2-2023

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Abstract

Aims
To describe the characteristics of hospital-based, patient-mediated interventions and their impact on patient, clinician and organization outcomes.

Design
Systematic review.

Data Sources
Health literature databases (MEDLINE, CINAHL and EMBASE) were searched in August 2021. Backward and forward citation searching was conducted.

Review Methods
Studies investigating patient-mediated interventions, targeted at adult hospitalized patients were eligible. Data were extracted related to study and intervention characteristics. Narrative synthesis was used to understand intervention impact on patient, clinician and organization outcomes (as per a framework). Methodological quality was assessed using the Mixed Methods Assessment Tool.

Results
Thirty-three studies, reporting 18 interventions, were included. Twelve interventions prompted patients to report health information about their own health/needs/concerns and six interventions encouraged patients to provide feedback about clinical practice. Across all interventions, there was evidence that patients used patient-mediated interventions and that they may improve patient communication. Healthcare professional outcomes were mixed for actual/intended use, acceptability and usefulness of interventions; yet there was some evidence of healthcare professional behaviour change. Interventions that encouraged patients to report health information about their own health/needs/concerns appeared more successful than other types of interventions.

Conclusions
There is some evidence that hospital-based patient-mediated interventions may influence patient communication and healthcare professional behaviour. Patient-mediated interventions that encourage patients to report patient data before a clinical encounter may be more impactful than interventions that encourage patient feedback during or post-encounter.

Impact

To date, most patient-mediated intervention research has been conducted in primary care settings; we uncovered the types of patient-mediated interventions that have been trialled in hospitals. We found that patient communication and healthcare professional behaviour may be influenced by these patient-mediated interventions. Future researchers could explore the suitability and effectiveness of a wider range of hospital-based patient-mediated interventions.

No patient or public contribution
There was no funding to remunerate a patient/member of the public for this review.

1 INTRODUCTION

Hospitals are facing a 'serious crisis' in improving health outcomes because 40% of patients do not receive evidence-based care (Banner et al., 2019). Poor research utilization adds to the billions of dollars of health and medical research funding wasted annually (Glasziou & Chalmers, 2018) and can contribute to variability in patient care. Barriers to evidence-based practice (EBP) of nurses and allied health professionals in hospitals include lack of authority to change practice (Tuppal et al., 2019), lack of awareness around research, and lack of time (Cardin & Hudson, 2018). Finding ways to embed high-quality evidence into healthcare professionals' work is a major challenge (Grimshaw et al., 2012). Interventions to enhance healthcare professional use of EBP have largely focussed on targeting healthcare professionals to directly influence healthcare professional behaviour (Foy et al., 2015; Johnson & May, 2015).

Patient engagement is the new frontier for translating research into practice. Internationally, healthcare policies advocate patient engagement as a strategy to increase healthcare safety and quality (Longtin et al., 2010). Patient engagement can range from involvement in direct care delivery to involvement in policy-making and research (Carman et al., 2013; McCarron et al., 2021). The emerging benefits of patient engagement include enhanced care, improved service delivery and changes in staff culture (Bombard et al., 2018).

Patient-mediated interventions can promote patient engagement, while also influencing healthcare professional uptake of EBP. Straus et al. (2013) define these as interventions that are targeted at patients but aim to change healthcare professionals' behaviour, and ultimately patient outcomes, through patient-provider interaction. Patient engagement strategies and interventions for hospitalized patients are being published at an increased rate since 2008 (Tobiano et al., 2021), providing an extensive evidence base for identifying patient-mediated interventions.

2 BACKGROUND

Previous literature reviews suggest that patient-mediated interventions may help improve patient outcomes and professional practice, but more research is needed to determine the impact of these interventions on patient and healthcare professional communication, adverse events and resources (Fønhus et al., 2018). There is evidence that patient-mediated interventions improve physician performance and test ordering behaviours (French et al., 2010; Oxman et al., 1995) and may also positively influence patients, including increased patient satisfaction, knowledge, decision-making, communication and behaviour (Gagliardi et al., 2016). However more evidence of effectiveness is

required, as other reviews show that outcomes of patient-mediated intervention are mixed (Ng & Gagliardi, 2018; Oxman et al., 1995) and that the evidence base is of low-moderate quality (Gagliardi et al., 2016). Reviews of patient-mediated interventions have predominantly included studies in primary, specialist, community or hospital outpatient settings, whereas reviews of hospital setting patient-mediated interventions are scarce (Fønhus et al., 2018; Gagliardi et al., 2016). In a review that focussed on patient-mediated interventions to improve prescriber behaviour in the hospital setting, only one patient-mediated intervention was found, which was bundled with other interventions, and was found to be ineffective (Brennan & Mattick, 2013). Given the imperative to enhance patient engagement in hospitals and support evidence-based practice of health professionals, the rise of patient-mediated interventions in hospitals is timely to increase uptake of EBP.

3 THE REVIEW

3.1 Aims

The aim of this review was to describe the characteristics of hospital-based patient-mediated interventions and their impact on patient, clinician and organization outcomes.

3.2 Design

This systematic review was conducted and reported per the Preferred Reporting Items for Systematic Reviews (PRISMA) criteria. The systematic review protocol is published online through PROSPERO (registration number: CRD42020173157).

3.3 Search methods

3.3.1 Information sources

Databases searched included MEDLINE, CINAHL and EMBASE. After the health literature database search occurred, reference lists of included studies were searched to identify other eligible studies. Forward citation searching was undertaken in Scopus to identify any additional studies that had cited any of the included studies. Grey literature was not included as it is not subject to peer-review processes characterizing publication in scientific journals (Lawrence et al., 2014), and methodological descriptions that facilitate quality appraisal are usually missing in grey publications (Adams et al., 2017).

3.3.2 Search

The search strategy was developed collaboratively by an expert health librarian (ST) and the author team. The author team had content expertise in the development and implementation of interventions for hospitalized patients and patient engagement; and had previously worked as healthcare professionals in hospitals. The full search strategies are provided in Appendix File 1. Subject headings and keywords were initially identified from Fønhus et al.'s (2018) review and expanded using authors' expertise. Working with a librarian experienced in developing and managing searches for systematic reviews, a search strategy was built to cover the following concepts: setting (hospitals), a range of healthcare professionals, patient-mediated intervention process (patient engagement) and patient-mediated intervention intent (changing healthcare professional behaviour). The search was conducted on 6 August 2021. One author conducted the search (GT) and exported search results to Endnote (Clarivate, 2022).

3.3.3 Eligibility criteria

Inclusion criteria were studies investigating patient-mediated interventions, targeted at adult hospitalized patients (aged ≥18 years). Given intervention developers are not fully aware of what constitutes patient-mediated interventions, and the historical lack of clarity around taxonomies (Ng & Gagliardi, 2018), many published accounts of patient-mediated interventions did not explicitly use the terminology 'patient-mediated' and we did not require that this term be explicitly used. Determination of whether an intervention was patient-mediated was undertaken by the author team, based on the definition by Straus et al. (2013). No restrictions were placed on research design or study type; however, systematic reviews, editorials, descriptions of interventions (with no empirical data), methodological papers, abstracts, dissertations, case studies and protocols were excluded. Studies were excluded if they targeted patients who were pregnant and/or children. Studies were excluded if published in a language other than English or if they were published prior to 2010, as we sought contemporary literature, recognizing that approaches to patient-centred care have evolved considerably in the last decade (Castro et al., 2016). Specifically, literature from 1 January 2010 to 6 August 2021 were included.

3.3.4 Study selection

Duplicate studies were removed in Endnote (Clarivate, 2022) before importing these studies into Rayyan for screening (Ouzzani et al., 2016). Pairs of authors (AM & ST, RM & SR, GT & CT) independently screened the title and abstract of studies against inclusion and exclusion criteria. Full-text papers were retrieved when the study met the inclusion criteria or where authors were unsure of inclusion and were screened by the same pairs of authors against the same criteria. Disagreements were resolved through consensus discussions and adjudicated in team meetings with all team members present, to ensure consistency across teams.

3.3.5 Data extraction

A data extraction form was developed, containing two sections. In section one, study characteristics were extracted, including author, year, country, setting, design, methods, sample and participants. In section two, intervention characteristics were captured. These data points were guided by the template for intervention description and replication (TIDieR) checklist (Hoffmann et al., 2014). Additionally, interventions were categorized as per Fønhus et al.'s (2019) types of patient-mediated interventions (see Table 1). One author independently extracted data (GT, SR, RM, TJO and CT). A second author checked data extraction for accuracy (GT, SR, RM and TJO). Data extraction tables showing characteristics of studies and the patient-mediated interventions were summarized in text to provide descriptions and further understanding.

TABLE 1. Fønhus et al.'s (2019) types of patient-mediated interventions

Intervention type	Fønhus et al.'s (2019) definitions of different types of patient-mediated interventions	An example
1	"Patient-reported health information about own health/needs/concerns or other relevant outcomes (collecting information from patients and giving it to professionals	"The patient or carer completes a questionnaire or form in the waiting area before a consultation. The doctor is then given

	before, or during a clinical encounter)" (Fønhus et al., 2019, pp. 476)	this information before or during the consultation" (Fønhus et al., 2019, pp. 476)
2	"Patient feedback about clinical practice (collecting information from patients after an encounter)" (Fønhus et al., 2019, pp. 476)	"After the patient has used a healthcare service, she might be asked about her experience with the service or doctor. This information is then fed back to the doctors and/or hospital" (Fønhus et al., 2019, pp. 476)
3	"Patient information where patients are informed about recommended care" (Fønhus et al., 2019, pp. 476)	"The patient is given a brochure with information about cancer screening" (Fønhus et al., 2019, pp. 476)
4	"Patient education/training/counselling to increase patients' knowledge about their condition" (Fønhus et al., 2019, pp. 476)	"The patient signs up for a group based self-management program where she is provided with information about her condition and becomes part of a patient group for sharing of experiences to increase self-efficacy and coping" (Fønhus et al., 2019, pp. 476)
5	"Patient decision aids to ensure that the choices about treatment and management reflect recommended care and the patients' values and preferences" (Fønhus et al., 2019, pp. 476)	"The patient is provided with information about treatment options including risks and benefits. The patient considers this information, either alone or with a healthcare professional, to reach a decision in accordance with her values and preferences" (Fønhus et al., 2019, pp. 476)
6	"Patients, or patient representatives, being members of a committee or board" (Fønhus et al., 2019, pp. 476)	"A patient representative from a patient organization is, on behalf of a patient group, part of a hospital board. The board may discuss patient care and make decisions about professional practice within the hospital" (Fønhus et al., 2019, pp. 476)
7	"Patient-led training or education of healthcare professionals" (Fønhus et al., 2019, pp. 476)	Patients taking part in training of doctors, e.g. to improve communication skills, how to perform physical examinations or the importance of certain clinical procedures" (Fønhus et al., 2019, pp. 476)

- *Note*: For further details about each type of intervention, please see: Fønhus, M.S., Dalsbø, T.K., Johansen, M., et al. (2019). Patient-mediated interventions to improve professional practice: A summary of a Cochrane systematic review. *Patient Education and Counselling*, *102*, 474–485. https://doi.org/10.1016/j.pec.2018.10.022.

3.3.6 Summary measures

A comprehensive list of outcomes of patient-mediated interventions was identified using Gagliardi et al.'s (2016) framework and Fønhus et al.'s (2018) descriptions, which included patient outcomes and healthcare professional and organizational outcomes (see Table 2). One author independently coded all outcomes against the list of outcome measures and provided valence (i.e. positive, mixed or negative) for the outcomes (GT, SR, RM, TJO and CT); a second author checked these for accuracy (GT, SR, RM and TJO).

TABLE 2. Patient-mediated intervention outcomes as per Gagliardi et al.'s (2016) framework and Fønhus et al.'s (2018) descriptions

Outcomes as defined by Gagliardi et al. (2016) and Fønhus et al. (2018)	Examples of outcomes
Patient outcomes	- Satisfaction with information - Decision-making - Communication - Acceptability - Perceived usefulness - Knowledge - Lifestyle behaviour intent/compliance - Symptom severity/control - Health outcomes [i.e. pain control, functional ability] - Positive relationship with healthcare professionals - Intended/actual use of patient-mediated intervention
Healthcare professional and organizational outcomes	- Adherence to recommended clinical practice or clinical practice guidelines by healthcare professionals - Acceptability - Perceived usefulness - Knowledge - Communication - Positive relationships with patients - Satisfaction - Intended/actual use of patient-mediated intervention - Health service use - Documentation

3.4 Quality appraisal

We originally planned to undertake a risk of bias assessment, however, the heterogeneity of study designs did not allow this, so we used the Mixed Methods Assessment Tool (MMAT) for quality assessment (Hong, Fàbregues, et al., 2018). This tool enables critical appraisal of diverse study designs and has demonstrated validity and reliability (Hong, Fàbregues, et al., 2018). Each study design (qualitative, quantitative randomized control trial, quantitative non-randomized, quantitative descriptive and mixed methods) has five different questions relevant to their design, which are scored 'yes', 'no' or 'cannot tell'. The MMAT provides a descriptive summary of which questions often perform well across studies with the same design. The MMAT creators discourage MMAT users from creating an overall score for each individual study by totalling how many questions scored 'yes'. For example, users can state that for all qualitative studies, question #1 frequently scored 'yes', however, they could not say that a single qualitative study scored 5/5 (i.e. scored 'yes' for all questions). Studies with different designs are not compared directly as they have different questions. One author and another researcher independently conducted quality appraisal (GT, SJ), and then met and discussed discrepancies. A third author adjudicated any discrepancies that could not be resolved (AM).

3.5 Synthesis

Meta-analysis was not possible due to heterogeneity in study designs, types of interventions and outcomes reported. A narrative-synthesis was undertaken using Popay et al.'s (2006) guidance. Narrative synthesis enables understanding of intervention effects (Popay et al., 2006). In step 1, we developed a 'preliminary synthesis' focussing on the direction of intervention effects reported. We used two tools for preliminary synthesis: 'grouping' and 'tabulating' (Popay et al., 2006). Similar interventions were grouped together, which made synthesis of the large number of studies more manageable. For example, all of the Tell-us cards interventions were grouped together (see Appendix S2). Next, outcomes of studies were displayed visually in tables. Results were transformed into a common rubric to allow comparison using the valence (positive, mixed or negative results) of outcome measures based on Gagliardi et al.'s (2016) framework and Fønhus et al.'s (2018) descriptions. Grouping and tabulating study results aided the process of looking for patterns across similar interventions that were grouped together. Descriptive summaries of the grouped and tabulated outcomes are provided in Appendix S2.

In step 2 of the narrative synthesis we 'explored relationships' across interventions, to find factors that might explain differences in the direction of effect across interventions (Popay et al., 2006). We used two tools for exploring relationships: 'conceptual models' and 'graphs' (Popay et al., 2006). For conceptual models, the lead author drew diagrams that linked extracted data (study and intervention characteristics) and preliminary synthesis findings for each intervention. Next, 'graphing' occurred using spider graphs to verify and present these results. The previously tabulated outcomes from Step 1 of the narrative synthesis (see the table in Appendix S2) were summed. The total positive, mixed and negative outcomes from type 1 and type 2 patient-mediated interventions were summed separately to allow comparison at a higher level. Further, patient outcomes and healthcare professional/organizational outcomes were summed separately to allow comparison. These summations were presented as spider graphs. Spider radar graphs provided comparisons of the frequency of outcomes reported and the directions of these outcomes.

4 RESULTS

4.1 Search outcome

A total of 6245 studies were retrieved from health literature databases, of which 31 had full-text review, and 13 were included. 701 studies were screened via backward and forward citation searching; 20 were included. Hence, a total of 33 studies were included in this review (see Figure 1). Across these 33 studies, there were 18 interventions, as some groups of authors published multiple studies about the same intervention.
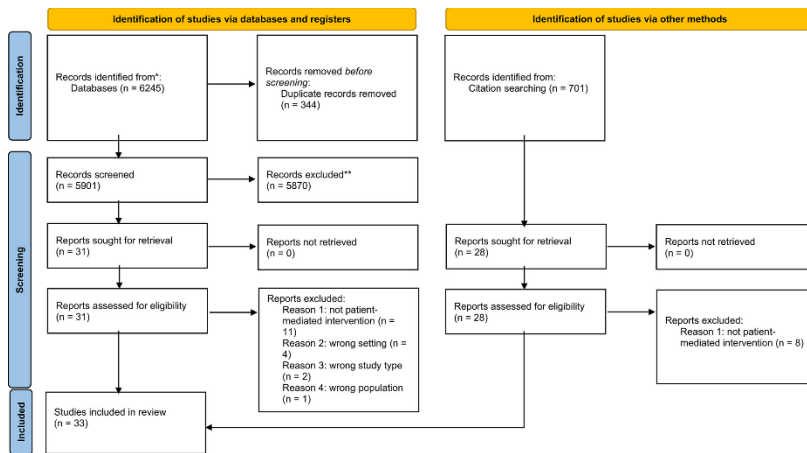
FIGURE 1 PRISMA flowchart (Page et al., 2021).

4.2 Study characteristics

Most studies were conducted in Europe (*n* = 15), followed by United Kingdom (*n* = 7), Canada (*n* = 5), United States of America (USA) (*n* = 3) and Asia (China, Saudi Arabia, Singapore) (*n* = 3; see Table 3). Two studies were conducted in both USA and Saudi Arabia. Studies were conducted across 1–33 hospitals (median = 1; IQR = 2.25). Most studies were conducted across a range of hospital inpatient units or the units were not explicit (n = 11). However, some studies were more specialized, targeting medical/surgical units (*n* = 8), inpatient cancer units (*n* = 8), palliative care units (*n* = 4), and emergency departments (*n* = 2). Study designs employed included randomized control trials (*n* = 5), quasi-experimental (*n* = 4), multi-methods including both qualitative and quantitative design (*n* = 1), qualitative (*n* = 13), pre-/post-evaluation (*n* = 3), mixed methods (*n* = 4), cohort design (*n* = 1) and cross-sectional quantitative design (*n* = 2). In terms of evaluating the interventions, nine included studies had patients as participants, 14 studies had staff as participants, and 10 studies had both patient and staff participants.

TABLE 3. Study characteristics

Author, year	Country	Setting	Design	Methods	Sample	Participant age/gender
Bobay et al. (2021)	USA and Saudi Arabia	30 Magnet hospitals; 28 in USA and 2 in Saudi Arabia (medical-surgical units)	Implementation evaluation study using qualitative design	Semi-structured focus group interviews	135 nurses	NS/NS
Børøsund et al. (2013)	Norway	2 teaching hospitals (3 inpatient and 1 outpatient cancer units)	Exploratory retrospective, qualitative study	Focus group interviews	20 nurses	34 years (mean); 23–55 years (range)/M = 2 (10%)
Cheng et al. (2017)	China	2 extended care hospitals (6 medical or surgical units)	Pilot study, pre-/post-evaluation	Interviews and observations	202 patients, 191 healthcare professionals	NS/NS
Coolbrandt, Steffens, et al. (2017)	Belgium	University hospital (6 oncology units and 2 one-day clinics)	Mixed methods	Survey, patient diaries and semi-structured interviews	143 (survey) and 17 (qualitative evaluation) patients	59–55 years (mean across methods), 13-16 years (SD across methods) M = 9 (53%)–71 (50%) (across methods)
Coolbrandt, Bruyninckx, et al. (2017)	Belgium	University hospital (6 oncology units and 2 outpatient clinics)	Mixed methods	Survey and focus group interviews	79 (survey) and 14 (focus group) nurses	39–41 years (mean across methods), 21–61 years (range)/M = 1 (7%) (focus group only)
Diedrich et al. (2020)	Germany	Tertiary care hospital (2 surgical units)	Pilot/feasibility, cross-sectional	Survey	29 unit employees (nurses, surgeons and others)	26–35 years (median)/M = 17 (77%)
Fisher et al. (2020)	USA	Large, urban community teaching hospital (all units except mother-baby and behavioural health)	Mixed methods	Interviews and detailed notes	30 (interviews) and 247 (detailed notes) key stakeholders such as bedside and managerial nurses, physicians, leaders, hospital administrators	NS/NS

Heyn et al. (2011)	Norway	University hospital (2 hospital units and 2 outpatient clinics)	Quasi-experimental	Surveys and audio-recorded consultations	196 patients (99 control and 97 intervention), 5 physicians, 19 nurses	Patients: 48.9 (mean), 15.5 years (SD), 18–80 years (range)/M = 68% HCPs: NS/M = 6 (31.5%)
Heyn, Finset, Eide, et al. (2013)	Norway	University hospital (2 hospital units and 2 outpatient clinics)	Quasi-experimental	Audio-recorded consultations	193 patients, 5 physicians, 19 nurses	Patients: 49.07 years (mean), 15.62 years, 18-80 years (range)/M = 68% HCPs: NS/M = 6 (31.5%)
Heyn, Finset and Ruland (2013)	Norway	University hospital (2 hospital units and 2 outpatient clinics)	Quasi-experimental	Audio-recorded consultations	196 patients (99 control and 97 intervention), 5 physicians, 19 nurses	Patients: 48.9 (mean), 15.5 years (SD), 18–80 years (range)/M = 68% HCPs: NS/M = 6 (31.5%)
Jangland et al. (2012)	Sweden	Large university hospital (2 surgical units)	Quasi-experimental design with control/ intervention groups	Surveys	310 patients (153 control and 157 intervention)	58–58.5 years (mean across groups), 14.5-16 years (SD across groups), 21–92 (range across groups); M = 58–65 (37–42%) (across groups)
Jangland and Gunningberg (2017)	Sweden	Large university hospital (5 surgical units)	Descriptive, using quantitative and qualitative methods	Surveys (patients only) and interviews (nurses only)	198 patients, 5 nurse managers	Patients: 61.6 years (mean), 15.4 years (SD), 23–92 years (range)/M = 96 (48%) Nurse managers: 45 years (mean), 41–48 years (range); M = 0 (0%)
Kapil et al. (2016)	Canada	Mixed community and academic hospital (ED)	Pre-/post-evaluation	Chart audit and informal feedback	308 patients (239 pre-intervention and 69 post-intervention)	54–60 years (median across groups), 47–68 years (IQR across groups)/M = 31%–47% (across groups)
Keng et al. (2015)	USA	Multispecialty academic centre (ED)	Prospective cohort	Chart audit	386 patients	58–59 years (median across cohorts), 20–

						88 years (range across cohorts)/M = 50%–54% (across cohorts)
Krawczyk and Sawatzky (2019)	Canada	Large, urban, tertiary hospital (palliative care unit)	Pilot, 'participatory' design, using qualitative methods	Focus group interviews, individual interviews and observations	23 patients (3 interviewed and 20 observed) and 5 HCPs (physician, nurses, rotating residents) interviewed	Patients: 66 years (average)/M = 75% HCPs: NS/NS
Krawczyk et al. (2019)	Canada	Suburban acute care hospital (palliative care unit)	Qualitative methods	Focus group and individual interviews	25 staff (nurses, patient care coordinator, unit clerk, social worker, pharmacist, physicians)	43 years (median)/M = 20%
Lawton et al. (2017)	UK	5 hospitals (33 units)	Cluster randomized controlled trial	Surveys and chart audit	Average of 25 patients per unit recruited at 3 time points	Reported at unit-level tertiles: <59 years: control = 5 (31.3%); intervention = 4 (23.5%); 59–64 years: control =4 (25.0%); intervention = 5 (29.4%); 65 years+: control = 7 (43.8%); intervention = 8 (47.1%)/ Control: M = 2 (12.5%); intervention: M = 3 (17.7%).
Liaw and Goh (2018)	Singapore	Large hospital (1 acute surgical unit)	Pre-/post-evaluation	Chart audit	90 patients (30 pre-implementation, 60 post-implementation)	NS/NS
Louch et al. (2017)	UK	2 acute NHS trust hospitals (NS wunit)	Qualitative	Focus groups and semi-structured	15 hospital volunteers, 3 voluntary services,	58.8–70.67 years (mean range across focus groups), 0.58–

					individual interviews	patient experience staff, 4 unit staff	21.38 years (SD range across groups)/M = 6 (33%)
Louch et al. (2019)	UK	3 acute NHS trust hospitals (7 units)	Qualitative	Semi-structured and focus group interviews and researcher notes	13 hospital volunteers, 5 voluntary services / patient experience staff	59.33–69.67 years (means across trusts), 3.54–9.61 years (SD range across trusts)/M = 6 (33%)
O'Hara et al. (2018)	UK	5 NHS trust hospitals (15 medical and 18 surgical units)	Cross-sectional, survey design	Surveys	2471 patients	60 (mean), 18.3 years (SD)/M = 1316 (53%)
Paulsen et al. (2019)	Norway	University hospital (2 departments)	Qualitative	Focus groups and semi-structured individual interviews	27 HCPs (nurses, physicians, dietitians, middle managers)	30–39 years (mean range across methods), 24-45 years (range across methods)/M = 2 (7.4%)
Ruland et al. (2010)	Norway	Specialized care and teaching hospital (3 inpatient and 3 outpatient cancer units)	Prospective repeated measures randomized controlled trial	Chart audit and surveys	145 patients (70 control and 75 intervention)	49–50 (mean across groups), 15–15 (SD across groups)/M = 45–45 (60 = 64.3%) (across groups)
Sawatzky et al. (2018)	Canada	2 hospitals (palliative inpatient unit and home care settings)	Qualitative	Focus group and individual interviews	18 patients, 17 family caregivers, 71 HCPs (doctors and nurses),	Patients: 61-73 years (median range across groups), 46–95 years (range across groups)/M = 13 (52%)[a] HCPs: 43-45 years (median range across groups); 26–63 years (range); M = 4 (9%)
Schick-Makaroff et al. (2020)	Canada	Tertiary hospital (1 inpatient palliative unit and 1 home care setting)	Secondary analysis of qualitative data	Focus group and individual interviews	66 HCPs (nurses, physicians, social workers and spiritual care coordinators)	NS/NS

Scott et al. (2019)	UK	4 teaching or general NHS Trust hospitals (16 cardiac, geriatric, orthopaedic or stroke units)	Feasibility, mixed methods	Incident reports, surveys and semi-structured individual / focus group interviews	366 patients (surveys), 28 patients (interviews) and 21 HCPs	Patients: NS/NS HCPs: NS/M = 4 (19%)
Sheard et al. (2017a)	UK	5 hospitals (17 acute units)	Qualitative process evaluation	Tapped meeting discussions, facilitator field notes and telephone interviews	63 staff (stage 1), 38 staff (stage 2), 32 staff (telephone interviews)	NS/NS
Sheard et al. (2017b)	UK	5 hospitals (17 acute units)	Qualitative process evaluation	Tapped meeting discussions, facilitator field notes and telephone interviews	Staff (n = NS)	NS/NS
Stewardson et al. (2016)	Switzerland	University, primary and tertiary care hospital (67 surgical, obstetrics/gynaecology, medical or geriatric and rehabilitation units)	Cluster randomized controlled trial	Observation and chart audit	NS patients and NS healthcare workers	NS/NS
Theys et al. (2020)	Belgium	5 regional hospitals and 1 university hospital (3 maternity, 2 surgical, 2 medical and 1 rehabilitation unit)	Qualitative	Semi-structured individual interviews	41 nurses (nurses, midwifes, assistant head nurses and nurse assistants)	36.5 years (mean), 24-59 years (range)/M = 6 (14.6%)
van Belle et al. (2021)	Netherlands	1 university hospital and 1 regional hospital (2 surgical and 2 cardiology units)	Cluster randomized controlled pilot study	Surveys	265 patients, nurses working on the units (n = NS)	Patients: 54–67 years (mean range across units), 11.3–15.0 (SD range across wards), 20-

						90 years (range)/M = 40%–63% (range across units) HCPs: NS/NS
Varsi et al. (2015)	Norway	1 hospital (3 inpatient and 2 outpatient cancer units)	Descriptive, qualitative	Semi-structured individual interviews	9 nurse or physician managers	Nurse managers: 40 years (average)/M = 0 (0%) Physician managers: 58 years (average)/M = 3 (100%)
Weiss et al. (2019)	USA and Saudi Arabia	33 Magnet hospitals; 31 in USA and 2 in Saudi Arabia (medical-surgical units)	Cluster randomized clinical trial	Chart audit	144,868 patient discharges (70, 263 control and 74,605 intervention)	59.59 years (mean), 17.54 years (SD)/M = 70,679 (48.8%)

Abbreviations: ED, emergency department; HCPs, healthcare professionals; ITPA, interactive tailored patient assessment; M, male; NHS, National Health Service; NS, not specified; SD, standard deviation.

a This percentage was reported in original paper.

4.3 Intervention characteristics

Across the 18 interventions (published in 33 studies), 12 type 1 interventions (patient-reported information about own health/needs/concerns or other relevant outcomes) and 6 type 2 interventions (patient feedback about clinical practice) were included in this review (see Table 4). For type 1 interventions, different teams of researchers tested Tell-us cards, a paper-based communication tool provided by nurses for patients to report goals, needs, questions and concerns, which nurses acted upon (Jangland et al., 2012; Jangland & Gunningberg, 2017; Theys et al., 2020; van Belle et al., 2021). Three type 1 interventions were focused on patients with cancer or patients who were palliative. These interventions elicited patients' symptoms, health problems and/or priorities using a handheld electronic device (Børøsund et al., 2013; Heyn et al., 2011; Heyn, Finset, Eide, et al., 2013; Heyn, Finset, & Ruland, 2013; Krawczyk et al., 2019; Krawczyk & Sawatzky, 2019; Ruland et al., 2010; Sawatzky et al., 2018; Schick-Makaroff et al., 2020; Varsi et al., 2015) or a paper-based symptom diary (Coolbrandt, Bruyninckx, et al., 2017; Coolbrandt, Steffens, et al., 2017) prior to consults with healthcare professionals or morning rounds (Børøsund et al., 2013; Coolbrandt, Bruyninckx, et al., 2017; Coolbrandt, Steffens, et al., 2017; Heyn et al., 2011; Heyn, Finset, Eide, et al., 2013; Heyn, Finset, & Ruland, 2013; Krawczyk et al., 2019; Krawczyk & Sawatzky, 2019; Ruland et al., 2010; Sawatzky et al., 2018; Schick-Makaroff et al., 2020; Varsi et al., 2015). These interventions encouraged both in-hospital and outpatient setting patient-healthcare professional communication (Børøsund et al., 2013; Coolbrandt, Bruyninckx, et al., 2017; Coolbrandt, Steffens, et al., 2017; Heyn et al., 2011; Heyn, Finset, Eide, et al., 2013; Heyn, Finset, & Ruland, 2013; Ruland et al., 2010; Sawatzky et al., 2018; Schick-Makaroff et al., 2020; Varsi et al., 2015).

TABLE 4. Intervention characteristics

Type	Author, year	Why	What procedures and materials	Who provided and how	When and how much
1	(Bobay et al., 2021; Weiss et al., 2019)	The *Readiness Evaluation and Discharge Interventions* (READI) used structured assessment of discharge readiness as a mechanism to improve discharge preparation (I.e. assisting the healthcare team in tailoring risk-mitigating actions to patient needs prior to discharge)	Three variations of the protocol were sequentially implemented progressing from nurse assessment of readiness for hospital discharge only (Protocol 1), to patient and nurse assessments of readiness for hospital discharge (Protocol 2) where patient self-assessment forms were given to the patient and reviewed by the discharging nurse immediately before completing the nurse-form, so that the patient's perspective would inform the nurse's assessment and action, to the addition of a requisite to act on low scores, requiring nurses to document an action to improve readiness and reduce readmission if the patient or nurse provided an assessment of low readiness for hospital discharge	*Who*: patient assessment of readiness for hospital discharge: given to patient by the discharging nurse *How*: patient assessment of readiness for hospital discharge: paper-based	Patient assessment of readiness for hospital discharge: administered once (taking 2–5 min), in the 4 hours prior to discharge

| | | | (Protocol 3). All protocols contained a structured assessment of discharge readiness, capturing four dimensions (personal status, knowledge, perceived coping ability and expected support) plus an instruction for nurse action | | |
| | (Børøsund et al., 2013; Heyn et al., 2011; Heyn, Finset, Eide, & Ruland, 2013; Heyn, Finset, & Ruland, 2013; Ruland et al., 2010; Varsi et al., 2015) | *CHOICE*, an Interactive Tailored Patient Assessment and communication (ITPA) tool helped prepare patients to actively report their symptoms, problems, and priorities for care, and supported HCPs to provide person-centred communication/care, as HCPs better elicit patient perspectives to provide individually tailored symptom management support and help address patients' individual symptoms and problems that matter most | Patients used computerized assessment system/touch pad computer to independently complete assessment of their symptoms and health problems along physical, functional, and psychosocial dimensions, noted their degree of distress or affliction, and prioritize their need for care for their symptoms. The assessment displayed tailored questions to each patient individually, based on his or her initial response. The summary is transferred to the hospital electronic system and HCPs used results to deliver face- | *Who*: assessment: nurse/researcher invited and explained assessment to patients
 How: assessment: electronic | Assessment: completed at own pace prior to seeing HCP |

			to-face person-centred care		
-	(Jangland et al., 2012; Jangland & Gunningberg, 2017)	*Tell-us cards* where patients recorded goals, specific questions and concerns for the day/before discharge, which were used as a tool for communication with healthcare professionals	Patients given a two-sided card and were responsible for completing it: one side of the card had instructions and information about patient participation e.g. tell us what is important for you today; and opposite side had space to write down questions/concerns and fill in goals for the day. The patient used the tool to communicate with HCPs during ward rounds, nurse rounds, and meetings. Flyers including the same information as the card were set-up in bedrooms and on department website	*Who*: card: Registered nurse placed card in patient room; flyers: NS *How*: card: paper-based; flyers: paper-based and electronic	Card: given daily during inpatient stay; flyers: NS
-	(Kapil et al., 2016)	*Fever advisory cards* were used as a communication tool to enable better identification of potential patients with febrile neutropenia and decrease time to antibiotics	Paper-based or digital photograph of the card carried by patients in pocket or smartphone. Patients presented cards to HCPs when they present to ED to improve the time to antibiotics for patients treated with chemotherapy	*Who*: cards: given by nurses *How*: paper-based and digital.	Card: given to patient when starting chemotherapy and nurses updated cards at each chemotherapy infusion

-	(Keng et al., 2015)	The *febrile neutropenia pathway* (FNP) utilized febrile neutropenia alert cards to reduce antibiotic administration delays for febrile patients with cancer presenting to the ED, providing improved quality of care for patients with febrile neutropenia	Patients were given wallet-sized cards with instructions for febrile patients. Patients presented the card at ED triage desk to alert personnel to the seriousness of febrile neutropenia and prompt the initiation of the FNP	*Who*: cards: NS *How*: cards: paper-based.	Cards: febrile neutropenia alert cards shown on presentation to the ED
-	(Coolbrandt, Bruyninckx, et al., 2017; Coolbrandt, Steffens, et al., 2017)	*Symptom diary* encouraged patients to monitor chemotherapy side effects to ultimately assist and supplement discussions with HCPs about symptoms experienced during visits	The symptom diary encouraged patients to monitor their symptom burden at home on a daily basis. During visits, nurses summarized the diary information in patients' electronic files. Doctors can consult the paper diary or electronic summary	*Who*: symptom diary: treating nurses were responsible for offering symptom diary and discussing its contents with patients *How*: symptom diary: paper-pencil based	Symptom diary: repeatedly offered at each new treatment cycle and patients encouraged to use diary daily
-	(Liaw & Goh, 2018)	Intervention to improve the accuracy of fluid intake charting in adults who require fluid balance monitoring, through patient involvement. *Intake chart* completed by patients and nurses review, confirm and transcribe information	Patients given intake chart and provided with training and rationale for chart and instructed how to record their own intake chart with pictorial guide. Within 24-hour period nurses review/confirm information with patient, then transcribe information onto official fluid balance charts used by hospital	*Who*: intake chart: nurses (implied); training and pictorial guide: nurses *How*: intake chart: paper-based; training and pictorial guide: face-to-face and paper-based	Intake chart, training and pictorial guide: upon admission when fluid balance chart is required

| - | (Krawczyk et al., 2019; Krawczyk & Sawatzky, 2019; Sawatzky et al., 2018; Schick-Makaroff et al., 2020) | The *quality of life assessment and practice support system* (QPSS) is a person-centred health care information system that provided a means for patients and their family caregivers to respond to questionnaires (PROMs and PREMs), which are summarized and presented back to HCPs who can use this information to monitor and address any revealed healthcare needs or concerns, and provides a basis for enhanced person-centred care and shared decision making | Patients/caregivers reported against PROMs and PREMs within the handheld tablet-based QPSS about their symptoms, their physical, psychosocial, social, and essential/spiritual well-being and their experiences of healthcare. Patients completed the questionnaires independently or with nurse assistance. Their responses are immediately summarized and presented back to HCPs who can use this information to monitor and address any revealed health care needs or concerns. The system produced instantaneously scored information and reports in both customisable tabular and graphical formats | *Who*: QPSS: delivered by outreach consult team nurses
How: QPSS: electronic | QPSS: the Edmonton symptom assessment system [revised] was intended to be completed prior to AM rounds; not mandated in home care. However in one study utilization data for each questionnaire is provided: the Edmonton symptom assessment system–revised version: 12 patients used it 20 times, the McGill quality of life questionnaire-revised version: 17 patients used it 23 times, and the Canadian health care evaluation project lite questionnaire: 5 patients used it 5 times |
| - | (Paulsen et al., 2019) | The *MyFood* decision support system provided a system where patients record their dietary intake and staff performed and followed recommendations to prevent /treat disease-related malnutrition | The app and website on handheld tablet consisted of four modules: (1) collection of information about the | *Who*: app and website: NS
How: app and website: electronic | App and website: patients expected to record intake daily |

			patient; (2) dietary assessment function; (3) evaluation of recorded dietary intake compared with individual needs and (4) report function for nurses and HCPs, including recommendations for nutrition-related actions tailored to the patient and template for nutrition care plan. The report was intended for monitor and follow up on a patient's nutritional status and treatment. Patients were expected to enter intake information, but if unable to, nurses were expected to perform		
-	(Theys et al., 2020)	*Tell-us cards wer* communication tool for patients/relatives to use to indicate what is important for them during their admission and before discharge, for nurses to read	The card includes: instructions on how to use the card; information for patients/relatives on how HCPs work with the tell-us card; specific prompts to write down concerns e.g. 'what is important for you today?'. The card was left on night table for nurses to read	*Who*: card: nurse/midwife *How*: card: paper-based	Card: during admission and/or before discharge, daily or as required

| - | (van Belle et al., 2021) | *Tell-us cards* a communication tool for inviting patients to talk about their preferences and needs, and to increase patient participation in daily care. The card facilitates communication between patients and nurses by means of patient preferences and needs being elicited and acted upon by nurses | Patients are invited to write down what is important to them for that day or before discharge on the card. Double-sided pocket-sized card: Side A includes instructions on how to use the card and information for patients/relatives on how HCPs work with the tell-us card, and specific prompts; side B has space for patients to write down what is important to them. The nurse goes back to the patient after an agreed amount of time to discuss the card and talk about what is important. They establish with the patient what follow-up actions are needed and by whom, which is reported in patient file | *Who*: Card: Nurses *How*: Card: Paper-based. | Card: Daily and at a mutually agreed time |
| 2 | (Cheng et al., 2017) | An *education and empowerment in hand hygiene program* to encourage patients to remind HCPs to perform hand hygiene | Formal education given to patients about importance of hand hygiene during hospitalization and promoting patients to remind HCPs to perform hand hygiene before direct contact with them, by politely asking | *Who*: formal education: infection control nurses provided patient education; visual aids: NS who provided to patients. *How*: formal education: face-to- | Formal education: weekdays, 1 × 10–15 min session (patient education); visual aids: NS |

			"Have you cleaned your hands?". Visual aids given to patients for them to show HCPs to remind them to perform hand hygiene politely e.g. 'Did you clean your hands'	face; visual aids: paper-based	
-	(Diedrich et al., 2020)	*The Activation, Help, Open communication and Infection prevention* (*AHOI*) *intervention* involves patients and visitors in hand hygiene and infection control and prevention. The intervention involved adherence (patients/visitors know hygiene standards), empowerment (patients/visitors consciously observe/ address HCP hygienic behaviour) and acceptance (HCPs convey to patients/visitors that they are on equal footing in terms of infection control and prevention and patient safety).	Patients given AHOI instruments such as: (1) Visual reminders, including posters and 2 videos for patients ("Mention It!" and "Stay clean - disinfect your hands!"); and (2) AHOI-welcome box, including information about infection risks, hygiene rules and support incentives	*Who*: visual reminders: posters/visual reminders presented in entrance hall, ward corridors, patient rooms and sanitary facilities; videos presented on screens in the entrance hall and on patient's bedside. AHOI-welcome box: NS. *How*: visual reminders: paper-based and electronic. AHOI-welcome box: paper-based	Visual reminders: videos presented on a continuous loop. AHOI-welcome box: given once-off upon admission.
-	(Fisher et al., 2020)	The *We Want To Know* (*WWTK*) campaign was designed to make it easy for hospitalized patients to speak up about breakdowns in care (something that went wrong during the hospitalization according to the patient) and receive a response in real-time	Campaign materials were used to increase patient awareness e.g. pocket cards, tent cards, posters, screen ads. There were multiple channels for patient reporting of care breakdowns e.g. website, email address, phone or in-person, as	*Who*: campaign materials: WWTK specialists delivered pocket cards and some campaign materials. Campaign materials played on plasma screens or placed in patient rooms and public areas of the hospital;	Campaign materials: NS; multiple channels for patient reporting: available as needed; outreach service: patients approached once sequentially

			well as an outreach service with inpatients where WWTK specialist approached patients one-by-one using open-ended questions to probe if any concerns were identified. WWTK specialist monitored the multiple channels for patient reporting and based on responses to outreach service facilitated resolution of breakdowns in real time	multiple channels for patient reporting monitored by WWTK specialists; outreach service provided by WWTK specialist. *How*: campaign materials: paperbased and electronic; multiple channels for patient reporting: electronic and face-to-face; outreach service: face-to-face	
-	(Lawton et al., 2017; Louch et al., 2017; Louch et al., 2019; O'Hara et al., 2018; Sheard et al., 2017a, 2017b)	The *Patient Reporting and Action for a Safe Environment* (*PRASE*) intervention was intended to provide routine and systematic feedback from patients about safety of their care environment (measurement) then presented to HCPs to interpret (feedback) and act on to inform local and organizational changes, and achieve patient-centred service improvement (action planning)	Anonymous feedback collected via tablet-based validated surveys 'Patient Measure of Safety' and 'Patient Incident Reporting Tool' (theory and evidence-based measures), which enables patients to report detailed safety concerns/lagging indicators of safety and/or positive experiences. Feedback presented to HCPs in the form of a 'feedback report', which assists staff to interpret patient feedback and aid service improvements. HCPs considered this information in an action	*Who*: surveys: research nurses/hospital volunteers (varied across phases of testing). *How*: surveys: electronic	Surveys: during hospital stay, once per patient (implied)

			planning meeting and were facilitated to make target improvements based on the patient feedback		
-	(Scott et al., 2019)	*Safety survey* to capture patient/carers reports of safety experiences across three stages of care transfer (discharge, journey and arrival or admission), to provide feedback to staff	The survey has 6 domains which measure patient experience of their own safety relating to care transition (communication, responsiveness, waiting times, falls, medication and hygiene) and patients asked to indicate level of safety (safe = green, neutral = yellow or unsafe = red). Patients provided with letter of invitation, survey and pre-paid return envelope	*Who*: survey: HCP or an administrator responsible for compiling discharge information, e.g. discharge coordinator or ward clerk *How*: survey: paper-based.	Survey: provided at point of discharge.
-	(Stewardson et al., 2016)	Enhanced performance feedback and *patient participation* designed to improve hand hygiene compliance	Patient participation materials: welcome pack consisting of a hand hygiene brochure and an individual pocket-sized bottle of alcohol-based hand rub; ward staff educated patients about hand hygiene; patients invited to ask healthcare professionals who did not visibly perform hand hygiene to do so before touching them.	*Who*: welcome pack: ward staff; education: ward staff *How*: welcome pack: paper-based and materials; education: face-to-face.	Welcome pack: provided on admission; education: NS

			Additionally enhanced performance feedback occurred (largely targeted at staff)		

Note: Type of patient-mediated intervention: 1: Patient-reported health information about own health/needs/concerns or other relevant outcomes; 2: Patient feedback about clinical practice

Two type 1 interventions focused on nutrition or fluid balance. The electronic MyFood intervention allowed patients to report their dietary intake daily, to prompt healthcare professionals to put in place strategies to prevent malnutrition (Paulsen et al., 2019). The other intervention was a paper-based fluid intake chart delivered by nurses on hospital admission when required, to ensure nurses accurately reported patients' fluid intake (Liaw & Goh, 2018). Two type 1 interventions encouraged patients to show febrile neutropenia alert cards on presentation to the emergency department, to decrease time to antibiotics (Kapil et al., 2016; Keng et al., 2015). The alert cards were paper-based, and in one study some patients took a photo of the paper-based card on their phones (Kapil et al., 2016; Keng et al., 2015). The final type 1 intervention was READI, where patients used a paper-based assessment to report their discharge readiness 4 h prior to discharge; and nurses were provided with instructions on how to respond to patient scores (Bobay et al., 2021; Weiss et al., 2019).

Six type 2 interventions were identified. Three type 2 interventions prompted patients to verbally remind their healthcare professionals to wash their hands (Diedrich et al., 2020; Stewardson et al., 2016); one of these also gave patients a visual aid they could use in place of verbal communication (Cheng et al., 2017). Patients were provided with face-to-face education from a nurse (Cheng et al., 2017) or ward staff (Stewardson et al., 2016) and/or paper-based welcome boxes with instructions to enable them to prompt hand hygiene (Diedrich et al., 2020; Stewardson et al., 2016). The remaining three interventions prompted patients to provide feedback on safety issues they experienced in hospital, such as communication issues and staff workload issues, to enhance healthcare professional performance (Fisher et al., 2020; Lawton et al., 2017; Louch et al., 2017, 2019; O'Hara et al., 2018; Scott et al., 2019; Sheard et al., 2017a, 2017b). Feedback was collected using paper-based surveys with prepaid return envelopes provided on discharge (Scott et al., 2019), electronic tablet-based surveys completed once during the hospital stay (Lawton et al., 2017; Louch et al., 2017, 2019; O'Hara et al., 2018; Sheard et al., 2017a, 2017b) and multiple methods for patients to report including website, email address, phone and in-person (Fisher et al., 2020).

4.4 Quality appraisal of individual studies

MMAT scores for individual studies are provided in Appendix S3. Common issues for RCTs were incomplete outcome data (3/5 studies, 60%) and lack of intervention adherence (4/5 studies, 80%). In three studies (60%), it was unclear if outcome assessors were blinded to the intervention. For 3/8 (38%) non-randomized studies, reviewers were often unable to tell if complete outcome data were collected. A common issue for non-randomized RCTs was determining if the intervention had been administered as intended (cannot tell = 4/8 studies, 50%; no = 2/8 studies, 25%). In quantitative descriptive studies the risk of nonresponse bias was not well reported (2/3 studies, 67%) or high (1/3 studies, 33%). For qualitative studies, 12/14 (86%) scored yes for all five items. For mixed methods, two studies scored yes for most items (4/5 items), while the other two studies scored 'cannot tell' for most (4/5 items). All mixed methods studies had varying results for qualitative and quantitative components.

4.5 Synthesis of results
4.5.1 Preliminary synthesis

See Appendix S2 for the step 1 preliminary synthesis. Looking across the tabulated data (Appendix S2), overall, we found some evidence that patient-mediated interventions influence outcomes like patient

communication and healthcare professional behaviours. However, process outcomes like intervention use and acceptability are mixed. Gaps exist in our understanding of the influence of patient-mediated interventions on patient knowledge and health outcomes, healthcare professionals' satisfaction and relationships with patients, and health service level changes, as these outcomes were rarely measured.

Summary of type 1 interventions

The tabulated data (Appendix S2) showed that interventions grouped together had similarities. Type 1 symptom reporting interventions appeared responsible for improving healthcare professional adherence to recommended clinical practice. This was despite healthcare professionals' mixed views for acceptability, perceived usefulness and intended/actual use. Although patient acceptability was mixed for symptom reporting interventions, patients did use these interventions, especially when they were in an electronic format. Healthcare professionals also preferred electronic interventions, as long as they were integrated with pre-existing electronic records. Symptom reporting interventions improved patient and healthcare professional communication; however, their success may be attributed to sample and setting. For example, patients on chemotherapy and who were undergoing palliative used these interventions, and sometimes continued using them in the community; these patients may have a more specialized pathway that facilitated patient-mediated interventions.

Other type 1 interventions including fever advisory cards and fluid/nutrition balance interventions made some positive changes to healthcare professional adherence to recommended clinical practice. There was some evidence that patients and healthcare professionals were using/intending to use these interventions; this was regardless of paper-based or electronic modes of delivery.

Some type 1 interventions had fewer positive findings. Although patients used Tell-us cards, outcomes were mixed and they were unacceptable to healthcare professionals. The discharge readiness assessment interventions had mixed outcomes for patients and healthcare professionals. Both of these were paper-based interventions for general patient populations (medical/surgical patients) at the point of care. They relied on nurses to deliver materials to patients on admission, daily and/or at discharge.

Summary of type 2 interventions

For type 2 hand hygiene interventions, although patients reported they were acceptable, using/intending to use the intervention was viewed as mixed or negative by patients. There were mixed results for these interventions changing healthcare professional adherence to recommended clinical practice and healthcare professionals' perceptions of acceptability and usefulness were mixed and negative. Healthcare professionals found type 2 hand hygiene interventions to increase their own satisfaction but had a negative impact on their communication.

Type 2 safety feedback interventions positively influenced patient communication and were viewed as acceptable by patients. However, patients did not use or intend to use the intervention and reported negative health outcomes and negative relationships with healthcare professionals because of the intervention. Healthcare professionals had mixed views for intervention acceptability, perceived usefulness, communication outcomes, intended/actual use and healthcare professional adherence to recommended clinical practice. Like patients, healthcare professionals also reported negative effects on relationships with patients, but positive health service outcomes. For both type 2 interventions

(hand hygiene interventions and safety feedback interventions) it did not appear that the format of the intervention (i.e. verbal patient feedback, paper-based, use cards, electronic) influenced their use.

4.5.2 Exploring relationships

When 'exploring relationships', it became evident that the differences in outcomes lay in the types of interventions (type 1 and type 2). Type 1 interventions may be more promising than type 2 interventions (see Figure 2). Patients intended to or were using type 1 interventions, and they improved patient communication. Further, they enhanced healthcare professional adherence to recommended clinical practice (especially among nurses) and healthcare professional communication outcomes. Type 2 interventions showed less influence on changing healthcare professional behaviour. Although patients stated these were acceptable and they improved patient communication, usage or intended usage by patients was low. Further, healthcare professionals' acceptance and intended/actual use were mixed, and in turn adherence to recommended clinical practice were all mixed outcomes.
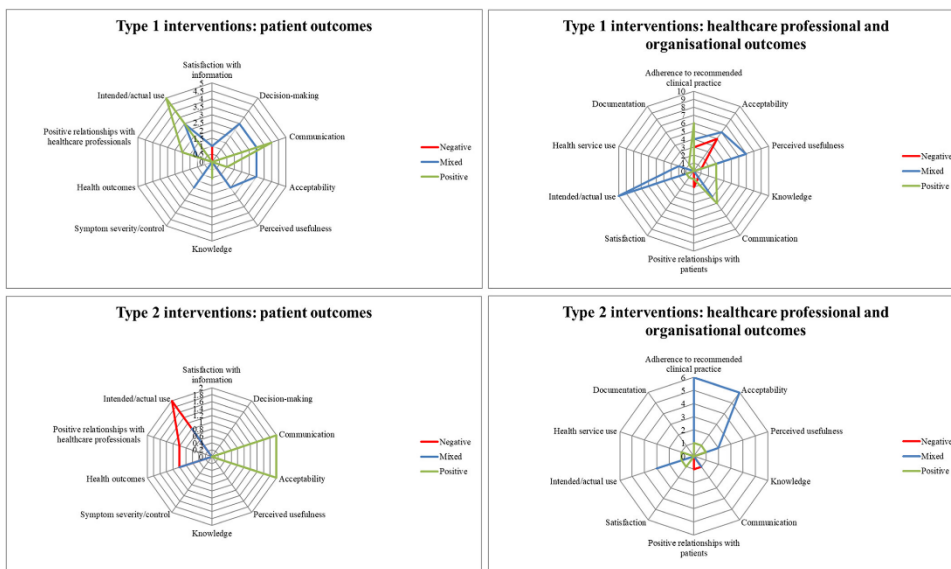
FIGURE 2 Relationships between type of patient-mediated intervention and outcomes. *Note*: Patient-mediated intervention outcomes defined by Gagliardi et al. (2016) and Fønhus et al. (2018) represented each axis of the spider graph. Type 1 and type 2 interventions are presented separately, and patient outcomes, and healthcare professional and organizational outcomes are presented separately. The spider graphs represent the frequency and direction of outcomes reported. For example, in the graph titled "type 1: patient outcomes" communication outcomes were reported in four studies, and these outcomes were positive.

5 DISCUSSION

In this review we found 33 studies, which were interventions that: (1) encouraged patient-reported information about own health/needs/concerns or other relevant outcomes; and (2) interventions that encouraged patient feedback about clinical practice. Most studies were from Europe and the UK and used qualitative evaluation methods suggesting the body of evidence included in this review has been conducted early in the intervention design phase. We found evidence that patient-mediated interventions influenced patient communication and healthcare professional behaviour change, while many process outcomes measures were variable (e.g. acceptability). A key finding was that type 1

interventions had more positive outcomes than type 2 interventions, including the ability to change healthcare professional behaviour; we discuss reasons for this finding in more depth below.

In our review, type 1 interventions that encouraged patients to share health information were somewhat successful in changing healthcare professional behaviour. Previous research shows that patients view themselves as experts in sharing information about themselves that healthcare professionals might not know (Jerofke-Owen & Dahlman, 2019). Thus, type 1 interventions may activate a behaviour that is comfortable for patients. However, healthcare professionals were more negative than patients about the acceptability of these interventions. There is overwhelming evidence that healthcare professionals' unwillingness towards patient engagement, owing to workload issues and ambivalence, is a key barrier to patient engagement (Chegini et al., 2021). Thus, ensuring healthcare professionals are responsive to patient engagement could influence the success of future patient-mediated interventions.

In comparison, type 2 interventions did not appear to change healthcare professional behaviour, which might be explained by their potentially confrontational nature. Like other integrative review findings, we found that patients viewed hand hygiene interventions positively but failed to engage in these interventions (Alzyood et al., 2018). Patients' behaviour is obstructed by their feelings of embarrassment, awkwardness and fears of reprisal or causing annoyance (Alzyood et al., 2018).. Healthcare professionals have also indicated they would feel irritated or there would be tension if patients asked them to wash their hands (Alzyood et al., 2018). While researchers suggest that safety feedback interventions are less confrontational for patients due to anonymity of feedback, healthcare professionals find these confrontational when complaints and concerns are raised (Maxwell, 2020). However, patient safety feedback interventions may also be challenging due to their multi-stepped nature, including: (1) making sense of patient data; (2) communicating data; and (3) making plans for improvement (Kumah et al., 2017). Completing these steps requires time, resources and working relationships at many organizational levels (Kumah et al., 2017); and may be why healthcare professionals in our review avoided these interventions. Ultimately, type 2 interventions appear to be confronting for healthcare professionals and may require changes to routine practice, highlighting the need to focus on context and factors affecting implementation.

All interventions included in our review met Straus et al.'s (2013) definition of patient-mediated interventions, yet 72% relied on healthcare professional initiation. In many cases, this was described as healthcare professionals giving patients the intervention materials, sometimes with education about the intervention provided by the healthcare professional. Given that explicitly inviting patients or expressively giving patients authority to engage is a facilitator to engagement (Tobiano et al., 2015), introducing the intervention to patients may be a critical point in the success of hospital-based patient-mediated interventions. Future researchers should provide in-depth descriptions of this process, emphasizing whether the intervention materials were simply handed to patients, or whether healthcare professionals engaged with patients and provided education to encourage uptake and adherence. This will contribute to building the quality of reporting of implementation strategies, which are poorly reported (Powell et al., 2019).

5.1 Limitations

Designing a search strategy for this review was challenging due to poor use of patient-mediated taxonomies. More articles were found using forward and backward citation searching than computerized database searching. We designed the most robust search strategy possible, based on previous reviews in the field; however, we acknowledge that some studies may have been missed. Given the diffuse terminology used in this field, we suggest that other approaches such as 'pearl growing', which uses gold standard papers to facilitate an iterative process of searching (Papaioannou et al., 2010), could be trialled in future research.

We have provided a broad range of patient-mediated interventions, which reduced our ability to pool results. Although five RCTs were included, their outcomes differed, hindering further analysis. In the future, targeted reviews may reveal more specific insights about interventions and their impact on specific clinical problems. For example, investigating 'fever advisory card' interventions and pooling the results of these may provide more specific information on their effectiveness. We also found that many interventions were in early development phases, and many qualitative evaluations occurred. Repeating this systematic review in the future may yield more RCTs and more evidence of outcomes.

Appraising the quality of studies with different methodologies is challenging. The MMAT, a widely used tool with demonstrated validity and reliability (Hong, Gonzalez-Reyes, et al., 2018; Souto et al., 2015), was selected to facilitate concurrent appraisal of the methodological quality of qualitative, quantitative and mixed methods studies. The MMAT has predefined questions, which ensured that key methodological aspects were reviewed in a systematic manner across all the included studies by the various study team members. More comprehensive quality appraisal may have been achieved using methodology-specific appraisal tools with additional criteria.

Our outcome data was mapped to a pre-existing framework by Gagliardi et al. (2016) and Fønhus et al. (2018). The framework treated all outcomes equally and did not acknowledge the time-dependent nature of outcomes, for example, impact of knowledge could be immediate, while health outcomes could take months or years to show impact. As the nature of our review was to describe impact, this framework has given a sense of what outcomes are currently measured and reported in this field. Also, we note that the healthcare professional outcomes and organizational outcomes were grouped together; and there was only one organizational outcome present in the framework. In future work, an inductive approach may be beneficial to ensure this framework is all encompassing, and if any other organizational outcomes require consideration for the hospital setting.

6 CONCLUSION

In conclusion, while patient-mediated interventions hold promise for improving patient communication and changing healthcare professional behaviour, uncertainties remain due to the infancy of this research. Many hospital-based patient-mediated interventions are in early development phases. These have been evaluated qualitatively, and critical questions remain about the influence of patient-mediated intervention on patient health outcomes and health service use. The most abundant evidence is for patient-mediated interventions that prompt patients to share health information such as symptoms, food intake and nutrition. While progress has been made in recognizing the value of

patients in improving outcomes through mediated interventions, there is still much to do to address the challenges outlined.

In light of the review findings, recommendations for clinical practice, education and research are provided. Given that the evidence base for type 1 interventions, such as symptom reporting interventions, is more robust, these could be more regularly integrated into clinical practice. However, the mismatch between patients' and healthcare professionals' views of acceptability of patient-mediated interventions suggests that educating health professionals about the benefits of, and patients' receptiveness to, these interventions may improve their uptake and effectiveness in clinical practice.

There are many recommendations for research. First, type 2 interventions require further investigation to find ways to make patients feel less afraid to act. Perhaps more confidential feedback mechanisms with assurances of no repercussions could be investigated. For healthcare professionals, it will be important to shift their viewpoints that type 2 interventions are intended to improve patient outcomes and non-confrontational ways of providing feedback such as grouped feedback could be trialled. Second, evaluating effectiveness and process outcomes also requires greater attention in patient-mediated interventions, which are complex interventions (Moore et al., 2015). In our review, relatively few researchers defined or described the components of intervention acceptability for both patients and healthcare professionals, which has potential implications for uptake and overall effectiveness of the intervention. A theoretical framework of acceptability with empirical indicators has been developed (Sekhon et al., 2017), which might serve to guide future research and improve reporting. Third, our review highlighted that patient knowledge and health outcomes, healthcare professional documentation, satisfaction and relationships with patients, and health service use were infrequently measured. Researchers should consider measuring a wider range of outcomes to further the evidence base for patient-mediated interventions. Finally, Fønhus et al.'s (2019) list of types of patient-mediated interventions includes more than two types; it may be that other types of patient-mediated interventions not included in this review are less common in hospitals, or were not identified in our search. Exploring and evaluating a broader range of types of patient-mediated interventions would extend our knowledge base in this area.

AUTHOR CONTRIBUTIONS

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

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