included studies

Reference		**Decisional conflict**	**Decisional regret, decisional satisfaction, decisional anxiety**	**Knowledge**
Allen (10)	2018	Favours intervention	**Decisional regret:** Favours control	Favours intervention
Carroll (19)	2017	Favours intervention		Favours intervention
Case (11)	2019	Favours intervention	**Decisional satisfaction:** "High" in both groups	Favours intervention
Coylewright (12)	2016	Favours intervention		Favours intervention
Doll (13)	2019	Favours intervention		Favours intervention
Fraenkel (14)	2012	Favours intervention		Favours intervention
Hess (15)	2012	Favours intervention		Favours intervention
Hess (8)	2016	Favours intervention		Favours intervention
Holbrook (20)	2007	Mean total DCS (5 point scale) = 2.1		Significant improvement in knowledge of AF after

		(SD 0.4); no usual care group for comparison in this study		PtDA regardless of format (p<0.01); no usual care group for comparison in this study
Kostick (16)	2018	Favours intervention	**Decisional regret:** Favours usual care **Decisional satisfaction:** Favours intervention	Favours intervention
Kunneman (9)	2020	Favours intervention		Favours intervention
Lewis (21)	2020	Favours usual care		Favours intervention
McAlister (23)	2005	Favours intervention		
Man-Son-Hing (22)	1999	Favours intervention	**Decisional satisfaction:** Favours intervention	Favours intervention
Morgan (24)	2000		**Decisional satisfaction:** Favours intervention	Favours intervention
Schwalm (25)	2012	Favours intervention		Favours intervention
Thomas (17)	2013	Favours usual care		Favours intervention
Thomson (18)	2007	Favours usual care	**Decisional anxiety**: Reduced in both groups	No difference

DCS decisional conflict scale, UC usual care, SD standard deviation, AF atrial fibrillation, PtDA patient decision aid.

Table 3 Risk of bias assessment of included studies

Reference		Random Sequence Generation	Allocation concealment	Performance Bias	Detection bias	Attrition bias	Reporting bias
Allen (10)	2018	Unclear	Unclear	High	Unclear	High	Low
Carroll (19)	2017	Low	Low	High	Low	Low	Low
Case (11)	2019	Low	Low	High	Unclear	Unclear	High
Coylewright (12)	2016	Low	Low	High	Unclear	Unclear	Low
Doll (13)	2019	Unclear	Unclear	High	Unclear	Low	Low
Fraenkel (14)	2012	High	Unclear	High	Unclear	Unclear	High
Hess (15)	2012	Low	Low	High	Low	Low	Low
Hess (8)	2016	Low	Low	High	Low	Low	Low
Holbrook (20)	2007	Low	Low	High	Unclear	Low	High
Kostick (16)	2018	Low	Low	Low	Unclear	High	Low
Kunneman (9)	2020	Low	Low	High	High	Low	Low
Lewis (21)	2020	Low	Low	Low	Unclear	Unclear	High
McAlister (23)	2005	low	low	High	Low	Low	low
Man-Son-Hing (22)	1999	Low	Low	High	Unclear	Unclear	Low
Morgan (24)	2000	Unclear	Unclear	High	High	High	Low
Schwalm (25)	2012	Low	Low	High	Unclear	Low	Low
Thomas (17)	2013	Low	Low	Unclear	Unclear	Low	High
Thomson (18)	2007	Low	Low	High	Unclear	High	High

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