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# Patient experiences of co-designed rehabilitation interventions: a rapid review



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# Patient experiences of co-designed rehabilitation interventions: a rapid review

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## ABSTRACT

**Background:** Co-design strengthens partnerships between healthcare workers and patients. It also facilitates collaborations supporting the development, design, and delivery of healthcare services. Prior rehabilitation reviews have focused mainly on clinical and organisational outcomes of co-design with less focus on the lived experience of rehabilitation patients.

**Objectives:** To explore patient experiences of co-designed hospital rehabilitation interventions.

**Design:** Rapid review and evidence synthesis of the literature.

**Data sources:** CINAHL, MEDLINE, Embase and Cochrane

**Study selection:** Studies reporting patient experiences of co-designed rehabilitation interventions in hospitals.

**Results:** 4156 studies were screened, and 38 full-text studies were assessed for eligibility. Seven studies were included in the final rapid review. All eligible studies used qualitative research methods. Thematic synthesis revealed that co-designed rehabilitation interventions can enable a meaningful experience for patients and facilitate tailoring of treatments to align with individual needs. Personalised rehabilitation increases patient involvement in rehabilitation planning, delivery, and decision-making. It also promotes positive feelings of empowerment and hope.

**Conclusion:** This rapid review supports the implementation of co-designed rehabilitation interventions to improve patient experience.

**PROSPERO registration number:** CRD42021264547.

## Strengths and limitations of this study

- This rapid review was co-authored and co-designed with rehabilitation consumers.
- Rapid review methodology facilitated the timely production of evidence on this emerging area of research.
- Fidelity of the review was strengthened by adherence to a published study protocol, a-priori rapid review methods and systematic reporting of study results.
- The major limitation was the rapid review process which restricted the number of years included, languages and number of databases searched.

## INTRODUCTION

Ensuring positive experiences for patients is a cornerstone of person-centred care.[1] Healthcare providers, health professionals, and policy makers seek consumer involvement when designing safe and high value health services across the globe.[2] This is reflected in the "Quadruple Aim",[3] a global framework for healthcare quality improvement, which emphases positive patient experiences as a central element of person-centred care.[3] The Beryl Institute describes patient experience as the "sum of all interactions shared by an organisation's culture that influence patient perceptions across the continuum of care."[4] Measuring and fostering positive patient experiences extends beyond documenting patient satisfaction, outcomes and perceptions.[2, 5] It also encompasses consumer engagement, co-design and co-production of interventions, based on high quality interactions between consumers and their healthcare team.[2] Positive patient experiences and consumer involvement in care design and delivery are associated with improved safety and clinical outcomes.[2, 6-8]

"Co-design" aims to improve patient experiences by involving stakeholders such as patients, carers, and families in the planning, design, and implementation of healthcare improvements.[1, 2, 7, 9-11] Co-design also involves care providers and organisations to improve patient experiences.[9-11] Healthcare improvements which are created in partnership with patients who have experience of the problem being addressed, are arguably more likely to achieve positive outcomes.[1, 9-11] Hospital standards across the globe emphasise the importance of three closely related concepts in healthcare delivery: co-design, patient engagement, and shared decision-making.[12, 13] Patient engagement involves care-recipients in the co-design of services[8]. It also relates to the connections that patients have with health professionals,[14] and the degree to which patients participate in the design and delivery of health initiatives.[13] Shared decision-making promotes patient involvement in clinical

decision-making in partnership with health professionals.[15] Shared decision-making can be used in the development, design and implementation of healthcare interventions by creating tailored treatment programs and patient-centred goals according to patients' preferences.[16]

Rehabilitation aims to enable people to optimise their mobility, capability, autonomy, function, and quality of life.[17] Rehabilitation also aims to provide hospital patients with the skills and tools to discharge home safely and independently.[18] An emerging area of co-design and rehabilitation research is mHealth which is the use of mobile technology in healthcare delivery.[19, 20] A systematic review on mHealth systems and co-design by Noorbergen *et al*[19] mapped co-design methods to four stages: pre-design, generative, evaluative, and post-design. They showed benefits for patients at each of these stages.[19] Although the literature noted the importance of the post-design stage, it was not included in the vast majority of studies.[19] Given this gap, the current review mainly focuses on the post-design stage of rehabilitation co-design, which relates to how patients report their experiences of inpatient rehabilitation after implementation has occurred.[21]

Prior systematic reviews have evaluated co-design in relation to services and clinical outcomes in hospitals;[7] the organisational and patient outcomes of co-designed hospital services and tools;[6] effects of patient engagement strategies on patients and health services;[8] the influence that co-designed interventions can have on changing health professional behaviour;[22] and contemporary co-design approaches in research and practice.[23] There is only limited research on how patients in hospital experience co-designed rehabilitation interventions. The primary objective of the current study is to evaluate patient experiences of co-designed rehabilitation interventions in hospitals. We also review methods used to co-

design hospital rehabilitation interventions and identify perceived barriers and facilitators to co-design implementation.

## METHODS AND ANALYSIS

The protocol for this rapid review has been published online in BMJ Open[24] and registered on the international prospective register of systematic reviews (PROSPERO CRD42021264547).[25] The rapid review has been completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) as there is no peer-reviewed reporting guideline for rapid reviews.[26, 27]

A rapid review was performed to satisfy stakeholder requests for timely evidence on this emerging research area. A rapid review uses streamlined methodology to provide an accelerated version of a traditional systematic review.[28] The Cochrane Rapid Reviews Method Group provided provisional recommendations and guidance on the methods of rapid reviews which has been implemented in the searching of the literature for this paper.[28] Their recommendations distinct to rapid reviews include the use of date restrictions during database searching, limiting databases searched, and a limit on grey and supplemental searching.[28] These abbreviated search methods have been shown to expediate the review process without reducing methodological rigour when compared to systematic reviews.[29]

### Patient and public involvement

This rapid review and its preceding protocol paper have been co-authored by two consumer representatives.[24] The consumer representatives assisted in the co-design of this paper in several ways including the conception, development, and refinement of the research question; providing advice on the thematic analysis and data synthesis; and editing and revising the

manuscript.

**Eligibility criteria**

Studies were included if they were manuscripts with any empirical study design published in English in either journals or conference proceedings; involved adult participants; conducted in an inpatient rehabilitation hospital such as acute, subacute, or slow stream musculoskeletal, neurological, or cardiorespiratory rehabilitation; involved a co-designed rehabilitation intervention; reported on patient experiences. Studies were excluded if they involved mental health alone, vocational, drug and alcohol rehabilitation; involved rehabilitation in the home or an outpatient setting; were protocols, abstracts of any type, book chapters, editorials, or doctoral theses; included only participants that required a medical decision-maker to participate on their behalf.

**Identification and selection of included papers**

The search strategy was devised with a health services librarian. Search terms were developed from key concepts including patient experiences, co-design, rehabilitation interventions, acute healthcare settings, hospitals. The databases of Cochrane, MEDLINE, Embase and CINAHL were searched from 1 January 2000 to 25 April 2022. The search strategy is given in supplementary file 1.

The search references were downloaded and combined in EndNote 20.[30] They were then imported into Covidence, a systematic review program.[31] After removal of duplicate studies in Covidence, two reviewers (JPM, SCS/CT) independently screened the titles and abstracts before completing the full text review. Screening differences were resolved by discussion

with a third reviewer (MEM).

**Method quality assessment**

Studies with any empirical design were eligible for inclusion. Although we made provisions for the assessment of any study design, the final yield of included papers only included qualitative studies. Therefore these were appraised with the JBI Critical Appraisal Checklist for Qualitative Research.[32, 33] This has a 10 question checklist which are accompanied by detailed explanatory notes which assist reviewers to assess the methodological bias of the included studies in a systematic review.[32, 33] Two critical appraisers (JPM, CT) assessed independently the methodological bias of each included study in accordance with the JBI checklist.[31-33] Any differences in the appraisals between the two authors were resolved through consultation with a third reviewer (MEM).

**Data extraction and management**

The Covidence Extraction 2.0 template was employed to extract the study characteristics from the included studies. Characteristics extracted included aim of study, healthcare setting, study design, population description, descriptive statistics if applicable, outcome data if applicable, co-designed intervention characteristics and description, co-design strategy used, patient experiences, themes, and facilitators or barriers to co-design.[31] This process was completed independently by two reviewers (JPM, CT) for all included studies. Differences in the extracted data were resolved through deliberation and consensus between the two reviewers.

**Data analysis/synthesis**

Data from the included studies were analysed and synthesised according to qualitative

methods described by Thomas and Harden.[34] This approach involved three main stages and has the support of the Cochrane Qualitative and Implementation Methods Group.[35] Firstly, thematic findings from each included study were extracted in Covidence.[31] Secondly, these themes were then grouped according to their similarities to develop overarching descriptive themes to encapsulate common insights.[34] Thirdly, the descriptive themes were analysed to form new analytical themes to answer the questions posed by this rapid review.[34]

**Confidence in cumulative evidence**

The Confidence in Evidence from Reviews of Qualitative Research (GRADE-CERQual) was used to make an assessment of the overall findings of this rapid review.[36] The GRADE-CERQual includes four components: adequacy of data, coherence, relevance, and methodological limitations.[36] The four components are used to assess the confidence in the evidence as very low or low, moderate or high. These levels describe the degree to which a review finding accurately represents the topic under review.[36] A GRADE-CERQual Summary of Findings table with an assessment of each review finding was completed by one author (JPM) and confirmed by a second reviewer (CT).

## RESULTS

### Included studies

A total of 6112 studies were imported for screening. 4156 titles and abstracts were screened after 1956 duplicate papers were removed. The full text of 38 studies were screened for eligibility. In total seven studies were included in this rapid review. A PRIMSA flow diagram is provided in Figure 1.[26]

### Quality appraisal

The seven included studies all had qualitative designs hence they were appraised with the JBI Critical Appraisal Checklist for Qualitative Research.[32, 33] All studies demonstrated congruity between their research methodology and purported philosophical perspective. All studies had congruity between their research question, data collection and analysis, research methods and interpretation of results.[37-43] Two studies addressed the relationship between the study participants and the researcher.[40, 42] One study included a statement on the theoretical perspectives and cultural orientation of the research team.[43] All studies were conducted ethically, had adequate representation of the voices of their participants, and had conclusions that were logically drawn.[37-43] See Table 1 for the quality appraisal summary.

**Characteristics of included studies**

The number of co-design participants ranged from 11 to 201 patients (Table 2). All studies used qualitative research methods and were conducted in inpatient rehabilitation hospitals in high-income countries including three studies published in the UK. Five out of the seven studies focused on neurological rehabilitation. Five out of seven were published within the last five years.

**Types of co-designed rehabilitation interventions**

Collaborative goal setting was employed as the co-design intervention in three studies.[37, 38, 43] Two involved a goal setting workbook,[37, 38] while one used an interactive goal setting application (Table 2).[43] Two studies involved personalised neurological rehabilitation.[40, 42] One study involved the development of care partnerships using patient advisors.[41] One study implemented improvements and increased supervision in stroke units.[39]

**Table 1** Methodological quality assessment for included studies using the JBI Critical Appraisal Checklist for Qualitative Research[32, 33]

| Study | Congruity between research methodology and purported philosophical perspective. | Congruity between the research question or aims and the research methodology. | Congruity between the data collection methods and the research methodology. | Congruity between the analysis of the data and the research methodology. | Congruity between the interpretation of results and the research methodology. | Locates the researcher theoretically and culturally. | Influence of the researcher on the researcher and vice-versa. | Participants voices were represented adequately. | Evidence of ethical approval. | Conclusions made are based on the data. |
|---|---|---|---|---|---|---|---|---|---|---|
| Holliday *et al*[37] | Yes | Yes | Yes | Yes | Yes | Unclear | No | Yes | Yes | Yes |
| Holliday *et al*[38] | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes |
| Jones *et al*[39] | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes |
| Last *et al*[40] | Yes | Yes | Yes | Yes | Yes | Unclear | Yes | Yes | Yes | Yes |
| Pomey *et al*[41] | Yes | Yes | Yes | Yes | Yes | No | Unclear | Yes | Yes | Yes |
| Scheel-Sailer *et al*[42] | Yes | Yes | Yes | Yes | Yes | Unclear | Yes | Yes | Yes | Yes |
| Strubbia *et al*[43] | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |

**Table 2** Patient experiences of co-designed rehabilitation interventions.

| Author (year), country | Study design, participants (n) | Setting | Aim of study | Co-designed rehabilitation intervention | Co-design strategy | Barriers and facilitators to co-design implementation | Patient experiences |
|---|---|---|---|---|---|---|---|
| Holliday *et al*[37] (2007)<br><br>United Kingdom | Qualitative, n = 28 | Inpatient neurological rehabilitation unit. | To investigate patients' perceptions of two goal setting methods that differ in the amount of patient involvement. | An increased participation goal setting approach. | Provision of a goal setting workbook and use of a key worker role to increase patient contact time with staff. | Barriers: staff shortages and time constraints.<br>Facilitators: positive relationship between key worker and patients. | Patients felt that the goals were specific and individualised when they were involved in goal setting. |
| Holliday *et al*[38] (2007)<br><br>United Kingdom | Non-randomised controlled study, n = 201 | Inpatient neurological rehabilitation unit. | To explore an increased participation goal setting method. | Increased participation goal setting. | Provision of a goal setting workbook with patient participation facilitated by a key worker. | Not reported | Patients use of a goal setting workbook led to increased therapy precision and greater patient satisfaction. |
| Jones *et al*[39] (2021)<br><br>United Kingdom | Mixed-methods case comparison, n = 156 | Four separate inpatient acute stroke units. | To evaluate co-designed improvements to increase therapeutic patient activity in stroke units. | Experience-based co-design improvement cycles. | Incorporated patient, family, and staff experiences to design and deliver quality improvements. | Barriers: staff shortages, increased severity of disability of patients. | The co-design process was perceived by users to improve social interaction between patients, families, and staff. |

**Table 2** Continued

| Author (year), country | Study design, participants (n) | Setting | Aim of study | Co-designed rehabilitation intervention | Co-design strategy | Barriers and facilitators to co-design implementation | Patient experiences |
|---|---|---|---|---|---|---|---|
| Last *et al*[40] (2021)<br><br>Canada | Qualitative, n = 11 | Three inpatient rehabilitation programs. | To explore patient perspectives of the facilitators and barriers to engaging in stroke rehabilitation in hospital. | Personalised rehabilitation. | Therapy activities were designed and refined to include activities which were meaningful to patients and in line with their goals. | Barriers: limited resources, low ratio of therapists to patients, negative attitude towards rehabilitation. | Patients perceived that therapy was enhanced by personalised rehabilitation. Therapy seemed to be most meaningful when it was designed to meet the goals of the patients. |
| Pomey *et al*[41] (2018)<br><br>Canada | Qualitative, n = 8 | Specialist acute and rehabilitation centre for amputation management | To increase rehabilitation adherence rates with patient advisors in a peer support program. | Patient advisor program. | Four focus groups were undertaken to develop approaches to improving patient adherence to rehabilitation. | Not reported | Patients who received support from patient advisors reported feeling less isolated, increased hopefulness and morale, and a reduction in pain perception and disability. |
| Scheel-Sailer *et al*[42] (2017)<br><br>Switzerland | Qualitative n = 22 | Single inpatient rehabilitation centre. | Explore patients' perception of their participation in decision-making after spinal cord injury. | Personalised rehabilitation. | Patients had the ability to choose additional treatments. | Barriers: time pressure.<br>Facilitators: a supportive therapeutic team. | Patients experienced a sense of empowerment and increased capability when they were able exercise their decision-making ability to choose additional therapies to tailor their rehabilitation. |
| Strubbia *et al*[43] (2021)<br><br>New Zealand | Qualitative n = 16 | Three inpatient rehabilitation services. | To detail the experiences of health workers and patients using a goal setting application aid. | Collaborative goal setting. | A tablet application decision-making tool. | Barriers: time constraints, accessibility of the tablet. | Use of the tool facilitated meaningful collaborative goal setting. Patients developed a broader understanding of rehabilitation and reported increased hope of recovery. |

## Co-design strategies

Three studies used collaborative goal setting to develop co-designed goals (Table 2).[37, 38, 43] In two studies, the patients were able to co-design their own rehabilitation program.[40, 42] The Partnership Co-design Lab method was in Pomey *et al*[41] to introduce patient advisors at patient bed sides.[41] Evidenced-based co-design and accelerated evidenced-based co-design was implemented in one study to address inactivity in stroke units.[39]

## Barriers and facilitators to co-design

Authors of the included studies identified two primary barriers to the co-design of rehabilitation interventions in hospitals. Firstly, co-design was often impeded by staff shortages (Table 2).[37, 39, 40] Staff shortages were reported by patients as being a key limitation to receiving a high quantity of therapy, in addition to increased waiting times for treatment.[37, 39, 40] Patients perceived these limitations as having a negative impact on their rehabilitation experiences.[40]

Limited time dedicated to patient-therapist interactions was also seen by some patients as a hurdle to the co-design process.[37, 42, 43] These patients reported experiencing stress or dissatisfaction due to having limited time to discuss their rehabilitation with doctors.[42] A lack of time with health professionals to discuss goals was perceived by patients as a negative factor influencing the co-design process.[37] The use of a tablet application to facilitate collaborative goal setting was perceived by health professionals as time consuming.[43]

A key facilitator of co-design was a positive relationship between patients and others involved in their rehabilitation such as peers, family, and health professionals.[37, 42] Patients mentioned that peers who had similar conditions to their own helped to support and provide

encouragement during the decision-making process.[42] High quality patient-therapist relationships were perceived as helpful in achieving rehabilitation goals.[37]

**Patient experiences**

Co-designed rehabilitation interventions resulted in a more positive experience for patients. The primary theme that emerged from the included studies was the paradigm of tailor-made rehabilitation. Tailor-made rehabilitation was associated with more meaningful therapy, increased patient involvement, empowerment and autonomy (Table 2).[37-40, 42] This concept was first described by patients in a study by Holliday *et al*[37] who felt that their increased involvement in goal setting enabled their goals to be specific to their needs. This increased their sense of ownership over their goals and resulted in a positive rehabilitation experience.[37] There were similar findings in a second study by Holliday *et al*[38] which also investigated collaborative goal setting. Patients who were in the increased participation goal setting group had higher satisfaction with their rehabilitation.[38] Providing patients with a structure to design their own goals resulted in greater patient autonomy and goal relevance.[38] Rehabilitation that involved increased patient participation in goal setting was perceived as more targeted to the individual.[38] Jones *et al*[39] found that co-designed changes which aimed to address inactivity of stroke patients in rehabilitation hospitals were beneficial. Patients and their carers associated the co-design approach with several improvements.[39] Co-designed activity boxes were provided to patients to enable them to engage in extra therapy such as a cooking group. This helped to reduce inactivity of patients after stroke and resulted in a more positive experience.[39]

Patients in Last *et al*[40] reported that their therapy was enhanced when their treatment was tailored to their specific preferences, needs, and goals. Tailored therapy was seen as more

meaningful, enjoyable, and motivating for patients.[40] This was best exemplified by a patient who had a goal of kayaking.[40] The patient's therapist incorporated kayaking, in a hydrotherapy pool, into the patient's rehabilitation program.[40] Patients in a study by Scheel-Sailer *et al*[42], had the ability to design their rehabilitation program by choosing additional therapies. Patients felt a sense of empowerment and self-efficacy by exercising this decision-making ability.[42] It was also emphasised by patients as an important method to make their rehabilitation programs more interactive and tailored.[42]

A secondary theme was that co-designed rehabilitation interventions provided inpatients with feelings of hope regarding their recovery. A co-designed tablet application for collaborative goal setting and decision-making described in Strubbia *et al*[43] assisted patients to have a more thorough understanding of their condition and treatment. This provided patients with hope for the future as they were educated on what to expect from rehabilitation.[43] Patients felt empowered through their increased understanding of their rehabilitation which enabled them to participate in making meaningful decisions regarding their care.[43]

Pomey *et al*[41] explored a co-designed patient advisor program to increase adherence to rehabilitation. Patient advisors supported patients in the hospital by answering their questions regarding treatment and ensuring that each patient received the necessary amount of care.[41] An evaluation of the interactions between patients and their advisors found that patients felt increased motivation and hopefulness regarding their rehabilitation.[41] Some patients who had support from patient advisors also reported reduced feelings of pain or disability.[41]

**Confidence in review findings**

Table 3 shows moderate to high confidence in the majority of the review findings. Whereas

there was high confidence in the finding that co-designed rehabilitation interventions increased patient involvement in treatment, decision-making autonomy and were perceived as more meaningful, there was moderate confidence in the finding that staff shortages and time constraints were barriers to co-design implementation. There was less confidence in the findings that co-designed rehabilitation interventions provided patients hope about their recovery and were facilitated by high quality patient-therapist relationships.

**Table 3** GRADE-CERQual Summary of Qualitative Findings.[36]

| Summary of review finding | Studies contributing to the review finding | Confidence assessment | Explanation of CERQual assessment |
|---|---|---|---|
| Staff shortages were a barrier to the implementation of co-designed rehabilitation interventions in hospitals. | Holliday *et al*[37]<br>Jones *et al*[39]<br>Last *et al*[40] | Moderate | Minor methodological limitations, relevance, and coherence concerns.<br>Moderate concerns about adequacy. |
| Time constraints were a barrier to the implementation of co-designed rehabilitation interventions in hospitals. | Holliday *et al*[37]<br>Scheel-Sailer *et al*[42]<br>Strubbia *et al*[43] | Moderate | Minor methodological limitations, relevance, and coherence concerns.<br>Moderate concerns about adequacy. |
| Co-designed hospital rehabilitation interventions were facilitated by a good quality relationship between patients and their therapist. | Holliday *et al*[37]<br>Scheel-Sailer *et al*[42] | Low | Minor methodological limitations, relevance, and coherence concerns.<br>Serious concerns about adequacy. |
| Co-designed rehabilitation interventions were meaningful to patients and associated with increased patient involvement in therapy, increased autonomy in decision-making, and empowerment. | Holliday *et al*[37]<br>Holliday *et al*[38]<br>Jones *et al*[39]<br>Last *et al*[40]<br>Scheel-Sailer *et al*[42] | High | Minor methodological limitations, relevance, and coherence concerns.<br>Minor concerns about adequacy. |
| Co-designed rehabilitation interventions improved inpatient experiences by providing patients with a better understanding of the rehabilitation process and increased feelings of hope for the future. | Pomey *et al*[41]<br>Strubbia *et al*[43] | Low | Minor methodological limitations, relevance, and coherence concerns.<br>Serious concerns about adequacy. |

## DISCUSSION

This rapid review showed positive patient experiences of co-designed rehabilitation interventions delivered in hospital settings.[37-43] Co-designed rehabilitation interventions included goal setting books, personalised rehabilitation therapies, patient advisors, hospital environmental and organisational changes, and technological collaborative goal setting applications.[37-43] In agreement with Clarke *et al*[7], the current review showed that the main barriers to co-design were related to staffing and time constraints.[37, 39, 40, 42, 43] Positive relationships between patients and therapists were a facilitator.[37, 39-43] As with Lim *et al*[6] patient experiences of co-designed rehabilitation interventions were reported to be positive.[37-43] Thematic analysis of included studies revealed that co-design facilitated the development of tailor-made treatment which increased patient involvement in their rehabilitation, autonomy over decision-making, and feelings of empowerment.[37, 38, 40, 42] Tailor-made rehabilitation was perceived by some patients as being more meaningful than usual care, which facilitated improved patient experiences of their rehabilitation.[37-40, 42] Co-designed rehabilitation interventions also fostered a feeling of hope among patients and improved their treatment expectations and outlook on their recovery.[41, 43]

This review was co-authored with two consumers and was rigorously conducted in accordance with a peer-reviewed protocol paper and best practice guidelines.[26, 28] As a rapid review, truncated methods endorsed by The Cochrane Rapid Reviews Method Group were used to expediate the review process.[28] This included a date restriction during database searching, a limit on databases searched and a restriction on grey and supplemental literature.

A limitation of this review is that it only yielded seven publications, all of which were qualitative in design. Also, it is possible that relevant case studies or conference proceedings

that were not peer-reviewed were not identified. Although we limited the search from the year 2000, five of the seven studies included in this review had been published since 2017. This highlights growing interest in this topic and suggests that future research on patient experiences of co-designed rehabilitation interventions is warranted.

## CONCLUSION

Positive patient experiences occur with co-designed rehabilitation interventions in hospitals.[37-43] Patients who are highly involved in their treatment report greater decision-making autonomy, positive experiences and better outomes.[37-40, 42, 44]

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**Author contributions**

JPM, SCS, JJ, and MEM designed the study and formulated the research question and search terms. JPM, SCS, CT, and MEM were involved the study screening and review process. JPM, CT, and MEM completed the data extraction and the method quality assessment of the included studies. JPM wrote the draft manuscripts which were edited by MEM and SCS. All authors reviewed the final manuscript before publication.

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## Competing interests

None declared.

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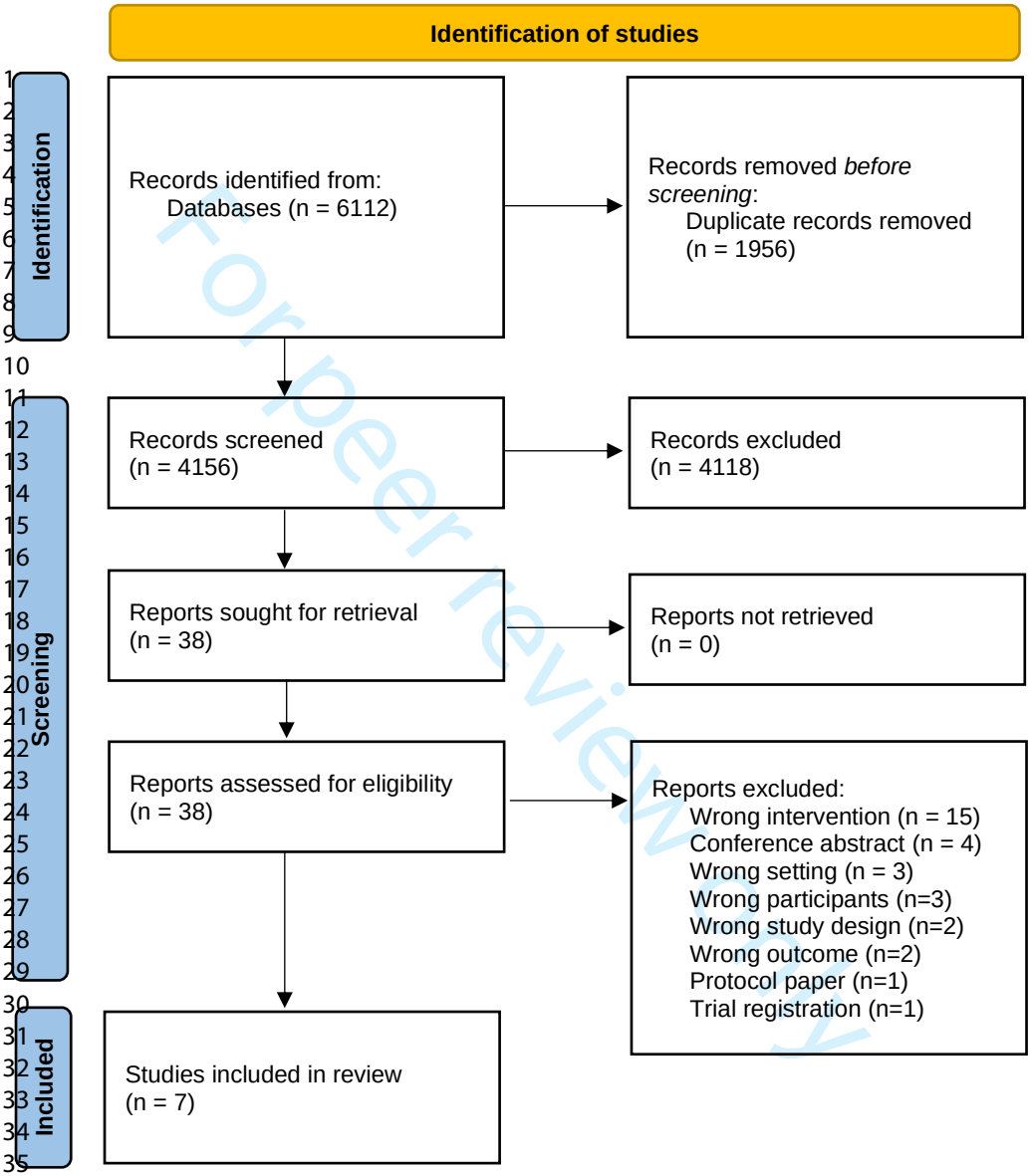




*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

# Medline Search Strategy

## Search Strategy:

Database(s): Ovid MEDLINE(R) ALL 1946 to April 25, 2022

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| 1 | (co-design* or codesign*).mp. | | 2291 |
| 2 | (co-produc* or coproduc*).mp. | | 6099 |
| 3 | (codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found*).mp. | | 1106 |
| 4 | participatory design*.mp. | | 746 |
| 5 | collaborative design*.mp. | | 167 |
| 6 | ("Experience based" adj2 design*).mp. | | 120 |
| 7 | Decision Making, Shared/ | | 1528 |
| 8 | (share* adj2 "decision making").mp. | | 12586 |
| 9 | or/1-8 | | 22556 |
| 10 | patient engagement.mp. | | 4141 |
| 11 | patient involvement.mp. | | 3195 |
| 12 | patient consultation.mp. | | 604 |
| 13 | Patient Participation/ | | 28483 |
| 14 | patient participation.mp. | | 30375 |
| 15 | patient input*.mp. | | 462 |
| 16 | Stakeholder Participation/ | | 1984 |
| 17 | stakeholder participation.mp. | | 2338 |
| 18 | consumer engagement.mp. | | 288 |
| 19 | consumer involvement.mp. | | 379 |
| 20 | consumer participation.mp. | | 425 |
| 21 | consumer input.mp. | | 105 |
| 22 | or/10-21 | | 38941 |
| 23 | design*.mp. | | 2422612 |
| 24 | 22 and 23 | | 8582 |
| 25 | 9 or 24 | | 29953 |
| 26 | exp Hospitals/ | | 302695 |
| 27 | hospital*.tw. | | 1475698 |
| 28 | Critical Care/ | | 58045 |

| | | | |
|---|---|---|---|
| 29 | Inpatients/ | | 26925 |
| 30 | inpatient*.mp. | | 137513 |
| 31 | Hospitalization/ | | 127177 |
| 32 | hospitali?ation.mp. | | 253648 |
| 33 | exp Hospital Units/ | | 127990 |
| 34 | ward*.tw,kw. | | 68060 |
| 35 | ((acute or subacute or sub-acute) adj3 (clinic* or care or department* or unit* or centre* or center*)).mp. | | 63844 |
| 36 | Subacute Care/ | | 1336 |
| 37 | or/26-36 | | 1830315 |
| 38 | (patient* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 182607 |
| 39 | (consumer* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 2981 |
| 40 | lived experience*.mp. | | 8999 |
| 41 | 38 or 39 or 40 | | 193363 |
| 42 | 25 and 37 and 41 | | 1978 |
| 43 | limit 42 to (english language and yr="2000 -Current") | | 1778 |

NOTE: [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

# Embase Search Strategy

## Search Strategy:

Database(s): **Embase Classic+Embase** 1947 to 2022 April 25

Search Strategy:

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| 1 | (co-design* or codesign*).mp. | | 2720 |
| 2 | (co-produc* or coproduc*).mp. | | 7026 |
| 3 | (codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found*).mp. | | 1769 |
| 4 | participatory design*.mp. | | 745 |
| 5 | collaborative design*.mp. | | 209 |
| 6 | ("Experience based" adj2 design*).mp. | | 185 |
| 7 | shared decision making/ | | 10938 |
| 8 | (share* adj2 "decision making").mp. | | 20421 |
| 9 | or/1-8 | | 32371 |
| 10 | patient engagement.mp. | | 6190 |
| 11 | patient involvement.mp. | | 4357 |
| 12 | patient consultation.mp. | | 967 |
| 13 | patient participation/ | | 31867 |
| 14 | patient participation.mp. | | 33793 |
| 15 | patient input*.mp. | | 953 |
| 16 | stakeholder engagement/ | | 5180 |
| 17 | stakeholder participation.mp. | | 472 |
| 18 | consumer engagement.mp. | | 411 |
| 19 | consumer involvement.mp. | | 539 |
| 20 | consumer participation.mp. | | 685 |
| 21 | consumer input.mp. | | 166 |
| 22 | or/10-21 | | 48923 |
| 23 | design*.mp. | | 2778148 |
| 24 | 22 and 23 | | 10219 |
| 25 | 9 or 24 | | 41503 |
| 26 | exp hospital/ | | 1381691 |
| 27 | hospital*.tw. | | 2350119 |

| | | | |
|---|---|---|---|
| 28 | intensive care/ | | 137710 |
| 29 | hospital patient/ | | 209253 |
| 30 | inpatient*.mp. | | 216494 |
| 31 | hospitalization/ | | 464833 |
| 32 | hospitali?ation.mp. | | 574517 |
| 33 | exp "hospital subdivisions and components"/ | | 682544 |
| 34 | ward*.tw,kw. | | 110340 |
| 35 | ((acute or subacute or sub-acute) adj3 (clinic* or care or department* or unit* or centre* or center*)).mp. | | 95956 |
| 36 | subacute care/ | | 1422 |
| 37 | or/26-36 | | 3291835 |
| 38 | (patient* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 285537 |
| 39 | (consumer* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 3521 |
| 40 | lived experience*.mp. | | 10626 |
| 41 | 38 or 39 or 40 | | 298099 |
| 42 | 25 and 37 and 41 | | 2643 |
| 43 | limit 42 to (english language and yr="2000 -Current") | | 2531 |

Note: [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]

# Cinahl Search Strategy

## Search Strategy:

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| S1 | co-design* or codesign* | | 1,241 |
| S2 | co-produc* or coproduc* | | 1,263 |
| S3 | codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found* | | 1,161 |
| S4 | "participatory design*" | | 385 |
| S5 | "collaborative design*" | | 89 |
| S6 | "Experience based" N2 design* | | 85 |
| S7 | (MH "Decision Making, Shared") | | 2,628 |
| S8 | share* N2 "decision making" | | 8,215 |
| S9 | S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 | | 12,154 |
| S10 | "patient engagement" | | 2,418 |
| S11 | "patient involvement" | | 1,755 |
| S12 | "patient consultation" | | 252 |
| S13 | "patient participation" | | 1,646 |
| S14 | "patient input*" | | 225 |
| S15 | (MH "Stakeholder Participation") | | 1,869 |
| S16 | "stakeholder participation" | | 1,965 |
| S17 | "consumer engagement" | | 237 |
| S18 | "consumer involvement" | | 234 |
| S19 | (MH "Consumer Participation") | | 22,668 |
| S20 | "consumer participation" | | 22,753 |
| S21 | "consumer input" | | 77 |
| S22 | S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 | | 28,799 |
| S23 | design* | | 936,925 |
| S24 | S22 AND S23 | | 5,934 |
| S25 | S9 OR S24 | | 17,423 |

| | | | |
|---|---|---|---|
| S26 | (MH "Hospitals+") | | 126,715 |
| S27 | TI hospital* OR AB hospital* | | 521,273 |
| S28 | (MH "Critical Care") | | 24,924 |
| S29 | (MH "Inpatients") | | 85,178 |
| S30 | inpatient* | | 127,159 |
| S31 | (MH "Hospitalization") | | 42,891 |
| S32 | hospitalization or hospitalisation | | 94,651 |
| S33 | (MH "Hospital Units+") | | 104,753 |
| S34 | TI ward* OR AB ward* | | 31,011 |
| S35 | (acute or subacute or sub-acute) N3 (clinic* or care or department* or unit* or centre* or center*) | | 43,192 |
| S36 | (MH "Subacute Care") | | 1,883 |
| S37 | S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 | | 753,566 |
| S38 | patient* N2 (experience* or perception* or belief* or believe* or participat*) | | 78,810 |
| S39 | consumer* N2 (experience* or perception* or belief* or believe* or participat*) | | 24,221 |
| S40 | "lived experience" | | 5,807 |
| S41 | S38 OR S39 OR S40 | | 105,861 |
| S42 | S25 AND S37 AND S41 | | 1,327 |
| S43 | S25 AND S37 AND S41 | | 1,310 |
| S44 | S25 AND S37 AND S41 | | 1,257 |

# Cochrane Search Strategy

## Search strategy:

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| #1 | co-design* OR codesign* | | 270 |
| #2 | co-produc* or coproduc* | | 142 |
| #3 | codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found* | | 145 |
| #4 | participatory NEXT design* | | 63 |
| #5 | collaborative NEXT design* | | 13 |
| #6 | Experience based NEAR/2 design | | 16 |
| #7 | MeSH descriptor: [Decision Making, Shared] this term only | | 70 |
| #8 | share* NEAR/2 "decision making" | | 1817 |
| #9 | {OR #1-#8} | | 2419 |
| #10 | patient engagement | | 675 |
| #11 | patient involvement | | 507 |
| #12 | patient consultation | | 151 |
| #13 | MeSH descriptor: [Patient Participation] this term only | | 1503 |
| #14 | patient participation | | 3233 |
| #15 | patient NEXT input* | | 61 |
| #16 | MeSH descriptor: [Stakeholder Participation] this term only | | 26 |
| #17 | stakeholder participation | | 38 |
| #18 | consumer engagement | | 33 |
| #19 | consumer involvement | | 75 |
| #20 | consumer participation | | 141 |
| #21 | consumer input | | 32 |
| #22 | {OR #10-#21} | | 4477 |
| #23 | design* | | 308726 |
| #24 | #22 AND #23 | | 1868 |
| #25 | #9 OR #24 | | 4065 |
| #26 | MeSH descriptor: [Hospitals] explode all trees | | 3939 |
| #27 | hospital*:ti,ab | | 181756 |
| #28 | MeSH descriptor: [Critical Care] this term only | | 1848 |
| #29 | MeSH descriptor: [Inpatients] this term only | | 1081 |
| #30 | inpatient* | | 21948 |
| #31 | MeSH descriptor: [Hospitalization] this term only | | 5724 |
| #32 | hospitalization OR hospitalisation | | 48006 |
| #33 | MeSH descriptor: [Hospital Units] explode all trees | | 4557 |
| #34 | ward*:ti,ab,kw | | 14811 |
| #35 | (acute or subacute or sub-acute) NEAR/3 (clinic* or care or department* or unit* or centre* or center*) | | 9124 |
| #36 | MeSH descriptor: [Subacute Care] this term only | | 22 |
| #37 | {OR #26-#36} | | 212809 |

| | | | |
|---|---|---|---|
| #38 | patient* NEAR/2 (experience* or perception* or belief* or believe* or participat*) | | 34618 |
| #39 | consumer* NEAR/2 (experience* or perception* or belief* or believe* or participat*) | | 305 |
| #40 | lived NEXT experience* | | 300 |
| #41 | {OR #38-#40} | | 35104 |
| #42 | #25 AND #37 AND #41 | | 546 |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review. | Page 1, line 1 |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | Page 5, lines 106-112 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Page 5-6, lines 112-115 |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | Page 7, lines 141-150 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 7, lines 155-156 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Supplementary file 1 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Page 7-8, lines 160-163 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Page 8, lines 176-184 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Page 8, lines 177-181 |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | Page 8, lines 177-181 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Page 8, lines 165-174 |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | N/A |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Pages 8-9, lines 186-193 |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | Pages 8-9, lines 186-193 |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | N/A |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | Pages 8-9, lines 186-193 |
| | 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | N/A |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | N/A |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | N/A |
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | Page 9, lines 195-203 |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Page 9, 205-210 |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | Figure 1 |
| Study characteristics | 17 | Cite each included study and present its characteristics. | Table 2 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | Table 1 |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | N/A |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | Table 1 |
| | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | N/A |
| | 20c | Present results of all investigations of possible causes of heterogeneity among study results. | N/A |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | N/A |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | N/A |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | Table 3 |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | Page 19, lines 316-331 |
| | 23b | Discuss any limitations of the evidence included in the review. | Table 1-2 |
| | 23c | Discuss any limitations of the review processes used. | Pages 19-20, lines 339-341 |
| | 23d | Discuss implications of the results for practice, policy, and future research. | |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | N/A |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | Page 6, line 118 |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol. | N/A |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | Page 20, lines 362-364 |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Competing interests | 26 | Declare any competing interests of review authors. | Page 21, lines 366-367 |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | N/A |

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

BMJ Open

# Patient experiences of co-designed rehabilitation interventions in hospitals: a rapid review

| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2022-068241.R1 |
| Article Type: | Original research |
| Date Submitted by the Author: | 12-Oct-2022 |
| Complete List of Authors: | McKercher, Jonathan P; La Trobe University, ARCH<br>Slade, Susan; Monash University, Department of Physiotherapy<br>Jazayeri, Jalal; La Trobe University, ARCH<br>Hodge, Anita; Healthscope Limited<br>Knight, Matthew; The Victorian Rehabilitation Centre<br>Green, Janet; University of Tasmania<br>Woods, Jeffrey; La Trobe University, ARCH<br>Thwaites, Claire; La Trobe University, ARCH; The Victorian Rehabilitation Centre<br>Morris, Meg; La Trobe University, ARCH; The Victorian Rehabilitation Centre |
| Primary Subject Heading: | Rehabilitation medicine |
| Secondary Subject Heading: | Patient-centred medicine |
| Keywords: | REHABILITATION MEDICINE, Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT |
| | |

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# Patient experiences of co-designed rehabilitation interventions in hospitals: a rapid review

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**Word count:** 2944

## ABSTRACT

**Background:** Co-design strengthens partnerships between healthcare workers and patients. It also facilitates collaborations supporting the development, design, and delivery of healthcare services. Prior rehabilitation reviews have focused mainly on clinical and organisational outcomes of co-design with less focus on the lived experience of rehabilitation patients.

**Objectives:** To explore patient experiences of co-designed hospital rehabilitation interventions.

**Design:** Rapid review and evidence synthesis of the literature.

**Data sources:** CINAHL, MEDLINE, Embase and Cochrane were searched from 1 January 2000 to 25 April 2022.

**Study selection:** Studies reporting patient experiences of co-designed rehabilitation interventions in hospitals.

**Results:** 4156 studies were screened, and 38 full-text studies were assessed for eligibility. Seven studies were included in the final rapid review. Five out of the seven studies involved neurological rehabilitation. All eligible studies used qualitative research methods. The main barriers to co-design were related to staffing and dedicated time allocated to face-to-face patient-therapist interactions. High-quality relationships between patients and their therapists were a facilitator of co-design. Thematic synthesis revealed that co-designed rehabilitation interventions can enable a meaningful experience for patients and facilitate tailoring of treatments to align with individual needs. Personalised rehabilitation increases patient involvement in rehabilitation planning, delivery, and decision-making. It also promotes positive feelings of empowerment and hope.

**Conclusion:** This rapid review supports the implementation of co-designed rehabilitation interventions to improve patient experiences in hospitals.

**PROSPERO registration number:** CRD42021264547.

## Strengths and limitations of this study

- This rapid review was co-authored and co-designed with rehabilitation consumers.
- Rapid review methodology facilitated the timely production for this evidence on this emerging area of research.
- Fidelity of the review was strengthened by adherence to a published study protocol, a-priori rapid review methods and systematic reporting of study results.
- A major limitation was the rapid review process which restricted the number of years included, languages and number of databases searched.

## INTRODUCTION

Ensuring positive experiences for patients is a cornerstone of person-centred care.[1, 2] Healthcare providers, health professionals, and policy-makers seek consumer involvement when designing safe and high value health services across the globe.[2] This is reflected in the "Quadruple Aim",[3] a global framework for healthcare quality improvement, which emphasises positive patient experiences as a central element of person-centred care.[3] The Beryl Institute describes patient experience as the "sum of all interactions shared by an organisation's culture that influence patient perceptions across the continuum of care."[4, 5] Measuring and fostering positive patient experiences extends beyond documenting patient satisfaction, outcomes and perceptions.[2, 5] It also encompasses consumer engagement, co-design and co-production of interventions, based on high quality interactions between consumers and their healthcare team.[2] Positive patient experiences and consumer involvement in care design and delivery are associated with improved safety and clinical outcomes.[2, 6-8]

"Co-design" aims to improve patient experiences by involving stakeholders such as patients, carers, and families in the planning, design, and implementation of healthcare improvements.[1, 2, 7, 9-11] Co-design also involves care providers and organisations to improve patient experiences.[9-11] Healthcare improvements which are created in partnership with patients who have experience of the problem being addressed are arguably more likely to achieve positive outcomes.[1, 9-11] Hospital standards across the globe emphasise the importance of three closely related concepts in healthcare delivery: co-design, patient engagement, and shared decision-making.[12, 13] Patient engagement involves care-recipients in the co-design of services[8, 14, 15]. It also relates to the connections that patients have with health professionals,[16] and the degree to which patients participate in the design and delivery of

health initiatives.[13] Shared decision-making promotes patient involvement in clinical decision-making in partnership with health professionals.[17] Shared decision-making can be used in the development, design and implementation of healthcare interventions by creating tailored treatment programs and patient-centred goals according to patients' preferences.[18]

Rehabilitation aims to enable people to optimise their mobility, capability, autonomy, function, and quality of life.[19] Rehabilitation also aims to provide hospital patients with the skills and tools to discharge home safely and independently.[20] An emerging area of co-design and rehabilitation research is mHealth which is the use of mobile technology in healthcare delivery.[21, 22] mHealth interventions can include "empathic avatars" which are digital animations of human users which incorporate interactive scenarios based on patient experiences.[23, 24] They are argued to facilitate behavioural change by providing health information in an engaging way.[24] Emphatic avatars designed to reflect the culture of the user's environment are perceived positively by patients.[25] A systematic review on co-designed mHealth systems by Noorbergen *et al*[21] mapped co-design methods to four stages: "pre-design, generative, evaluative, and post-design."[21] They showed benefits for patients at each of these stages.[21] Although the literature noted the importance of the post-design stage, it was not included in the vast majority of studies.[21] Given this gap, the current review mainly focuses on the post-design stage of rehabilitation co-design, which relates to how patients report their experiences of inpatient rehabilitation after implementation has occurred.[21, 26]

Prior systematic reviews have evaluated co-design in relation to services and clinical outcomes in hospitals;[7] the organisational and patient outcomes of co-designed hospital services and tools;[6] effects of patient engagement strategies on patients and health services;[8] the influence that co-designed interventions can have on changing health professional

behaviour;[27] and contemporary co-design approaches in research and practice.[28] There is only limited research on how patients in hospital experience co-designed rehabilitation interventions. The primary objective of the current study is to evaluate patient experiences of co-designed rehabilitation interventions in hospitals. We also review methods used to co-design hospital rehabilitation interventions and identify perceived barriers and facilitators to co-design implementation.

## METHODS AND ANALYSIS

The protocol for this rapid review has been published online in BMJ Open and registered on the international prospective register of systematic reviews (PROSPERO CRD42021264547).[29, 30] The rapid review has been completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) as there is no peer-reviewed reporting guideline for rapid reviews.[31, 32]

A rapid review was performed to satisfy stakeholder requests for timely evidence on this emerging research area. A rapid review uses streamlined methodology to provide an accelerated version of a traditional systematic review.[33] The Cochrane Rapid Reviews Method Group provided provisional recommendations and guidance on the methods of rapid reviews which has been implemented in the searching of the literature for this paper.[33] Their recommendations include the use of date restrictions during database searching, limiting databases searched, and a limit on grey and supplemental searching.[33] These abbreviated search methods have been shown to expediate the review process without reducing methodological rigour when compared to systematic reviews.[34]

### Patient and public involvement

This rapid review and its preceding protocol paper have been co-authored by two consumer representatives.[30] The consumer representatives assisted in the co-design of this paper in several ways including the conception, development, and refinement of the research question; providing advice on the thematic analysis and data synthesis; and editing and revising the manuscript.

**Eligibility criteria**

Studies were included if they were manuscripts with any empirical study design published in English in either journals or conference proceedings; involved adult participants; conducted in an inpatient rehabilitation hospital such as acute, subacute, or slow stream musculoskeletal, neurological, or cardiorespiratory rehabilitation; involved a co-designed rehabilitation intervention; reported on patient experiences. Studies were excluded if they involved mental health alone, vocational, drug and alcohol rehabilitation; involved rehabilitation in the home or an outpatient setting; were protocols, abstracts of any type, book chapters, editorials, or doctoral theses; included only participants that required a medical decision-maker to participate on their behalf.

**Identification and selection of included papers**

The search strategy was devised with a health services librarian. Search terms were developed from key concepts including patient experiences, co-design, rehabilitation interventions, acute healthcare settings, hospitals. The databases of Cochrane, MEDLINE, Embase and CINAHL were searched from 1 January 2000 to 25 April 2022. The search strategy is given in supplementary file 1.

The search references were downloaded and combined in EndNote 20.[35] They were then

imported into Covidence, a systematic review program.[36] After removal of duplicate studies in Covidence, two reviewers (JPM, SCS/CT) independently screened the titles and abstracts before completing the full text review. Screening differences were resolved by discussion with a third reviewer (MEM).

**Method quality assessment**

Studies with any empirical design were eligible for inclusion. Although we made provisions for the assessment of any study design, the final yield of included papers only included qualitative studies. Therefore these were appraised with the JBI Critical Appraisal Checklist for Qualitative Research.[37, 38] This has a 10 question checklist which are accompanied by detailed explanatory notes which assist reviewers to assess the methodological bias of the included studies in a systematic review.[37, 38] Two critical appraisers (JPM, CT) assessed independently the methodological bias of each included study in accordance with the JBI checklist.[36-38] Any differences in the appraisals between the two authors were resolved through consultation with a third reviewer (MEM).

**Data extraction and management**

The Covidence Extraction 2.0 template was employed to extract the study characteristics from the included studies.[36] Characteristics extracted included aim of study, healthcare setting, study design, population description, descriptive statistics if applicable, outcome data if applicable, co-designed intervention characteristics and description, co-design strategy used, patient experiences, themes, and facilitators or barriers to co-design.[36] This process was completed independently by two reviewers (JPM, CT) for all included studies. Differences in the extracted data were resolved through deliberation and consensus between the two reviewers.

## Data analysis/synthesis

Data from the included studies were analysed and synthesised according to qualitative methods described by Thomas and Harden.[39] This approach involved three main stages and has the support of the Cochrane Qualitative and Implementation Methods Group.[40] Firstly, thematic findings from each included study were extracted in Covidence.[36] Secondly, these themes were then grouped according to their similarities to develop overarching descriptive themes to encapsulate common insights.[39] Thirdly, the descriptive themes were analysed to form new analytical themes to answer the questions posed by this rapid review.[39]

## Confidence in cumulative evidence

The Confidence in Evidence from Reviews of Qualitative Research (GRADE-CERQual) was used to make an assessment of the overall findings of this rapid review.[41] The GRADE-CERQual includes four components: adequacy of data, coherence, relevance, and methodological limitations.[41] The four components are used to assess the confidence in the evidence as very low or low, moderate or high. These levels describe the degree to which a review finding accurately represents the topic under review.[41] A GRADE-CERQual Summary of Findings table with an assessment of each review finding was completed by one author (JPM) and confirmed by a second reviewer (CT).[41]

# RESULTS

## Included studies

A total of 6112 studies were imported for screening. 4156 titles and abstracts were screened after 1956 duplicate papers were removed. The full text of 38 studies were screened for eligibility. In total seven studies were included in this rapid review. A PRIMSA flow diagram

is provided in Figure 1.[31]

## Quality appraisal

The seven included studies all had qualitative designs hence they were appraised with the JBI Critical Appraisal Checklist for Qualitative Research.[37, 38] All studies demonstrated congruity between their research methodology and purported philosophical perspective.[42-48] All studies had congruity between their research question, data collection and analysis, research methods and interpretation of results.[42-48] Two studies addressed the relationship between the study participants and the researcher.[45, 47] One study included a statement on the theoretical perspectives and cultural orientation of the research team.[48] All studies were conducted ethically, had adequate representation of the voices of their participants, and had conclusions that were logically drawn.[42-48] See Table 1 for the quality appraisal summary.

## Characteristics of included studies

The number of co-design participants ranged from 11 to 201 patients (Table 2). Studies were conducted in inpatient rehabilitation hospitals in high-income countries including three studies published in the UK. Five out of the seven studies focused on neurological rehabilitation. Five out of seven were published within the last five years.

## Types of co-designed rehabilitation interventions

Collaborative goal setting was employed as the co-design intervention in three studies.[42, 43, 48] Two involved a goal setting workbook,[42, 43] while one used an interactive goal setting application (Table 2).[48] Two studies involved personalised neurological rehabilitation.[45, 47] One study involved the development of care partnerships using patient advisors.[46] One study implemented improvements and increased supervision in stroke units.[44]

**Table 1** Methodological quality assessment for included studies using the JBI Critical Appraisal Checklist for Qualitative Research[37, 38]

| Study | Congruity between research methodology and purported philosophical perspective. | Congruity between the research question or aims and the research methodology. | Congruity between the data collection methods and the research methodology. | Congruity between the analysis of the data and the research methodology. | Congruity between the interpretation of results and the research methodology. | Locates the researcher theoretically and culturally. | Influence of the researcher on the researcher and vice-versa. | Participants voices were represented adequately. | Evidence of ethical approval. | Conclusions made are based on the data. |
|---|---|---|---|---|---|---|---|---|---|---|
| Holliday *et al*[42] | Yes | Yes | Yes | Yes | Yes | Unclear | No | Yes | Yes | Yes |
| Holliday *et al*[43] | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes |
| Jones *et al*[44] | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes |
| Last *et al*[45] | Yes | Yes | Yes | Yes | Yes | Unclear | Yes | Yes | Yes | Yes |
| Pomey *et al*[46] | Yes | Yes | Yes | Yes | Yes | No | Unclear | Yes | Yes | Yes |
| Scheel-Sailer *et al*[47] | Yes | Yes | Yes | Yes | Yes | Unclear | Yes | Yes | Yes | Yes |
| Strubbia *et al*[48] | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes |

**Table 2** Patient experiences of co-designed rehabilitation interventions.

| Author (year), country | Study design, participants (n) | Setting | Aim of study | Co-designed rehabilitation intervention | Co-design strategy | Barriers and facilitators to co-design implementation | Patient experiences |
|---|---|---|---|---|---|---|---|
| Holliday *et al*[42] (2007)<br><br>United Kingdom | Qualitative, n = 28 | Inpatient neurological rehabilitation unit. | To investigate patients' perceptions of two goal setting methods that differ in the amount of patient involvement. | An increased participation goal setting approach. | Provision of a goal setting workbook and use of a key worker role to increase patient contact time with staff. | Barriers: staff shortages and time constraints.<br>Facilitators: positive relationship between key worker and patients. | Patients felt that the goals were specific and individualised when they were involved in goal setting. |
| Holliday *et al*[43] (2007)<br><br>United Kingdom | Non-randomised controlled study, n = 201 | Inpatient neurological rehabilitation unit. | To explore an increased participation goal setting method. | Increased participation goal setting. | Provision of a goal setting workbook with patient participation facilitated by a key worker. | Not reported | Patients use of a goal setting workbook led to increased therapy precision and greater patient satisfaction. |
| Jones *et al*[44] (2021)<br><br>United Kingdom | Mixed-methods case comparison, n = 156 | Four separate inpatient acute stroke units. | To evaluate co-designed improvements to increase therapeutic patient activity in stroke units. | Experience-based co-design improvement cycles. | Incorporated patient, family, and staff experiences to design and deliver quality improvements. | Barriers: staff shortages, increased severity of disability of patients. | The co-design process was perceived by users to improve social interaction between patients, families, and staff. |

**Table 2** Continued

| Author (year), country | Study design, participants (n) | Setting | Aim of study | Co-designed rehabilitation intervention | Co-design strategy | Barriers and facilitators to co-design implementation | Patient experiences |
|---|---|---|---|---|---|---|---|
| Last *et al*[45] (2021)<br><br>Canada | Qualitative, n = 11 | Three inpatient rehabilitation programs. | To explore patient perspectives of the facilitators and barriers to engaging in stroke rehabilitation in hospital. | Personalised rehabilitation. | Therapy activities were designed and refined to include activities which were meaningful to patients and in line with their goals. | Barriers: limited resources, low ratio of therapists to patients, negative attitude towards rehabilitation. | Patients perceived that therapy was enhanced by personalised rehabilitation. Therapy seemed to be most meaningful when it was designed to meet the goals of the patients. |
| Pomey *et al*[46] (2018)<br><br>Canada | Qualitative, n = 8 | Specialist acute and rehabilitation centre for amputation management | To increase rehabilitation adherence rates with patient advisors in a peer support program. | Patient advisor program. | Four focus groups were undertaken to develop approaches to improving patient adherence to rehabilitation. | Not reported | Patients who received support from patient advisors reported feeling less isolated, increased hopefulness and morale, and a reduction in pain perception and disability. |
| Scheel-Sailer *et al*[47] (2017)<br><br>Switzerland | Qualitative n = 22 | Single inpatient rehabilitation centre. | Explore patients' perception of their participation in decision-making after spinal cord injury. | Personalised rehabilitation. | Patients had the ability to choose additional treatments. | Barriers: time pressure.<br>Facilitators: a supportive therapeutic team. | Patients experienced a sense of empowerment and increased capability when they were able exercise their decision-making ability to choose additional therapies to tailor their rehabilitation. |
| Strubbia *et al*[48] (2021)<br><br>New Zealand | Qualitative n = 16 | Three inpatient rehabilitation services. | To detail the experiences of health workers and patients using a goal setting application aid. | Collaborative goal setting. | A tablet application decision-making tool. | Barriers: time constraints, accessibility of the tablet. | Use of the tool facilitated meaningful collaborative goal setting. Patients developed a broader understanding of rehabilitation and reported increased hope of recovery. |

## Co-design strategies

Three studies used collaborative goal setting to develop co-designed goals (Table 2).[42, 43, 48] In two studies, the patients were able to co-design their own rehabilitation program.[45, 47] The Partnership Co-design Lab method was used in Pomey *et al*[46] to introduce patient advisors at patient bed sides.[46] Evidenced-based co-design and accelerated evidenced-based co-design was implemented in one study to address inactivity in stroke units.[44]

## Barriers and facilitators to co-design

Authors of the included studies identified two primary barriers to the co-design of rehabilitation interventions in hospitals. Firstly, co-design was often impeded by staff shortages (Table 2).[42, 44, 45] Staff shortages were reported by patients as being a key limitation to receiving a high quantity of therapy, in addition to increased waiting times for treatment.[42, 44, 45] Patients perceived these limitations as having a negative impact on their rehabilitation experiences.[45]

Limited time dedicated to patient-therapist interactions was also seen by some patients as a hurdle to the co-design process.[42, 47, 48] These patients reported experiencing stress or dissatisfaction due to having limited time to discuss their rehabilitation with doctors.[47] A lack of time with health professionals to discuss goals was perceived by patients as a negative factor influencing the co-design process.[42] The use of a tablet application to facilitate collaborative goal setting was perceived by health professionals as time consuming.[48]

A key facilitator of co-design was a positive relationship between patients and others involved in their rehabilitation such as peers, family, and health professionals.[42, 47] Patients mentioned that peers who had similar conditions to their own helped to support and provide

encouragement during the decision-making process.[47] High quality patient-therapist relationships were perceived as helpful in achieving rehabilitation goals.[42]

**Patient experiences**

Co-designed rehabilitation interventions resulted in a more positive experience for patients. The primary theme that emerged from the included studies was the paradigm of tailor-made rehabilitation. Tailor-made rehabilitation was associated with more meaningful therapy, increased patient involvement, empowerment and autonomy (Table 2).[42-45, 47] This concept was described by patients in a study by Holliday *et al*[42] who felt that their increased involvement in goal setting enabled their goals to be specific to their needs. This increased their sense of ownership over their goals and resulted in a positive rehabilitation experience.[42] There were similar findings in a second study by Holliday *et al*[43] which also investigated collaborative goal setting. Patients who were in the increased participation goal setting group had higher satisfaction with their rehabilitation.[43] Providing patients with a structure to design their own goals resulted in greater patient autonomy and goal relevance.[43] Rehabilitation that involved increased patient participation in goal setting was perceived as more targeted to the individual.[43] Jones *et al*[44] found that co-designed changes which aimed to address inactivity of stroke patients in rehabilitation hospitals were beneficial. Patients and their carers associated the co-design approach with several improvements.[44] Co-designed activity boxes were provided to patients to enable them to engage in extra therapy such as a cooking group. This helped to reduce inactivity of patients after stroke and resulted in a more positive experience.[44]

Patients in Last *et al*[45] reported that their therapy was enhanced when their treatment was tailored to their specific preferences, needs, and goals. Tailored therapy was seen as more

meaningful, enjoyable, and motivating for patients.[45] This was best exemplified by a patient who had a goal of kayaking.[45] The patient's therapist incorporated kayaking, in a hydrotherapy pool, into the patient's rehabilitation program.[45] Patients in a study by Scheel-Sailer *et al*[47], had the ability to design their rehabilitation program by choosing additional therapies. Patients felt a sense of empowerment and self-efficacy by exercising this decision-making ability.[47] It was also emphasised by patients as an important method to make their rehabilitation programs more interactive and tailored.[47]

A secondary theme that emerged was co-designed rehabilitation interventions provided inpatients with feelings of hope regarding their recovery. A co-designed tablet application for collaborative goal setting and decision-making described in Strubbia *et al*[48] assisted patients to have a more thorough understanding of their condition and treatment. This provided patients with hope for the future as they were educated on what to expect from rehabilitation.[48] Patients felt empowered through their increased understanding of their rehabilitation which enabled them to participate in making meaningful decisions regarding their care.[48] Health professionals suggested that the tablet application could be improved for patients by including culturally appropriate images.[48]

Pomey *et al*[46] explored a co-designed patient advisor program to increase adherence to rehabilitation. Patient advisors supported patients in the hospital by answering their questions regarding treatment and ensuring that each patient received the necessary amount of care.[46] An evaluation of the interactions between patients and their advisors found that patients felt increased motivation and hopefulness regarding their rehabilitation.[46] Some patients who had support from patient advisors also reported reduced feelings of pain or disability.[46]

## Confidence in review findings

Table 3 shows moderate to high confidence in the majority of the review findings. Whereas there was high confidence in the finding that co-designed rehabilitation interventions increased patient involvement in treatment, decision-making autonomy and were perceived as more meaningful, there was moderate confidence in the finding that staff shortages and time constraints were barriers to co-design implementation. There was less confidence in the findings that co-designed rehabilitation interventions provided patients hope about their recovery and were facilitated by high quality patient-therapist relationships.

**Table 3** GRADE-CERQual Summary of Qualitative Findings.[41]

| Summary of review finding | Studies contributing to the review finding | Confidence assessment | Explanation of CERQual assessment |
|---|---|---|---|
| Staff shortages were a barrier to the implementation of co-designed rehabilitation interventions in hospitals. | Holliday *et al*[42]<br>Jones *et al*[44]<br>Last *et al*[45] | Moderate | Minor methodological limitations, relevance, and coherence concerns.<br>Moderate concerns about adequacy. |
| Time constraints were a barrier to the implementation of co-designed rehabilitation interventions in hospitals. | Holliday *et al*[42]<br>Scheel-Sailer *et al*[47]<br>Strubbia *et al*[48] | Moderate | Minor methodological limitations, relevance, and coherence concerns.<br>Moderate concerns about adequacy. |
| Co-designed hospital rehabilitation interventions were facilitated by a good quality relationship between patients and their therapist. | Holliday *et al*[42]<br>Scheel-Sailer *et al*[47] | Low | Minor methodological limitations, relevance, and coherence concerns.<br>Serious concerns about adequacy. |
| Co-designed rehabilitation interventions were meaningful to patients and associated with increased patient involvement in therapy, increased autonomy in decision-making, and empowerment. | Holliday *et al*[42]<br>Holliday *et al*[43]<br>Jones *et al*[44]<br>Last *et al*[45]<br>Scheel-Sailer *et al*[47] | High | Minor methodological limitations, relevance, and coherence concerns.<br>Minor concerns about adequacy. |
| Co-designed rehabilitation interventions improved inpatient experiences by providing patients with a better understanding of the rehabilitation process and increased feelings of hope for the future. | Pomey *et al*[46]<br>Strubbia *et al*[48] | Low | Minor methodological limitations, relevance, and coherence concerns.<br>Serious concerns about adequacy. |

## DISCUSSION

This rapid review showed positive patient experiences of co-designed rehabilitation interventions delivered in hospital settings.[42-48] Co-designed rehabilitation interventions included goal setting books, personalised rehabilitation therapies, patient advisors, hospital environmental and organisational changes, and technological collaborative goal setting applications.[42-48] In agreement with Clarke *et al*[7], the current review showed that the main barriers to co-design were related to staffing and time constraints.[42, 44, 45, 47, 48] Positive relationships between patients and therapists were a facilitator.[42, 44-48] As with Lim *et al*[6] patient experiences of co-designed interventions were reported to be positive.[42-48] Thematic analysis of included studies revealed that co-design facilitated the development of tailor-made treatment which increased patient involvement in their rehabilitation, autonomy over decision-making, and feelings of empowerment.[42, 43, 45, 47] Tailor-made rehabilitation was perceived by some patients as being more meaningful than usual care, which facilitated improved patient experiences of their rehabilitation.[42-45, 47] Co-designed rehabilitation interventions also fostered a feeling of hope among patients and improved their treatment expectations and outlook on their recovery.[46, 48]

This review was co-authored with two consumers and was rigorously conducted in accordance with a peer-reviewed protocol paper and best practice guidelines.[30, 31, 33] As a rapid review, truncated methods endorsed by The Cochrane Rapid Reviews Method Group were used to expediate the review process.[33] This included a date restriction during database searching, a limit on databases searched and a restriction on grey and supplemental literature.

A limitation of this review is that it only yielded seven publications, all of which were qualitative in design. Also, it is possible that relevant case studies or conference proceedings

that were not peer-reviewed were not identified. Although we limited the search from the year 2000, five of the seven studies included in this review had been published since 2017. This highlights growing interest in this topic and suggests that future research on patient experiences of co-designed rehabilitation interventions is warranted.

## CONCLUSION

Positive patient experiences occur with co-designed rehabilitation interventions in hospitals.[42-48] Patients who are highly involved in their treatment report greater decision-making autonomy, positive experiences and better outomes.[42-48]


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## Author contributions

JPM, SCS, JAJ, and MEM designed the study and formulated the research question and search terms. JPM, SCS, JAJ, AH, MK, JG, JW, CT, and MEM assisted in the planning for this rapid review. JPM, SCS, CT, and MEM were involved in the study screening and review process. JPM, CT, and MEM completed the data extraction and the method quality assessment of the included studies. JPM wrote the draft manuscripts which were edited by MEM and SCS. All authors reviewed the final manuscript before publication.


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## Competing interests

None declared.

## Ethics approval

Not applicable.

## Data sharing statement

Data are available on request from the corresponding author.

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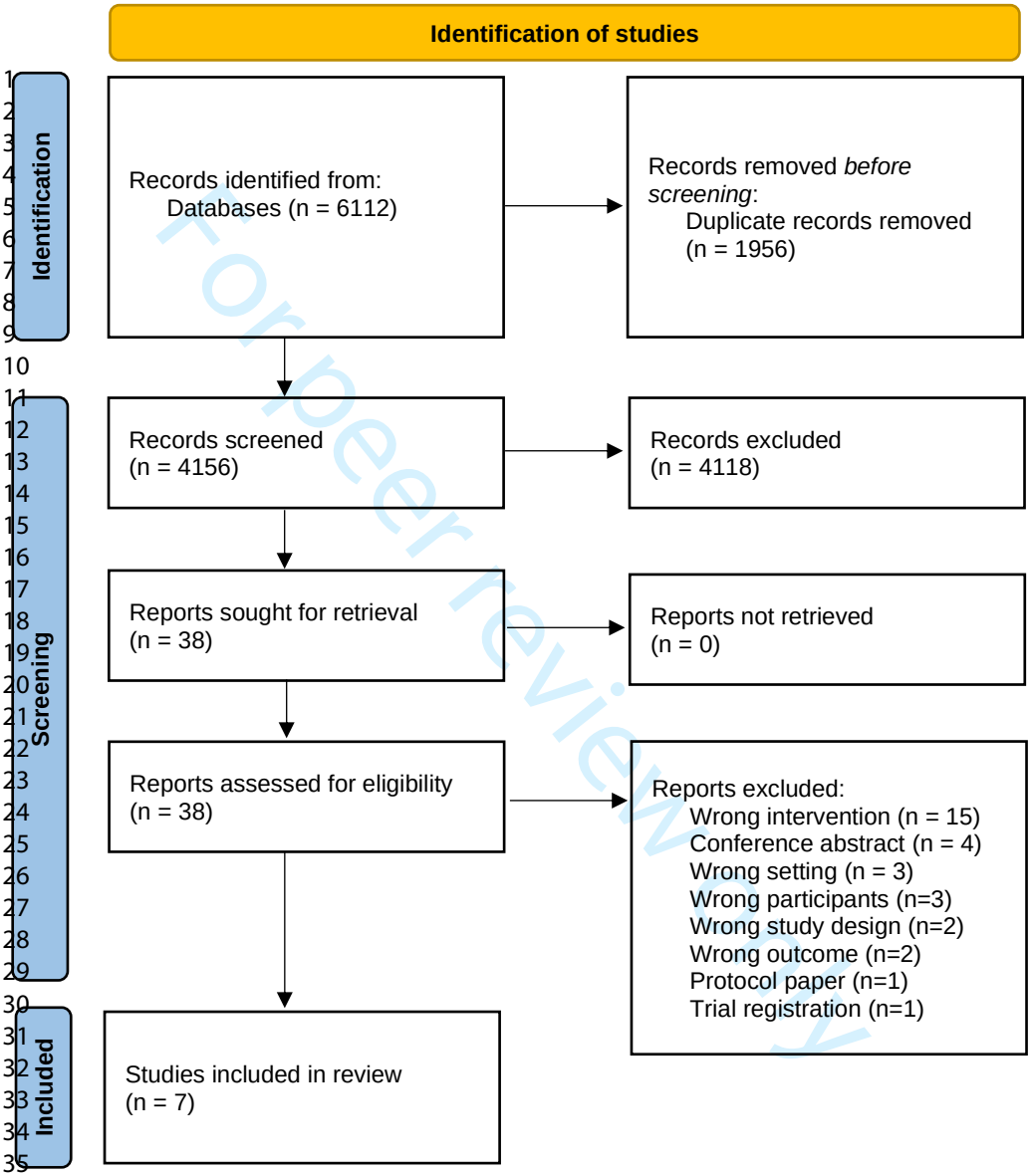




*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

# Medline Search Strategy

## Search Strategy:

Database(s): **Ovid MEDLINE(R) ALL** 1946 to April 25, 2022

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| 1 | (co-design* or codesign*).mp. | | 2291 |
| 2 | (co-produc* or coproduc*).mp. | | 6099 |
| 3 | (codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found*).mp. | | 1106 |
| 4 | participatory design*.mp. | | 746 |
| 5 | collaborative design*.mp. | | 167 |
| 6 | ("Experience based" adj2 design*).mp. | | 120 |
| 7 | Decision Making, Shared/ | | 1528 |
| 8 | (share* adj2 "decision making").mp. | | 12586 |
| 9 | or/1-8 | | 22556 |
| 10 | patient engagement.mp. | | 4141 |
| 11 | patient involvement.mp. | | 3195 |
| 12 | patient consultation.mp. | | 604 |
| 13 | Patient Participation/ | | 28483 |
| 14 | patient participation.mp. | | 30375 |
| 15 | patient input*.mp. | | 462 |
| 16 | Stakeholder Participation/ | | 1984 |
| 17 | stakeholder participation.mp. | | 2338 |
| 18 | consumer engagement.mp. | | 288 |
| 19 | consumer involvement.mp. | | 379 |
| 20 | consumer participation.mp. | | 425 |
| 21 | consumer input.mp. | | 105 |
| 22 | or/10-21 | | 38941 |
| 23 | design*.mp. | | 2422612 |
| 24 | 22 and 23 | | 8582 |
| 25 | 9 or 24 | | 29953 |
| 26 | exp Hospitals/ | | 302695 |
| 27 | hospital*.tw. | | 1475698 |
| 28 | Critical Care/ | | 58045 |

| | | | |
|---|---|---|---|
| 29 | Inpatients/ | | 26925 |
| 30 | inpatient*.mp. | | 137513 |
| 31 | Hospitalization/ | | 127177 |
| 32 | hospitali?ation.mp. | | 253648 |
| 33 | exp Hospital Units/ | | 127990 |
| 34 | ward*.tw,kw. | | 68060 |
| 35 | ((acute or subacute or sub-acute) adj3 (clinic* or care or department* or unit* or centre* or center*)).mp. | | 63844 |
| 36 | Subacute Care/ | | 1336 |
| 37 | or/26-36 | | 1830315 |
| 38 | (patient* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 182607 |
| 39 | (consumer* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 2981 |
| 40 | lived experience*.mp. | | 8999 |
| 41 | 38 or 39 or 40 | | 193363 |
| 42 | 25 and 37 and 41 | | 1978 |
| 43 | limit 42 to (english language and yr="2000 -Current") | | 1778 |

NOTE: [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]

# Embase Search Strategy

## Search Strategy:

Database(s): **Embase Classic+Embase** 1947 to 2022 April 25
Search Strategy:

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| 1 | (co-design* or codesign*).mp. | | 2720 |
| 2 | (co-produc* or coproduc*).mp. | | 7026 |
| 3 | (codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found*).mp. | | 1769 |
| 4 | participatory design*.mp. | | 745 |
| 5 | collaborative design*.mp. | | 209 |
| 6 | ("Experience based" adj2 design*).mp. | | 185 |
| 7 | shared decision making/ | | 10938 |
| 8 | (share* adj2 "decision making").mp. | | 20421 |
| 9 | or/1-8 | | 32371 |
| 10 | patient engagement.mp. | | 6190 |
| 11 | patient involvement.mp. | | 4357 |
| 12 | patient consultation.mp. | | 967 |
| 13 | patient participation/ | | 31867 |
| 14 | patient participation.mp. | | 33793 |
| 15 | patient input*.mp. | | 953 |
| 16 | stakeholder engagement/ | | 5180 |
| 17 | stakeholder participation.mp. | | 472 |
| 18 | consumer engagement.mp. | | 411 |
| 19 | consumer involvement.mp. | | 539 |
| 20 | consumer participation.mp. | | 685 |
| 21 | consumer input.mp. | | 166 |
| 22 | or/10-21 | | 48923 |
| 23 | design*.mp. | | 2778148 |
| 24 | 22 and 23 | | 10219 |
| 25 | 9 or 24 | | 41503 |
| 26 | exp hospital/ | | 1381691 |
| 27 | hospital*.tw. | | 2350119 |
| 28 | intensive care/ | | 137710 |

| | | | |
|---|---|---|---|
| 29 | hospital patient/ | | 209253 |
| 30 | inpatient*.mp. | | 216494 |
| 31 | hospitalization/ | | 464833 |
| 32 | hospitali?ation.mp. | | 574517 |
| 33 | exp "hospital subdivisions and components"/ | | 682544 |
| 34 | ward*.tw,kw. | | 110340 |
| 35 | ((acute or subacute or sub-acute) adj3 (clinic* or care or department* or unit* or centre* or center*)).mp. | | 95956 |
| 36 | subacute care/ | | 1422 |
| 37 | or/26-36 | | 3291835 |
| 38 | (patient* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 285537 |
| 39 | (consumer* adj2 (experience* or perception* or belief* or believe* or participat*)).mp. | | 3521 |
| 40 | lived experience*.mp. | | 10626 |
| 41 | 38 or 39 or 40 | | 298099 |
| 42 | 25 and 37 and 41 | | 2643 |
| 43 | limit 42 to (english language and yr="2000 -Current") | | 2531 |

Note: [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]

# Cinahl Search Strategy

## Search Strategy:

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| S1 | co-design* or codesign* | | 1,241 |
| S2 | co-produc* or coproduc* | | 1,263 |
| S3 | codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found* | | 1,161 |
| S4 | "participatory design*" | | 385 |
| S5 | "collaborative design*" | | 89 |
| S6 | "Experience based" N2 design* | | 85 |
| S7 | (MH "Decision Making, Shared") | | 2,628 |
| S8 | share* N2 "decision making" | | 8,215 |
| S9 | S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 | | 12,154 |
| S10 | "patient engagement" | | 2,418 |
| S11 | "patient involvement" | | 1,755 |
| S12 | "patient consultation" | | 252 |
| S13 | "patient participation" | | 1,646 |
| S14 | "patient input*" | | 225 |
| S15 | (MH "Stakeholder Participation") | | 1,869 |
| S16 | "stakeholder participation" | | 1,965 |
| S17 | "consumer engagement" | | 237 |
| S18 | "consumer involvement" | | 234 |
| S19 | (MH "Consumer Participation") | | 22,668 |
| S20 | "consumer participation" | | 22,753 |
| S21 | "consumer input" | | 77 |
| S22 | S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 | | 28,799 |
| S23 | design* | | 936,925 |
| S24 | S22 AND S23 | | 5,934 |
| S25 | S9 OR S24 | | 17,423 |

| | | | |
|---|---|---|---|
| S26 | (MH "Hospitals+") | | 126,715 |
| S27 | TI hospital* OR AB hospital* | | 521,273 |
| S28 | (MH "Critical Care") | | 24,924 |
| S29 | (MH "Inpatients") | | 85,178 |
| S30 | inpatient* | | 127,159 |
| S31 | (MH "Hospitalization") | | 42,891 |
| S32 | hospitalization or hospitalisation | | 94,651 |
| S33 | (MH "Hospital Units+") | | 104,753 |
| S34 | TI ward* OR AB ward* | | 31,011 |
| S35 | (acute or subacute or sub-acute) N3 (clinic* or care or department* or unit* or centre* or center*) | | 43,192 |
| S36 | (MH "Subacute Care") | | 1,883 |
| S37 | S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 | | 753,566 |
| S38 | patient* N2 (experience* or perception* or belief* or believe* or participat*) | | 78,810 |
| S39 | consumer* N2 (experience* or perception* or belief* or believe* or participat*) | | 24,221 |
| S40 | "lived experience" | | 5,807 |
| S41 | S38 OR S39 OR S40 | | 105,861 |
| S42 | S25 AND S37 AND S41 | | 1,327 |
| S43 | S25 AND S37 AND S41 | | 1,310 |
| S44 | S25 AND S37 AND S41 | | 1,257 |

# Cochrane Search Strategy

## Search strategy:

| Search ID# | Search Terms | Search Notes | Results |
|---|---|---|---|
| #1 | co-design* OR codesign* | | 270 |
| #2 | co-produc* or coproduc* | | 142 |
| #3 | codevise* or cocreate* or co-create* or co-invent* or cogenerate* or co-found* | | 145 |
| #4 | participatory NEXT design* | | 63 |
| #5 | collaborative NEXT design* | | 13 |
| #6 | Experience based NEAR/2 design | | 16 |
| #7 | MeSH descriptor: [Decision Making, Shared] this term only | | 70 |
| #8 | share* NEAR/2 "decision making" | | 1817 |
| #9 | {OR #1-#8} | | 2419 |
| #10 | patient engagement | | 675 |
| #11 | patient involvement | | 507 |
| #12 | patient consultation | | 151 |
| #13 | MeSH descriptor: [Patient Participation] this term only | | 1503 |
| #14 | patient participation | | 3233 |
| #15 | patient NEXT input* | | 61 |
| #16 | MeSH descriptor: [Stakeholder Participation] this term only | | 26 |
| #17 | stakeholder participation | | 38 |
| #18 | consumer engagement | | 33 |
| #19 | consumer involvement | | 75 |
| #20 | consumer participation | | 141 |
| #21 | consumer input | | 32 |
| #22 | {OR #10-#21} | | 4477 |
| #23 | design* | | 308726 |
| #24 | #22 AND #23 | | 1868 |
| #25 | #9 OR #24 | | 4065 |
| #26 | MeSH descriptor: [Hospitals] explode all trees | | 3939 |
| #27 | hospital*:ti,ab | | 181756 |
| #28 | MeSH descriptor: [Critical Care] this term only | | 1848 |
| #29 | MeSH descriptor: [Inpatients] this term only | | 1081 |
| #30 | inpatient* | | 21948 |
| #31 | MeSH descriptor: [Hospitalization] this term only | | 5724 |
| #32 | hospitalization OR hospitalisation | | 48006 |
| #33 | MeSH descriptor: [Hospital Units] explode all trees | | 4557 |
| #34 | ward*:ti,ab,kw | | 14811 |
| #35 | (acute or subacute or sub-acute) NEAR/3 (clinic* or care or department* or unit* or centre* or center*) | | 9124 |
| #36 | MeSH descriptor: [Subacute Care] this term only | | 22 |
| #37 | {OR #26-#36} | | 212809 |

| | | | |
|---|---|---|---|
| #38 | patient* NEAR/2 (experience* or perception* or belief* or believe* or participat*) | | 34618 |
| #39 | consumer* NEAR/2 (experience* or perception* or belief* or believe* or participat*) | | 305 |
| #40 | lived NEXT experience* | | 300 |
| #41 | {OR #38-#40} | | 35104 |
| #42 | #25 AND #37 AND #41 | | 546 |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review. | Page 1, line 1 |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | Page 5, lines 114-120 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Page 5-6, lines 120-123 |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | Page 7, lines 149-158 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 7, lines 163-164 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Supplementary file 1 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Page 7-8, lines 167-171 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Page 8, lines 184-192 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Page 8, lines 186-189 |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | Page 8, lines 186-189 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Page 8, lines 173-182 |
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | N/A |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Pages 9, lines 194-201 |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | Pages 9, lines 194-201 |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | N/A |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | Pages 9, lines 194-201 |
| | 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | N/A |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | N/A |

# PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | N/A |
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | Page 9, lines 203-211 |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Page 9-10, lines 213-218 |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | Figure 1 |
| Study characteristics | 17 | Cite each included study and present its characteristics. | Table 2 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | Table 1 |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | N/A |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | Table 1 |
| | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | N/A |
| | 20c | Present results of all investigations of possible causes of heterogeneity among study results. | N/A |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | N/A |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | N/A |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | Table 3 |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | Page 19, lines 326-331 |
| | 23b | Discuss any limitations of the evidence included in the review. | Table 1 & 3 |
| | 23c | Discuss any limitations of the review processes used. | Pages 19-20, lines 339-341 |
| | 23d | Discuss implications of the results for practice, policy, and future research. | Page 20, lines 343-349 |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | N/A |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | Page 6, line 126 |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol. | N/A |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | Page 20, lines 363-365 |

## PRISMA 2020 Checklist

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Competing interests | 26 | Declare any competing interests of review authors. | Page 21, lines 367-368 |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | N/A |

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
For more information, visit: http://www.prisma-statement.org/