

BMJ Open Quality Effect of interventions to improve safety culture on healthcare workers in hospital settings: a systematic review of the international literature

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To cite: Finn M, Walsh A, Rafter N, *et al.* Effect of interventions to improve safety culture on healthcare workers in hospital settings: a systematic review of the international literature. *BMJ Open Quality* 2024;**13**:e002506. doi:10.1136/bmjopen-2023-002506

► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/bmjopen-2023-002506>).

Received 16 July 2023
Accepted 17 April 2024



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ABSTRACT

Background In an era of safety systems, hospital interventions to build a culture of safety deliver organisational learning methodologies for staff. Their benefits to hospital staff are unknown. We examined the literature for evidence of staff outcomes. Research questions were: (1) how is safety culture defined in studies with interventions that aim to enhance it?; (2) what effects do interventions to improve safety culture have on hospital staff?; (3) what intervention features explain these effects? and (4) what staff outcomes and experiences are identified?

Methods and analysis We conducted a mixed-methods systematic review of published literature using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The search was conducted in MEDLINE, EMBASE, CINAHL, Health Business Elite and Scopus. We adopted a convergent approach to synthesis and integration. Identified intervention and staff outcomes were categorised thematically and combined with available data on measures and effects.

Results We identified 42 articles for inclusion. Safety culture outcomes were most prominent under the themes of leadership and teamwork. Specific benefits for staff included increased stress recognition and job satisfaction, reduced emotional exhaustion, burnout and turnover, and improvements to working conditions. Effects were documented for interventions with longer time scales, strong institutional support and comprehensive theory-informed designs situated within specific units.

Discussion This review contributes to international evidence on how interventions to improve safety culture may benefit hospital staff and how they can be designed and implemented. A focus on staff outcomes includes staff perceptions and behaviours *as part of* a safety culture and staff experiences *resulting from* a safety culture. The results generated by a small number of articles varied in quality and effect, and the review focused only on hospital staff. There is merit in using the concept of safety culture as a lens to understand staff experience in a complex healthcare system.

INTRODUCTION

Fostering a supportive safety culture is increasingly recognised as a strategy to

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Hospital interventions seeking to build a culture of safety deliver organisational learning methodologies for staff. The effect of interventions to improve safety culture on staff outcomes is not known.

WHAT THIS STUDY ADDS

⇒ Key experiences for hospital staff impacted by safety culture interventions included increased stress recognition and job satisfaction, reduced emotional exhaustion, burnout and turnover, and improvements to working conditions. Effects were documented for interventions with longer time scales, strong institutional support and theory-informed interventions situated within specific units.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This review contributes to international evidence on how interventions to improve safety culture can support staff in hospitals and how such interventions may be appropriately designed and implemented.

strengthen learning in healthcare systems.^{1–3} Safety culture is a complex and varied concept⁴ but can be broadly defined as organisational beliefs, values and behaviours for patient safety.^{5–7} The concept can form a valued component of high-performance organisations.³ Safety climate, a term often used interchangeably with safety culture, refers instead to a group or team *perception* of safety culture in organisations.⁸ A major focus of safety culture in healthcare is on reducing patient harm and learning from events when they occur.⁴ At national and organisational levels, methods for learning from events are incorporated into incident management frameworks, thereby strengthening systems through policy.^{9 10} Hospital interventions to build a safety culture often seek to support staff learning.^{11–13}



To reduce preventable patient harm, much analysis to date has sought to understand the effects of hospital safety culture on patients.¹⁴ While patients are considered the first victims of patient safety events,³ healthcare providers can experience a second victim impact.^{15 16} Safety culture analyses include staff behaviour that is *part of* safety culture (eg, propensity to report events¹⁷). Experiences *resulting from* safety culture, for example, staff health and well-being (eg, injury rates) and staff retention (eg, turnover intention)^{18 19} are less understood. The benefits to staff from the effects of interventions to improve safety culture are under-researched.^{20 21}

We conducted a systematic review of the literature to examine the evidence for interventions to improve hospital safety culture and staff outcomes. The research questions were: (1) how is safety culture defined in studies with interventions that aim to enhance it?; (2) what effects do interventions to improve safety culture have on hospital staff?; (3) what intervention features explain these effects? and (4) what staff outcomes and experiences are identified? As a first examination of staff outcomes, the inclusion criteria were broad.

METHODOLOGY

Following our protocol,⁴ we conducted a mixed-methods systematic review^{22 23} of published literature guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).²⁴ Studies were included if they had been published since 2000, specifically in peer-reviewed journals (table 1). The term safety culture came to the fore with the Chernobyl disaster in the early 1980s and in healthcare upon the publication of *To Err is Human*, when empirical studies became more prevalent.²⁵ Studies were also included if they concerned healthcare workers, interventions to improve safety culture with a measure of

that improvement, took place in hospitals and included staff-related outcomes and experiences (table 1).

Search strategy

The search was conducted in MEDLINE, EMBASE, CINAHL, Health Business Elite and Scopus. The primary search began in PUBMED using Medline Medical Subject Headings, such as 'patient safety,' 'safety climate' and 'hospital workforce'. Search terms were used in conjunction with the boolean operators 'AND' and 'OR.' Online supplemental file 1 provides details of the full search strategy and returns for each database.

Article review process

Search results were entered into Endnote,²⁶ where duplicates were removed. Screening for article titles, abstracts and full texts took place in Covidence.²⁷ Among a group of three reviewers (MF, HYC and AN), each article was independently assessed against the inclusion and exclusion criteria by two people. Discrepancies were resolved by discussion with a third person. Reference lists of all articles included in the final sample were also searched.

Data extraction and quality assessment

Data were extracted into Excel (online supplemental file 2) according to patient, intervention, comparison and outcome criteria.²⁸ Data from the included articles were assessed independently by three authors (MF, HYC and AN) and cross-checked for accuracy with three other authors (LM, AW and SMC). The mixed-methods appraisal tool (MMAT)²⁹ was used for quality assessment, with three authors (MF, HYC and AN) determining and cross-checking quality scores.^{24 30 31} MMAT is a valuable tool used to coherently score studies across several methodologies.^{29 32 33}

Table 1 Systematic review inclusion and exclusion criteria.

	Inclusion criteria	Exclusion criteria
Population	Hospital healthcare workers, including clinical, non-clinical and management staff.	Primary or specialist care
Intervention	Intervention studies designed to improve safety culture that include an explicit measure of safety culture.	Descriptions of safety culture interventions without any measures or outcomes captured.
Context	Hospitals Global: high-income, middle-income and low-income countries	Non-hospital settings
Outcome	Staff-related safety culture outcomes and experiences that are identified following a hospital-based intervention to improve safety culture.	Safety culture outcomes, safety climate outcomes, or patient outcomes with no distinction of staff outcomes or experiences.
Date range	Published from 2000 (the publication date of <i>To Err is Human</i>).	Published before 2000
Publication type	Research article	Conference abstracts, conference proceedings, grey literature, reports
Languages	All	

Data synthesis and analysis

A convergent approach to synthesis and integration was adopted.^{4 23 30 31} The identified intervention outcomes were categorised thematically and combined with available data on measures and effects.²³ A framework of 11 safety culture dimensions³⁴ guided the thematic analysis of the overall effects of interventions. The full range of safety culture intervention outcomes was categorised under a relevant dimension: ‘Leadership and Leadership Support for Safety’, ‘Perceptions of Safety’, ‘Teamwork and Collaboration’, ‘Safety Systems’, ‘Prioritisation of Safety’, ‘Resources and Constraints’, ‘Reporting and Just Culture’, ‘Openness’, ‘Learning and Improvement’, ‘Awareness of Human Limits’ and ‘Well-being’. Outcome measurements and intervention features influencing outcomes were also documented. Lastly, specific staff outcomes were isolated from overall effects by analysing the meaning and definition of effects.

RESULTS

Conducted in May 2022, the search yielded 22 922 articles, of which 4987 duplicates were removed. 17 935 returns were screened at the title and abstract phases; 76 articles progressed to full-text screening, and 32 articles progressed to the final sample. A review of reference lists for the final sample yielded 19 articles, of which 10 were included, bringing the final number of included articles to 42 (figure 1).

Article characteristics

Most studies were conducted in the USA (n=26), followed by the UK (n=4), Canada (n=2), Jordan (n=2) and Iran (n=2). One each was conducted in Australia,³⁵ China,³⁶ Denmark,³⁷ Finland,³⁸ Netherlands³⁹ and Sweden.⁴⁰ Studies were conducted between 2005 and 2021. Apart from general hospitals (n=15), settings included children’s hospitals (n=3), veteran affairs medical centres (n=3), a psychiatric hospital,³⁸ a radiation oncology

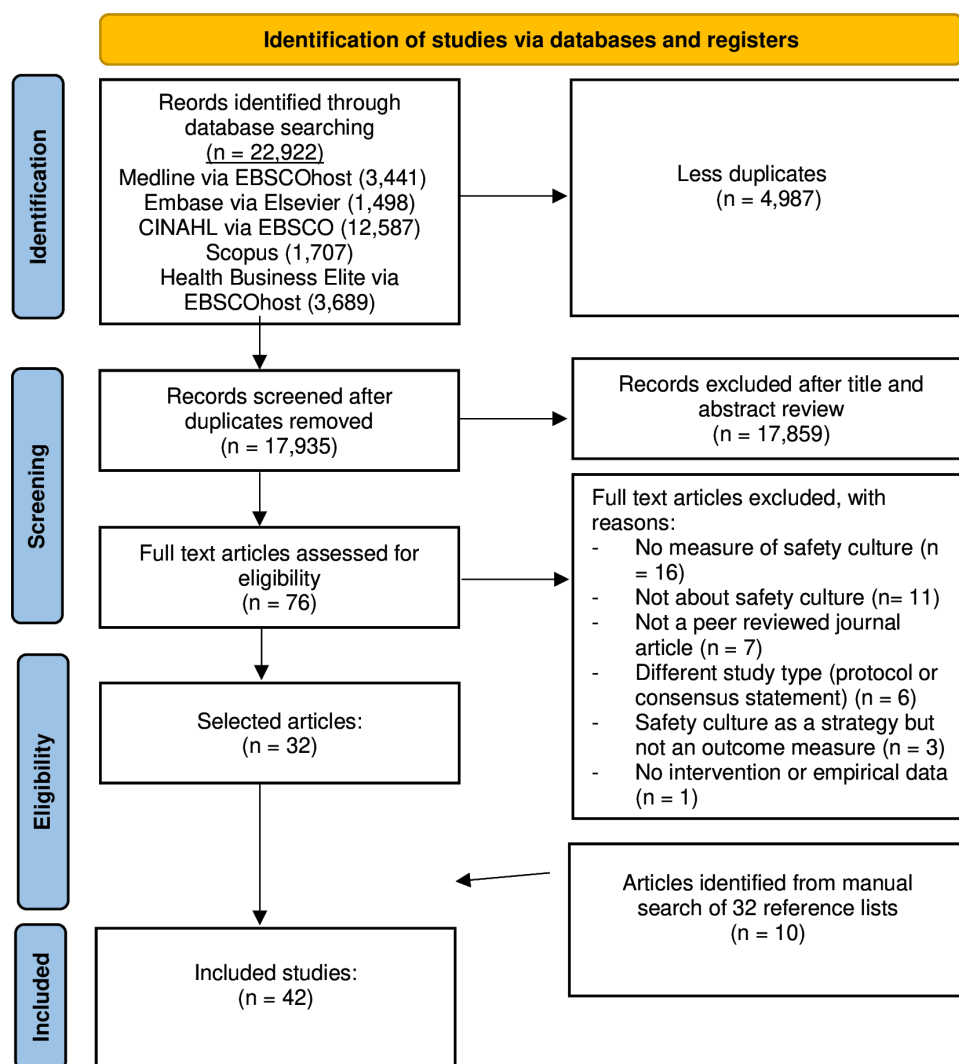


Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2009 flow diagram. *Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers). **If automation tools were used, indicate how many records were excluded by humans and how many were excluded by automation tools. Adopted from Page MJ *et al.*⁸⁸

hospital,⁴¹ an eye hospital³⁹ and a teaching hospital.⁴² Settings included units across multiple hospitals: intensive care (n=5), mental health wards^{35 43} (n=2) and inpatient units⁴⁴ (n=1). Thirteen studies were conducted in specialist units such as emergency^{40 45} (n=2), maternity or obstetric^{46 47} (n=2), psychiatric³⁷ (n=1), perioperative⁴⁸ (n=1), a paediatric intensive care unit (ICU)⁴⁹ (n=1) and an ultrasound service⁵⁰ (n=1).

Fourteen population groups included nurse professionals, physicians, surgeons, therapists, technicians and administrators. Population sizes ranged from 100 to 7510. Sample sizes range from n=33 to n=5440. Response rates ranged from 8.9% to 98.4% (online supplemental file 2).

Intervention features

Intervention designs comprised Quality Improvement Channels^{41 51 52} (n=3), TeamSTEPPS^{45 50 53} (n=3), Comprehensive Unit-Based Safety Programmes^{54–56} (n=3), Nightly Huddles⁵⁷ (n=2), Leadership Walkrounds⁵⁸ (n=2), Safety Walkrounds^{59 60} (n=2), train-the-trainer models⁴⁶ (n=1), Crew Resource Management⁶¹ (n=1) and Servant Leadership Models⁴⁸ (n=1). Other more general programmes included educational programmes (n=5), patient safety programmes or workshops, diffusion of innovation strategies,³⁹ simulation-based trainings^{62 63} and general training (n=3) (online supplemental file 2).

Fourteen studies expressed a general aim to improve safety culture. In other studies, a general aim to improve safety culture was articulated via outcome measurement of defined tasks, for example, via safer medication

administration,⁶⁴ improved conversation and decision-making⁴⁵ and decreased medical error.⁶² Two studies sought to improve patient safety via an improvement in elements of safety culture, for example, team dynamics⁴⁰ and communication.⁵⁰ Single studies sought to improve the safety climate⁵⁶ and staff attitudes towards patient safety.⁶⁵ A minority of studies linked safety culture to clinical or operational outcomes such as patient fall prevention⁶⁶ or ICU-related infections.⁶⁷

Interventions ranged in duration from hours⁶⁵ or days^{37 62} to a maximum of 3 years^{38 54 59} or 4 years.^{56 68} Approximately half the sample had interventions under 1-year duration, including interventions of 1 month,^{45 66 69} 2 months,⁴⁸ 3–6 months,^{35 42 46 50 55 70} up to 8 months or 10 months.^{36 64 71} Those over 1 year (n=16) included anything between 1 and 2 years.

Evaluation features

Thirty-five studies adopted quantitative preassessments and postassessments with two time points as the evaluation design. Three studies adopted quantitative assessments with three time points of pre-evaluation and post-evaluation^{43 62 71}; two used three time points of pre, during and post^{61 68} and one used four time points.⁴⁷ Four studies used qualitative interviews^{39 47 70} and observations^{39 64} as methods of evaluation (table 2).

Fifteen studies conducted the evaluation within a 1-year timeframe, 10 within 2 years and nine within 6 months. A minority were more than 2 years (n=5). Three studies

Table 2 Measures used to determine effects

Measure/tool	Number	Sources using the measure/tool
Hospital Survey on Patient Safety Culture	n=18	Multiple sources ^{36 38 43–46 48 53 58 60 66 68–70 73 74 79 89}
Safety Attitudes Questionnaire	n=20	Multiple sources ^{35 37 40 49–51 54–56 58–60 62–65 67 71 76 77}
Organisational Patient Safety Climate and Capability Score	n=1	Benn <i>et al</i> ⁵²
Safety Behaviour Scale	n=1	Dickens <i>et al</i> ³⁵
Safety Climate Questionnaire (27 items)	n=1	Kuy and Romero ⁶¹
Safety Culture and Leadership Survey	n=1	Ginsburg <i>et al</i> ⁴²
Maslach Burnout Inventory	n=1	Sexton <i>et al</i> ⁵⁸
Culture Assessment Survey	n=1	Reszel <i>et al</i> ⁴⁷
Systems Thinking Scale	n=1	Tetuan <i>et al</i> ⁶⁴
Other non-validated independent surveys, interview guides and observation protocols		
Four-question survey developed to evaluate perceptions of quality of communication and interdisciplinary teamwork	n=1	Zhu <i>et al</i> ⁵⁷
Fourteen-question semistructured interview guide to gather in-depth information about interprofessional team experience	n=1	Reszel <i>et al</i> ⁴⁷
Interviews and Observations. Critical Incident Technique.	n=1	De Korne <i>et al</i> ³⁹
Interviews and project-specific questionnaires as part of Kirkpatrick's Levels of Evaluation Model	n=1	Slater <i>et al</i> ⁷⁰
Observations on workaround and medication errors	n=1	Tetuan <i>et al</i> ⁶⁴

did not record the evaluation duration.^{39 47 70} The shortest duration was 4 hours,⁶⁵ and the longest was 4 years.⁶⁸

Nineteen studies reported the findings as a percentage of positive responses; 10 reported the mean score scaled at 0–5, and eight reported the mean score scaled at 0–100. The remaining, which did not report specific figures, were either qualitative^{39 47} or provided no specific figures.⁵⁸ Full details of outcomes and measures of effect sizes, where provided, are in online supplemental file 2. Variations in baseline and range of effect are evident. For example, some studies had higher baseline rates⁵¹ than others⁴⁰ but improved to a greater extent.^{56 63} Some studies did not report percentages.^{49 60 62 71}

Quality assessment

The MMAT, which recommends including all studies regardless of quality, was applied to each article.^{29 72} The overall quality of the articles tended towards a stronger quality: 11 studies scored ‘5’, n=17 scored ‘4’, n=11 scored ‘3’ and n=3 studies scored ‘2’.

Objective 1: how is safety culture defined in studies with interventions that aim to enhance it?

Online supplemental file 3 lists article definitions or descriptions of safety culture. Safety culture was defined diversely across studies as safety climate, safety culture or patient safety culture.⁴ Twelve studies did not cite a definition. Eighteen studies drew on the Hospital Survey on Patient Safety Culture⁷ (HSOPSC) safety culture definition and 20 on the Safety Attitudes Questionnaire⁸ (SAQ) safety climate definition. Some studies used no definition but generally discussed safety culture,⁵⁵ patient safety^{44 73} or organisational safety.⁴⁷ Studies with aims not directly related to safety culture outlined the importance of quality processes⁶⁸ and organisational culture.^{37 66 74}

The HSOPSC⁷ and the SAQ⁸ dominated the sample. Studies overall assumed the possibility of intervening in and influencing a culture of safety.⁷⁵ Two studies^{39 47} undertook qualitative work and viewed culture change as more long term and complex. Overall, the heterogeneity observed in the wider literature⁴ was reflected in the sample.

Objective 2: what effects do interventions to improve safety culture have on hospital staff?

The overall effects of safety culture interventions under the thematic framework of Churruca *et al*³⁴ are summarised in table 3. Most outcomes were within the themes of ‘teamwork and collaboration’ (n=60), ‘leadership and leadership support for safety’ (n=44), ‘reporting and just culture’ (n=42), ‘perceptions of safety’ (n=30) and ‘resources and constraints’ (n=25). Some outcomes related to ‘openness’ (n=16), ‘well-being’ (n=16), ‘learning and improvement’ (n=15) and ‘awareness of human limits’ (n=15). Less salient outcomes were under the themes of ‘prioritisation of safety’ (n=4) and ‘safety systems’ (n=1).

We next summarise data from five themes, selected for prominence and relevance to staff. Results are reported where they are observed as significant at a $p < 0.05$ level or are identified by participants. Full details of effect sizes, strengths, and explanations are provided in online supplemental file 2.

Teamwork and collaboration

‘Teamwork climate’ from the SAQ,⁸ ‘teamwork within units’ and ‘teamwork across units’ from the HSOPS⁷ comprised this theme. The teamwork climate was improved by virtue of a medical team training programme⁷⁶ and simulation training on teamwork and communication.⁶² Teamwork within and across units was improved by a 3-year patient safety intervention³⁸ and a suite of patient safety initiatives across 15 months.⁴⁴ Perceptions of ‘interdisciplinary teamwork’ were improved by nightly huddles.⁵⁷ ‘Interprofessional team experience’ was described as beneficial by staff engaged in an obstetric patient safety programme.⁴⁷ Three studies^{37 62 76} reported improved effects on teamwork. Team orientation, replacing a functional culture with a social culture, was reported by participants to increase via a team resource management programme in a Dutch eye hospital.³⁹

Leadership and leadership support for safety

Leadership comprised the SAQ dimension of ‘Perceptions of Management’, the HSOPS domains of ‘Manager Expectations and Actions Promoting Patient Safety’, ‘Management Support for Patient Safety’ and ‘Leadership Improvement’ from the Safety Culture and Leadership Survey.⁴² A Comprehensive Unit-based Safety Programme (CUSP) for patient safety,⁵⁶ a quality improvement collaborative⁵¹ and a medical team training programme⁷⁶ resulted in improved perceptions of management. An intervention examining ethical principles in nurses’ perceptions of patient safety improved management expectations and actions promoting safety.⁴³ Improvements to ‘Management Support for Patient Safety’ were increased due to the introduction of a patient safety reporting system,³⁸ a standardised patient safety course³⁶ and a course on ethical principles of patient safety.⁴³ Leadership support for improvement explained the variance in patient safety culture measures following a training programme on patient safety.⁴²

Perceptions of safety

This theme comprised ‘safety climate’ (SAQ), ‘overall perception of patient safety’ (HSOPS), ‘perceived state of safety’ from the SCLS⁴² and ‘safety awareness’ from the safety climate and capability.⁵² In qualitative studies, safety awareness³⁹ and safety attitude³⁵ were also described by participants. Effects on ‘safety climate’ were evident through a leadership intervention,³⁷ a simulation-based teamwork and communication training⁶² and a medical team training programme.⁷⁶ ‘Overall perception of patient safety’ was increased by a 3-year patient safety intervention³⁸ and a health education programme.⁶⁶

**Table 3** Thematic presentation of effect of safety culture interventions on staff

Churruca theme	Subdomains	Items/ references
Teamwork and Collaboration	Teamwork (SCC) (CAS) Teamwork Climate (SAQ) (SCQ) Teamwork with Units (HSOPS) Teamwork across Units (HSOPS) Handoffs and Transitions (HSOPS) Interdisciplinary teamwork Interprofessional team experience Team Orientation	60
Leadership and Leadership Support for Safety	Perceptions of Management (SAQ) Manager Expectations and Actions Promoting Patient Safety (HSOPS) Management Support for Patient Safety (HSOPS) Leadership Improvement (SCLS)	44
Reporting and Just Culture	Frequency of Events Reported (HSOPS) Non-Punitive Response to Error (HSOPS) Fear of Negative Repercussions (SCLS) Reporting of near misses Information Processes (SCC) Feedback and Communication about Error (HSOPS)	42
Perceptions of Safety	Safety Climate (SAQ) Overall Perception of Patient Safety (HSOPS) Safety Climate (SCQ) Perceived State of Safety (SCLS) Safety Awareness (SCC) Safety Awareness (awareness of risks) Safety Attitude	30
Resources and Constraints	Working Conditions (SAQ) Staffing (HSOPS) Turnover	25
Openness	Communication Openness (HSOPS) Open Communication (CAS) Quality of Communication Communication (SCC) Multiprofessional Communication	16
Well-being	Job Satisfaction (SAQ) Emotional Exhaustion (Maslach Burnout Inventory) Valuing Individuals (CAS) Empowering People (CAS)	16
Learning and Improvement	Organisational Learning/Continuous Improvement (HSOPS) Learning (CAS) Organisational Learning and Improvement Processes (SCC) Organisational Culture Assessment	15
Awareness of Human Limits	Stress Recognition (SAQ)	13
Prioritisation of Safety	Commitment to Safe Practice (SCC) Safety behaviour Valuing Safety (SCLS) Patient safety is everyone's priority (CAS)	4
Safety Systems	Systems Thinking	1

CAS, Culture Assessment Survey; HSOPSC, Hospital Survey on Patient Safety Culture; SAQ, Safety Attitudes Questionnaire; SCC, Safety Climate and Capability; SCLS, Safety Culture and Leadership Survey.

The safety climate⁶¹ was positively impacted by a crew resource management training programme for surgical staff.⁶¹ A training programme on perceptions of safety culture⁴² improved the 'perceived state of safety', which

was explained by leadership for improvement.⁴² Lastly, developing 'safety awareness',³⁹ was reported by participants who took part in a team resource management programme.

Resources and constraints

This theme incorporated ‘working conditions’ from the SAQ, ‘staffing’ from the HSOPS and ‘turnover’.⁵⁴ Timmel *et al*⁵⁴ achieved a reduction in staff turnover from 27% in 2006 to 0% by virtue of a hospital-wide CUSP. An intervention establishing structural and training changes for interprofessional teamwork in an emergency department⁴⁰ and a CUSP⁵⁴ reported improvements to working conditions over time. Changes could not be attributed to any cause⁴⁰; however, improved communication and collaboration among emergency department nurses and physicians by virtue of the CUSP led to more effective coordination of daily care plans and efficient patient discharge, increasing the efficiency and timeliness of rounds and nurse access to physicians.⁵⁴

Well-being

‘Well-being’ included ‘job satisfaction’ from the SAQ, ‘emotional exhaustion’ from the Maslach Burnout Inventory⁵⁸, and ‘valuing individuals’ and ‘empowering people’ from the Culture Assessment Survey.⁴⁷ A leadership intervention in a psychiatric department³⁷ resulted in improvements to ‘job satisfaction,’ though the authors could not attribute any aspect of the intervention to the change. Improvements to emotional exhaustion,⁵⁸ derived from the Maslach Burnout Inventory, were associated with WalkRounds feedback.

Objective 3: what intervention features explain these effects?

Online supplemental file 2 lists all intervention features, causes attributed to statistical effects and participant descriptions of perceived effects. Causal factors included formal structures to continuously identify and address patient safety defects,^{44 46 59 77} face-to-face communication,⁵⁷ strengthening leadership,³⁷ reporting good events,⁴⁸ a change team comprising members from across departments⁵⁰ and early adoption and reporting on processes of change,⁵² feedback⁵⁸ and training.^{36 38 45 61 66}

Leadership support for interventions

The presence of leadership support for safety culture was identified as important in the majority of studies. In their education programme in adult ICUs, Amiri *et al*⁷³ attributed a lack of effect to the absence of involvement of higher-level management. A patient safety reporting system was found to have positive effects by virtue of leadership support for safety.³⁸

Timeframe

Timeframe was an influencing factor. A 4-year quality and safety programme comprising event learning resulted in a gradual pace of change.⁶⁸ In contrast, small changes are possible in shorter timeframes, with attitudes and values towards safety changing in a team-based safety programme over 20 weeks.⁷⁰ In their comparison of staff perceptions of flexible and learning cultures, Jones *et al*⁵³ noted that the adoption of team behaviours was stronger in units that adopted the training earlier.⁵³

Intervening at the unit level

Working at a unit level rather than a hospital level was also cited as beneficial. Tetuan *et al*⁶⁴ observed that an educational focus at the unit level facilitates a systematic review of threats, shared learning, involvement of leadership and interdisciplinary collaboration, resulting in improved perceptions of safety culture and job satisfaction. A focus on the unit level was often connected to the use of CUSPs.^{54–56} These studies were assertive in associating change to features of the intervention⁵⁵ and in describing what aspects led to change,⁵⁶ as set out next.

Comprehensive conceptual designs

Comprehensive conceptual designs fostered successful outcomes.⁵³ Paine *et al*,⁵⁶ Timmell *et al*⁵⁴ and Sexton *et al*⁵⁵ attributed outcomes to the features of CUSPs. Features included a conceptual model of high-reliability organisations, using prior unit-based research, structures to establish a system of safety while maintaining local flexibility, prioritising areas with low culture scores, CUSP team leaders with time allocated, practical tools to improve safety and a continuous unit process. Timmel *et al*'s CUSP to address nurse and physician collaboration in an ICU impacted safety climate but also improved staff morale and turnover.⁵⁴ In fact, studies reporting CUSPs consistently demonstrated effects and accounted for them, while other interventions were more varied and mixed.

Sometimes, interventions can prevent decline rather than promote improvement. Ginsburg *et al* (2005)⁴² noted that while their training may not improve all aspects of safety culture, they may act as a buffer against deteriorations in certain aspects of safety culture. The authors suggested that their intervention guarded against a decline rather than creating an improvement.⁴²

The challenges of attributing effects to interventions were articulated in the studies. Following the implementation of their medical centre team training programme, Watts *et al*⁷⁶ acknowledged that their programme was ineffective at inducing change in some domains. They contended that the interpretation of improvement in a specific domain must be done with caution.⁷⁶ SAQ scores had different baselines and did not universally improve, which the authors attributed to the incomplete effectiveness of the Medical Team Training (MTT) programme.⁷⁶ Kuy *et al*⁶¹ identified complexity in improving safety culture following the implementation of crew resource management training. Creating a culture of safety occurs over time, requires repeated reinforcement and results from many factors, including training itself, leadership support, patient safety tools and staff engagement.⁶¹ Creating a culture of safety requires hospital leadership support and active staff commitment to sustain change.⁶¹

Objective 4: what staff outcomes and experiences are identified?

We analysed specific staff outcomes from the available literature (online supplemental file 2). Outcomes are categorised as staff perceptions, staff behaviour and



staff experiences (online supplemental file 4). Staff perceptions and behaviours are a defined *part of* safety culture,^{8 78} while staff experiences are outcomes *resulting from* safety culture. Staff perceptions included those of management (SAQ) and state of safety,⁴² awareness of safety⁵² and risks³⁹ and fear of negative repercussions.⁴² Behaviours included interprofessional team experience,⁴⁷ safety behaviour³⁵ and reporting of near misses,³⁹ among others. Staff experiences as outcomes included working conditions (SAQ), staff turnover⁵⁴ and emotional exhaustion,⁵⁸ among others (online supplemental file 4).

DISCUSSION

In the era of safety systems,¹ a strong focus on the importance of a safety culture for high-reliability learning organisations in healthcare is evident.⁵ Our study found that overall safety culture outcomes were most prominent under the themes of leadership and teamwork,³⁴ reflecting the prominence of several training programmes focusing on these domains.^{37 40 79} Distinct outcomes of safety culture interventions beneficial to staff included increased stress recognition and job satisfaction, reduced emotional exhaustion,⁵⁸ burnout⁸⁰ and turnover,⁵⁴ and improvements to working conditions.⁵⁴

The Hospital Survey on Patient Safety⁷ and the Safety Attitudes Questionnaire⁸ were prominent measurement tools.^{62 70} Other measurement tools captured changes between time points, reflecting orientations that view safety culture as possible to influence by intervention.

Separating staff outcomes and experiences from safety culture is challenging. Staff outcomes were both *part of* safety culture and *resulted from* safety culture. They occurred at the individual, team and organisational levels. These are illustrated in figure 2, alongside intervention components that influenced outcomes.

Staff perceptions and behaviours inevitably form component parts of the safety culture itself. Nevertheless, our review indicates that perceptions and behaviours can be experienced in organisational safety culture,⁸ affecting staff as individuals. Other experiences, such as stress recognition and turnover, *result from* a culture of safety. Experiences included both wider organisational measures, such as turnover,⁵⁴ and individual experiences, such as job satisfaction or emotional exhaustion.⁵⁸ Again, while turnover⁵⁴ is measured organisationally, it is experienced at an individual level.

Working conditions, stress recognition and job satisfaction are each derived from the Safety Attitudes Questionnaire.⁸ Therefore, 'turnover' associated with a CUSP,⁵⁴ 'emotional exhaustion' associated with leadership walkarounds⁵⁸ and 'burnout' associated with safety walkarounds⁸⁰ remain as explicit individual and organisational staff outcomes impacted within three studies.

Effects were documented most clearly where interventions had longer time scales, strong leadership and institutional support, were comprehensive, theory-informed, and situated within specific units. Long timescales and

comprehensive programme designs were particularly important components. Effects at the unit level were documented due to the deployment of CUSPs. Nevertheless, findings of mixed and weak effects reflect debates¹¹ that evidence for change is not clear. Some studies acknowledged the challenge of influencing safety culture, recognising that time and complex interventions are required to change culture.^{39 43 65} Sexton *et al*⁵⁵ caution against drawing conclusions about causality, instead focusing on association. Furthermore, national cultural differences may affect safety culture, for example, through attention to power differentials⁸¹ or management and leadership practices.^{82 83}

This review has highlighted the ambiguity in current research, demonstrating that components of safety culture, such as teamwork and perception of safety, have been approached as both explanations and effects of safety culture. The lack of definitive explanations for changes in safety culture suggests a focus on intervention might not have the most utility.⁸⁴ It has been argued that the concept of safety culture is better deployed as a conceptual lens to inform the analysis of the healthcare system.^{75 84} Here, safety behaviours are part of a broader organisational culture, influenced by multiple internal and external system dynamics.^{84 85} Safety culture and staff outcomes could instead be the emergent properties of other system processes and structures. They may be bidirectional, as we acknowledge in our protocol,⁴ where staff behaviours and experiences may contribute to a better system culture.

Future interventions could include staff experiences in their evaluations to generate a stronger understanding of how safe systems can support valued healthcare providers. They could prioritise a measurable improvement to a concept of staff outcome or experience. With turnover and burnout as two staff experiences not embedded within existing concepts of safety culture or safety climate, what impacts them may indeed be analysed through the lens of safety culture.⁸⁴ A consistent outcome set for measuring the effects of interventions would be useful for establishing a common language for improving staff outcomes and consistent methods for assessing improvements.

This review contributes to the literature by furthering understanding of how hospital staff are affected by training and programmes to support safety culture in hospitals. Key to our analysis was a focus on staff outcomes of safety culture interventions. Our motivation was the lack of understanding of how hospital staff, who deliver patient care, are themselves affected by safety culture.⁴ It follows that, similar to Churrua,³⁴ we agree that more qualitative approaches are important, as is greater planning in designing tools for measuring safety culture. Since safety culture might not be easily intervened in, quantitative instruments dominate, and turnover and working conditions are identified as outcomes distinct from elements of safety culture interventions, a focus on staff outcomes could usefully illuminate how to strengthen organisational conditions

A model illustrating the influence of safety culture interventions on hospital staff perceptions, behaviours, values, and experiences.

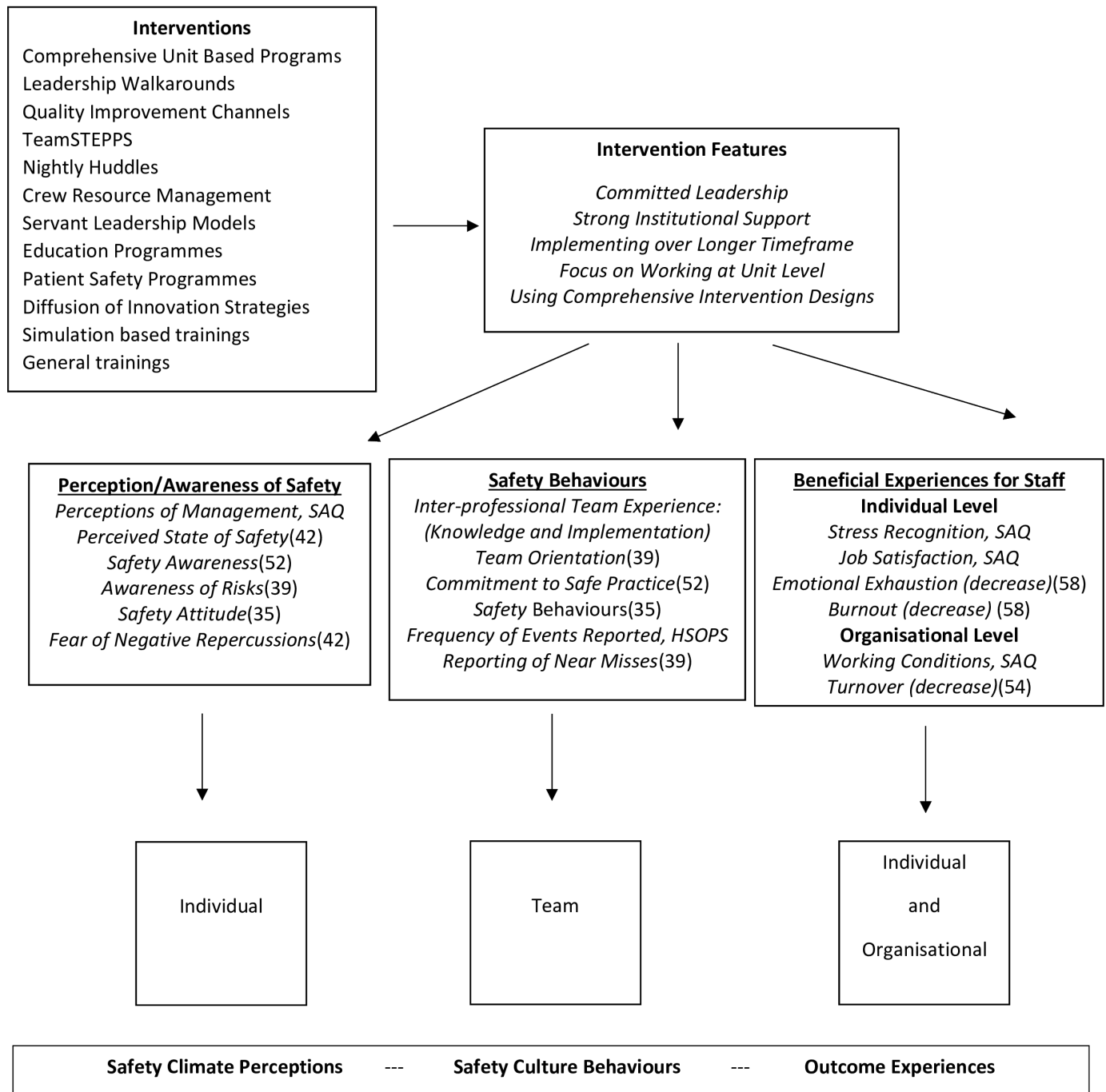


Figure 2 Logic diagram (and citations).

and improve workplaces for staff to support enhanced patient care.

STRENGTHS AND LIMITATIONS

Strengths included a research team with a high number of screeners and data extractors to cross-check decisions; a comprehensive, reproducible and precise methodology following PRISMA guidance as published in the study protocol⁴; the inclusion of studies from a range of

jurisdictions, and the MMAT²⁹ and data extraction tool accompanying this manuscript provide a high level of detail beyond that reported here.

The review is not without limitations: we extracted data according to how they were termed in the articles, and different terminologies may overlap; while the search was conducted in all languages, the included articles were in the English language only; the results generated a small number of articles varied in quality and effect, and



the review only focused on hospital staff. There may be other issues unique to primary care staff, an often under-researched group that does not receive interventions.

Our objectives and review methodology were designed to generate knowledge about the effect of safety culture interventions on hospital staff. The study was the first examination of whether there is an effect on hospital staff. As such, we have not conducted subanalyses by occupation or care setting within the hospital or type of hospital, and we could not discern meaningful trends in our dataset. The study findings were heterogeneous, and it was not possible to identify trends among occupations, care settings or units. We recommend that further research through reviews or qualitative approaches analysing specific settings incorporate questions comparing occupations or care settings to generate evidence on patterns across workplaces. Indeed, a separate analysis of this dataset, taking occupational groupings or workplace settings as the organising analytical start point, could also be conducted.

CONCLUSION

In examining the impact of safety culture interventions on staff outcomes, evidence on staff experiences is scarce. Our systematic review highlights a dearth of research on hospital staff experiences within the safety cultures. It is staff who deliver safe care to patients^{11 14 86} and who are faced with pressures within the hospital environment.⁸⁷ A focus on staff outcomes would provide meaningful insight into staff experience within safety culture and results from the safety culture. In recognising the challenges associated with influencing safety culture, there is merit in using the concept as a lens to understand staff experience in a complex healthcare system. With an enhanced focus on safety systems,¹ improving staff outcomes in safety cultures is a paramount step towards patient safety.⁸⁷

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Funding This work has been funded by a bursary from the 2022 Royal College of Surgeons in Ireland Research Summer School (22157A01). It has also been funded

by the Health Research Board Applied Partnership Award (APA2019-024), including co-funding from the Health Service Executive in Ireland.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Ethical approval was not required because this study retrieved and synthesised data from already published studies.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request.

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