

No.	Author	Year	MMAT Method	Questions	Response	Comment	Score
1	DeKorne	2014	Qualitative	1	Yes	To evaluate the implementation of a broad-scale TRM program on safety culture in a Dutch eye hospital, detailing the program's content and procedures	
				2	Yes	Mixed Methods: Interviews and Observation and Surveys. Critical Incident Technique.	
				Quality Criteria		First, safety audits of processes and (team) activities and feedback by aviation experts, second, classroom training sessions and lectures on safety awareness and human factors by aviation experts, third, a flight simulator session in Boeing 737-800 aircraft simulator with feedback on team performances, and fourth, video recording of (team) activities and feedback by aviation experts ("black box"). These are all appropriate for the research question and problem.	
				1	Yes		

						<p>Data sources justified. First, observations were made during eight multidisciplinary group meetings (medical and nursing staff, administrative staff, and aviation experts) where the program was developed. Second, semi-structured interviews: Pre- intervention: 19 semi-structured interviews, topic list based on safety culture dimensions. Post-intervention: After the TRM-program (T1, December 2009), 11 interviews were conducted with ophthalmologists (3), residents (2), nurses (3) administrative staff (2) and a manager who also were interviewed at T0, using the same questions to observe differences after the introduction of the program. Third, we conducted unstructured observations during the program. At 24 TRM sessions, the reactions, behaviors and discussions were written down by a participating researcher.</p>	
				2	Yes		
				3	No	Thematic analysis seen in study, however findings are not adequately derived from data	
				4	Yes	Interpretation of results supported by the data collected	
				5	Yes	Clear links between data sources, collection, analysis and interpretation	4
2	Abstoss	2011	Quantitative non-randomized	1	Yes	To better understand the impact of both system-level and safety culture strategies deployed in our paediatric intensive care unit (PICU) on medication error reporting and harm.	

				2	Yes	Measured Medication error report rates and medication error with harm rates (before and after intervention), SAQ pre post scores for assessment	
				Quality Criteria			
				1	No	Not Specific, only stated PICU staff	
				2	Yes	Component sufficiently intergrated	
				3	Yes	Complete outcome data, Time 1 : 88% rr, time 2 : 90% rr	
				4	Yes	undertaken in a prospective quality improvement Intervention in PICU only, results is plotted against control in graphs	
				5	Yes		4
3	AbuAlRub	2014	Quantitative non-randomized	1	Yes	To examine the impact of patient safety educational interventions among senior nurses on their perceptions of safety culture, and the rate of reported adverse events, pressure ulcers, and patients' falls.	
				2	Yes	HSPSC (pre- post-) to measure patient safety culture, rates of adverse events , rates of hospital acquired pressure ulcers, rate of patient falls	
				Quality Criteria			
				1	Yes	Clearly defined population inclusion criteria ( Senior nurse with managerial or clinical position, 3 years of nursing diploma, 6 months experience in current workplace, no plans leaving within the next 6 months )	
				2	Yes	component sufficiently intergrated	
				3	No	no mention of response rate or missing values	
				4	No	not mentioned	

				5	Yes	participants in each group were given the option to have a 2-day workshop or a 2-hr session every day for 9 days. All of the groups preferred the 2-day workshop.	3
4	Blegen	2009	Quantitative non-randomized	1	Yes	To improve unit-based safety culture through implementation of a multidisciplinary (pharmacy, nursing, medicine) teamwork and communication intervention	
				2	Yes	The Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture was used to determine the impact of the training with a beforeafter design	
			Quality Criteria				
				1	Yes	All participants who took part in the intervention were surveyed	
				2	Yes	Measurements are the AQHR HSOPS Survey	
				3	Yes	The response rate was 96% before and 81% after.	
				4	No	There is no discussion of possible confounders	
				5	Yes	The intervention was administered as intended.	4
5	Amiri	2018	Quantitative randomized controlled trials	1	Yes	To determine the effect of empowering nurses and supervisors through an educational program on patient safety culture in adult ICUs.	
				2	Yes		
			Quality Criteria				
				1	Yes	Nurse & supervisor, selected based on proportional stratified sampling ( criteria specified) , how RCT performed described in detail	

				2	Yes	Pre post comparison for experimental and control group, also compared between experimental vs control group at same time point 61/80 (76.25%rr) To randomly allocate nurses, a number was assigned to each ICU and categorized into the control and experimental groups, based on permuted block randomization. No information provided on intervention adherence, only stated 3 months post survey	
				3	Yes		
				4	Yes		
				5	CT		4
6	Ansari	2020	Quantitative non-randomized (Prospective Observational Cohort Study)	1	Yes	To evaluate the impact of maternity orientated human factors training program on safety culture in a tertiary maternity unit. Completion of the HSOPS before and after the intervention	
			Quality Criteria	2	Yes		
				1	Yes	All participants who took part in the intervention were surveyed The AQHR HSOPS survey was used pre-post, as well as Kirkpatrick's Training Evaluation and the SBAR.	
				2	Yes		
				3	Yes	The response rate was 93% was given as well as details of how many did not answer the research questions.	

				4	Yes	A confounding factor is that some maternity staff had already received training in human factors. This was limited to three consultant obstetricians and three consultant anaesthetists. A strong confounding factor was the introduction of strong local leadership in human factors, as well as the educational intervention per se. This, however, should be considered as a factor when attempting to reproduce these results.	
				5	Yes	Theoretical and experiential training was administered as intended.	5
7	Basson	2021	Quantitative non-randomized	1	Yes	to improve the safety culture at a Veterans Administration hospital using evidence-based approaches.	
				2	Yes	prepost HSOPSC survey	
			Quality Criteria	1	Yes	Target population clearly listed	
				2	Yes	HSOPSC and SAQ validated	
				3	No	For HSOPSC Time point 1 : 18% RR, Time point 2: 9%. For SAQ Time point 1: 11% rr, 18% rr	
				4	no	Confounding factor was not included during design, only state when in discussion : "Our results may have been diluted by including nonclinical areas such as fiscal, engineering, etc. We included these areas because we feel that everyone contributes to safety culture; however, in retrospect we may have had more specific and measurable impact if we had started smaller and with more focus. "	
				5	Yes	Intervention administered as intended	3

8	Benn	2012	Quantitative non-randomized	1	Yes	To analyse change in a survey measure of organisational patient safety climate and capability (SCC) resulting from participation in the UK Safer Patients Initiative and (2) To investigate the role of a range of programme and contextual factors in predicting change in SCC scores Organisational patient safety climate and capability (SCC) score (31 item) .
				2	Yes	
				Quality Criteria		
				1	Yes	Due to the organic nature of development of the programme at each participating site, prespecification of individuals for inclusion was not possible. Instead, sampling was stratified according to criteria defined by the researchers to include representation of the full multi-disciplinary programme team at each site, including the subprogramme leads and the broader network of healthcare professionals, clinicians, nurses and health service managers involved in local implementation.
				2	Yes	SCC scale developed and tested prior. A further scale quantified a series of 14 local programme implementation factors in terms of the degree of positive or negative impact in the initial structured phase of the SPI. ( in Table 2). high reliability ( Cronbach's alpha =0.952)
				3	No	incomplete, dropout rate 55%

				4	Yes	The statistical design used controls for potential confounding factors for each hypothesis through prior entry of covariates, but this type of analysis is sensitive to the order of entry of sets of variables, which in turn is influenced by the researcher's ability to construct an unambiguous underpinning model that specifies temporal or causal priority	
				5	Yes	Administered as intended	4
9	Berry	2020	Quantitative non-randomized	1	Yes	To document an association between improved safety and teamwork culture and decreased patient harm across an entire hospital system and across multiple harm types.	
				2	Yes	The Safety Attitudes Questionnaire was used, in conjunction with hospital data on safety event reporting.	
			Quality Criteria	1	Yes	The survey was administered to all employees, the full population	
				2	Yes	Yes, the safety and teamwork climate surveys are used next to hospital data on errors and reporting.	
				3	Yes	Response rates were 74%, 80% and 90% respectively. No details of missing values are provided but full n are given in all reporting.	
				4	No	No confounders are discussed	
				5	Yes	The Zero Hero Patient Safety/High-Reliability Program is administered as intended and fully described.	4



11	Chera	2014	Quantitative descriptive	1	Yes	To quantify the impact of several operational efficiency and safety initiatives on prospectively collected, clinically meaningful, metrics. Data from 5 QI projects as well as from the AQHR HSOPS survey.				
				Quality Criteria				2	Yes	
								1	Yes	Sampling strategy is relevant to address the research question
								2	Yes	Sample is representative of target population
								3	CT	Measurements are appropriate but not comprehensive
								4	Yes	Risk of nonresponse bias is acceptable
			5	Yes	Statistical analysis is appropriate to answer the research question	4				
12	Dickens	2020	Quantitative non-randomized	1	Yes	To evaluate whether a two-part culture				
				Quality Criteria		2		Yes	Pre-test and post-test study was conducted to evaluate change associated with a mandated intervention aimed at culture change	
						1		Yes	Target population clearly listed	
						2		Yes	SAQ-SF subscales clearly measured	
						3		No	Under half (46.1% and 35%) of participants contributed to almost all measures	
						4		No	There is no discussion of possible confounders	
			5	Yes	Nurse leader culture programme and a workplace culture programme administered as intended	3				
13	Ginsburg	2005	Quantitative non-randomized	1	Yes	To design a training intervention and then test its				
				Quality Criteria		2		Yes	survey	

				1	Yes	Individual nurse clinical leaders	
				2	Yes	previously validated by the authors but not used	
				3	Yes	83% Baseline RR ,72% follow up RR	
				4	No	No mention of confounders	
				5	Yes	Intervention administered as intended	4
14	Gupta	2014	Quantitative non-randomized	1	Yes	To implement an evidence based teamwork system to improve communication and teamwork and to assess teamwork and safety climate before and after implementation	
				2	Yes	A pre- post- administration of the Safety Attitudes Questionnaire.	
			Quality Criteria				
				1	Yes	Participants included all staff in the unit, and the intervention and survey targeted a representative sample.	
				2	Yes	The SAQ is used	
				3	Yes	46 individuals (71.9%) completed surveys before implementation and 63 individuals (98.4%) filled out surveys after implementation. Both administrations received the minimum response rate of 60%. There is no report of missing data.	
				4	No	No confounders are accounted for	
				5	Yes	Sufficient details are provided about the planning of the intervention and it did go according to plan	4
15	Habahbeh	2019	Quantitative non-randomized	1	Yes	To evaluate the effect of a surgical safety educational programme on the attitudes of nurses to patient safety in operating rooms (OR)	

				2	Yes	An interventional one-group pre-/post-test design, which sought to measure changes in OR nurses' attitudes toward patient safety culture.	
				Quality Criteria			
				1	Yes	Simple random sampling, a full account of procedures is provided by the authors	
				2	Yes	The Safety Attitudes Questionnaire is used	
				3	Yes	Full response rate details are provided.	
				4	No	There was no discussion of possible confounders	
				5	Yes	Full details are provided of the design and administration of the intervention.	4
16	Hinde	2016	Quantitative non-randomized	1	Yes	To assess the impact of interprofessional point of care simulation on the safety culture of operating theatres.	
				2	Yes	Pre post SAQ ( before each simulation scenario and after 6-12 months )	
				Quality Criteria			
				1	Yes	Demographic % reported	
				2	Yes	Pre post to assess impact of interprofessional in situ simulation on safety and teamwork climate change	
				3	No	64% follow up rate ( 46/72) ( sample small)	
				4	No	no mention of confounders	
				5	No	no mention on how they did the intervention	2
17	Kristensen	2016	Quantitative non-randomized	1	Yes	To investigate staff's perceptions of patient safety culture in a Danish psychiatric department before	
				2	Yes	Pre post SAQ	
				Quality Criteria			
				1	Yes	clearly listed in table 1	
				2	Yes	Pre- post- to investigate staff's perception of PSC	
				3	Yes	>75% RR in both Pre and post survey	

				4	Yes	In practice, a group of staff is dynamic over time; staff are leaving and coming, and it cannot be ruled out that staff attitudes are related to the status of employment and choice of participation, for example, leavers and dropouts might be more negative in their perception than the stable group of staff. Likewise, laggards and newcomers might have safety culture perceptions different from the stable group. The unique personal identifier applied in this study allowed us to describe and compare SAQ-DK mean scores for the five subgroups aforementioned.	
				5	Yes		administered as intended
18	Kousmanen	2019	Quantitative non-randomized	1	Yes	intervention, more specifically, the used to evaluate patient safety culture at two	
				2	Yes		
				Quality Criteria			
				1	Yes	the demography of the sample was accounted for.	
				2	Yes	tool	
				3	Yes	test.	
				4	No	factors	
				5	CT	the intervention. However detailed reference to	3
19	Kuy	2017	Quantitative non-randomized	1	Yes	To describe implementation of CRM in a Veterans Affair (VA) surgical service. To assess whether staff CRM training is related to improvement in staff perception of a safety climate.	
				2	Yes	Safety Climate questionnaire Pre during post to compare effect of intervention	
				Quality Criteria			

				1	Yes	Clearly stated in Figure 2	
				2	Yes	Safety Climate questionnaire used	
				3	No	68% rr in base line, 38% rr in 6 month, 33% rr in 12 month ( Small sample size of 88)	
				4	No	No mention of confounders	
				5	Yes	Administered as intended	3
20	Ling	2016	Quantitative non-randomized	1	Yes	To assess the impact of a standardized patient safety course on health care worker patient safety culture.	
				2	Yes	AQHR HSOPS was administered before and after the intervention	
			Quality Criteria				
				1	Yes	The majority of participants took part in the survey and are represented according to cadre.	
				2	Yes	The AQHR HSOPS was used.	
				3	Yes	Response rate was 74.8%, no account of missing values are provided but the response n is provided.	
				4	Yes	Confounding factors are accounted for in the analysis and interpretation. The authors posit that senior staff signaling the importance of patient safety culture may have influenced the effect of the intervention.	
				5	Yes	There is substantial detail on how the intervention was implemented, and it's content was administered as intended.	5
21	Lopez-Jeng	2020	Quantitative non-randomized	1	Yes	internal assessment of falls and safety issues and patient safety culture but can be used to conduct	
				2	Yes		
			Quality Criteria				
				1	Yes	Clearly listed in table 1	
				2	Yes	Pre post HSOPSC used	

				3	No	small population)	
				4	Yes	implement a new data reporting system for falls	
				5	No	information for the education session	3
22	Lozito	2018	Quantitative non-randomized	1	Yes	To improve the culture of safety in our perioperative department by implementing the Good Catch Campaign	
				2	Yes	Pre post AHRQ HSOPSC administered	
			Quality Criteria	1	Yes	Participants clearly listed	
				2	Yes	Pre post HSOPSC used	
				3	Yes	Pre: (Time 1 n= 58, Time 2 n=35), Post n= 71 (increase respondents)	
				4	No	No confounders discussed	
				5	Yes	Intervention administered as intended	4
23	Mazur	2015	Quantitative non-randomized	1	Yes	To present our approach and results from our quality and safety program and to report their possible impact on our culture of patient safety. Uses the HSOPS although the wording is altered from the original scale.	
				2	Yes	There is no information on the number of participants or the full population for the AQHR. The authors present details for the good catch counting, but they don't provide details for the pre- post- measure.	
			Quality Criteria	1	No	The AQHR HSOPS is used, adjusted to local context. Reporting counts 'good catches' are also captured and documented.	
				2	Yes		
				3	CT	There is no detail on a response rate. Table 4 suggests participants were 20, 20 and 42 across three years but there is no sense of the extent to which this can represent the full population.	

				4	No	No confounders are discussed.	
				5	Yes	The intervention is administered as intended. There is sufficient detail on the intervention.	2
24	Milton	2020	Quantitative non-randomized	1	Yes	To evaluate the effect of organizational changes to interprofessional team assessment processes on staff perception of teamwork and safety attitudes in the ED.	
				2	Yes	Pre post SAQ administered to measure ED staff perception of patient safety related domains	
			Quality Criteria	1	Yes	Population clearly listed in table 3	
				2	Yes	Pre post SAQ used	
				3	No	Time point 1: 40% RR, time point 2: 45% rr (sample size 112 and 121), low response rate for a small sample ****yes no may change depending on final cut off point ****	
				4	No	No confounder mentioned	
				5	Yes	Intervention administered as intended	3
25	Profit	2014	Quantitative non-randomized	1	Yes	To evaluate the association between WR feedback, patient safety culture and caregiver burnout. We hypothesised that the WR feedback was positively associated with safety culture domains and negatively associated with caregiver burnout.	
				2	Yes	A survey to investigate safety culture and workforce engagement using existing validated metrics from multiple instruments: The SAQ, the HSOPSC, and the Maslach Burnout Inventory.	
			Quality Criteria				

				1	Yes	The participants are representative of the target population	
				2	Yes	The authors use three survey instruments to measure the outcomes and they are appropriate to the outcome and the intervention.	
				3	Yes	The response rate was 62.9%, with a high n, no account of missing data but sufficient detail on all of the participants.	
				4	Yes	The authors note that it is possible that effects from unobserved confounding variables, such as significant disruptions of the work environment, such as leadership changes, may have influenced our findings.	
				5	Yes	The intervention is administered as intended. Substantial detail is provided;	5
26	Razzani	2020	Quantitative descriptive	1	Yes	principles on nurses' perception of patient safety	
				2	Yes	Data collected suggests education on ethical principles exerts a positive effect on nurses' perception of patient safety culture	
			Quality Criteria	1	Yes	The study population included nurses working in	
				2	Yes	There is a match between respondents and target population	
				3	Yes	Measurements are appropriate for what is being collected (Demographics questionnaire and HSOPSC)	
				4	No	No full population is available and therefore impossible to eliminate nonresponse bias	
				5	No	Descriptive analysis. No mention of whether change is related to intervention.	3
27	Reszel	2019	Mixed methods	1	Yes	participant knowledge, organizational culture, and	



				2	Yes	54-item 'Culture Assessment Survey' was used as well as a 14-question semi-structured interview guide was used to gather in-depth information about interprofessional team experiences with the MORE program	
				Quality Criteria			
				1	Yes	Simultaneous data collection and subsequent analysis and integration of data from quantitative (i.e., surveys) and qualitative (i.e., semi-structured interviews) sources allowed them to compare and corroborate findings from different data sources	
				2	Yes	Different components of the study are effectively integrated to answer the research question The use of a mixed-methods approach is acknowledged as an important strength of this study. Data was used from two surveys, carried out at four time points as participants progressed through the MORE program to more accurately interpret the impact of the program on	
				3	Yes	outcomes	
				4	Yes	There is no divergence	
				5	Yes	The quality of both components are high	5
28	Slater	2012	Mixed Methods	1	Yes	To evaluate an innovative multiprofessional, team-based training program that embeds patient safety within quality improvement methods.	
				2	Yes	The data collected is through evaluation, validated surveys and interviews.	
				Quality Criteria			

						<p>The authors sought to collect data for all levels of Kirkpatrick's Return on Investment Model. The evaluation was based on the return on investment (ROI) model developed by Donald Kirkpatrick, which is specifically designed for evaluating educational interventions. We did not collect data on the costs of delivering the program or the financial savings associated with the program, and therefore no financial return is calculated here. We did, however, seek to provide some evidence for each of the levels (1–4) of the model and this approach is consistent with the conceptual model for assessing continuing medical education proposed by Moore.</p>	
				1	Yes		
				2	Yes	The evaluation, the knowledge assessment, the AQHR, the outcome measures and the interview data were all integrated to fully answer the research question.	
				3	Yes	The outputs are integrated in the presentation of findings and the discussion	
				4	Yes	Divergences and inconsistencies are accounted for in the discussion	
				5	Yes	There is sufficient detail on design and analysis regarding the separate components of the study	5
29	Tetuan	2017	Quantitative non-randomized	1	Yes	To identify nurse workarounds during medication administration, to assess changes in the rates of medication events and workarounds after STEP, to assess changes in systems thinking and safety culture after STEP, and to correlate safety culture and systems thinking.	

	2	Yes	SAQ for nurses' perception of safety culture , System thinking scale for testing ability to recognise , understand, synthesize interaction and interdependencies in a set of components designed for a specific purpose. Observation of workarounds and medication error. a pre-post comparison with a STEP intervention (including medication huddles) and organization-wide monthly education for 1 year. They used observation reports as well.
	Quality Criteria		
	1	Yes	population clearly listed in table 1
	2	Yes	SAQ for nurses' perception of safety culture , System thinking scale for testing ability to recognise , understand, synthesize interaction and interdependencies in a set of components designed for a specific purpose. Observation of workarounds and medication error. a pre-post comparison with a STEP intervention (including medication huddles) and organization-wide monthly education for 1 year. They used observation reports as well.
	3	No	40% RR in in time 1 and 23% RR in time 2

				4	Yes	<p>confounders considered: a change in the medication safety officer also affected the data sets.</p>
				5	No	<p>Intervention not administered as intended as there were change in electronic reporting system during data collection, resulting researchers to be unable to address this hypothesis " With an increase in perception of safety culture will be a simultaneous increase in voluntary reporting of medication errors. "</p>
30	Timmell	2010	Quantitive non-randomized	1	Yes	<p>To improve patient safety, nurse/physician collaboration, and safety on the unit. An evaluation of the impact of CUSP (1) on safety climate, which describes staff perceptions of the safety norms and behaviors in the workplace, and (2) on teamwork climate in an adult surgical oncology unit, as well as on staff's ability to learn from medical errors.</p>
				2	Yes	<p>The Safety Attitudes Questionnaire was used</p>
			Quality Criteria	1	Yes	<p>Participants were recruited based on their role and to establish representativeness</p>
				2	Yes	<p>SAQ and score of turnover</p>

				3	Yes	60% response rate was recorded, in accordance with the literature. Overall response rates for the SAQ were 89% (25 of 28) in 2006 and 100% (n = 27) in 2007 and 2008 (n = 28).	
				4	Yes	Confounders were considered in the limitations (the analysis) and in the design. The senior hospital executive leads safety and quality improvement initiatives at the Johns Hopkins Hospital, and his credibility may have contributed to the results achieved in W4C, making them less generalizable to other units.	
				5		The intervention was administered as intended.	5
31	Watts	2010	Quantitative non-randomized	1	Yes	We report on an attempt to use the Safety Attitude Questionnaire as an outcome measure for a patient safety implementation project (medical team training (MTT) program). Pre post SAQ for comparison via nonparametric statistical testing	
				2	Yes		
			Quality Criteria	1	No	Population not stated clearly	
				2	Yes	Pre post SAQ used	
				3	No	Population number not stated, only stated 76% RR for Pre test, 50% RR for Post test	

Confounder considered in analysis. It is notable that the SAQ scores did not universally improve. Although we believe this is partially due to the incomplete effectiveness of the MTT program, future work will explore possible limitations in the SAQ as a measure. Although the SAQ overall was a reasonable measure of change in our population, the potential to measure change was not equally realized across the domains. This may be partially due to the baseline (pre-MTT) distributions of several domains including stress recognition and job satisfaction: these domains were significantly skewed to the right, leaving limited possibility for improvement. We saw limited indication of confounding based on the response rates. This was only seen in the stress recognition domain; again, it is notable that this domain was significantly different in only 1 of 63 hospitals. The other domains showed no indication of confounding based on response rate. This was even true when the response rates at a facility were quite low. Despite this, we urge caution in interpreting change in a clinical unit based on limited number of postsurveys or low response rates.

4

Yes

				5	Yes	The intervention is not in this paper, it is in another paper: Dunn EJ, Mills PD, Neily J, Crittenden MD, Carmack AL, Bagian JP. Medical team training: applying crew resource management in the Veterans Health Administration. <i>Jt Comm J Qual Patient Saf.</i> 2007 Jun;33(6):317-25. doi: 10.1016/s1553-7250(07)33036-5. PMID: 17566541. An MTT program based on applied CRM principles was successfully developed and implemented in 43 VA medical centers from September 2003 to May 2007.	3
10	Yuce	2020	Quantitative non-randomized	1	Yes	To examine whether implementation of a comprehensive, multicomponent, statewide surgical quality improvement collaborative is associated with changes in hospital safety culture. SAQ Pre post to measure change in perception of hospital safety culture	
				2	Yes		
			Quality Criteria	1	Yes	Target population clearly listed	
				2	Yes	SAQ validated and widely used to measure patient safety culture	
				3	Yes	43% RR (580/1350) in time 1 , 39% RR (444/1138) in time 2	
				4	No	No confounders in design	
				5	Yes	Implemented as intended	4
32	Zhu	2020	Quantitative non-randomized	1	No	No clear objective, only stated hypothesis	
				2	Yes	The huddle was evaluated with pre/post surveys of nurses and residents, as well as analysis of paging volume and rapid response events	

				Quality Criteria			
				1	No	No count number of Population representative Survey developed to answer thier survey ( Pre post implemented )	
				2	Yes	No response rate given, only have no. of surveys completed ( 121 pre , 155 post )	
				3	No	No mention of confounders	
				4	No		
				5	yes	Intervention implemented as intended	2
33	Edwards	2008	Quantitative non-randomized	1	Yes	To use the Agency for Healthcare Research and Quality staff patient safety survey as a tool to both identify areas in need of improvement and measure the impact of projects initiated to improve patient safety in particular areas.	
				2	Yes	HSOPSC pre- post- used to meausre outcomes of patient safety culture	
				Quality Criteria			
				1	Yes	Population clearly listed in table 2	
				2	Yes	Pre post HSOPSC used	
				3	No	Time point 1 24% RR ( 394 ) , Time point 2 32% RR (428 )	



						<p>Confounder considered within design. In addition, increased communication regarding near-miss events may have created a greater awareness among staff regarding the potential for harm created by these work-arounds. Several steps were taken to address this, including workflow changes and additional work on the SBAR and Transfer of Care Check Sheet initiatives. These initiatives are also anticipated to help improve hospital teamwork across units over time. Another staff survey is planned to gauge the effectiveness of these new interventions.</p>	
				4	Yes		
				5	Yes	intervention administered as intended	4
34	Frankel	2008	Quantitative non-randomized	1	Yes	To evaluate the impact of rigorous WalkRounds on frontline caregiver assessments of safety climate, and to clarify the steps and implementation of rigorous WalkRounds.	
				2	Yes	Pre post SAQ to assess change in patient safety culture	
			Quality Criteria	1	Yes	Population clearly listed in table 2	
				2	Yes	Pre post SAQ used	
				3	Yes	Pre 62% RR ( 790/1265) , Post 60% RR (741/1256)	
				4	Yes	Confounders discussed in limitations: While Walk-Rounds were the most visible effort during this period, the improvements might have been due to a more general temporal trend toward improved safety climate or other patient safety activities	

				5	Yes	Intervention administered as intended	5
35	Hefner	2016	Quantitative Non-Randomised	1	Yes	To examine the impact of a systematic CRM implementation across 8 departments spanning 3 hospitals and 2 campuses.	
				2	Yes	The HSOPS was used to collect pre- and post-measures	
			Quality Criteria				
				1	Yes	Full details are provided for participants and the full population and how they are representative.	
				2	Yes	The HSOPS is used pre- and post- and the measures are appropriate.	
				3	Yes	Response rates varied by department and date sent but on balance averaged at 50%. This was from a total n of approximately 1350.	
				4	No	No confounding factors are mentioned	
				5	Yes	There is sufficient detail and the intervention is administered as intended.	4
36	Jones, F.	2013	Quantitative non-randomized	1	Yes	to determine if teamwork training improved employees' perception of the culture of safety in the emergency department.	
				2	Yes	AHRQ patient safety culture survey	
			Quality Criteria				
				1	Yes	Population clearly listed and accounted for the lack of physicians : The project lacked physician participation in the training sessions. It was difficult for a physician to leave the ED and to attend training while on duty.	
				2	Yes	Pre post AHRQ survey used in both Hospitals	

				3	No	33% RR in pre survey, 22% RR in post survey ( population <100) , 29% of population received training	
				4	No	no confoundings mentioned	
				5	Yes	Intervention administered as intended	3
37	Jones, K.	2013	Quantitative non-randomized	1	Yes	Evaluated the impact of a year-long team training programme on safety culture in 24 hospitals using two theoretical frameworks	
				2	Yes	HSOPS pre post for comparison of patient safety culture change	
			Quality Criteria	1	Yes	Clearly listed population in table 2	
				2	Yes	HSOPS pre post survey used	
				3	Yes	>80% RR	
				4	no	No discussion of confounders	
				5	Yes	Intervention administered as intended	4
38	Paine	2010	Quantitative descriptive	1	Yes	To describe the authors' hospital-wide efforts to improve safety climate at a large academic medical centre.	
				2	Yes	The Safety Attitudes Questionnaire was used	
			Quality Criteria	1	Yes	All staff working more than 50% were invited to take part in the survey	
				2	Yes	All staff were targeted and data was broken down by cadre. The response rates were 77% and 79% respectively.	
				3	Yes	The SAQ is used, and the measures are appropriate.	
				4	Yes	The study was hospital wide, with all invited and a high response rate	

				5	Yes	Descriptive statistics were carried out and expressed as percentages and means, with standard deviations. Paired sample t-tests were assessed to compare scores for each domain and the mean improvement for each domain was calculated across time.	5
39	Patterson	2012	Mixed Methods	1	Yes	To improve patient safety in a paediatric ED by implementing a multidisciplinary, simulation- Methods to sustain improvements included mandatory participation of all new staff in simulation-based training and the introduction of routine in situ simulations	
				2	Yes		
				Quality Criteria			
				1	Yes	Qualitative approach appropriate for research question and problem	
				2	Yes	Justified SAQ validated, pre-/post- + reevaluation design	
				3	Yes	Findings derived from data using Friedman's test, Wilcoxon Signed ranks test with Bonferroni correction	
				4	Yes	The interpretation of results is supported by the data collected	
				5	Yes	Clear links between data sources, collection, analysis and interpretation	5
40	Pronovost	2008	Quantitative non-randomized	1	Yes	To describe the design and lessons learned from implementing a large-scale patient safety collaborative and the impact of an intervention on teamwork climate in intensive care units (ICUs) across the state of Michigan.	
				2	Yes	SAQ used to address research question	
				Quality Criteria			
				1	Yes	Clear description of target population and sample (critical care nurses and respiratory therapists)	

				2	Yes	Validated and reliability tested measures of the intervention and outcome of interest are used post-CUSP (2005) SAQ administrations. Of 72 Acknowledgement of bias and measures taken to minimise it Intervention administered as intended	5
			3	Yes			
			4	Yes			
			5	Yes			
41	Sexton	2011	Quantitative non-randomized	1	Yes	To evaluate the impact of a comprehensive unit-based safety program on safety climate in a large cohort of intensive care units participating in the Keystone intensive care unit project SAQ pre- post- used to evaluate safety program impact	
				2	Yes		
			Quality Criteria				
				1	No	No clear description of target population and of the sample. ICUs broadly involved.	
				2	Yes	Measurements justified and explained 71% response rate pre-intervention (2004) and 73% post-intervention (2006)	
				3	Yes		
				4	Yes	Each ICU functioned as its own control (pre-post)	
				5	Yes	Intervention administered as intended	4
42	Vigorito	2011	Quantitative non-randomized	1	Yes	(1) To examine the impact of a SAQAP on the 2008 SAQ and (2) determine the impact of an SAQAP on ICU CLABSI and VAP rates.	
				2	Yes	Teams that developed SAQAPs improved their unit culture and clinical outcomes. An active, targeted intervention in culture can translate into improved outcomes for patients	
			Quality Criteria				
				1	Yes	Target population clearly listed	
				2	Yes	SAQ validated	
				3	Yes	Response rate of 82-85%	

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	4	No	There is no discussion of possible confounders	
	5	Yes	Survey implemented as intended	4

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