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Are improvements in occupational health and safety for hospital staff associated with improvements in patient health and safety?

Summary of an evidence scoping review

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Summary of an evidence scoping review

Background/problem

Health care workers experience some of the highest rates of nonfatal occupational illness and injury. In particular, musculoskeletal disorders (MSD) associated with patient handling constitute a significant proportion of work-related pain and injury in hospital staff. Although convincing evidence exists that safe patient handling interventions and programs result in fewer and less severe injuries to hospital staff, the evidence linking these interventions to patient outcomes is less well explored.

Purpose

The current review aims to identify whether there is evidence investigating the potential association between improvements in occupational health and safety (OHS) for hospital staff and patient health and wellbeing outcomes.

Specifically this scoping review aimed to identify evidence to address the following questions;

1. Is there a relationship between occupational health and safety interventions to prevent/reduce the risk of manual handling based musculoskeletal disorders in hospital staff and patient health and wellbeing outcomes?
2. If this association exists, what are the patient outcomes which are improved following positive health and safety for hospital staff?

Evidence review process

A scoping review, which provides an overview of the state of current evidence on a particular topic, was conducted to identify original research papers and systematic reviews examining the association between OHS initiatives for staff and patient outcomes. Five electronic databases were searched; Pubmed, Embase, Scopus, CINAHL, Cochrane Library and Google Scholar. All publications were identified using a predesigned search strategy (see Evidence Review Plan for details) and were screened for relevance using title, abstract and in some cases full-text analysis. Publications reporting on MSD related OHS interventions or patient safety culture and patient outcomes were included in the review. Only English language full text papers published since 2005 were included.

Results

What the review found – major themes

The search identified over 1,000 publications of interest. After title and/or abstract screening, 248 papers were identified as potentially relevant to the association between OHS interventions for staff and patient outcomes. Of the studies identified, the number relating specifically to MSD related OHS interventions was relatively low.

The following themes, including the primary area of interest, emerged from the literature.

Themes identified	Number of studies
<p><i>Patient handling interventions (primary research question)</i> Interventions included in the studies were; 1) patient handling equipment such as ceiling and floor based lifts, sit-to-stand assists, ambulation aides, and lateral slides, 2) safe patient handling programs which generally consist of administrative policies/procedures and patient handling equipment, and 3) other patient handling initiatives such as adaptive clothing and scheduled toileting.</p>	12
<p><i>Safety climate or culture increase patient safety</i> While not a specific OHS intervention, safety climate/culture appears to be a significant theme in the literature linking worker and patient safety. Details of the evidence around safety culture have therefore been included in this review where patient outcomes have been measured/reported.</p>	12

<i>Human factors and ergonomics approaches in the hospital setting increase patient safety</i> A number of studies were identified that address the relationship between the design and implementation of technologies, processes, workflow and teams with patient safety outcomes.	6
<i>Healthcare worker conditions impact on patient safety and clinical outcomes</i> There is a large body of work in the literature that addresses the relationship between hospital working conditions and patient outcomes. For example hospital staff workload and fatigue.	44
<i>Improvements in work environment improve patient experience and safety</i> There is also a large body of work that examines the relationship between other elements of the work environment and patient outcomes. For example improved communication, healthy work environments, and violence prevention.	31

Patient handling interventions and programs

Nine original research papers (1-9) and three systematic reviews (10-12) were identified as relevant to MSD related OHS interventions for staff and patient outcomes. Most studies were conducted in America in long-term care or rehabilitation settings. The study methods include case studies, cross-sectional surveys, and one retrospective cohort analysis. Both directly measured patient outcomes and provider reported patient outcomes have been reported in these studies (refer to evidence table in Appendix).

The evidence suggests that there is a relationship between MSD related OHS interventions for hospital staff and patient health and wellbeing outcomes.

- Eight papers reported a positive effect on patient outcomes from various MSD related OHS programs or interventions for hospital staff. The patient outcomes included increased comfort during patient handling activity (1, 6, 9), improved functional recovery during rehabilitation (2, 3), independence in self-care/mobility (4), patient safety (reduced falls) (8, 9), reduced complications of immobility (such as pressure ulcers, depression, urinary incontinence) (6-8) and length of stay (not statistically significant) (2).
- One paper (5) reported a negative relationship between MSD related OHS interventions and patient health and wellbeing outcomes. This observational study noted that skin and fall related adverse events occur in the setting of safe patient handling programs and provides recommendations for reducing the risk of these adverse events.

Safety climate or culture increases patient safety

Safety culture or safety climate (used interchangeably in the literature) is defined as staff perceptions about the extent to which healthcare organisations value safety (for workers and patients), commit resources to safety-related initiatives and equipment, and promote safe behaviors.(13)

Eleven original research papers (including a meta-analysis) (14-24) and a systematic review (25) were identified as relevant to hospital safety culture and patient outcomes. Most studies were conducted in America or Europe in acute healthcare inpatient settings, particularly intensive care units. Safety culture/climate was measured most often using a validated questionnaire or survey and interventions varied widely and included staff training, team communication initiatives, interdisciplinary walk rounds, and general safety programs.

- Ten papers reported a positive relationship between safety culture or climate and patient outcomes. The patient outcomes included composite patient safety indicators (21, 22), rates of patient injury and adverse events (such as pressure ulcers, medication errors, falls, hospital acquired infection) (14, 15, 17, 21, 23, 24), patient/family satisfaction (15, 16), readmission rates (16, 19), mortality rates (16, 20) and length of stay (20).
- One paper (18) reported that patient safety climate was not significantly related to any of the patient outcomes studied.

Gaps in the evidence

While evidence of a relationship between MSD related OHS interventions for hospital staff and patient health and wellbeing outcomes was identified, the interventions and the patient outcomes measured or reported were highly heterogeneous. There is consequently a gap in our understanding of which interventions improve different patient outcomes. In addition, as most of the evidence has been generated in the long-term care or rehabilitation setting, there is limited evidence relating to the acute healthcare setting.

A relatively low number of papers addressing the relationship between MSD related OHS interventions for hospital staff and patient health and wellbeing outcomes were found. Further evidence may be held within grey literature documents and other unpublished information such as internal organisational audits and anecdotes.

Scoping review implications

The scoping review highlights the following key findings:

- There is a relationship between OHS interventions to prevent or reduce the risk of manual handling based MSD in hospital staff and patient health and wellbeing outcomes.
- The patient outcomes which are improved following positive musculoskeletal health and safety for hospital staff are largely related to comfort and mobility, however there is a gap in our understanding of which staff interventions improve which patient outcomes.
- The evidence is currently limited, only 9 studies relevant to the research questions were identified.
- Most studies provided a snapshot at a given point in time rather than following up study participants over time which would provide better evidence of a causal relationship between OHS interventions and patient outcomes, and most studies were undertaken in the long-term care or rehabilitation setting.
- Given the high level of heterogeneity in staff OHS interventions, measured/reported patient outcomes and study designs, a full evidence review which includes quality assessment of the research evidence is required with the following benefits;
 - this approach will provide a detailed and objective assessment and synthesis of the current research evidence relating to MSD related OHS interventions for hospital staff and patient health and wellbeing outcomes,
 - inclusion of grey literature and other unpublished sources would provide valuable evidence of relevance and increase our ability to draw conclusions, and
 - the findings would provide insights into which interventions/approaches improve which patient outcomes and result in the greatest improvements in patient outcomes.

Use of the evidence

In the setting of limited health care resources, evidence that MSD related OHS interventions have a direct impact on both worker and patient outcomes adds weight to value of these interventions from an organisational perspective. The findings identified in this review, or a full evidence review if it were undertaken, may provide a suitable evidence-base to support policy decisions and develop communication tools.

Appendix - Evidence Table

Specifically this scoping review aimed to identify evidence to address the following questions;

Is there a relationship between occupational health and safety interventions to prevent/reduce the risk of manual handling based musculoskeletal disorders in hospital staff and patient health and wellbeing outcomes?

If this association exists, what are the patient outcomes which are improved following positive health and safety for hospital staff?

The search identified over 1,000 publications of interest. After title and/or abstract screening, 248 papers were identified as potentially relevant to the association between OHS intervention and patient outcomes. To address the above research question the papers relating specifically to MSD related OHS interventions (12) and safety culture (12) are outlined in the following table.

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
Patient handling programs and assist devices					
<p>Alamgir, H., et al. (2009). "Evaluation of ceiling lifts: Transfer time, patient comfort and staff perceptions." Injury 40(9): 987-992. (1)</p> <p>County: Canada</p> <p>Aim: The purpose of this study was to evaluate ceiling lifts in comparison to floor lifts based on transfer time, patient comfort and staff perceptions in three long-term care facilities with varying ceiling lift coverage</p> <p>Design: Observational study</p>	<p>Residents of long term care facilities in British Columbia.</p>	<p>The objectives were: (1) to measure and compare the time spent to perform various patient transfer tasks using ceiling lifts or floor lifts, (2) to determine the impact of ceiling lifts on patient comfort levels compared to floor lifts, and (3) to determine healthcare workers' perceptions on use of transfer devices for optimal patient handling.</p> <p>The time required to transfer or reposition patients along with patient comfort levels were recorded for 119 transfers.</p> <p>In the three facilities, 143 healthcare workers were surveyed on their perceptions of</p>	<p>Comfort (measured according to a standard discomfort and pain scale)</p>	<p>Transfers performed with ceiling lifts required on average less time (bed to chair transfers: 156.9 seconds for ceiling lift, 273.6 seconds for floor lift) and were found to be more comfortable for patients ($p < 0.001$).</p>	<p>Interpretation of comfort was undertaken by research observers rather than self-reporting by patients.</p>

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
		patient handling tasks and equipment.			
<p>Campo, M., et al. (2013). "Effect of a safe patient handling program on rehabilitation outcomes." Archives of Physical Medicine and Rehabilitation 94(1): 17-22. (2)</p> <p>County: USA</p> <p>Aim: To evaluate the effect of a safe patient handling (SPH) program on rehabilitation mobility outcomes</p> <p>Design: Retrospective cohort study</p>	<p>Patients without a SPH program in place (n=507) and patients with a SPH program in place (n=784) in a rehabilitation unit in a hospital system.</p>	<p>The objective of the study was to determine the effect of a SPH program on patient functional mobility outcomes, the SPH program consisted of administrative policies and patient handling technologies. The policies limited manual patient handling. Equipment included ceiling- and floor-based dependent lifts, sit-to-stand assists, ambulation aides, friction-reducing devices, motorized hospital beds and shower chairs, and multi-handled gait belts.</p>	<p>Patient functional status (as measured by the mobility subscale of the FIM)</p>	<p>No statistically significant difference was observed between groups in discharge mobility scores. A significant difference between groups was noted for patients with initial mobility FIM scores of 15.1 and higher, after controlling for initial mobility FIM score, age, length of stay, and diagnosis - these patients performed better with a SPH in place.</p>	<p>While not statistically significant patients with a SPH program achieved a shorter length of hospital stay.</p> <p>SPH programs do not appear to inhibit recovery (one hypothesis is that the use of lifting equipment may lead to dependence and impede patient recovery/rehab).</p>
<p>Darragh, A. R., et al. (2013). "Safe-patient-handling equipment in therapy practice: Implications for rehabilitation." American Journal of Occupational Therapy 67(1): 45-53. (3)</p> <p>Country: USA</p> <p>Aim: to determine how safe-patient-handling (SPH) equipment is used in rehabilitation and how it</p>	<p>Thirty-five occupational and physical therapist practitioners from three inpatient rehab facilities using SPH programs participated in structured focus group discussions.</p>	<p>The project addressed the following questions: (1) how is SPH equipment used by occupational and physical therapy personnel in rehabilitation, and (2) how does the use of equipment affect rehabilitation practice?</p>	<p>Patient mobility and functional recovery (as reported by therapists – not directly measured)</p>	<p>Three themes emerged from the analysis:</p> <ul style="list-style-type: none"> • Choice; therapists engage in a highly individualized, complex process of decision making when selecting and using SPH. • Potential; to treat a greater range of patients such as bariatric or complex medical patients and to mobilise patients earlier. 	<p>Qualitative methodology not generalisable.</p> <p>Indirect measurement of patient outcomes.</p>

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
affects therapists, patients, and therapy practice Design: Qualitative, instrumental case study				<ul style="list-style-type: none"> Safety; reduced number of patient falls and complications of immobility. 	
Darragh, A. R., et al. (2014). "Effects of a safe patient handling and mobility program on patient self-care outcomes." American Journal of Occupational Therapy 68(5): 589-596. (4) Country: USA Aim: to determine the effect of a safe patient handling and mobility (SPHM) program on patient self-care outcomes Design: Retrospective cohort study design	Electronic medical records of 1,292 patients receiving inpatient rehabilitation services	To compare self-care scores for patients who participated in rehabilitation before implementation of an SPHM program (n=507) with the scores of patients who participated after implementation of the SPHM program (n=785).	Patient self-care performance as measured by the self-care subscale of the FIM.	No difference in self-care scores observed between groups. Patients who received inpatient rehabilitation services with an SPHM program were as likely to achieve at least modified independence in self-care as those who received inpatient rehabilitation services without an SPHM program.	
Elnitsky, C. A., et al. (2014). "Implications for patient safety in the use of safe patient handling equipment: A national survey." Int J Nurs Stud 51(12): 1624-1633. (5) Country: USA Aim: To explore adverse patient events and approaches to preventing	A convenience sample of safe patient handling program managers from 51 US Department of Veterans Affairs medical centres	The objective of this study was to explore adverse patient events associated with SPH programs and preventive approaches in US Veterans Affairs medical centres.	Patient injury: skin-related and fall-related adverse patient events as reported by SPH program managers.	Both skin- and fall-related adverse patient events occurred in the setting of a SPH program. Skin-related events included abrasions, contusions, pressure ulcers and lacerations. Fall-related events included sprains and strains, fractures, concussions and bleeding.	The findings have implications for how nursing professionals can implement safe patient handling programs in ways that are safe for both staff and patients.

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>events where a safe patient handling (SPH) program has been implemented</p> <p>Design: Cross sectional survey design</p>				(Negative outcome but provides recommended mitigation strategies)	
<p>Griffiths, H. (2012). "Adverse risk: a 'dynamic interaction model of patient moving and handling'." J Nurs Manag 20(6): 713-736. (6)</p> <p>Country: UK</p> <p>Aim: The aim of the study was to examine patient adverse events associated with sub-optimal patient moving and handling.</p> <p>Design: Narrative literature review and development of a conceptual model of patient handling</p>	<p>60 peer reviewed publications published 1992 to 2010 that report on patient manual handling</p>	<p>The objective was to consolidate a conceptual model of patient moving and handling from a narrative literature review for an orthopaedic rehabilitation setting.</p>	<p>Search terms for this review included: pain, fear and functional position of the patient</p>	<p>Five predominant themes emerged from the narrative literature review: 'patient's need to know about analgesics prior to movement/ambulation'; 'comfort care'; 'mastery of and acceptance of mobility aids/equipment'; 'psychological adjustment to fear of falling'; and 'the need for movement to prevent tissue pressure damage'.</p>	<p>This review cites evidence of increased patient comfort and reduced pressure ulcers associated with use of mechanical lifting.</p>
<p>Gucer, P. W., et al. (2013). "Sit-stand powered mechanical lifts in long-term care and resident quality indicators." Journal of Occupational and Environmental Medicine 55(1): 36-44. (7)</p> <p>Country: USA</p>	<p>Nursing home residents (Medicare & Medicaid Services data) and Directors of Nursing (n= 271) of long-term care facilities Nationwide.</p>	<p>To explore the relationship between resident quality indicators of well-being and (1) the safe lifting policies and procedures and (2) the availability of different kinds of powered mechanical lift assist equipment.</p>	<p>Mobility-related resident outcomes (6 Quality Indicators; physical restraint, chemical restraint, bedfast, pressure ulcers, falls and fractures)</p> <p>Number of PMLs per 100 residents</p>	<p>Safe lift practices and lift assist device are associated with benefits to residents of long term care facilities.</p> <p>Four of six derived resident quality indicators improved with the number of PMLs (physical restraint, chemical restraint, bedfast, pressure ulcers).</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>Aim: To determine associations between long-term care powered mechanical lift (PML) availability and mobility-related resident outcomes</p> <p>Design: Data linkage study</p>				<p>Falls and fractures were found to be more frequent with more lift use, however this risk was mitigated by a comprehensive safe lift program (policies and procedures).</p>	
<p>Nelson, A., et al. (2008). "Link between safe patient handling and patient outcomes in long-term care." <i>Rehabil Nurs</i> 33(1): 33-43. (8)</p> <p>Country: USA</p> <p>Aim: To examine the relationship between safe patient handling and quality of care measures</p> <p>Design: Retrospective observational design</p>	<p>111 residents living on 24 units in six Veterans Administration nursing homes.</p>	<p>The objective of this study was to test the hypothesis that quality of care would improve with implementation of an evidence-based patient care ergonomics program.</p>	<p>Quality of patient care as demonstrated by 10 quality domains; patient demographics, cognition, depression, physical functioning, continence, fall risk, higher engagement in activities, higher levels of alertness during the day, discharge potential and health care utilization.</p>	<p>Following implementation of the program statistically significant improvements were noted; lower levels of depression, improved urinary continence, higher engagement in activities, lower fall risk, and higher levels of alertness during the day. Additionally, four areas showed a decline in function: pain, combativeness, locomotion, and cognition.</p> <p>Findings from this study may be useful in enhancing organizational support for safe patient-handling programs and could be used to build a business case for improving caregiver safety.</p>	
<p>Yassi, A. and T. Hancock (2005). "Patient safety--worker safety: building a culture of safety to improve healthcare worker and patient well-being." <i>Healthc Q</i> 8 Spec No: 32-38. (9)</p>		<p>To examine several major OHS initiatives launched by the Occupational Health and Safety Agency for Healthcare (OHSAH) in British Columbia to improve the healthcare workplace: the promotion of safe patient handling (ceiling</p>	<p>Improved patient safety and comfort (self-reported and staff perceptions)</p>	<p>Results of the projects are at various stages of completion, but ample evidence has been obtained to indicate that looking after the well-being of healthcare workers results in safer and better quality patient care.</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>Country: Canada</p> <p>Aim: To examine how the rate of health care worker injury has declined and link the OHS factors addressed to patient safety.</p> <p>Design: Policy/program analysis</p>		<p>lifts); adaptive clothing; scheduled toileting; stroke management training; measures to improve management of aggressive behaviour; and infection control.</p>			
Patient handling reviews					
<p>Hallmark, B., et al. (2015). "Ergonomics: safe patient handling and mobility." <i>Nurs Clin North Am</i> 50(1): 153-166. (10)</p> <p>Country: USA</p> <p>Aim: To investigate current standards of practice in the area of safe patient handling and movement in addition to outlining evidenced-based recommendations for clinical practice.</p> <p>Design: Literature review</p>		<p>This article reviews and investigates the issues surrounding ergonomics, with a specific focus on safe patient handling and mobility.</p>	<p>No patient outcomes but has cost outcomes & SPHM program implementation recommendations</p>	<p>Safe patient handling and mobility is on the forefront of the movement to improve patient safety.</p> <p>Organisations estimate that they can save 60% to 80% of workers compensation costs related to patient handling if they have a SPH program (<i>Celona J Making the business case for a SPHM program. Am Nurse Today 2014:9(9);26-9</i>).</p>	
<p>Kay, K., et al. (2014). "It's not about the hoist: A narrative literature review of manual handling in healthcare." <i>Journal of Research in Nursing</i> 19(3): 226-245. (11)</p>		<p>This paper reviews the contemporary international literature regarding manual handling interventions noting the unique context for injury prevention strategies within healthcare. The review includes</p>	<p>No patient outcomes</p>	<p>The complexity of manual handling in healthcare has resulted in a theoretical shift from single factor interventions based on technique training towards an emerging multidimensional</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>Country: Australia</p> <p>Aim: To comprehensively review the literature on both the contemporary practices of manual handling and the injury prevention interventions adopted within health care settings</p> <p>Design: Narrative literature review</p>		<p>the recognition of underlying assumptions inherent in the conceptualisation of manual handling and its management, and the preponderance of the post-positivist paradigm in this field.</p>		<p>approach. However the key elements for sustainable solutions to reduce nurses' manual handling injuries have not yet been identified and consensus is lacking regarding the implementation and appropriate evaluation of injury prevention programmes.</p>	
<p>Thomas, D. R. and Y. L. N. Thomas (2014). "Interventions to reduce injuries when transferring patients: A critical appraisal of reviews and a realist synthesis." Int J Nurs Stud 51(10): 1381-1394. (12)</p> <p>Country: New Zealand</p> <p>Design: Critical appraisal of systematic reviews and a realist synthesis to identify best practices for moving and handling programmes</p>	<p>A literature search of five databases (Medline, EMBASE, CINAHL, PsycINFO and ScienceDirect) located 150 reports assessing programme outcomes published in refereed journals between 2000 and 2013.</p>	<p>The objective was to assess the effectiveness of interventions in reducing back pain and injuries among healthcare staff. The critical appraisal included six systematic reviews. The realist synthesis included 47 studies that provided descriptive information about programme mechanisms.</p> <p>Given the absence of experimental trials for multi-component programmes, the best available evidence for the effectiveness of multi-component programmes is from pre-post studies and large-scale surveys.</p> <p>The realist synthesis provided detailed information about the core components for effective programmes.</p>	<p>No patient outcomes</p>	<p>Five of the six systematic reviews covered interventions involving either staff training or training and equipment supply. One review covered multi-component interventions. All concluded that training staff by itself was ineffective.</p> <p>The realist synthesis noted the need for management commitment and support, and six core programme components; a policy requiring safe transfer practices, ergonomic assessment of spaces where people are transferred, transfer equipment including lifts, specific risk assessment protocols, adequate training of all care staff, and</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
				coordinators coaches or resource staff.	
Safety climate/culture (attitudes, values, norms and beliefs towards patient safety)					
<p>Agnew, C., et al. (2013). "Patient safety climate and worker safety behaviours in acute hospitals in Scotland." J Safety Res 45: 95-101. (14)</p> <p>Country: Scotland</p> <p>Aim: to test which dimensions of hospital safety climate were associated with patient and worker safety outcomes.</p> <p>Design: Cross sectional survey</p>	<p>1,866 NHS clinical staff in six Scottish acute hospitals</p>	<p>To obtain a measure of hospital safety climate from a sample of National Health Service (NHS) acute hospitals in Scotland and to test whether these scores were associated with worker safety behaviours, and patient and worker injuries.</p>	<p>Staff reported patient injury rate (not directly measured).</p> <p>Hospital safety climate behaviours, and worker and patient injuries were measured using the Scottish Hospital Safety Questionnaire.</p>	<p>Hospital safety climate scores were significantly correlated with clinical workers' safety behaviour and patient and worker injury measures, although the effect sizes were smaller for the latter.</p> <p>The dimensions of safety climate most strongly associated with patient injuries were management support, staffing and teamwork.</p>	
<p>Ausserhofer, D., et al. (2013). "The association of patient safety climate and nurse-related organizational factors with selected patient outcomes: A cross-sectional survey." Int J Nurs Stud 50(2): 240-252. (15)</p> <p>Country: Switzerland</p> <p>Aim: to explore the relationship between patient safety climate (PSC) and patient</p>	<p>997 patients and 1630 registered nurses (RNs) working in 132 surgical, medical and mixed surgical-medical units within 35 Swiss acute care hospitals.</p>	<p>The purpose of this study was to explore the relationship between PSC and patient outcomes in Swiss acute care hospitals.</p> <p>PSC was measured with the 9-item Safety Organizing Scale.</p> <p>Other organizational variables measured with established instruments included the quality of the nurse practice environment, implicit rationing of nursing care, nurse staffing, and skill mix levels.</p>	<p>Seven nurse-reported patient outcomes (not directly measured); medication errors, pressure ulcers, patient falls, urinary tract infection, bloodstream infection, pneumonia; and patient satisfaction</p>	<p>PSC was not found to be a significant predictor for any of the seven patient outcomes in this patient population.</p> <p>Other factors, predominantly rationing of nursing care, were associated with patient outcomes.</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>outcomes, adjusting for major organizational variables.</p> <p>Design: Cross sectional survey</p>					
<p>DiCuccio, M. H. (2015). "The Relationship Between Patient Safety Culture and Patient Outcomes: A Systematic Review." J Patient Saf 11(3): 135-142. (16)</p> <p>Country: USA</p> <p>Aim: to systematically review studies to determine if there are tools, levels of measure and outcomes that have been shown to result in significant correlations between patient safety culture and patient outcomes.</p> <p>Design: Systematic review</p>		<p>The purpose of this review is to evaluate the state of research connecting patient safety culture and patient outcomes to determine nurse-sensitive patient outcomes that have been significantly correlated to culture of safety and commonly used tools to measure culture of safety in the studies with significant correlations.</p>	<p>Only studies that directly measured patient outcomes in relationship to patient safety culture in hospitals involving registered nurses as a participant were included.</p>	<p>Evidence of relationships between patient safety culture and patient outcomes exist at the hospital (readmission rates, safety indicators, mortality and patient satisfaction) and nursing unit (mortality and family satisfaction) level of analysis.</p> <p>However, the number of studies finding statistically significant correlations particularly using nurse-sensitive outcomes is limited.</p>	
<p>Farup, P. G. (2015). "Are measurements of patient safety culture and adverse events valid and reliable? Results from a cross sectional study." BMC Health Serv Res 15(1). (17)</p> <p>Country: Norway</p>	<p>185 employees and 272 patient records from the medical departments in two geographically separated</p>	<p>This study explored associations between the patient safety culture and adverse events, and evaluated the validity of the tools used for the measurements.</p> <p>A survey on patient safety culture was performed with a validated Norwegian version of</p>	<p>Adverse events (retrospectively analyzed from medical records using a validated tool, the Global Trigger Tool).</p>	<p>The study found a negative association between better patient safety culture and adverse events when comparing two general medical departments.</p>	<p>Small underpowered study</p>

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>Aim: to explore associations between the safety culture and adverse events</p> <p>Design: Cross sectional study</p>	hospitals of Innlandet Hospital Trust, Norway	the Hospital Survey on Patient Safety Culture (HSOPSC).			
<p>Groves, P. S. (2014). "The relationship between safety culture and patient outcomes: results from pilot meta-analyses." <i>West J Nurs Res</i> 36(1): 66-83. (18)</p> <p>Country: USA</p> <p>Aim: To examine the relationship between patient safety outcomes and safety culture in acute care hospitals</p> <p>Design: Meta-analysis</p>	<p>Studies (14) with a quantitative measure of safety culture and directly measured patient outcome in an acute-care hospital setting</p>	<p>Five small pilot meta-analyses were conducted using 10 papers, examining the relationship between safety culture and each of the following: pressure ulcers, falls, medication errors, nurse-sensitive outcomes, and post-operative outcomes.</p> <p>Four papers were not included because the outcomes reported were not similar enough to include in a meta-analysis (<i>Hansen et al 2011, Huang et al 2010 and Mardon et al 2010</i>).</p>	<p>Pressure ulcers, falls, medication errors, risk standardised readmission rates, ICU mortality and composite patient safety indicators</p>	<p>No significant relationships of any size were identified.</p> <p>A small positive effect was noted for pressure ulcers, falls, medication errors and a nurse sensitive composite indicator.</p> <p>A small negative effect was noted for the post-operative composite indicator.</p>	<p>Low overall power due to lack of empirical studies to analyse.</p>
<p>Hansen, L. O., et al. (2011). "Perceptions of hospital safety climate and incidence of readmission." <i>Health Serv Res</i> 46(2): 596-616. (19)</p> <p>Country: USA</p> <p>Aim: to examine the relationship between hospital patient safety climate and hospital readmission</p>	67 acute-care hospitals with readmission outcomes data available for selected diagnoses (AMI, HF and pneumonia)	<p>To define the relationship between hospital patient safety climate (a measure of hospitals' organizational culture as related to patient safety) and hospitals' rates of readmission within 30 days of discharge.</p> <p>Safety climate was measured through a survey of a random sample of hospital employees (n=36,375).</p>	30-day risk-standardized readmission rates	<p>There was a significant positive association between lower safety climate and higher readmission rates for AMI and HF (p<.05 for both disease specific models) but not pneumonia.</p> <p>The dimensions of safety climate that most consistently demonstrated significant association with readmission were; unit safety norms,</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
Design: Cross-sectional study				overall emphasis on safety, and collective learning.	
<p>Huang, D. T., et al. (2010). "Intensive care unit safety culture and outcomes: A US multicenter study." International Journal for Quality in Health Care 22(3): 151-161. (20)</p> <p>Country: USA</p> <p>Aim: to determine if intensive care unit (ICU) safety culture is independently associated with outcomes.</p> <p>Design: Multicenter cohort study</p>	<p>A total of 65,978 patients admitted January 2001-March 2005 in thirty ICUs and 2,103 employees from those ICUs</p>	<p>The objective of this study was to determine if ICU safety culture is independently associated with patient hospital mortality and LOS.</p> <p>Safety culture was assessed with the Safety Attitudes Questionnaire-ICU version, a validated instrument that assesses safety culture across six factors.</p>	<p>Hospital mortality and length of stay (LOS).</p>	<p>Perceptions of management and safety climate were moderately associated with patient outcomes, however no associations were identified for other domains of safety culture.</p>	
<p>Mardon, R. E., et al. (2010). "Exploring relationships between hospital patient safety culture and adverse events." J Patient Saf 6(4): 226-232. (21)</p> <p>Country: USA</p> <p>Aim: To test the hypothesis that hospitals with a more positive patient safety culture would have lower patient safety indicator (PSI) rates.</p>	<p>179 hospitals representing data collected from 56,480 staff respondents and patient safety indicators derived from discharge data</p>	<p>The objective of this study was to undertake a systematic analysis of the relationship between 2 measures: (1) a patient safety culture instrument and (2) a refined set of patient safety indicators.</p>	<p>Rates of in-hospital complications and adverse events as measured by the AHRQ Patient Safety Indicators (PSIs).</p> <p>15 patient safety culture variables and a composite measure of adverse clinical events based on 8 risk-adjusted PSIs</p>	<p>Nearly all of the relationships tested were in the expected direction (negative), and 7 (47%) of the 15 relationships were statistically significant. All significant relationships were of moderate size, indicating that hospitals with a more positive patient safety culture scores had lower rates of in-hospital complications or adverse events as measured by PSIs.</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
Design: Cross sectional study					
<p>Rosen, A. K., et al. (2010). "Hospital safety climate and safety outcomes: is there a relationship in the VA?" Medical care research and review: MCRR 67(5): 590-608. (22)</p> <p>Country: USA</p> <p>Aim: to explored the potential relationship between safety climate and Veterans Health Administration hospital safety performance using the Patient Safety Indicator (PSI) rates.</p> <p>Design: Cross sectional study</p>	4,581 employees of 30 Veterans Health Administration Hospitals	To test the hypothesis that: (1) higher levels of safety climate would have lower rates of PSIs, (2) dimensions of safety climate likely to affect individuals' behaviour the most are most directly related to PSIs, and (3) safety climate perceptions are more strongly associated with PSIs for frontline workers than for senior managers.	PSIs and a PSI composite measure	<p>Safety climate overall was not related to the PSIs or to the PSI composite.</p> <p>A few individual dimensions of safety climate were associated with specific PSIs (greater fear of blame and punishment for making mistakes was negatively associated with higher rates of pressure ulcer and deep vein thrombosis" ($p < .05$ and $p < .01$, respectively) and overall emphasis on safety was negatively associated with pressure ulcer and iatrogenic pneumothorax.</p> <p>Perceptions of frontline staff were more closely aligned with PSIs than those of senior managers.</p>	Some significant relationships of individual safety climate dimensions with selected PSIs, suggest that efforts to achieve a strong safety climate are warranted.
<p>Steyrer, J., et al. (2013). "Attitude is everything? The impact of workload, safety climate, and safety tools on medical errors: a study of intensive care units." Health care management review 38(4): 306-316. (23)</p> <p>Country: Austria</p>	378 patients in 57 intensive care units	To investigate to what extent production pressure (i.e., increased staff workload and capacity utilization) and safety culture (consisting of safety climate among staff and safety tools implemented by management) influence the occurrence of medical errors and if/how safety climate and safety tools interact.	Incidence of errors (error rate was the ratio of patients affected by errors in a given ICU to the total number of patients in that unit)	<p>All safety climate scales were significantly correlated with error rate.</p> <p>Overall conclusions were that increased workload and capacity utilization increase the occurrence of medical error, an effect that can be offset by a positive safety climate but not by formally</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>Aim: to examine the trade-off between production and protection posited in the literature for a high-risk hospital setting (intensive care)</p> <p>Design: prospective, observational, 48-hour cross-sectional study</p>		<p>Safety climate was assessed using a psychometrically validated four-dimensional questionnaire.</p>		<p>implemented safety procedures and policies.</p>	
<p>Taylor, J. A., et al. (2012). "Do nurse and patient injuries share common antecedents? An analysis of associations with safety climate and working conditions." <i>BMJ Quality and Safety</i> 21(2): 101-111. (24)</p> <p>Country: USA</p> <p>Aim: To examine the relationship between safety climate and both patient and nurse injuries</p> <p>Design: Cross-sectional study</p>	<p>723 nurses and 28,876 patient discharges from an urban, level-one trauma centre</p>	<p>To examine the association of unit-level safety climate and specific nurse working conditions with injury outcomes for both nurses and patients in a single hospital.</p> <p>Safety climate was measured in 2004 using the Safety Attitudes Questionnaire (SAQ).</p>	<p>Patient injuries included 290 falls, 167 pulmonary embolism/deep vein thrombosis (PE/DVT), and 105 decubitus ulcers.</p>	<p>The study found a negative association between two SAQ domains, Safety and Teamwork, with the odds of both decubitus ulcers and nurse injury.</p> <p>Registered nursing hours per patient day showed a negative association with patient falls and decubitus ulcers.</p> <p>Unit turnover was positively associated with nurse injury and PE/DVT, but negatively associated with falls and decubitus ulcers.</p>	<p>The authors suggest that patient and nurse safety may be linked outcomes.</p>
<p>Weaver, S. J., et al. (2013). "Promoting a culture of safety as a patient safety strategy: a systematic review." <i>Ann Intern Med</i> 158(5 Pt 2): 369-374. (25)</p> <p>Country: USA</p>	<p>Relevant English-language studies published from January 2000 to October 2012.</p>	<p>Eight studies included executive walk rounds or interdisciplinary rounds; 8 evaluated multicomponent, unit-based interventions; and 20 included team training or communication initiatives.</p>		<p>Twenty-nine studies reported some improvement in safety culture or patient outcomes, but measured outcomes were highly heterogeneous. Strength of evidence was low, and most studies were pre-post evaluations of low to</p>	

Study details	Population and setting	Research objective	Patient Outcome	Result	Notes
<p>Aim: to identifies and assesses interventions used to promote safety culture or climate in acute care settings.</p> <p>Design: Systematic review</p>				<p>moderate quality. Within these limits, evidence suggests that interventions can improve perceptions of safety culture and potentially reduce patient harm.</p>	

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