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Review article

Remote shared decision making through telemedicine: A systematic review of the literature

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ABSTRACT

Objectives: To assess the extent to which shared decision making (SDM) can take place in telemedicine (remote SDM).
Methods: We searched Medline, Cochrane, and Scopus from 2010 until August 7th, 2020 for articles on remote SDM in the care of any patient using any technology. We also conducted a search for telemedicine articles citing key reports on SDM outcome measures. Two reviewers independently screened titles and abstracts, reviewed full text eligible studies, and synthesized their content using thematic analysis.
Results: Of the 12 eligible articles, most were European with patients with chronic disease or mental and behavioral health. 8 articles used synchronous remote SDM and 1 used asynchronous remote SDM. Themes related to interactional workability of both telemedicine technologies and SDM emerged, namely access to broadband, digital literacy, and satisfaction with the convenience of remote visits.
Conclusions: Telemedicine technologies may foster virtual interactions that support remote SDM, which, in turn, may promote productive patient-clinician interactions and patient-centered care.
Practice implications: Digitally-mediated consultations surged amidst the COVID-19 pandemic. The extent to which SDM frameworks developed for in-person use need any adaptation for remote SDM remains unclear. Investment in innovation, design, implementation, and effectiveness research to advance remote SDM are needed.

Contents

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1. Introduction

Shared decision making (SDM) is a key approach to patient-centered care. It is a conversation between clinicians and patients to co-produce an evidence-based, sensible, and feasible response to the problematic situation of the patient [1,2]. While these SDM conversations have traditionally taken place in in-person encounters, practice and policy changes in response to the COVID-19 pandemic have accelerated the adoption of telemedicine and increased the prevalence of remote visits [3–5]. The pandemic has caused significant changes in all points of care creating new opportunities to modernize what patient centered care is and how it can be done.

The possibility of routine remote visits as part of post-pandemic usual care demands the exploration of opportunities and challenges for the practice of SDM within these visits.

Telemedicine technologies may enable SDM by improving access to care, enabling sharing information, and supporting deliberative clinical conversations within digitally-mediated visits [6]. The extent to which SDM can take place in remote visits – which here we call remote SDM – remains unclear. Interaction processes in remote SDM can be divided in synchronous and asynchronous. Synchronous SDM involves the use of decision components through verbal interaction in sequential speech acts in circumscribed time and space and with written or pictorial decision aids. Asynchronous SDM extends decision making and sharing through written or pictorial exchanges across space and time (Fig. 1).

For the purpose of this review, we defined remote SDM as taking place when patients and clinicians engaged in SDM while separated only in space (synchronous) or separated in both space and time (asynchronous). We considered that remote SDM was synchronous even when the technological intervention collected data from patients or supported them in preparation for a subsequent remote synchronous SDM visit.

How digitally mediated interactions support remote SDM is likely to differ whether they take place synchronously or asynchronously. The aim of this review is to address these questions: how best to implement patient-centered care in general and SDM in particular within remote visits, what are the context-specific barriers and facilitators for its practice, and what is the effectiveness of interventions to promote it. To answer these questions, we conducted a systematic literature review about remote SDM.

2. Methods

This protocol-guided systematic review of the literature on remote SDM is reported according to the PRISMA statement (Appendix 1) [7].

2.1. Study identification

Following a search strategy designed in collaboration with an experienced reference librarian (L.J.P.) using each database's controlled vocabulary and keywords indicative of the concepts of

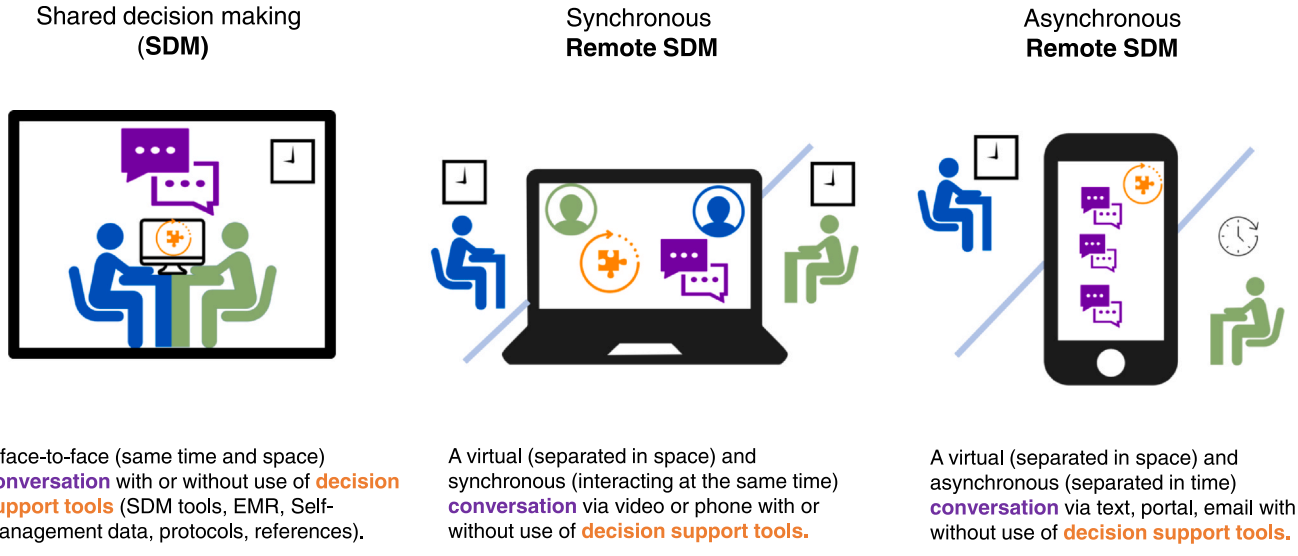

Fig. 1. Shared decision making in in-person visits or in telemedicine visits (remote SDM).

telemedicine and shared decision making, we conducted a comprehensive search from 2010 to August 7th, 2020 on Ovid MEDLINE® and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, and Daily, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, Ovid Cochrane Database of Systematic Reviews, and Scopus databases. This search was based on authors reporting SDM and telemedicine in the abstracts. We focused on the last decade to increase the relative pertinence of eligible articles to extant technologies. We supplemented this initial search strategy by also searching using Scopus and Web of Science for telemedicine-related articles that cited studies validating SDM outcome measures included in a review of SDM measurement instruments by Gärtner et.al. [8]. This second search was done to include articles that measured SDM in their methods, indicating that SDM was an objective of their study even if not highlighted in the title and abstract.We did not restrict the output by language. Appendix 2 describes these two search strategies.

2.2. Eligibility criteria

Eligible articles described an implementation of remote SDM, or an evaluation of its effects, implemented in the care of any patient using any technology. They described SDM when they reported that patient and clinician had a conversation (asynchronously or synchronously) with the intention to address the patient's concern and support patient participation in decision making (i.e. offered information about the options, provided clinician input, and included the patient deliberation and decision making). To be eligible, an article had to include an example of SDM, even if the intervention included other instances of ineligible interactions such as those directed at modifying behaviors. Because we are inclusive, we also included articles that, while relevant to the topic of remote SDM, addressed the issue only indirectly, i.e., the study did not directly assess the occurrence, feasibility, quality or effectiveness of remote SDM. These articles were classified as indirect evidence of SDM. Editorials, protocols of research, studies focused on supporting informed patient decision making, or only on changing patient behavior without SDM (i.e., m- or e-health applications that monitor behavior and intervene to change it such as smoking cessation or exercise) were excluded.

2.3. Study selection

Reviewers conducted calibration exercises to clarify and develop a common understanding of criteria and process. Two reviewers independently performed the title and abstract screening using Distiller SR (S.A.H. and A.G.B.), and the full text screening using Excel (S.A.H. and A.F.H.). During this process, we encountered challenges particularly with the use of the terms 'telemedicine' and 'SDM'. These were frequently used in the title and abstract, and were therefore included for the text full screening. However, in many cases, there was no further mention of these subjects in the article. Most disagreements were resolved through discussion; arbitration from a third party (V.M.M.) was needed for 3 articles.

2.4. Data extraction and analysis

Three reviewers (S.A.H., A.F.H, A.G.B.) extracted study characteristics in duplicate. We extracted information in any section of the paper describing the study design, the approach to technology, and the use of SDM. In all cases, we searched for data on funding sources, health care system, sample size, study design, study aims, type of SDM, SDM application to technology, and patient's characteristics.

First, two reviewers (S.A.H and A.F.H.) extracted results from the single studies related to or describing SDM. Each reviewer independently coded the extracted text to its meaning and content. Codes were directly derived from the text data. These codes were analyzed axially for consistency of coding across the studies. The two reviewers then compared, discussed and refined these codes by considering the underlying context of the text. We then grouped these codes together when relevant to develop descriptive themes to identify common themes across articles [9]. The reviewers used descriptive themes to generate analytical themes focusing on overarching concepts related to remote SDM. Each reviewer first did this independently and then as a group, discussing and concluding on a set of analytical themes.

Two authors (S.A.H and V.M.M) independently and in duplicate critically appraised the methods used to draw inferences about remote SDM in each of the included articles. After identifying which inference about remote SDM was drawn, if any, the authors identified the methods used to draw them, and used criteria appropriate for each method (trial, observational study, qualitative study) in the Users Guides to Medical Literature [10–12] to assess the extent to which these methods protected the results from error. All disagreements were discussed until a consensus was reached.

3. Results

Fig. 2 shows the study selection process which yielded 12 eligible articles: 8 about synchronous remote SDM (e.g. video consult), of which 1 was about technology used in preparation for a synchronous remote visit (e.g. data from a symptom-tracking device that will be used during a subsequent synchronous conversation), 1 about asynchronous remote SDM (patient-clinician conversation using apps), and 3 articles that provided indirect evidence about remote SDM. Most were from Europe in the care of patients with chronic conditions (Tables 1 and 2).

3.1. Emerging themes related to synchronous remote SDM with synchronous technology (Table 3)

The themes identified in the articles describing synchronous remote SDM were all addressing the context-specific barriers and facilitators for remote SDM. However, the patient and clinician satisfaction with the encounter also addresses the effectiveness of interventions to promote remote SDM. Table 3.

3.1.1. Practical issues

In addition to the need for improved access (from home, without need to travel) [13], and patient training, these articles noted equipment and bandwidth limitations, the need to integrate patients and clinicians in the use of technology and virtual care within clinical workflows [14–17].

3.1.2. Technology and communication quality

Synchronous visits took place via video consultations, phone calls, and online platforms (used for surveys or communication). Participant willingness (e.g. when deciding to give video consultations a try in the future) to use and adopt a technology was key to its successful use as well as the offer of choice in selecting which remote approach will be used [15]. In one study, SDM decision aids were judged useful in supporting remote SDM [14].

3.1.3. Satisfaction

'Patient and clinician satisfaction with the encounter' was a common theme in articles about synchronous remote SDM. Video consultations improve patient and clinician satisfaction with the

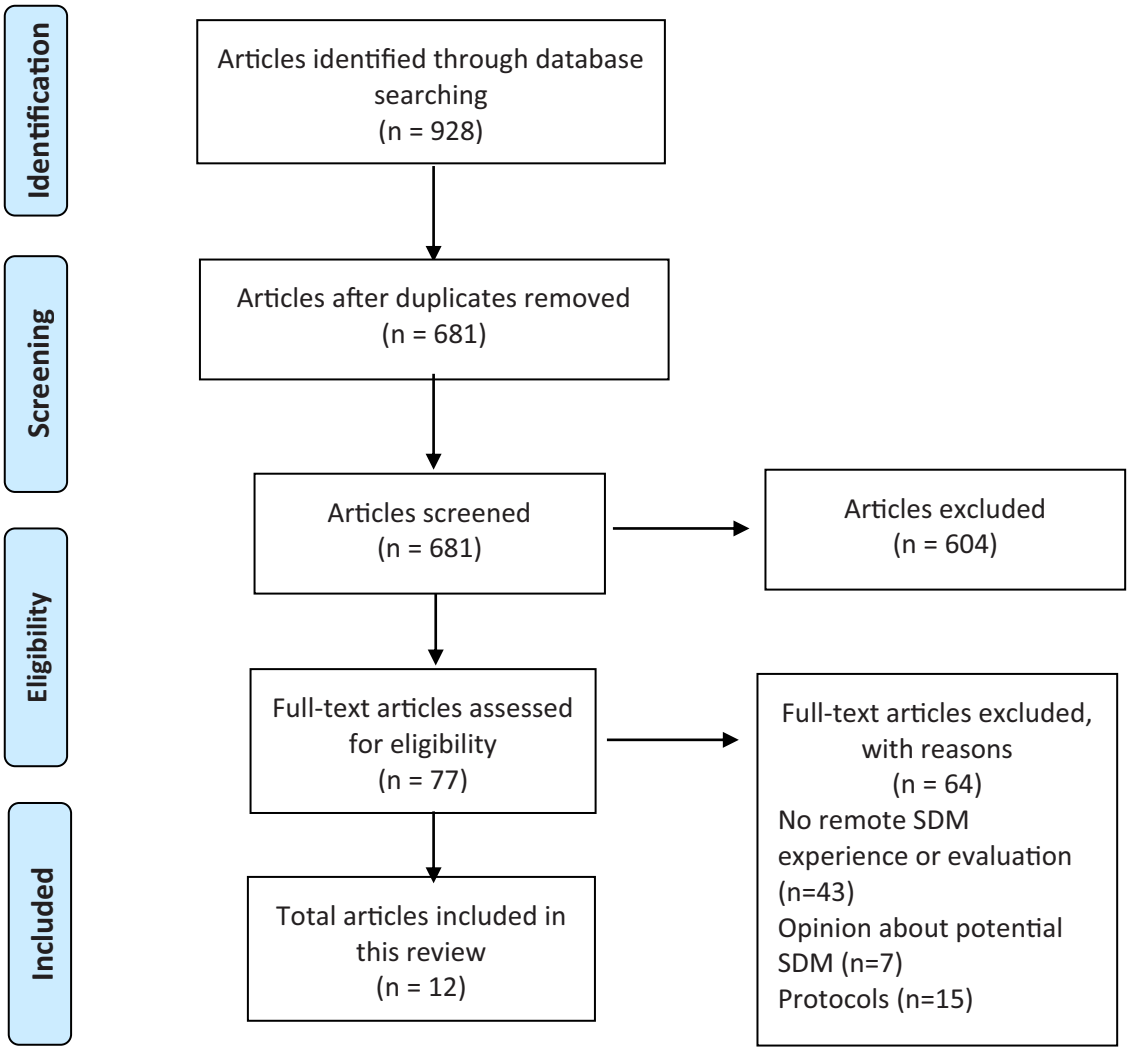

Fig. 2. Article selection process.

encounter, particularly when they perceive that more time and attention is spent [18]. In some cases, SDM was integrated as part of the workflow of a virtual visit with high patient engagement and patient satisfaction [12]. However, other articles focused on caring for patients with chronic conditions (diabetes and wound care) reported higher satisfaction with more frequent and brief remote visits than with longer in-person consultations [19,20].

3.2. Emerging themes related to asynchronous remote SDM (Table 3)

3.2.1. Technology and communication quality

We found an article using a digital tool to support asynchronous remote SDM, e.g., SDM conducted via text messaging, dedicated web applications, or portal message exchanges [21]. Technology facilitated remote SDM. The digital tool's content was designed to fit the format, making its use easier and more intuitive [17]. It is important to note that the contribution of the patient here is deliberative e.g. the information shared in the app or m-health device is used for conversations between patients and clinicians, not just to track or feed information into clinic visits.

3.2.2. Practical issues

The digital tool's main purpose was to facilitate communication, promote shared care planning and reduce treatment burden [17].

3.3. Emerging themes related to synchronous remote SDM with asynchronous technology (Table 3)

3.3.1. Practical issues

The articles here focused on obtaining, tracking, and relaying information to the clinic either reported by the patient in real time or obtained from patient behavior or physiological trackers over time [20].

3.3.2. Empowerment

Asynchronous approaches may reduce the burden placed on patients to collect and organize information used to make visits more efficient and conversations with the clinician more productive [20].

For a detailed description of the themes please refer to Appendix 3.

3.4. Indirect evidence on remote SDM

Three articles were considered topically relevant, although bearing only indirectly on remote SDM (Table 2). One article focused on the use of technology to promote peer engagement and support patient self-management [22], another drew and integrated data from patient-reported measures and wearable devices to support

Table 1
Characteristics of included studies.

First author	Year/ Country	Setting	Study design and size	Population	Study aims	Definition of SDM or SDM measure used	Effect on SDM	Technology	Trustworthiness of inferences about remote SDM
Asynchronous remote SDM									
Seljelid	2020/ Norway.	Tertiary referral center.	Qualitative study; 14 patients and 11 HCP.	Adults with chronic conditions.	Develop a digital tool (InvolveMe) for patient-provider communication in chronic health care settings and to report symptoms and preferences to their HCP using secure messaging.	A process where patients and HCP work together to understand and address the patient's situation. Focus on patient provider relationship, information exchange. Tools: improve knowledge and awareness.	N/A	Digital tool.	No inferences about remote SDM offered.
Synchronous remote SDM using synchronous technology									
Barsom	2020/ Netherlands.	Tertiary referral center.	Observational study; 50 patients.	Adults with colorectal cancer. F2F group: 68 years (57–74) 39% male. VC group: 61 years (53–69) 52% male.	Compare satisfaction with VC vs. F2F consultations in patients with colorectal cancer and their surgeons. Determine patient's preference for these modalities.	No definition of SDM provided.	Satisfaction survey included item "The healthcare provider involves me enough in decisions about the treatment." Apparently, more patients were neutral about this item in the VC than in the F2F group (statistics not offered).	Video consultation.	Low (allocation by choice, VC users were slightly younger and had more experience with VC), small study).
Dobke	2011/ USA.	Primary care clinic.	Survey; 36 PCPs for 230 patients.	No description of PCPs. Patients: 54 years old, 51% male.	Determine the factors that influence the use of telemedicine consultation by PCPs with wound management consultants in the management of patients with problem wounds.	No definition of SDM provided.	N/A. PCPs reported that patients and families were more satisfied with SDM when PCPs participate in the telemedicine program.	Video consultation.	Low (survey, indirect evidence).
Griffith	2016/ USA.	Rural primary care clinic.	Feasibility study; 17 patients.	Adults with type 2 diabetes.	Create, integrate, and evaluate a team based SDM approach using SDM aids for diabetes patients in a rural community that could be used in a telemedicine model of care.	Patients and clinicians together make health care decisions that are tailored to the specific characteristics and values of the patient encouraging them to collaboratively negotiate health-related decisions.	N/A. Self-reported satisfaction with the use of educational tools (called SDM aids).	Educational tools used during video consultation.	Low (observational, small study, unclear).
Huppelschoten	2019/ Netherlands.	Tertiary referral center.	Clinical pilot study; 27 patients.	Young adults with infertility.	Explore the experiences of both patients and professionals with an online platform using video consultations for patients with infertility.	Used CollaboRATE to measure SDM.	Median score of 8 (range 7–9) on: 1) helping to understand health issues, 2) listen to things that matter most, 3) what to do next.	Online platform and video consultation.	Low (observational, post intervention questionnaire, no control).
Metz	2018/ Netherlands.	Tertiary referral mental health outpatient facility.	Clustered randomized trial; 200 patients (94 intervention, 106 control).	Young adults with depression, anxiety, and personality disorders.	Compare the effects of a multifaceted SDM digital intake process vs. usual intake process on decisional conflict and extent of SDM as measured using SDM-Q-9.	Used SDM-Q-9 for patients and clinicians.	No significant effect of the intervention on SDM-Q-9 at 2 weeks in patients or clinicians. Significant improvement at 2 months in SDM-Q-9 among patients (effect size 0.32).	e-health portal.	Moderate-to-high (unblinded, 13% loss to follow-up, imprecise results).

(*continued on next page*)

Table 1 (*continued*)

First author	Year/ Country	Setting	Study design and size	Population	Study aims	Definition of SDM or SDM measure used	Effect on SDM	Technology	Trustworthiness of inferences about remote SDM
Pappas	2019/UK.	Primary care clinic.	Qualitative study (conversation analysis); 10 video-mediated consultations between patients, general practitioner, and specialists.	Adults with vascular or cardiovascular conditions.	Identify skills that health professionals and patients use at reaching diagnosis and decision-making in telemedicine consultations.	A model of the clinician-patient relationship where both have an equal role in determining the course of action by considering screening, treatment, or management options, their benefits and harms.	N/A Patient involvement in telemedicine consultations with specialists and GPs was limited by professional talk.	Video consultation.	No inferences about remote SDM offered.
Tates	2017/ Netherlands.	Academic department.	Observational study; 12 interns and 6 simulated patients.	N/A	Identify impact of a consultation medium on a doctor's and patient's communicative behavior, relationship building and SDM.	A process where patients take a more active role, and decisions are reached in partnership between patient and provider.	Items from the Cologne Patient Questionnaire and from the Patient Participation Scale. Neither patients nor interns reported significantly greater SDM with web-based consultations vs. F2F consultations.	Video consultation.	Low (indirect (simulated patients, interns), small study).
Synchronous remote SDM using asynchronous technology									
Hsu	2016/ USA.	Tertiary referral center.	Randomized control trial; 40 patients (20 control, 20 intervention).	Adults with type 2 diabetes.	Identify if adopting a new mobile technology could help individuals starting basal insulin achieve better glycemic control compared with standard clinical practice.	No definition of SDM provided.	N/A Patients mentioned being satisfied with collaborating in making treatment decisions.	Patient self-tracking tools, text messages, virtual visits (audio, video).	Low (exit interviews in the intervention group)

F2F: face-to-face; HCP: health care professional; N/A: not applicable; PCP: primary care physician; VC: video consult; SDM: shared decision making

Table 2
Indirect evidence on remote SDM.

First author	Year/ Country	Setting	Study design and size	Population	Study aims	Definition of SDM or SDM measure used	Effect on SDM	Technology	Trustworthiness of inferences about remote SDM
Kreps	2013/ USA.	N/A	Participatory design; 30 patients and 4 clinicians.	N/A	Test the value of the patients' observations of daily living. Provide computer-mediated support to patients to track their medication adherence, weight, and sleep, and share that information with providers to improve decision making.	No definition of SDM provided.	N/A	App.	No inferences about remote SDM offered.
Veroff	2013/ USA.	Health Dialog (a for-profit population health management firm).	Cost effectiveness analysis of a randomized trial of support for SDM.	Patients with one or more of six different conditions: heart, benign uterine, benign prostatic hyperplasia, hip pain, knee pain, back pain.	Compare effects of receiving usual level of support in making a medical treatment decision with the effects of receiving enhanced support (more contact with health coaches).	It is the process by which patients and clinicians jointly review the best medical evidence as well as patients' preferences and values.	N/A	Phone call, mail, and software to guide coaching sessions.	No inferences about remote SDM offered.
Timotijevic	2020/ Greece, Italy, Slovenia, UK.	Academic department.	Case study of 12 clinicians' user needs.	Adults with Parkinson's disorder.	Development of a m-health based clinical decision support system to help clinicians monitor motor and non-motor symptoms using easily portable devices such as smart phones. These are worn by patients and capture objective data about their condition.	No definition of SDM provided.	N/A	m-health Clinical Decision Support System.	No inferences about remote SDM offered.

N/A: not applicable; SDM: shared decision making

Table 3
Most common emerging themes and examples.

Type of remote SDM	Most common themes	Examples	Taken from
Synchronous (with synchronous technology)	Patient and clinician satisfaction with the encounter	Patients perceived SDM was positively related to satisfaction with consultation. Doctors' perceived SDM was not significantly related to their satisfaction with the consultation.	Tates
	Technology and communication quality	Training for all actors involved in the use of telemedicine should not only focus on the technical aspects.	Barsom
	Practical issues	Overcome necessary travel using video consultations.	Pappas
Asynchronous	Technology and communication quality	Communicate each patient's current situation to the clinician can provide insight into patients' clinical status and help identify important themes for patient-provider discussions.	Seljelid
Synchronous (with asynchronous technology)	Empowerment	"I enjoy the power sharing in making decisions on insulin doses." "I feel more equal with the coach in making decisions about my health."	Hsu
	Practical issues	Time saved by the patients: there was no need to travel to and from the clinician's office for a face-to-face visit and no wait time.	Hsu

decision making [23], and a third evaluated the use of coaching (including phone interactions) in support of SDM [24].

4. Discussion and conclusion

4.1. Discussion

This systematic review demonstrated that the literature on remote SDM is sparse and heterogeneous with much of its attention focused on what the technology can do and less on the extent to which it can support the collaboration between patients and clinicians necessary for SDM. None of the included articles dealt primarily with remote SDM, despite SDM being mentioned in their titles and abstracts without further development in the body of the articles.

Our review used a comprehensive literature search, protocol-driven study selection and review, duplicate and independent judgments, and identification of common themes. Despite using two independent search strategies, it is possible that we may have missed relevant articles, which might have contributed to our limited findings. Nevertheless, the heterogeneity and sparsity of this body of evidence severely limited our efforts to draw meaningful inferences. We erred on the side of inclusion, considering articles that were topically relevant but which dealt only indirectly with remote SDM. Most studies that directly addressed remote SDM did so with methods that did not fully protect inferences against error (i.e., its results only warranted limited trustworthiness). Inspection of Tables 1 and 2 demonstrates a mismatch between the breath of technologies (e.g., digital tools, video consultations, apps) involved and the dearth of research reports contained in this literature. Perhaps of greater importance for the post-pandemic world, this review documents that remote SDM is an opportunity area in need of innovation, implementation, and effectiveness research. To promote discussion and action in the research community, we propose a preliminary research agenda in remote SDM of topics we consider very relevant but that we were unable to answer with this review. (Table 4).

4.1.1. Implications for research

SDM, particularly as part of the care of patients with chronic conditions, requires a partnership that may emerge from the continuity of interaction between patients and clinicians [25]. SDM benefits not only from clinician's skills in communication and compassion but also from the ability of participants to come to an understanding of what is the aspect of the patient's problem that requires action and to uncover together what action that problem demands. Synchronous digitally mediated visits may facilitate the complex interactions necessary for remote SDM, provided that practical issues such as access to broadband and training in and ease of use of the technology are addressed. On the other hand, synchronous remote visits mimic in-person encounters, but these encounters are not really 'like' traditional face-to-face ones. They are two-dimensional, and are structured around the limitations that technology places on interpersonal interactions [26]. As remote visits become normalized [27], one would expect that the structural requirements – e.g., digital literacy [15], access to broadband, ease of use, and accessibility support of the communicative technologies – and the challenges to integrating remote visits into the routines of patients and of clinical practices– would fade into the background enabling clinicians and patients to work with patient's alternatives, desires, problems, and their humanity to uncover a sensible caring response [2]. To arrive at this point, further research focused on the regulatory context, training, and technological needs is necessary as is work focused on promoting interactional workability, e.g. the work that must be done to operationalize the interactional practices needed to accomplish remote SDM [28].

SDM continues to be promoted as a form of patient-centered care but its true prevalence in routine care remains unclear and presumed low. A recent development, the formulation of purposeful SDM, may lead to the recognition of forms of SDM which are commonly used to respond to patients' problematic situations but which have not been counted as SDM- for example, a patient and clinician working through how to maintain insulin use and glycemic control in the face of dramatic drug cost increase [2]. Some SDM tools have been designed to ensure access to summaries of evidence during face-to-face visits; whether and how they may need to be adapted for remote SDM remains unclear [29]. Available telemedicine applications variably offer features that enable sharing SDM tools (e.g., sharing the computer screen), and recording of the interaction for subsequent SDM evaluation (e.g., using the observer-based SDM measures of clinician's effort to involve patients in decision making on encrypted recordings of the clinical visit). Yet, whether and how

Table 4
Proposed research agenda for remote SDM.

Evaluate the prevalence and quality of remote SDM, preferably from the perspective of the patient, clinician, and a third-party observer.
Compare the effectiveness of existing encounter SDM tools in supporting remote SDM.
Design (develop or adapt) SDM interventions specifically to support remote SDM.
Evaluate telemedicine applications for their ability to support remote SDM.
Evaluate the (time) investments necessary to have remote SDM encounters.
Identify and quantify disparities in access, use, quality, and outcomes of remote SDM considering broadband and digital literacy disparities in addition to traditional socioeconomic factors.
Determine the factors that promote and hinder the routine implementation of remote SDM.
Evaluate patient and clinician experience of telemedicine in encounters in which remote SDM takes place.

measures of the extent and quality of SDM in in-person visits can be used to evaluate remote SDM, whether asynchronous or synchronous, also remains unclear.

4.2. Conclusion

This systematic review has found evidence for important technological, practical, and research gaps at the intersection of telemedicine and SDM, i.e., on remote SDM. These gaps must be closed to advance patient-centered care as remote visits becomes normalized in practice.

4.3. Practical implications

Both telemedicine and SDM are evolving fields. The COVID-19 pandemic accelerated the availability of workable applications that supported remote visits, and catalyzed changes in regulation and funding for telemedicine [30]. There appears to be potential for synchronous technologies in particular to foster the kind of productive patient-clinician interactions that support remote SDM, which, in turn, promote patient-centered care. The extent to which SDM frameworks developed for in-person visits need any adaptation for remote SDM remains unclear. Innovation, design, implementation, and effectiveness research to advance remote SDM are needed.

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CRediT authorship contribution statement

Hartasanchez: Conceptualization, Validation, Investigation, Writing - original draft. **Heen**: Conceptualization, Validation, Investigation, Writing - review & editing. **Kunneman**: Writing - review & editing. **Garcia-Bautista**: Writing - review & editing, Validation, Investigation. **Hargraves**: Writing - review & editing. **Prokop**: Writing - review & editing, Methodology. **May**: Conceptualization, Writing - review & editing. **Montori**: Conceptualization, Writing - review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pec.2021.06.012.

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