

LITERATURE REVIEW

Improving Healthcare Workforce and Patient Safety: A Scoping Meta-Review

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Abstract: *Background:* Despite recognition of the integral relationship between healthcare worker (HCW) safety and patient safety, few studies have evaluated practices that improve safety for both groups. We undertook a scoping meta-review including only systematic reviews (SRs) to determine the extent to which existing literature identifies practices likely to benefit both HCW safety/well-being and patient safety and remaining research questions.

Methods: Literature searches were conducted for SRs and meta-analyses from 2011 to 2020 that reported outcome measures related to improving HCW safety/well-being or organizational safety culture as well as patient safety. After multi-stage screening, studies were classified as relationship/association or focused on a specific practice. Among practice-focused, those that found positive outcomes for both HCW/organizations and patients were considered potentially promising practices. Information was extracted on topic area, interventions, care settings, HCW type, outcomes measured and improvements. *Findings:* Of 1,619 abstracts, 114 reviews met all inclusion criteria. Major topic groups were Worker Safety/Well-being ($n=33$), Operational Practices ($n=34$), Organization Safety Culture ($n=24$), and Patient Safety/Quality ($n=23$). Of 78 reviews addressing specific practices, 48 described practices likely to benefit both groups. Practices/interventions targeting how work is organized were most promising (subtopics staffing/human resources; structure, policies/procedures; human factors engineering). Practices addressing teamwork and engagement suggest opportunities to enhance safety climate. *Conclusions/Application to Practice:* A wide range of practices and topic areas may directly and/or indirectly improve safety for both HCWs/organizations and patients, suggesting an integrated approach to examining

interventions and operational practices. Occupational health/safety and patient safety leaders should consider collaborating to implement promising practices.

Keywords: healthcare worker safety, patient safety, promising practices, safety culture

Background

The US Surgeon General stated “the nation’s health depends on the well-being of our health workforce” (U.S. Department of Health and Human Services, 2022). The long-standing view of healthcare worker self-sacrifice for the patient’s benefit was challenged in part by the COVID-19 pandemic experience and factors contributing to the “great resignation” (Abbasi, 2022; Nigam et al., 2023; Shen et al., 2024).

Growing awareness of the inter-relationships between patient and worker safety has motivated many efforts to improve healthcare worker (HCW) well-being (Agency for Healthcare Research and Quality [AHRQ], 2024b; Grime, 2021; Hodgkinson et al., 2022; National Academy of Medicine, 2022; National Steering Committee for Patient Safety, 2020; The Joint Commission, 2012). These efforts recommend a systems approach to improving safety (National Steering Committee for Patient Safety, 2022). Historically, safety efforts have been siloed to address either HCWs (Anger et al., 2024; Panagioti et al., 2017; Sinsky et al., 2020; West et al., 2016) or patients (K. K. Hall et al., 2020; Zegers et al., 2016). Few studies examine practices that improve safety for both HCWs and patients; examples include workplace violence (Lipscomb & El Ghaziri, 2013) and safety culture (Morello et al., 2013; Occupational Safety and Health Administration, n.d.; Weaver et al., 2013).

We undertook a scoping meta-review (ScMR) to identify promising, evidence-based practices that improve safety for both HCWs and patients. A ScMR is a novel variation of a scoping review used for high-level mapping of a new field based on evidence solely from systematic reviews (SRs; Sarrami-Foroushani et al., 2015). We defined safety as “freedom from exposure to danger and protection from the occurrence or risk of injury or loss” (National Library of Medicine, 1991). The term “healthcare worker” included paid employees, volunteers, licensed practitioners and contractors, and “patient” included setting-preferred terms such as clients, nursing home residents, and customers. The primary research aim was to determine the extent to which the literature identifies practices that improve safety for both HCWs and patients. The secondary aim was to identify research gaps and remaining questions to be addressed. We did not intend to evaluate the effectiveness of specific practices (as done in SRs) but rather to assess the range and breadth of topics that affect safety for both groups and the types of outcomes used for evaluation.

Conceptual Framework

The most widely used work systems model in healthcare is Systems Engineering Initiative for Patient Safety (SEIPS). This human factors engineering-based model describes four interactive components: people; tasks, tools, and technologies; the physical environment; and organizational conditions (Carayon et al., 2020; Xie & Carayon, 2015). These components have also been applied to examining worker safety (Carayon et al., 2015; Zink et al., 2024). Organizational conditions, such as safety culture and leadership, greatly influence both well-being for workers and patient safety. Leaders and managers often determine operational policies, practices, and also unit-level safety culture (Sfantou et al., 2017; Shanafelt et al., 2015; Swensen et al., 2013).

We used a conceptual framework that integrates safety concerns for both groups: (a) the HCW and/or their organization and (b) patients (Figure 1). We focused on one SEIPS model component—practices/interventions implemented by the healthcare organization to improve safety. In the integrated model, organizations can take different paths to improve safety depending on their short- and long-term goals. Efforts targeted to one group may also affect the other, since organizational safety culture and operational practices can have bi-directional effects. For example, organizational efforts to improve safety culture, infection prevention, and workplace violence prevention may directly or indirectly affect both HCWs and patients.

Methods

Scoping reviews examine the extent, range, and nature of existing research activity in a broad topic area, contextualize the current state of understanding, and recommend next steps for types of research needed (Morris et al., 2016; Peters et al., 2024). We followed methodology recommended by

scoping meta-review developers, limiting article types searched to SRs and meta-analyses (Sarrami-Foroushani et al., 2015) as well as the Joanna Briggs Institute (JBI) guidance for conducting scoping reviews and the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR; Pollock et al., 2023; Tricco et al., 2018). This activity was reviewed by CDC, deemed research not involving human subjects, and conducted consistent with applicable federal law and CDC policy. No a priori review protocol was specified and evaluation of SRs quality was not done.

Data Sources and Searches

A medical librarian searched PubMed (MEDLINE), APA PsycINFO, CINAHL, and Cochrane Database of Systematic Reviews for SRs and meta-analyses published between 2011 and 2020 using keywords and MeSH terms related to HCWs, patients, safety/well-being, and organizational safety culture. See Supplemental Table 1 for detailed search terms and supplemental searches with additional keywords generated through relevant results. We operationally defined HCW well-being to include topics related to staff burnout, wellness, fatigue, psychological distress, second victim phenomenon, resilience, job satisfaction, disclosure perceptions, and medical resident duty hour limitations.

The article inclusion criteria were: (1) a systematic review or meta-analysis, (2) addresses actions or associations related to improving HCW safety, well-being or organization culture and patient safety, (3) reports outcome measures for both HCW/patient safety, and (4) primary focus is on both HCW/organizational safety and patient safety. Measures of culture were considered organizational outcomes because they aggregated worker responses for relevant domains. SRs evaluating HCW educational and training efforts were included if the outcomes addressed work environment satisfaction, stress, burnout, turnover intent, attitudes, perceptions, confidence, self-efficacy, etc. All project team members contributed to developing the inclusion/exclusion criteria and screening processes.

We excluded SRs that (1) only reported process of care measures (e.g., guideline adherence, medication errors) without outcomes, (2) measured outcomes for only one group, (3) narrative reviews due to selection bias potential (Uman, 2011), and (4) only included studies which originated from countries with very dissimilar income levels or healthcare systems from those found in western nations.

Data Selection and Extraction

The team used DistillerSR[®] to perform four-level screening of abstracts and articles (Evidence Partners, 2022). DistillerSR[®] distributed each abstract to two of four team members who independently screened each title and abstract (Level 1). Conflicts were resolved at Level 2 by a third team member. At Level 3, each full-text SR was evaluated against the inclusion

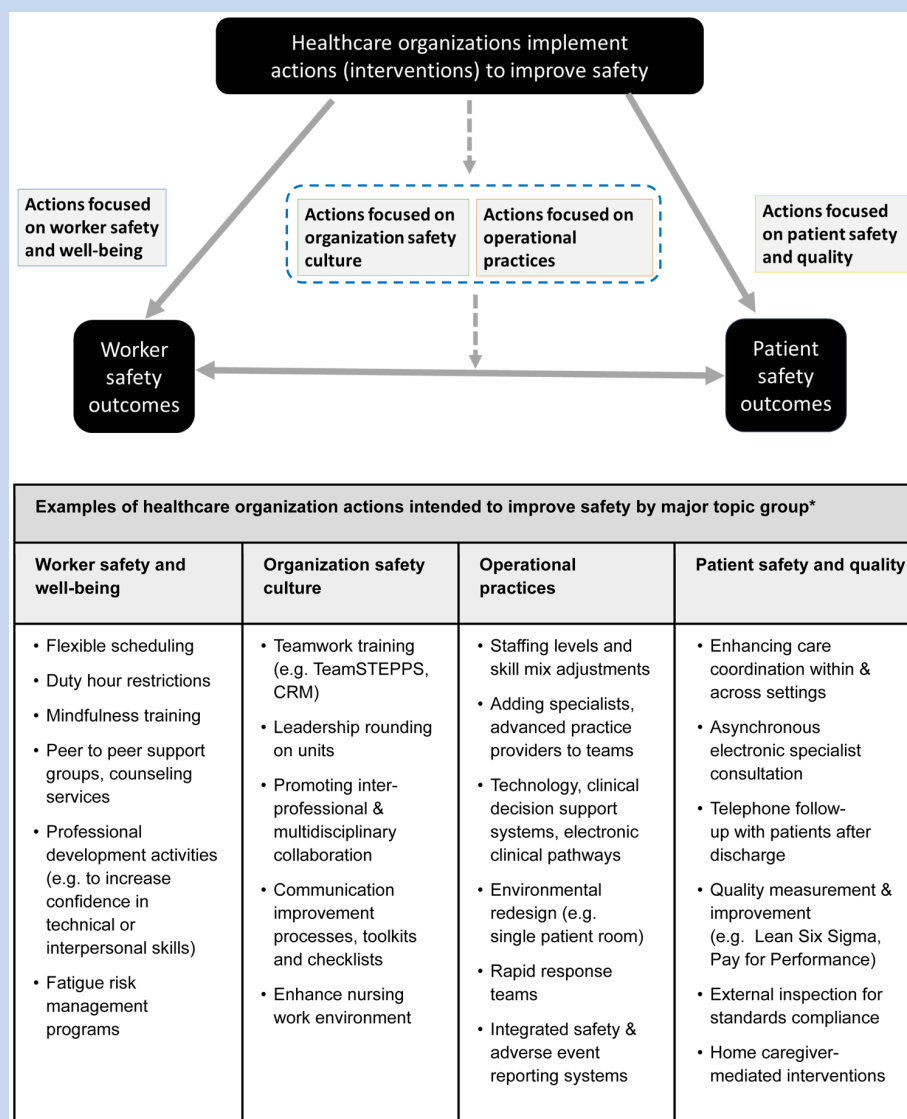


Figure 1. Actions to improve healthcare safety can be targeted toward workers, organizations, and/or patients

*For this study, actions were categorized into mutually exclusive major topic groups, however in practice some actions cross multiple topic groups.

criteria independently by two reviewers and discrepancies were resolved by consensus at weekly meetings.

Patient safety categories were partially based on the AHRQ's topic taxonomy (AHRQ, 2024a). When multiple inter-related topics were identified, we applied simple hierarchical rules to improve consistency. Three members (MB, EU, BB) focused on data mapping at Level 4, for which we assessed abstractor consistency by having 12 articles mapped by at least two abstractors. (A detailed guidance document for abstracting 26 data elements is available from the authors).

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design, conduct and in contributing to this report but not in data collection and analysis.

Data Synthesis and Analysis

We classified SRs into two groups: (1) "Relationship-focused" studies that examined an association or correlation between two factors (e.g., associations between clinician burnout and patient adverse events) or (2) "Practice-focused" studies which examined the effectiveness of a specific intervention or practice (e.g., teamwork training). For SRs evaluating specific practices, we examined authors' findings and conclusions for evidence of improvements in safety for HCWs and patients. When the authors reported positive impact for both, we classified the SR

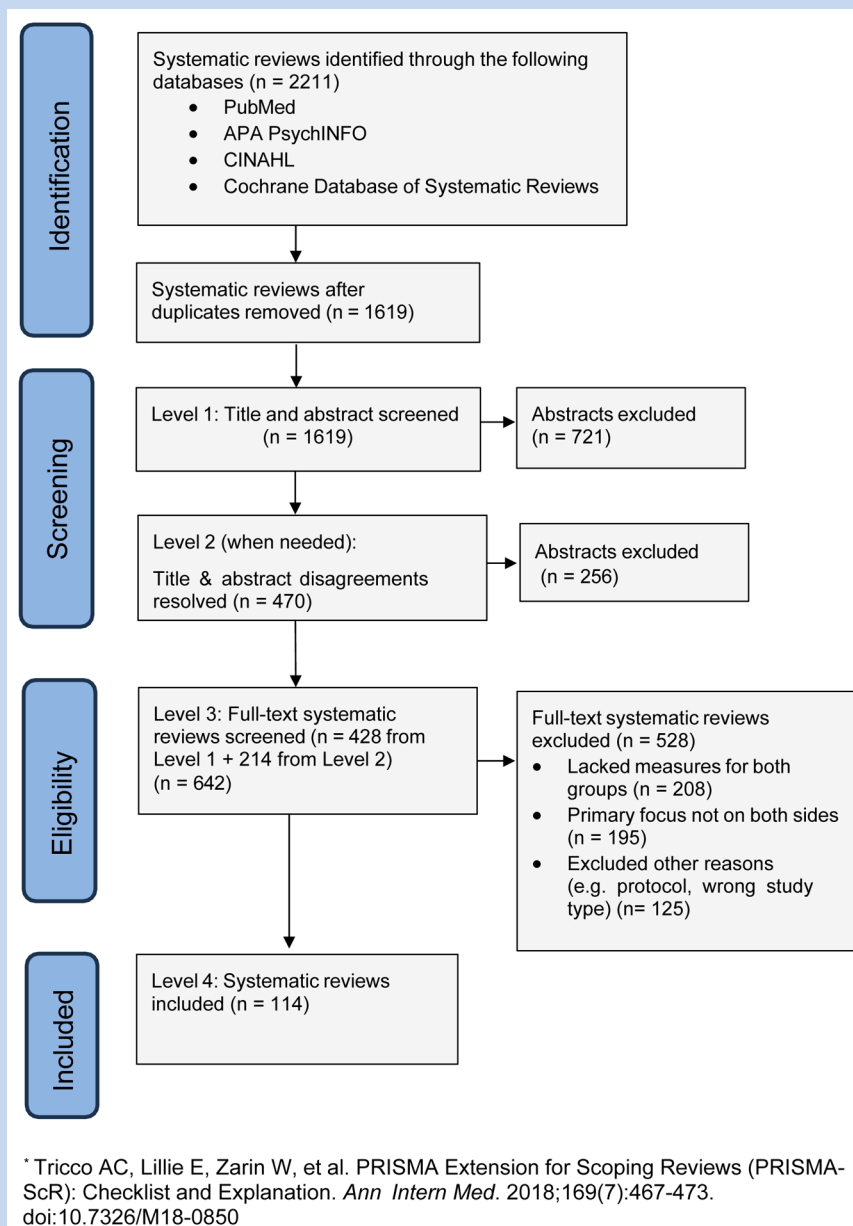


Figure 2. PRISMA-ScR flow diagram

Source. Tricco et al. (2018).

as having practices likely to benefit both groups referred to as “promising practices.”

We assigned one of 14 primary subtopics to the problem addressed, then grouped subtopics into four major topic areas: (1) Worker Safety and Well-being, (2) Organization Safety Culture, (3) Operational Practices, and (4) Patient Safety and Quality.

We identified research gaps by considering topics for which there were few included SRs, SRs with outcomes for only one group, and those without positive impact due to lack of

interventions or major methodological weaknesses. We calculated aggregate frequencies for categorical variables and means (*SD*) for continuous variables using Microsoft Excel.

Results

We screened 1,619 abstracts, of which 428 moved directly to full-text review (Level 3). Additionally, 214 moved to full-text review after conflict resolution. As shown in Figure 2, of 642 articles receiving full-text review, 528 were excluded, leaving 114 SRs that met all inclusion criteria. (A table listing

excluded studies lacking both outcome measures is available upon request).

Aggregated Findings Across Included Reviews

Overall, 36 (31.6%) focused on relationships between variables while most ($n=78$, 68.4%) focused on a specific practice. Table 1 lists relationship-focused reviews and brief findings. Table 2 lists all practice-focused reviews. Among the SRs that examined specific practices, 48 (61.5%) were considered to have promising practices likely to benefit both HCWs/organizations and patients.

Most included reviews were SRs ($n=89$, 78.1%), however, six (5.3%) were meta-analyses, and 19 (16.7%) were classified as both (National Library of Medicine, 2025). The total number of articles across included SRs was 4,171, with mean studies per review of 36.9 ($SD=38.9$, range 2–297).

The SRs were published in 76 different journals across several disciplines: medicine ($n=25$); evidence synthesis ($n=18$); nursing ($n=16$); quality/patient safety ($n=13$); interdisciplinary studies ($n=10$); healthcare administration/policy/research ($n=10$); surgery ($n=8$); informatics ($n=4$); pharmacy ($n=3$); occupational/environmental health ($n=2$); and other ($n=5$). Most reviews ($n=79$, 69.3%) were written by author teams affiliated only with organizations outside the U.S. Most SRs ($n=97$, 85.1%) evaluated the quality of their included studies using an objective tool such as GRADE (Guyatt et al., 2011) or JBI critical appraisal tool (JBI, n.d.).

Supplemental Table 2 summarizes the outcome measures reported, settings included, and types of HCW involved. Most reviews described multiple types of outcomes and HCWs, often physicians ($n=81$, 71.1%), and nurses ($n=75$, 65.8%). Common settings were hospitals ($n=101$, 88.6%) and ambulatory care ($n=48$, 42.1%).

Findings for the Four Major Topic Areas

Within major topic areas, the number of included studies was Worker Safety and Well-being ($n=33$), Organization Safety Culture ($n=24$), Operational Practices ($n=34$), and Patient Safety and Quality ($n=23$) (Figure 3). Examples of subtopics comprising the four major topic areas are listed at the bottom of Figure 1. Because of the variation in practices and outcomes, in the sections below we summarize studies that found associations within subtopics, first for relationship-focused studies then for practice-focused studies. Detailed information about practices, measures, and findings for each study is provided in Supplemental Tables 3 to 6.

Worker Safety and Well-Being Focused Topics

Within this topic area, four subtopics were addressed: well-being ($n=16$), staff education, skills, and knowledge ($n=14$), interpersonal behavior ($n=2$), and workplace violence ($n=1$). Thirteen focused on relationships and 20 addressed specific practices. Supplemental Table 3 provides additional detail about each SR, listing first those found to be a promising practice for

both, then relationship-focused then those not found to be promising for both.

Among 13 relationship-focused reviews (Table 1), six examined burnout, of which four (Dewa et al., 2017; Garcia et al., 2019; L. H. Hall et al., 2016; Salyers et al., 2017) associated burnout with decreased patient safety and two (Rather et al., 2018; Tawfik et al., 2019) yielded mixed results. One found fatigue was associated with decreased patient safety (Mansukhani et al., 2012) while another found no clear differences in patient outcomes between sleep-deprived and non-sleep-deprived physicians (Gates et al., 2018). One examined adverse work schedule arrangements and found an association with decreased patient safety (Bernström et al., 2019). Another found better working conditions for physicians was associated with clinical excellence and patient safety (Teoh et al., 2019). One found independent associations between teamwork, clinician well-being, and patient safety (Welp & Manser, 2016). Another examined clinicians' personality and interpersonal behaviors but found little effect on outcomes (Boerebach et al., 2014). Finally, one found that bullying influenced nursing practice errors and patient outcomes (Johnson & Benham-Hutchins, 2020).

Among 20 practice-focused SRs (Table 2), eight were considered to have promising practices. Examples of promising practices include simulation and tele-education (Bligard et al., 2019; Marples et al., 2017; Tudor Car et al., 2019; Zhou et al., 2016), and surgical resident rotations in aesthetic (cosmetic) surgery clinics (Kaplan et al., 2019). Also promising were mindfulness-based interventions (Braun et al., 2019) and team-based rapid response to workplace violence (Choi et al., 2019).

Three SRs examined medical resident duty hour restrictions but did not show benefits for patient outcomes (Ahmed et al., 2014; Bolster & Rourke, 2015; Philibert et al., 2013). Three SRs examined cultural competency training (Chae et al., 2020; Horvat et al., 2014; Lie et al., 2011), one of which was considered promising (Lie et al., 2011).

Organization Safety Culture Focused Topics

Reviews within this topic area addressed four subtopics: teamwork and engagement ($n=11$), culture of safety ($n=10$), communication ($n=2$), and leadership ($n=1$). Nine were classified as relationship SRs and 15 addressed specific practices. Supplemental Table 4 provides additional details about each SR.

All relationship-focused reviews were on the subtopic of culture of safety (Table 1). Four examined nurse work environments and generally found positive associations with patient outcomes (Bae, 2011; Lake et al., 2019; Stalpers et al., 2015; Wei et al., 2018). Two examined workplace culture across settings and found a positive association between culture and patient outcomes (Braithwaite et al., 2017; Dicuccio, 2015). Three examined associations within specific populations with mixed results: safety attitudes of ED staff (Alzahrani et al., 2019);

Table 1. Systematic Reviews Focused on Relationships and Associations

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Brief summary of authors' findings
Worker safety and well-being			
Well-being	Influence of burnout on patient safety: Systematic review and meta-analysis (Garcia et al., 2019)	19	"The presence of burnout among health professionals is associated with worsening patient safety."
	The relationship between physician burnout and quality of healthcare in terms of safety and acceptability: A systematic review (Dewa et al., 2017)	12	"Results suggest there is moderate evidence that burnout is associated with safety-related quality of care."
	The relationship between professional burnout and quality and safety in healthcare: A meta-analysis (Salys et al., 2017)	82	"... greater burnout among healthcare providers was associated with poorer-quality healthcare and reduced safety for patients."
	Healthcare staff wellbeing, burnout, and patient safety: A systematic review (L. H. Hall et al., 2016)	46	"Poor wellbeing and moderate to high levels of burnout are associated, in the majority of studies reviewed, with poor patient safety outcomes such as medical errors, however the lack of prospective studies reduces the ability to determine causality."
	Evidence for the quadruple aim: A systematic review of the literature on physician burnout and patient outcomes (Rathert et al., 2018)	28	"Studies using self-reports of suboptimal quality and errors found that physicians higher in burnout consistently reported worse quality, yet studies linking burnout to independent clinical outcomes found no relationships."
	Evidence relating health care provider burnout and quality of care: A systematic review and meta-analysis (Tawfik et al., 2019)	123	"Of 114 unique burnout-quality combinations, 58 indicated burnout related to poor-quality care, 6 indicated burnout related to high-quality care, and 50 showed no significant effect."
	Sleep deprivation in resident physicians, work hour limitations, and related outcomes: A systematic review of the literature (Mansukhani et al., 2012)	14	"Long work hours resulted in poor performance on tasks requiring sustained attention and vigilance, resulting in an increased number of errors and delayed reaction time."
	Impact of fatigue and insufficient sleep on physician and patient outcomes: A systematic review (Gates et al., 2018)	47	"28 studies showed associations between fatigue or insufficient sleep and physician health and well-being outcomes."
	Healthy working time arrangements for healthcare personnel and patients: A systematic literature review (Bernström et al., 2019)	52	"Studies that find that working time is detrimental to employee health, generally also find detrimental results for patient safety."
	Doctors' perceived working conditions and the quality of patient care: A systematic review (Teoh et al., 2019)	21	"A greater number of significant relationships were observed for clinical excellence and patient safety than patient experience."
	Integrating teamwork, clinician occupational well-being and patient safety—Development of a conceptual framework based on a systematic review (Welp & Manser, 2016)	98	"We found support for the existence of independent associations between teamwork, clinician occupational wellbeing and patient safety."
	The impact of clinicians' personality and their interpersonal behaviors on the quality of patient care: A systematic review (Boerebach et al., 2014)	85	"The majority of the studies included in this systematic review found little or no effect of clinicians' personality and their interpersonal behaviors on the quality of patient care."
Interpersonal behavioral	The influence of bullying on nursing practice errors: A systematic review (Johnson & Benham-Hutchins, 2020)	14	"This review shows that bullying against and perpetrated by nurses may affect nursing practice errors, although the degree and mechanism through which bullying may increase nursing practice errors and potentially harm patients is unclear."

(continued)

Table 1. (continued)

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Brief summary of authors' findings
Organization safety culture			
Culture of safety	A meta-analysis of the associations between the nurse work environment in hospitals and 4 sets of outcomes (Lake et al., 2019)	17	"Consistent, significant associations between the work environment and all outcome classes were identified."
	The state of the science of nurse work environments in the United States: A systematic review (Wei et al., 2018)	54	"This review shows that a healthy work environment plays a significant role in healthcare delivery and is fundamental in providing high quality patient care."
	Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: A systematic review of literature (Stalpers et al., 2015)	29	"Nurse staffing was inversely related to patient falls; more favorable staffing hours were associated with fewer fall incidents."
	Assessing the relationships between nurse working conditions and patient outcomes: Systematic literature review (Bae, 2011)	11	"The studies reflected the association between nurse working patient outcomes in an Army Medical centre, haemodialysis facilities, and acute-care hospitals."
	The relationship between patient safety culture and patient outcomes: A systematic review (Dicuccio, 2015)	17	"Evidence of relationships between patient safety culture and patient outcomes exist at the hospital and nursing unit level of analysis; however, the number of studies finding statistically significant correlations particularly using nurse-sensitive outcomes is limited."
	Association between organisational and workplace cultures, and patient outcomes: Systematic review (Braithwaite et al., 2017)	62	"We found that overall, positive organisational and workplace cultures were consistently associated with a wide range of patient outcomes . . ."
	Safety attitudes in hospital emergency departments: A systematic review (Alzahrani et al., 2019)	12	"Importantly, three studies compared safety attitudes to patient adverse event data with only one study showing the number of adverse events was related to a poor safety and team climate, poor inter-departmental working relationships, and increased cognitive demands."
	The effect of working conditions on patient care: A systematic review (Kapinos et al., 2012)	Unable to determine	"Overall, the studies we reviewed suggest that in primary care settings: 1) a lighter provider workload/shorter work hours, more provider training, and computerized systems result in higher patient quality of care, 2) provider training and work hours have no effect on patient satisfaction."
	Organizational culture and performance in health care for older people: A systematic review (Hunt et al., 2012)	20	"In terms of outcomes, none of the studies reviewed found evidence of a relationship between culture and performance. It is clear that any relationship between culture and performance is highly unlikely to be simple: such relationships are more likely to be multiple, complex, contingent and dynamic."

(continued)

Table 1. (continued)

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Brief summary of authors' findings
Operational practices			
Staffing and human resources	Nurse-to-patient ratios and neonatal outcomes: A brief systematic review (Sherenian et al., 2013)	6	"Three reported an association between lower nurse-to-patient ratios and higher mortality, and one reported just the opposite."
	Impact of nurse staffing on patient and nurse workforce outcomes in acute care settings in low- and middle-income countries: A systematic review (Assaye et al., 2021)	27	"Low nurse-to-patient ratio or high nurse workload was associated with higher rates of in-hospital mortality, hospital-acquired infection, medication errors, falls, and abandonment of treatment."
	Can nurses' shift work jeopardize the patient safety? A systematic review (Di Muzio et al., 2019)	19	". . . it was observed that medication errors occur more frequently during occasional night shifts and rotating shifts."
	12h shifts and rates of error among nurses: A systematic review (Clendon & Gibbons, 2015)	13	"Six studies reported higher rates of error for nurses working greater than 12h on a single shift, four reported higher rates of error on shifts of up to 8 h, and three reported no difference."
	Hospital nurse-staffing models and patient- and staff-related outcomes (Butler et al., 2019)	19	This Cochrane review found . . . "that the introduction of advanced or specialist nurses may lead to little or no difference in one patient outcome (i.e. mortality) with greater uncertainty about other patient outcomes (i.e. readmissions, ED attendance, length of stay and pressure ulcer rates)."
	The effect of nurse staffing on clinical outcomes of children in hospital: A systematic review (Wilson et al., 2011)	8	"Increased Registered Nurse nursing hours per patient day was associated with decreases in eight adverse events."
	Rationing of nursing care, a deviation from holistic nursing: A systematic review (Mandal et al., 2020)	57	"Rationing influenced patient satisfaction, mortality and a number of adverse events and was associated with decreased job satisfaction, increased intention to leave and high turnover among nurses."
	Rationing of nursing care and nurse-patient outcomes: A systematic review of quantitative studies (Papastavrou et al., 2014)	17	". . . rationing appears to be an important organizational variable linked with patient safety and quality of care."
	Twenty-four/seven: A mixed-method systematic review of the off-shift literature (de Cordova et al., 2012)	60	"Patient outcomes on weekends and employee outcomes at night are worse than during the day."
Human factors design and engineering	Associations of workflow disruptions in the operating room with surgical outcomes: A systematic review and narrative synthesis (Koch et al., 2020)	38	"Most studies reported negative or non-significant associations of flow disruptions (FDs) with surgical outcomes."
	The psychiatric ward as a therapeutic space: Systematic review (Papoulias et al., 2014)	23	"No strong causal links between design and clinical outcomes were found. Private spaces and a homely environment may contribute to patient well-being."
Structure, policies and procedures	Hospital organisation, management, and structure for prevention of health-care-associated infection: A systematic review and expert consensus (Zingg et al., 2015)	92	Among the recommendations, "infection prevention and control is a priority for patients' safety and should involve HCWs at all levels and be part of the hospital organisation as a whole."
Patient safety and quality			
Quality/safety general	Systematic review of the volume-outcome relationship for radical prostatectomy (Leow et al., 2018)	49	"Most of the studies demonstrated that higher-volume surgeries are associated with better outcomes including reduced mortality, morbidity, postoperative complications, length of stay, readmission, and cost-associated factors."
Care coordination	Factors supporting good partnership working between generalist and specialist palliative care services: A systematic review (Gardiner et al., 2012)	22	"Factors supporting good partnership working included: good communication between providers; clear definition of roles and responsibilities; opportunities for shared learning and education; appropriate and timely access to specialist palliative care services; and coordinated care."

Note: ED = Emergency Department; FDs = flow disruptions; HCWs = healthcare workers.

Table 2. Systematic Reviews Focused on a Specific Practice

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Practice addressed	Is it a promising practice likely to benefit safety for both workers/organizations and patients?
Worker safety and well-being				
Well-being	Can mindfulness in health care professionals improve patient care? An integrative review and proposed model (Braun et al., 2019)	26	Mindfulness based interventions in behavioral health and hospital settings	Yes
	Duty-hour limits and patient care and resident outcomes: Can high-quality studies offer insight into complex relationships? (Philbert et al., 2013)	83	Resident duty-hour limits	No
	The effect of restricting residents' duty hours on patient safety, resident well-being, and resident education: An updated systematic review (Bolster & Bourke, 2015)	27	Restricting residents' duty hours	No
	A systematic review of the effects of resident duty hour restrictions in surgery: Impact on resident wellness, training, and patient outcomes (Ahmed et al., 2014)	135	Resident duty hour restrictions in surgery	No
	Impact of hospital lockdown secondary to COVID-19 and past pandemics on surgical practice: A living rapid systematic review (Lee et al., 2021)	61	Hospital lockdown secondary to COVID-19	No
	Does cultural competency training of health professionals improve patient outcomes? A systematic review and proposed algorithm for future research (Lle et al., 2011)	7	Cultural competency training	Yes
	Simulation training for operative vaginal delivery among obstetrics and gynecology residents: A systematic review (Bligard et al., 2019)	8	Simulation training for operative vaginal delivery among obstetrics and gynecology residents	Yes
Staff education, skills and knowledge	Health professions digital education on clinical practice guidelines: A systematic review by Digital Health Education collaboration (Tudor Car et al., 2019)	17	Health professions digital education	Yes
	A systematic review of resident aesthetic clinic outcomes (Kaplan et al., 2019)	10	Aesthetic (cosmetic) surgery clinics in resident training	Yes
	The effect of nutrition training for health care staff on learner and patient outcomes in adults: A systematic review and meta-analysis (Maples et al., 2017)	24	Nutrition training	Yes
	The impact of project ECHO on participant and patient outcomes: A systematic review (Zhou et al., 2016)	39	Tele-education to bridge knowledge gaps	Yes
	Effectiveness of cultural competence educational interventions on health professionals and patient outcomes: A systematic review (Chae et al., 2020)	11	Cultural competence educational interventions	No
	Cultural competence education for health professionals (Horvat et al., 2014)	5	Cultural competence education	No
	Multi-professional simulation-based team training in obstetric emergencies for improving patient outcomes and trainees' performance (Fransen et al., 2020)	8	Multi-professional simulation-based team training in obstetric emergencies	No
	Digital education for health professions on smoking cessation management: Systematic review by the digital health education collaboration (Sermwal et al., 2019)	11	Digital education on smoking cessation management	No
	Online digital education for postregistration training of medical doctors: Systematic review by the digital health education collaboration (George et al., 2019)	93	Online digital education for post registration training of medical doctors	No
	Education and training to enhance end-of-life care for nursing home staff: A systematic literature review (Anstey et al., 2016)	21	Education and training to enhance end-of-life care for nursing home staff	No
	Motivational interviewing by general practitioners for type 2 diabetes patients: A systematic review (Therapongsa et al., 2017)	8	Motivational interviewing	No
	Interprofessional education: Effects on professional practice and healthcare outcomes (update) (Reeves et al., 2013)	15	Interprofessional education	No
	An integrative literature review of psychiatric rapid response teams and their implementation for de-escalating behavioral crises in nonpsychiatric hospital settings (Choi et al., 2019)	7	Psychiatric rapid response teams	Yes

(continued)

Table 2. (continued)

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Practice addressed	Is it a promising practice likely to benefit safety for both workers/organizations and patients? ^a
Organization safety culture				
Teamwork and engagement	Improving team performance and patient safety on the job through team training and performance support tools: A systematic review (Costar & Hall, 2020)	20	Structured teamwork and communication interventions	Yes
	Saving lives: A meta-analysis of team training in healthcare (Hughes et al., 2016)	129	Team training	Yes
	Interventions to improve team effectiveness within health care: A systematic review of the past decade (Buljac-Samarzic et al., 2020)	297	Interventions with the goal of improving team effectiveness	Yes
	Does team reflexivity impact teamwork and communication in interprofessional hospital-based healthcare teams? A systematic review and narrative synthesis (McHugh et al., 2020)	15	Team reflexivity (ability to pay critical attention to individual and team practices with reference to social and contextual information)	Yes
	Interventions for improving teamwork in intrapartem care: A systematic review of randomised controlled trials (Wu et al., 2020)	9	Interventions for improving teamwork in intrapartem care	Yes
	A systematic review of teamwork in the intensive care unit: What do we know about teamwork, team tasks, and improvement strategies? (Dietz et al., 2014)	85	Teamwork, team tasks, and team improvement strategies in the ICU	Yes
	Meta-analysis of surgical safety checklist effects on teamwork, communication, morbidity, mortality, and safety (Lyons & Popejoy, 2014)	19	Effectiveness of surgical safety checklists	Yes
	Interprofessional collaboration in hospitals: A critical, broad-based review of the literature (Pomare et al., 2020)	34	Interprofessional collaboration (IPC)	Yes
	Quantitative systematic review of multi-professional teamwork and leadership training to optimize patient outcomes in acute hospital settings (Husebe & Akerjordet, 2016)	12	Teamwork and leadership training	No
	Non-technical skills training in the operating theatre: A meta-analysis of patient outcomes (Leuschner et al., 2019)	9	Non-technical skills training in the operating theatre	No
Culture of safety	Non-technical skills in minimally invasive surgery teams: A systematic review (Gjeras et al., 2016)	11	Non-technical skills training and assessment in minimally invasive surgery teams	No
	Teamwork, communication and safety climate: A systematic review of interventions to improve surgical culture (Sacks et al., 2015)	47	Interventions to improve surgical culture	Yes
	Physician-to-nurse handover: A systematic review on the effectiveness of different models (Odone et al., 2022)	10	Adoption of effective handover practice	Yes
	The effect of communication skills training for generalist palliative care providers on patient-reported outcomes and clinician behaviors: A systematic review and meta-analysis (Selman et al., 2017)	19	Communication skills training for generalist palliative care providers	No
Leadership	Antecedents, mediators, and outcomes of authentic leadership in healthcare: A systematic review (Aliliyani et al., 2018)	21	Authentic leadership (a relational leadership style to promote healthy work environments)	Yes

(continued)

Table 2. (continued)

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Practice addressed	Is it a promising practice likely to benefit safety for both workers/organizations and patients?*
Operational practices				
Staffing and human resources	Physician extenders on surgical services: A systematic review (Jhal & Dodd, 2017)	29	Physician extenders (NPs and PAs) in surgical services	Yes
	The impact of the advanced practice nursing role on quality of care, clinical outcomes, patient satisfaction, and cost in the emergency and critical care settings: A systematic review (Woo et al., 2017)	15	Role of advanced practice nursing in emergency and critical care settings	Yes
	A systematic review of advance practice providers in acute care: Options for a new model in a burn intensive care unit (Edkins et al., 2014)	18	Utilization of advanced practice providers in critical care units	Yes
	The effect of delegation of therapy to allied health assistants on patient and organisational outcomes: A systematic review and meta-analysis (Snowdon et al., 2020)	22	Delegation of therapy to allied health assistants	Yes
	The effectiveness and cost-effectiveness of clinical nurse specialists in outpatient roles: A systematic review (Kilpatrick et al., 2014)	65	The role of clinical nurse specialists in outpatient settings	Yes
	Is it worth reorganising cancer services on the basis of multidisciplinary teams (MDTs)? A systematic review of the objectives and organisation of MDTs and their impact on patient outcomes (Prades et al., 2015)	51	Multidisciplinary teams in cancer care	Yes
	Nurse-patient ratios as a patient safety strategy: A systematic review (Shekelle, 2013)	55	Nurse-patient ratios as a patient safety strategy	No
Structure, policies and procedures	Realist synthesis of intentional rounding in hospital wards: Exploring the evidence of what works, for whom, in what circumstances and why (Sims et al., 2018)	44	Intentional rounding in hospital wards	Yes
	The potential of integrated nurse-led models to improve care for people with functional gastrointestinal disorders: A systematic review (Lineale et al., 2020)	6	Integrated nurse-led models for people with functional gastrointestinal disorders	Yes
	Demonstrating the value of the oncology pharmacist within the healthcare team (Segal et al., 2019)	66	Oncology pharmacists within healthcare teams	Yes
	A systematic literature review of Releasing Time to Care: The Productive Ward (Wright & McSherry, 2013)	18	Releasing time to care: a UK initiative titled The Productive Ward	Yes
	Do Magnet®-accredited hospitals show improvements in nurse and patient outcomes compared to non-Magnet hospitals: A systematic review (Pettit Ditt Daniel & Regnaud, 2015)	10	American Nurses Credentialing Center Magnet Recognition Program®	No
	Specialized nursing practice for chronic disease management in the primary care setting: An evidence-based analysis (Health Quality Ontario, 2013)	8	Specialized nursing practice for chronic disease management in primary care	No
	Human factors approaches to evaluating outpatient parenteral antimicrobial therapy services: A systematic review (Bugeja et al., 2020)	27	Human factors aspects relating to outpatient parenteral antimicrobial therapy service delivery	Yes
Human factors design and engineering	Evidence-based design for neonatal units: A systematic review (O'Callaghan et al., 2019)	29	An optimally designed NICU	Yes
	An evaluation of the effects of human factors and ergonomics on health care and patient safety practices: A systematic review (Mao et al., 2015)	28	Human factors and ergonomics (HFE) interventions	Yes
	A systematic review of human factors and ergonomics (HFE)-based healthcare system redesign for quality of care and patient safety (Xie & Carayon, 2015)	23	Human factors and ergonomics-based healthcare system redesign	Yes

(continued)

Table 2. (continued)

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Practice addressed	Is it a promising practice likely to benefit safety for both workers/organizations and patients? ^a
Technological capacity	A systematic review of the effects of implementing clinical pathways supported by health information technologies (Neame et al., 2019)	44	Health information technology for implementing clinical pathways	Yes
	A systematic review of trials evaluating success factors of interventions with computerised clinical decision support (Van de Velde et al., 2018)	66	Computerized clinical decision support interventions	Yes
	Impact of electronic health records on long-term care facilities: Systematic review (Kuse et al., 2017)	28	Implementation of electronic health records in long-term care	Yes
	Computerized clinical decision support systems for chronic disease management: A decision-maker-researcher partnership systematic review (Roshanov et al., 2011)	55	Computerized clinical decision support systems for chronic disease management across settings	No
	Health information exchange (Hersh et al., 2015)	136	Health information exchanges across settings	No
Patient safety and quality				
Quality/safety general	The clinical microsystems approach: Does it really work? A systematic review of organizational theories of health care practices (Côté et al., 2020)	35	Clinical microsystems approach to quality improvement	Yes
	A mixed-methods systematic review of the effectiveness and experiences of quality improvement interventions in radiology (Jabin et al., 2022)	18	Quality improvement interventions in radiology	Yes
	The use of Lean and Six Sigma methodologies in surgery: A systematic review (Mason et al., 2015)	23	Lean and Six Sigma quality improvement methodologies in surgery	Yes
	Systematic review of interventions to improve constant observation on adult inpatient psychiatric wards (Reen et al., 2020)	24	Interventions to improve constant observation on adult inpatient psychiatric wards	Yes
	Do large-scale hospital- and system-wide interventions improve patient outcomes: A systematic review (Clay-Williams et al., 2014)	6	Large-scale hospital- and system-wide patient safety interventions	Yes
	Interventions for providers to promote a patient-centred approach in clinical consultations (Dwamena et al., 2012)	43	Interventions for providers to promote a patient-centred approach in clinical consultations	Yes
	Social norms interventions to change clinical behaviour in health workers: A systematic review and meta-analysis (Cotterill et al., 2020)	106	Social norms interventions to change clinical behaviour	Yes
	Patient outcomes, patient experiences and process indicators associated with the routine use of patient-reported outcome measures (PROMs) in cancer care: A systematic review (Graupner et al., 2021)	22	Patient-reported outcome measures in cancer care	Yes
	Effectiveness of guideline dissemination and implementation strategies on health care professionals' behaviour and patient outcomes in the cancer care context: A systematic review (Tomasone et al., 2020)	33	Dissemination and implementation of clinical practice guidelines in cancer care	Yes
	Spread tools: A systematic review of components, uptake, and effectiveness of quality improvement toolkits (Hempel et al., 2019)	77	Quality improvement toolkits across settings	No
	External inspection of compliance with standards for improved healthcare outcomes (Fiodgren et al., 2016)	2	External inspection of compliance with standards	No
	Effectiveness of external inspection of compliance with standards in improving healthcare organisation behaviour, healthcare professional behaviour or patient outcomes (Fiodgren, Pomey, et al., 2011)	2	External inspection of compliance with standards	No
	Manually-generated reminders delivered on paper: Effects on professional practice and patient outcomes (Pantoja et al., 2019)	57	Manually-generated reminders delivered on paper	No
	Pay for Performance for Hospitals (Mathes et al., 2019)	27	Pay for performance for hospitals	No
	Payment methods for outpatient care facilities (Yuan et al., 2017)	21	Payment methods for outpatient care	No
	Local opinion leaders: Effects on professional practice and health care outcomes (Fiodgren, Parmelli, et al., 2011)	18	Local opinion leaders disseminating and implementing best evidence	No

(continued)

Table 2. (continued)

Major topic area and subtopic	Title of systematic review or meta-analysis (reference)	No. of studies included in this review article	Practice addressed	Is it a promising practice likely to benefit safety for both workers/organizations and patients? ^a
Care coordination	A systematic review of asynchronous, provider-to-provider, electronic consultation services to improve access to specialty care available worldwide (Liddy et al., 2019)	43	Asynchronous, provider-to-provider, electronic consultation services for specialty care	Yes
	Translating evidence to patient care through caregivers: A systematic review of caregiver-mediated interventions (Fiest et al., 2018)	56	Non-clinical caregiver-mediated interventions	Yes
	The chronic care model and diabetes management in US primary care settings: A systematic review (Stellefson et al., 2013)	16	Chronic care model for diabetes management in primary care	Yes
	Systematic review and meta-analysis of the effectiveness of pharmacist-led medication reconciliation in the community after hospital discharge (Mcneab et al., 2018)	14	Pharmacist-led medication reconciliation in the community after hospital discharge	No
	Integrated literature review of postdischarge telephone calls (Bahr et al., 2014)	19	Postdischarge telephone calls	No

Note: COVID-19 = Coronavirus disease of 2019; HFE = human factors and ergonomics; ICU = intensive care unit; IPC = interprofessional collaboration; MDT = multi-disciplinary team; NICU = neonatal intensive care unit; NPs = nurse practitioners; PAs = physician assistants; UK = United Kingdom.
^a“Yes” indicates a promising practice based on improvements in outcomes for both workers or organizations and for patients and “No” indicates review suggested either no benefits for workers/organizations and patients or only benefits one side (either workers/organizations or patients).

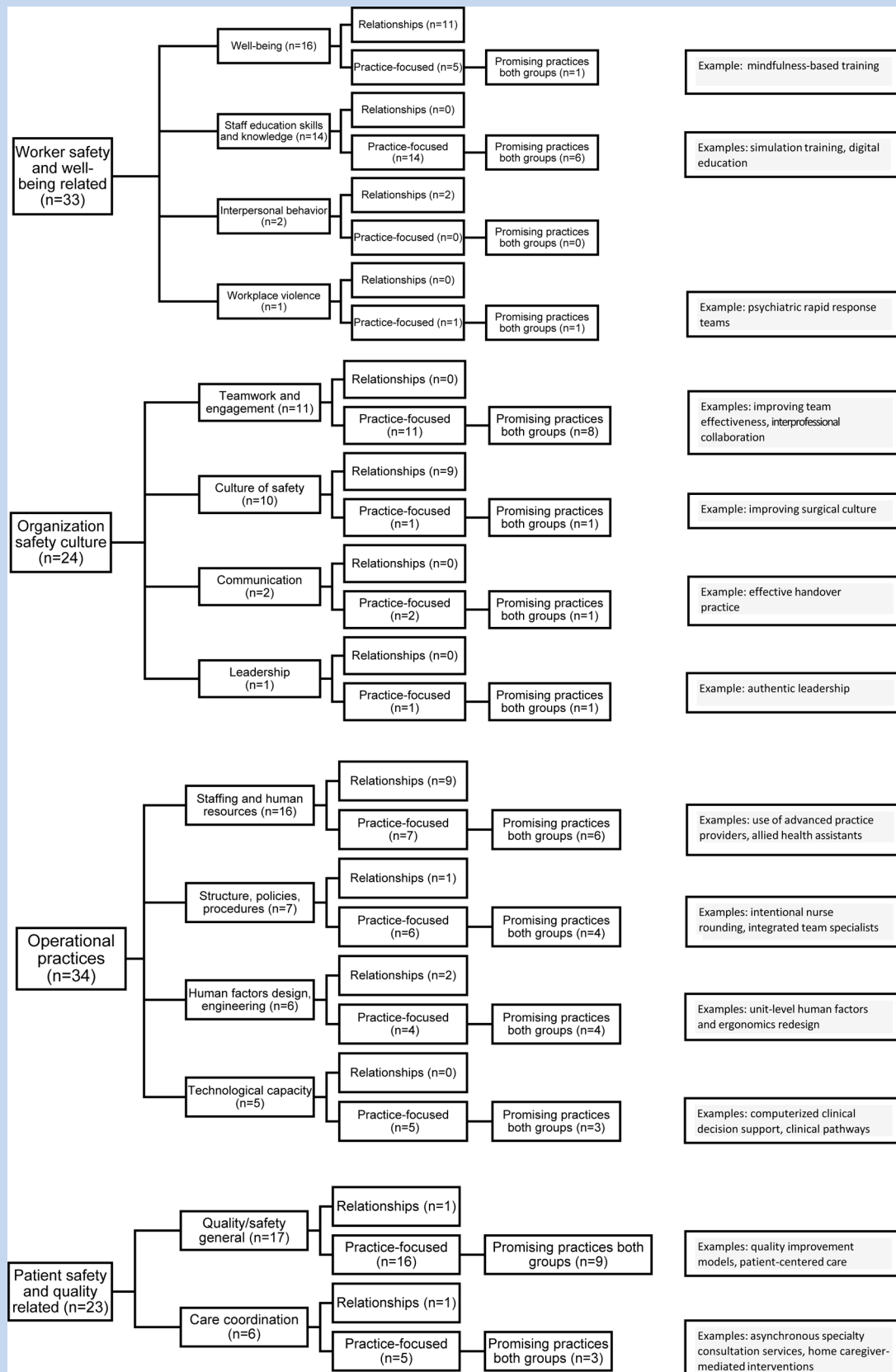


Figure 3. Frequency of included review subtopics and promising practices within major topic areas

primary care workplace conditions (Kapinos et al., 2012), and organizational culture and performance (activity and outcomes) for older people (Hunt et al., 2012).

Among the 15 practice-focused SRs, 11 were considered to have promising practices for both groups (Table 2). Examples of promising practices include training and interventions to improve teamwork and team effectiveness (Buljac-Samardzic et al., 2020; Costar & Hall, 2020; Dietz et al., 2014; Hughes et al., 2016; Wu et al., 2020), communication (McHugh et al., 2020; Odone et al., 2022), and inter-professional collaboration (Pomare et al., 2020). Also promising were surgery-specific checklists (Lyons & Popejoy, 2014), interventions to improve culture (Sacks et al., 2015) as well as relational (authentic) leadership style (Alilyyani et al., 2018).

Operational Practices Focused Topics

This topic area addressed four subtopics: staffing and human resources ($n=16$); structure, policies, and procedures ($n=7$); human factors design and engineering ($n=6$); and technological capacity ($n=5$). Twelve were classified as relationship studies and 22 addressed specific practices. Supplemental Table 5 provides additional detail about each SR.

Among 12 relationship SRs (Table 1), several examined nurse staffing practices such as staffing ratios (Assaye et al., 2021; Sherenian et al., 2013), shift length (Clendon & Gibbons, 2015; Di Muzio et al., 2019), and staffing models (Butler et al., 2019; Wilson et al., 2011) and found associations with specific adverse events. Two examined rationing of nursing care and found associations with negative outcomes (Mandal et al., 2020; Papastavrou et al., 2014). One examined the impact of night/weekend/holiday shift work and found negative associations with specific patient outcomes (de Cordova et al., 2012). Other reviews showing mixed results examined workflow disruptions in the operating room (Koch et al., 2020), design of psychiatric wards (Papoulias et al., 2014), and hospital management and structure for prevention of healthcare-associated infections (Zingg et al., 2015).

Among 22 practice-focused SRs, 17 were considered to have promising practices for both groups (Table 2). Examples of promising operational and clinical staffing models include use of advanced practice clinicians in surgical, emergency, and critical care services (Edkins et al., 2014; Johal & Dodd, 2017; Woo et al., 2017), clinical nurse specialists in outpatient roles (Kilpatrick et al., 2014), integrated nurse-led models for people with functional gastrointestinal disorders (Linedale et al., 2020), incorporating oncology pharmacists on teams (Segal et al., 2019), use of multidisciplinary teams for cancer care (Prades et al., 2015), and use of allied health assistants (Snowdon et al., 2020). Other nursing-related practices included intentional rounding (Sims et al., 2018) and increasing time to provide direct care (Wright & McSherry, 2013). Four SRs addressed human factors and ergonomic interventions (Bugeja et al., 2020; Mao et al., 2015; O'Callaghan et al., 2019; Xie & Carayon, 2015). Three addressed use of health information technology and

computerized clinical decision support (Kruse et al., 2017; Neame et al., 2019; Van de Velde et al., 2018). Two others with mixed results were related to health information technology (Hersh et al., 2015; Roshanov et al., 2011).

Patient Safety and Quality Focused Topics

Within this topic area, two subtopics were addressed: quality/safety general ($n=17$) and care coordination ($n=6$). Two were classified as relationship studies and most ($n=21$, 91%) addressed specific practices. Additional details are available in Supplemental Table 6.

Among the relationship studies (Table 1), one found positive associations between surgical volume and outcomes (Leow et al., 2018); the other examined partnerships between generalist and specialist palliative care services and patient/family experience of care with mixed results (Gardiner et al., 2012).

Among 21 practice studies (Table 2), 12 were considered promising, examples of which include quality improvement and performance measurement-related approaches for specific services and settings (Clay-Williams et al., 2014; Côté et al., 2020; Graupner et al., 2021; Jabin et al., 2022; Mason et al., 2015). Also promising were actions directed at changing clinician behavior (Cotterill et al., 2020; Dwamena et al., 2012; Tomasone et al., 2020) and asynchronous, provider-to-provider, electronic consultation services for specialty care (Liddy et al., 2019). Other practices include the chronic care model for diabetes management in primary care (Stellefson et al., 2013), interventions to improve constant observation on inpatient psychiatric wards (Reen et al., 2020), and interventions targeted at family and other non-clinical caregivers (Fiest et al., 2018). Community pharmacist-led medication reconciliation (McNab et al., 2018) and post-discharge telephone calls (Bahr et al., 2014) had mixed results.

Research Gaps

Regarding the secondary research aim to identify gaps, we noted several observations. The literature showed few SRs with explicit goals to measure outcomes for both groups and few prospective controlled designs. Many SRs included a preponderance of correlational analyses within cross-sectional studies and differential attention to either the HCW or patient. Almost all reviews identified the need for more rigorous study designs (controls or comparison groups) and longitudinal data. Among practice-focused SRs, 13 did not identify promising practices for either group; in six of these, authors did not draw any conclusions because the quality of evidence was too weak.

Several included SRs ($n=17$) reported promising practices only for one group, suggesting opportunities for further research in these topic areas. Many seemingly relevant SRs were excluded because they only reported outcome measures for one group. These topic areas are ripe for additional research measuring outcomes for both groups with rigorous designs.

Rarely found were common worker safety and well-being topics including task-specific processes (e.g., workflow), physical environment changes (e.g., exposure to hazards, built environment design), and injuries related to safe patient handling and fall prevention. Finally, the lack of objective outcome measures for HCWs, such as loss-time injuries, hazard exposures, work attendance, turnover, etc. suggests a gap in outcome measurement for occupational health research.

Discussion

This scoping meta-review aimed to determine the extent to which existing research identifies promising, evidence-based practices that improve safety for both HCWs/organizations and patients and to identify research gaps. Overall, 114 reviews met the inclusion criteria and were classified as either relationship studies ($n=36$) or practice-focused studies ($n=78$), of which 48 practices were considered promising, defined as likely to benefit both workers and patients.

The findings revealed that safety for HCWs and patients can potentially be improved through promising practices and actions directed toward either or both groups. Similarly, a wide range of topic areas can be addressed that directly or indirectly impact worker safety, organizational culture, operational practices, and patient safety. Examples of promising practices included team-based strategies to improve performance, technological skills, quality improvement and patient-centered care, actions that foster leadership engagement in safety culture, and increased attention to human factors and systems design.

The Intersection of Topic Areas and Promising Practices

Though separated for analysis purposes, many interrelationships exist among the four major topic areas. For example, operational practices (e.g., staffing patterns) set by leadership will affect staff perceptions of culture as will responses to adverse events (Tawfik et al., 2023). In three of four major topic areas, more than 50% of practice-focused reviews were considered promising for both groups, highlighting the interactive relationships in healthcare settings.

Actions targeting how work is designed and organized may offer the most benefits to both workers and patients. The Operational Practices topic area had the highest yield of promising practices within the subtopics of staffing and human resources, structure, policies and procedures, and human factors design and engineering.

The Organization Safety Culture subtopic of teamwork and engagement yielded 73% promising practices, suggesting greater uptake of these practices may enhance safety climate (Rotenstein et al., 2024). Arguably, teamwork and engagement may be thought of as an attribute of an organization's safety culture, as it relates to "the way we do things around here," which is often used as a commonplace definition of organizational culture (Grissinger, 2014). The high proportion of reviews finding teamwork likely to benefit both groups may be

in part because some training strategies have been formally evaluated in nationwide studies (Buljac-Samardžić et al., 2021; Chen et al., 2019; Dinh et al., 2020).

Reviews focused on Patient Safety and Quality frameworks for improvement were also likely to benefit both groups. Such efforts typically target important parameters of patient care (e.g., patient centeredness) and direct attention to operational processes and interactions, which can also enhance worker participation, horizontal integration, and overall engagement (AHRQ, 2020; Plsek, 1999; Simpson, 2009). For example, Aiken reported that clinicians preferred improvements in staffing and work environments for enhancing their well-being over clinician wellness and resilience programs (Aiken et al., 2023).

Reviews related to Worker Safety and Well-being relationships showed that burnout, fatigue, and bullying were consistently associated with adverse effects on both patients and HCW. However, reviews addressing the impact of medical resident duty hour restrictions on patient outcomes did not document patient benefit (Ahmed et al., 2014; Bolster & Rourke, 2015; Philibert et al., 2013) and one SR suggested increased complication rates in high-acuity surgical patients (Ahmed et al., 2014).

Reviews focusing on the more abstract concept of safety culture showed few promising practices but yielded several relationships. This is unsurprising as safety culture is challenging to measure and harder to change (Schein, 2010). Similarly, fewer promising practices in the Worker Safety and Well-being topic area may be due to the design of the SR's included studies, which often measure outcomes like burnout and fatigue but do not feature initiatives designed to alleviate these outcomes. Also, the databases searched comprised more medical care journals than occupational health journals, the latter of which may be less likely to address patient outcomes than the converse.

Nevertheless, few promising practices in subtopic areas do not imply these relationships are unimportant. Strong and consistent associations across SRs provide important signals demanding further attention and evaluation of specific interventions. Similarly, lack of supportive evidence for a practice does not necessarily mean it is ineffective, that is, "absence of evidence of effect need not imply evidence of absence of effect." (Boerebach et al., 2014). Lack of evidence could be due to reasons such as few evaluation studies, weak or underpowered study designs, and/or publication bias.

Strengths and Limitations

To our knowledge, this is the first ScMR to take a systems-level, integrated approach to considering practices that can improve both worker and patient safety. The integrated approach, broad inclusion criteria, and general definition of safety enabled the wide range of topics and available SRs. All included SRs reported actual outcome measures for both groups, not just process of care measures. Reliability was enhanced through two-person screening of all abstracts and full-text articles with team discussion to resolve disagreements.

However, several limitations exist. Importantly, our findings are limited to publications through 2020. Many reviews have given this area increased attention after the pandemic (Li et al., 2024; Tawfik et al., 2023). The breadth of topics, study designs, and heterogeneity of outcomes precluded assessing the quality and extent of SR bias. We searched widely in peer-reviewed literature but not gray literature. Excluding SRs measuring only care processes without outcomes may have led to missing some relevant studies.

A review of reviews makes it impracticable to know the details of individual studies within the SRs; some data elements may have been missed or misclassified. Terminology challenges existed; few authors differentiated between measures of quality of care and patient safety, partly because patient safety-related outcomes are rare events and inconsistently defined (AHRQ, 2019; Mitchell, 2008; Shahian et al., 2016). Safety culture was another poorly defined term used differently among SRs (Guldenmund, 2000). Given the preponderance of studies by non-U.S. authors, we may have misinterpreted specific terms.

Finally, identifying promising practices from SR authors' conclusions sometimes required judgment, as authors' conclusions varied by their included study designs (e.g., only controlled studies); evaluation of study quality; outcome measures reported; and the sensitivity of the outcomes to the intervention. In some cases, authors had a worker or patient safety research perspective which influenced interpretations and conclusions. Related challenges occurred when findings from both groups were not explicitly mentioned in conclusions, when a SR addressed multiple interventions, or when the primary focus group was unclear.

Implications for Research

We found several major research gaps. Methodologically stronger designs with outcomes for both groups are required for evaluating practices. The dearth of SRs evaluating interventions related to burnout and safety culture suggests a critical area for future research. Valid and reliable measures exist for assessing burnout and culture, but future research could focus on developing and testing interventions (e.g., workplace policies and programs) that aim to reduce adverse outcomes. Also, researchers may wish to focus on fewer topic areas and evaluate the quality of the included reviews. Our breadth in topic areas made categorization challenging.

The wide variety of outcome measures for workers, organizations, and patients across SRs can be useful for those evaluating the impact of practice on multiple groups. Reviews often included both objective and subjective measures, which sometimes yielded inconsistent findings about a particular practice. Mixed method evaluation may support the feasibility of collecting outcome data sensitive to the expected mechanism of effect. Per Tawfik et al. (2019), "further research is needed to determine the appropriate balance between insensitivity of objective quality metrics and potential for recall bias with subjective quality metrics." Proxy outcomes are

sometimes needed when measuring actual outcomes for both groups is unethical. For example, one cannot prospectively assess the impact of sleep deprivation on surgical patient outcomes using intentionally sleep-deprived surgeons, however, simulators can be used to measure performance (Whelehan et al., 2020).

We were surprised to find that most included studies were done by teams of authors, all of whom were from outside the U.S. National healthcare systems may be better positioned to examine changes that impact both worker and patient safety than systems tied to private and public insurance. This suggests more research is needed to enhance generalizability across countries.

Implications for Practice

These findings strengthen the case for organizations to consider an integrated, non-siloed approach to improving safety that assesses the impact of interventions to both HCWs and patients. As recommended by Benishek et al. (2023) "If clinician well-being is not considered as part of the patient safety equation, we risk losing buy-in for future interventions, burning out the workforce, fueling turnover, and ultimately reducing the efficiencies and care quality we have fought so hard to improve. However, if it is done right and a human-centered mindset is adopted, well-being to clinicians can be restored through an enhanced work environment and to patients through improved care quality." Since healthcare settings comprise interactive systems, it seems only logical to consider safety for both workers and patients together.

Before adopting or adapting any of the identified promising practices, readers are strongly encouraged to examine the referenced SRs and source articles therein to ascertain the quality of each study and appropriateness of the authors' conclusions. Reviews led by evidence synthesis organizations (e.g., Cochrane Collaboration or JBI) often had very stringent inclusion criteria. It is important to consider the context of the SRs' included studies and the need for and readiness of one's own organization for implementing the practice.

Similarly, this report does not conclusively demonstrate directionality or causation regarding the promising practices. Most studies included in the SRs were not randomized controlled trials and are subject to confounding factors and biases (Weinberger et al., 2001). For example, one cannot easily determine that strengthening safety culture caused better patient outcomes or that enhancing patient care coordination increased worker satisfaction. Instead, one must acknowledge that associations may be direct or indirect. As described by Tawfik et al. (2019), "whether curtailing burnout improves quality of care, or whether improving quality of care reduces burnout, is not yet known, and adequately powered and designed randomized trials will be indispensable in answering these questions." Similarly, we did not address the magnitude of improvement when identifying promising practices. In some

cases, the effect size of improvements when reported was large, but in many cases the differences in outcomes were quite small.

Conclusion

This scoping meta-review identified a wide range of practices and topic areas that can be addressed to directly and/or indirectly improve safety for both HCWs/organizations and patients. It is important for healthcare leaders and managers to consider adopting an integrated approach to evaluating the impact of safety improvement interventions and operational practice changes on both patients and workers to enhance the effectiveness and value of efforts to improve safety.

Implications for Occupational Health Practice

Efforts to improve healthcare worker safety have traditionally been viewed as separate and unrelated to patient safety. This study identified synergies between worker and patient safety and calls for an integrated approach to intervention and operational practice design. Occupational health, safety, and patient safety leaders should consider working collaboratively to implement promising practices that improve both worker and patient safety in healthcare settings.

In Summary

- Because few studies have evaluated practices that improve safety for both workers and patients, this scoping meta-review (including only systematic reviews) was conducted to determine the extent to which existing literature identifies practices that improve outcomes for both groups.
- After multi-stage screening of 1,619 abstracts and 642 full texts, 114 reviews met the inclusion criteria and addressed 4 major topic areas: Worker Safety and Well-being ($n=33$), Operational Practices ($n=34$), Organization Safety Culture ($n=24$), and Patient Safety and Quality ($n=23$).
- Of 78 systematic reviews addressing specific practices, 48 reported evidence of being likely to benefit both workers and patients and are described in Table 2 and Supplemental Tables 3 to 6.
- Occupational health/safety and patient safety leaders should consider working collaboratively to implement promising practices that improve both worker and patient safety.

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Author Contributions

Conceptualization—BB, DD, MC, DW; Methodology—BB, DD, MC, DW, MB, KO, AR; Software—KO; Validation—BB, MB, DD, AR; Formal Analysis—BB, MB, DD; Investigation—BB, DD, MB, KO, AR; Data curation—MB, KO, BB; Writing—Original Draft—BB, MB, DD; Writing Review & Editing—DD, MC, AR, DW; Visualization—BB, MB.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical Considerations

This activity was reviewed by CDC, deemed research not involving human subjects, and conducted consistent with applicable federal law and CDC policy. No a priori review protocol was specified and evaluation of systematic review quality was not done.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention or The Joint Commission. No AI was utilized in manuscript preparation.

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Supplemental Material

Supplemental material for this article is available online.

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