

Research scan:

Does improving safety culture affect patient outcomes?

November 2011

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Health Foundation research scans provide information to help those involved in improving the quality of healthcare understand what research is available on particular topics.

Research scans provide a rapid collation of empirical research about a topic relevant to the Health Foundation's work. Although all of the evidence is sourced and compiled systematically, they are not systematic reviews and they have not been formally peer reviewed.

This research scan was prepared by The Evidence Centre on behalf of the Health Foundation

Key messages

There is an increasing focus on ways to measure and improve safety culture in healthcare. This research scan examines whether improving safety culture has an impact on patient and staff outcomes.

Safety culture and climate

Safety culture refers to the way patient safety is thought about, structured and implemented in an organisation. Safety climate is a subset of this, focused on staff attitudes about patient safety.

In recent years, a great deal of research has explored ways to measure safety culture and safety climate in healthcare. There is a growing emphasis on interventions to improve organisational safety culture and staff attitudes towards safety. It is assumed that improving safety culture will directly or indirectly affect patient outcomes. This research scan examines whether there is any empirical evidence to support this assumption.

The scan describes studies examining the link between safety culture or climate and patient outcomes. Nine bibliographic databases and numerous websites were searched for published and unpublished material available in early August 2011. More than 100 articles were included, 50 of which explicitly examined links between safety culture or climate and outcomes.

Impact on outcomes

Many studies and descriptive articles postulate a link between safety culture and patient outcomes or suggest that there is a need for research in this area. However, little empirical research has actually sought to test this relationship in detail.

The evidence that does exist has mixed findings and is of variable quality. Most research focuses on the hospital context and examines a single time period, sometimes at single institutions.

A small number of studies have found a relationship between safety culture or climate and hospital morbidity, adverse events and readmission rates. But other studies have found that safety culture has no impact on patient outcomes.

There is more evidence that improving safety culture impacts on staff safety behaviours and injury rates among staff.

Some studies have found simultaneous improved safety culture and patient outcomes following improvement initiatives. Therefore rather than a one-way causal relationship, with culture influencing behaviours and clinical outcomes, there may be a circular relationship, with changes in behaviours and outcomes also improving safety culture.

1 Scope

1.1 Purpose

The way an organisation or healthcare team thinks about and implements patient safety processes may have a significant impact on the people using services and the staff providing them.¹

In recent years, a large number of studies have examined tools to measure safety culture²⁻⁶ and there is an increasing focus on developing initiatives to improve safety culture and behaviours.⁷⁻¹³ Underpinning this focus is the assumption that improving the organisational culture surrounding safety will have a direct impact on patient safety and clinical outcomes.

This research scan examines the extent to which this assumption is warranted. It compiles readily available evidence about the link between safety culture and patient outcomes.

The scan addresses the following questions:

- What evidence is available about the link between safety culture or climate and patient outcomes?
- Are there any studies about this link in maternity care?

The scan collates empirical research rather than descriptive material such as historical or contextual articles, narratives or work that is not research based.

All of the evidence has been sourced and compiled systematically, but the scan is not a systematic review and does not seek to summarise every study on this topic. The purpose is to provide a rapid overview of readily available information to help consider the potential for further work in this area.

After providing a brief overview of how ‘safety culture’ and ‘safety climate’ were defined for the purposes of the scan, this section outlines the methods used to collate information. The following sections then address each of the questions of interest in turn.

1.2 What is safety culture?

Organisations and systems are increasingly focused on improving the safety of healthcare processes and techniques. This has led to a greater recognition of the importance of the culture within the organisations and teams making improvements.

There are many conflicting and complex definitions of what constitutes ‘safety culture’. A number of surveys, frameworks and assessment tools have been developed to define and measure this concept.¹⁴⁻²⁶

The terms ‘safety culture’ and ‘safety climate’ are sometimes used interchangeably, but in academic and research literature, the terms tend to be given distinct meanings as follows.

'Safety culture' relates to the extent to which organisations prioritise and support improvements in safety. Organisations with a positive safety culture have communication based on mutual trust, shared perceptions of the importance of safety, confidence in the effectiveness of preventive measures, and support for the workforce. The term first became popular following the Chernobyl nuclear disaster when it was suggested that organisations can reduce accidents and safety incidents by developing a 'positive safety culture'. The notion of safety culture is not unique to healthcare, and has been used extensively in the oil, gas and energy industries, the transport sector, aviation and the military, amongst others.

The term 'safety climate' is sometimes used interchangeably with 'safety culture' but for others it has a specific meaning and is one aspect of safety culture. In this view, safety culture is a broad term representing an organisation's values and actions related to safety, whereas safety climate focuses on staff perceptions about the way in which safety is managed in their organisation.

Some suggest that it is easier to measure safety climate because culture is much broader, whereas climate focuses on staff perceptions of safety in relation to management support, supervision, risk-taking, safety policies and practices, trust and openness.

Thus 'safety culture' could be broadly defined as:

*'a global phenomenon [that] encompasses the norms, values, and basic assumptions of an entire organisation. Climate, on the other hand, is more specific and refers to the employees' perceptions of particular aspects of the organisation's culture.'*²⁷

In this scan, the focus is on both safety culture and climate. These definitions are not used consistently throughout the literature, so for the purposes of this scan we have used the term 'safety culture' to include assessments of both culture and climate - unless individual studies used the term 'safety climate', in which case this is noted.

1.3 Methods

To collate evidence, two reviewers independently searched bibliographic databases, reference lists of identified articles and the websites of relevant agencies for information available as at early August 2011.

The databases included MEDLINE, Ovid, Embase, the Cochrane Library and Controlled Trials Register, PsychLit, Google Scholar, the World Health Organization (WHO) library, Web of Science, Science Direct and the Health Management Information Consortium. All databases were searched from 1990 until August 2011, although all of the substantive material ultimately included was published after 2000.

Search terms included combinations and similes of safety climate, safety culture, safety attitudes, organisational culture, outcomes, impact, behaviour, hospital, primary care, primary healthcare, family practice, community, nursing home, care home and pharmacy.

In addition, since unpublished research was also of interest, websites of about 30 relevant agencies were searched, a general web search was undertaken, a newspaper scan was completed and experts in the field were contacted for additional studies.

To be eligible for inclusion, studies had to be:

- primary research or reviews
- readily available online, in print or from relevant organisations
- available in abstract, journal article, or full report form
- addressing one or more of the core questions listed
- available in English or readily available for translation.

We scanned more than 15,000 pieces of research, selecting the most relevant to summarise here. No formal quality weighting was undertaken within the scan, apart from the selection process outlined above. The focus was on studies of any design that examined potential links between safety culture or climate and outcomes. Findings from more than 100 articles are synthesised, 50 of which explicitly examined relationships between safety culture and patient or staff outcomes.

Data were extracted from all publications using a structured template and studies were grouped according to key questions and outcomes to provide a narrative summary of trends.

2 Impact on patient outcomes

2.1 Hospital settings

We identified 23 studies exploring the link between safety culture and patient outcomes. The majority of research has been conducted in a hospital setting and focuses on safety climate (staff perceptions and attitudes), measured using structured tools at one point in time.

The main outcomes researchers have focused on include hospital readmission rates, length of stay, mortality, complications such as pressure ulcers or falls, general composite adverse events, and medication errors.

Readmission rates

For instance, researchers in the USA examined the relationship between hospital patient safety climate and rates of rehospitalisation within 30 days of discharge. Survey data from 36,375 staff from 67 hospitals were compared with risk standardised hospital readmission rates. Poorer safety climate was associated with higher readmission rates for heart attacks and heart failure. Frontline staff perceptions of safety climate were associated with readmission rates but senior management perceptions were not.²⁸

Length of stay

Other researchers in the USA examined whether safety climate influences patient outcomes in intensive care units. Data from 65,978 patients admitted to 30 intensive care units (ICUs) were analysed and 2,103 staff were surveyed. After adjusting for patient, hospital and ICU characteristics, perceptions about management were associated with hospital mortality and safety climate was associated with length of stay. For every 10% decrease in safety climate, length of stay increased by 15%.²⁹

Mortality

Studies have also examined potential associations with clinical outcomes, but not all have found positive trends. In the USA, 6,083 staff from 52 sites were surveyed and data about safety climate were correlated with surgical outcomes. However, teamwork climate, safety climate, working conditions, recognition of stress effects, job satisfaction, and burnout did not correlate with risk-adjusted morbidity and mortality outcomes. Reported levels of communication and collaboration with attending and resident doctors correlated with risk-adjusted morbidity.³⁰

Complications

Research about complication rates is more likely to find links with safety climate scores. For example, eight hospitals in the USA implemented the WHO surgical safety checklist. Before and after analysis found that the intervention was associated with improved safety attitudes among clinicians. The level of improvement in safety attitudes was correlated to reductions in post-operative complication rates. The authors concluded that the checklist led to improved perception of teamwork and safety climate, which in turn was associated with improvements in post-operative outcomes.³¹

Not all findings are positive. In the USA, safety attitudes were measured among operating theatre staff at 63 Veterans Affairs medical centres before and after taking part in team training. Out of the 63 centres, 26 had improved safety attitudes following training, but there was no correlation between enhanced attitudes and improvements in complication rates and safety outcomes.³²

Researchers in the Netherlands examined whether the type of organisational culture, team climate and preventive pressure ulcer quality management at ward level were related to the prevalence of pressure ulcers. Data from 1,274 patients and 460 healthcare professionals in 37 general hospital wards and 67 nursing home wards were analysed. There were no associations between organisational culture, team climate or quality management and the prevalence of pressure ulcers.³³

Medication errors

The link between aspects of safety climate and medication errors has also been examined. For instance, researchers in the USA investigated the impact of safety climate on nurse and patient outcomes. A survey of staff from a random sample of hospitals found that safety climate predicted medication errors, nurse back injuries, urinary tract infections, patient satisfaction, patient perceptions of nurse responsiveness and nurse satisfaction. Safety climate had more of an effect when a unit was dealing with more complex patient conditions.³⁴

Another study looked at whether safety climate influenced the impact of other variables on outcomes. The joint impacts of safety organising behaviours, leadership (trust in manager) and use of care pathways on reported medication errors was examined by surveying 1,033 nurses and 78 nurse managers in emergency, internal medicine, intensive care, and surgery nursing units from 10 acute hospitals. Medication errors were analysed over a six-month period. The benefits of safety organising behaviours on reported medication errors grew when there were high levels of trust in the manager or when care pathways were used.³⁵ In other words, aspects of the safety climate mediated the impact of specific safety behaviours and initiatives on medication errors.

Researchers in Israel examined safety climate in 21 medical units in a general hospital. The results were cross-validated in 15 units in another hospital. The study examined aspects of safety climate that may mediate or impact upon treatment errors. Perceived suitable safety procedures and frequent and clear information flow reduced treatment errors only when managers prioritised and demonstrated safety within the unit.³⁶ In other words, safety climate perceptions only had an impact on medication errors when there was a positive safety culture.

Adverse events

Some studies examine the incidence of composite 'adverse events' such as mortality, complication rates and medication errors combined. The definition of adverse events differs between studies.

Researchers in the USA examined relationships between the Agency for Healthcare Research and Quality's (AHRQ) Hospital Survey of Patient Safety Culture and rates of hospital complications and adverse events. Data from 179 hospitals were analysed. There was a trend towards better patient safety culture being associated with fewer patient safety incidents. All significant relationships were of moderate size.³⁷

Other researchers in the USA assessed the relationship between hospital safety climate and patient safety performance indicators. Data from 91 hospitals were analysed. Hospitals with better safety climate overall had fewer patient safety incidents. Interestingly, frontline staff perceptions of better safety climate predicted lower risk of experiencing patient safety incidents, but senior manager perceptions did not.³⁸

There are also studies about adverse events within specific hospital departments. Researchers in the USA examined the benefits of team training in operating theatres in a high volume thoracic surgery centre.³⁹ A less functional emotional climate corresponded to more threats to outcome in the sterile surgical environment prior to team training. There was no relationship after training.⁴⁰ This suggests that a component of safety climate may be linked to the risk of adverse events and that safety climate perceptions are amenable to change.

Researchers in Canada investigated contributing factors in predicting adverse events in hospital settings. Data from more than 8,000 admissions to 40 different units in three hospitals were analysed. A more positive culture of patient safety was related to lower incident severity.⁴¹

Other researchers in Canada tested whether nurse work environments influence burnout and, subsequently, patient safety outcomes. This is an example of research that focuses on one component of safety culture. 8,597 hospital nurses were surveyed. Nursing leadership and staffing levels impacted on nurse perceptions and behaviours - and both directly affected patient outcomes. The authors concluded that patient safety outcomes are related to the quality of the work environment and the actions of nursing leaders.⁴²

But not all studies have found positive associations between safety culture or climate and patient outcomes. For instance, researchers examined relationships between safety climate and patient safety incident rates at US Veterans Health Administration hospitals. Safety climate survey data were merged with hospital discharge data. Controlling for organisational-level variables, safety climate was not related to incident rates. However a few individual dimensions of safety climate were associated with specific incident or error rates. As found in other studies, the perceptions of frontline staff were more closely aligned with incident rates than those of senior managers.⁴³

Another example is the Patient Safety Consortium, which included 26 hospitals in California. Hospitals implemented safety initiatives over a two-year period but there was no change in measures of safety climate over this time. Although patient outcomes and processes improved, there was no change in staff perceptions. The authors concluded that cultural change takes time and may not be associated with specific improvements in processes.⁴⁴

Simultaneous improvements

Despite these negative findings, a number of studies suggest that safety culture or climate grows alongside changes in safety behaviours or clinical outcomes following a specific improvement initiative.

Much of the research from the UK falls into this category. For example, investigators in England examined whether exposure to pre-surgery briefings is related to perceptions of safety climate. Operating theatre staff were surveyed in 2003, 2004 and 2006. There was a link between briefing practices and attitudes towards safety.⁴⁵

Another example is the Health Foundation's Safer Patients Initiative, which aimed to support improvements in 24 acute hospital trusts. Interviews and surveys with local participants found that the programme was thought to have simultaneously impacted on culture, strategic priorities, organisational capability and clinical care delivery. Safety climate was thought to be most sensitive to change.⁴⁶

Similar simultaneous improvements in safety culture and outcomes have been found internationally. For instance, researchers in the USA tested the hypothesis that improving patient safety begins at the highest level of the organisation with a transformational leadership style, which in turn creates a culture of safety that is associated with adopting patient safety initiatives, and ultimately with improved outcomes. Data from a survey of over 200 hospitals supported this theory.⁴⁷

Another team in the USA examined the effects of an initiative to improve safety performance and culture in a paediatric radiology department. The programme included error prevention training for all staff, a safety coach, safety awards, communications training, and operational rounds with radiology leaders. There were simultaneous improvements in safety culture and reductions in serious safety events.⁴⁸

Many other studies reinforce the idea that specific safety initiatives can simultaneously impact on processes, safety culture and selected patient outcomes. The important point is that these studies do not show a causal relationship between safety culture and patient outcomes. They suggest that safety culture does not necessarily have to improve first in attempts to enhance processes and outcomes.

2.2 Maternity services

This research scan examined whether there was any evidence of a link between safety culture and patient outcomes in maternity services.

Just one study directly examining this relationship was identified. In the USA an obstetrics service introduced patient safety interventions over a two-year period, including outside expert review, protocol standardisation, a patient safety nurse position and patient safety committee, and training in team skills and foetal heart monitoring interpretation. There were improvements in adverse outcomes and simultaneous improvements in safety climate.⁴⁹ This is an example of a trend in the wider literature, whereby culture and outcomes appear to improve together rather than culture necessarily influencing a change in patient outcomes. No studies were identified examining a direct causal relationship between safety culture and patient outcomes in maternity services.

A number of other studies have focused on safety culture in maternity services, but not explicitly the link between safety culture and patient outcomes. A small number of examples are provided to give a flavour of work in this area.

Some studies have focused on ways to measure safety culture or climate specific to maternity services. For example, researchers in Canada surveyed 143 staff and conducted follow-up interviews to assess patient safety culture change in obstetric units. Six cultural scales emerged: patient safety as everyone's priority; teamwork; valuing individuals; open communication; learning; and empowering individuals. The tool was found to be reliable.⁵⁰

Others have investigated which aspects of safety culture are most relevant in understanding safety behaviours. Staff from eight neonatal intensive care units (ICUs) and one surgical paediatric ICU in the Netherlands were surveyed before an improvement intervention and again one year later. The authors found that a non-punitive approach to error, hospital management support for patient safety, and overall perceptions of safety predict incident reporting behaviour.⁵¹

In another example, researchers in the USA examined when and how clinicians speak up to address safety concerns in two maternity care units. 125 staff were surveyed. A higher perception of harm, respondent role, specialty experience and site predicted the likelihood of speaking up among staff. Doctors and nurses differed in their harm ratings, and harm rating was a predictor of speaking up.⁵²

Other research focuses on the levels of safety culture or climate in maternity services. Researchers in England examined attitudes towards safety and teamwork in a maternity unit with a track record of good clinical performance. There was positive safety culture, teamwork climate and job satisfaction. Male staff had better safety attitudes.⁵³

Another study examined safety culture in the delivery suites of four UK hospitals and described the main mechanisms supporting team situational awareness. Extensive observation found that handover, whiteboard use and a coordinator role were the key processes facilitating team coordination. Safety culture and other contextual factors influenced the use of these processes.⁵⁴

Researchers in Australia examined safety culture in a maternity service at two public hospitals. The safety culture was found to need improvement. There was a perceived lack of leadership at all levels to drive safety, and insufficient infrastructure. Safety culture was not a key priority and was not valued by the organisation.⁵⁵

Similarly, investigators in Egypt examined healthcare workers' attitudes towards patient safety in maternity care. Managers, doctors, nurses, pharmacists and technicians from 35 primary care centres were surveyed. Only 36% of participants viewed the safety climate positively. The authors concluded that the culture penalised staff for errors. There was suppressed error reporting, a lack of communication and infrequent feedback.⁵⁶

There are also examples of research about ways to improve safety culture in maternity services. For instance, a case study in Canada described improving safety at one women's and children's hospital. Safety briefings and leadership walkarounds were used to improve safety culture.⁵⁷

A US study examined the effect of an obstetrics patient safety initiative on staff safety culture. The programme included an obstetrics patient safety nurse, protocols for standardised practice, crew resource management training, oversight by a patient safety committee, 24 hour obstetrics hospitalist services and an anonymous event reporting system. Over a five year period there were significant improvements in the proportion of staff with favourable perceptions of teamwork culture, safety culture, job satisfaction and management.⁵⁸

Researchers in Switzerland examined the effect of crew resource management on teamwork and communication skills in the labour and delivery units of a large hospital. 239 midwives, nurses, doctors and technicians from the departments of anaesthesia, obstetrics and paediatrics took part in training to improve teamwork and communication skills. There were improvements in knowledge of teamwork and shared decision making. One year later there was a positive change in the team and safety climate in the hospital.⁵⁹

These are all examples of work recently undertaken about safety culture in maternity services, but they serve to emphasise that to date, few authors have directly examined the links between improving safety culture and patient outcomes.

2.3 Other settings

We searched for studies about the link between safety culture and patient outcomes across healthcare settings, including hospitals, primary care, community care, nursing homes and pharmacy. While studies measuring safety culture or examining ways to improve safety culture are available in all of these settings, few studies examine the relationship between safety climate and outcomes.

Nursing homes

We identified just one study directly examining the link between safety culture and patient outcomes in a setting outside hospital. Investigators in the USA examined whether certified nursing assistants' perceptions of patient safety culture were correlated with clinical outcomes such as rates of falls, pressure ulcers and daily restraint use in a random sample of 72 nursing homes across five states. 1,579 nursing assistants were surveyed. Good perceptions of safety culture were associated with increased reporting of falls but there was no association with pressure ulcer rates.⁶⁰

2.4 Ongoing research

Many national and international organisations have specific research programmes about patient safety underway. Researchers state that it is a real priority to investigate the link between safety culture and outcomes, but we identified no publicly available records of studies currently underway with this focus. This does not indicate that no such studies are underway, just that records are not readily available. Given the considerable and growing interest in safety culture in recent years, it is likely that researchers are currently investigating this topic to some degree.

Most of the research available is published but there is a notable exception. A PhD thesis in the USA has explicitly examined the link between safety culture and clinical outcomes. The author concluded that certain aspects of safety culture are more likely to have an impact than others. Hospital management and supervisor support was found to lead to improved perceptions of safety, but the link with incidents and incident reporting was more difficult to determine. There was some indication that positive safety culture may be associated with an *increased* rate of medication incidents, but this may be because a positive safety culture means that staff are more likely to report incidents and therefore error rates appear to rise.⁶¹

2.5 Media attention

Analysis of public news archives suggests that media attention regarding ‘safety culture’ in healthcare has grown since 2005. The term ‘safety culture’ is used explicitly in the press in both the UK and North America. The term ‘safety climate’ is not commonly used in the media with regards to health.

There have been stories postulating a link between safety culture and healthcare processes,⁶²⁻⁶⁴ errors,⁶⁵⁻⁶⁹ morbidity⁷⁰ and fatalities.⁷¹ As just one example to provide a flavour, there have been reports in *The Times* about how one in ten prescriptions written in hospital may contain an error, and this has been linked to a general lack of safety culture in the NHS.⁷²

Stories about maternity units have also mentioned the concept of safety culture as one aspect in need of improvement.⁷³⁻⁷⁵

But most of the media reports available are opinion pieces or describe the outcomes of specific research reports.⁷⁶

In the health press, there have been stories comparing the safety culture in healthcare to the culture and outcomes of other industries such as aviation,⁷⁷⁻⁷⁹ and stories about ways to measure^{80,81} or build safety culture.⁸²⁻⁸⁸ Like many research reports, these media stories assume a link between safety culture and patient outcomes, but do not tend to question or explore this in any detail.

3 Impact on staff outcomes

Our search strategy focused on the relationship between safety culture and patient outcomes. However, during the literature search it became evident that there is a growing evidence base about the link between safety culture and outcomes for healthcare staff. Here we briefly summarise 27 relevant studies to give a flavour of emerging findings.

Research suggests that improving safety culture may directly impact on two specific staff outcomes: staff injury rates and safety behaviours among staff which may in turn have follow-on impacts for staff and patient safety.

3.1 Staff behaviour

Behaviours to improve safety

A number of studies have found a positive link between safety culture and the safety behaviours of staff. For instance, an organisation in the USA found that strengthening safety culture improved how healthcare workers handle hazardous drugs and substances.⁸⁹

Researchers in Taiwan examined how organisational culture may influence patient safety behaviour in hospital. 788 staff from 42 hospitals were surveyed. Patient safety culture had a positive impact on patient safety behaviour among staff. The authors concluded that the safety behaviours of hospital staff are partly influenced by the prevailing cultural norms in their organisations and work groups.⁹⁰

Other researchers in China examined the relationship between safety climate, perceived colleagues' safety knowledge and behaviour, and an individual's own safety behaviours and performance. Safety climate and perceived knowledge and behaviour of colleagues both impacted on safety behaviour. The more positive the safety climate, the stronger the effect of perceptions about colleagues was on people's own safety behaviour.⁹¹

In Norway, almost 2,000 safety climate surveys were completed by hospital workers and a similar number were completed at a large petroleum company. There were common safety climate factors across the industries. The most significant variables involved organisational management support for safety and manager expectations and actions promoting safety. These attributes indirectly enhanced safety behaviour and teamwork within units as well as learning, feedback and improvement.⁹²

Specific components of safety culture such as information and awareness may also have links to staff outcomes and behaviours. Researchers in the USA found that teaching medical students about patient safety makes them more likely to intervene in clinical encounters to avoid patient errors.⁹³

Investigators in Australia examined the factors that influence patient safety behaviours by nurses, doctors and allied health professionals. 5,294 clinical and managerial staff were surveyed. A belief that engaging in behaviours will lead to improved patient safety and perceptions about the patient safety-related behaviours of one's colleagues influenced safety behaviour across all professional groups.⁹⁴

Most of these studies suggest a link between safety culture or climate and healthcare workers' safety behaviours. However, this link may not be as straightforward as it first appears.

Researchers in the Netherlands examined if 11 dimensions of safety culture were linked to whether seven organisational patient safety initiatives were implemented in 33 A&E departments. Several dimensions of safety culture were negatively or positively associated with the implementation of safety initiatives. A culture in which hospital handoffs and transitions were perceived as adequate was related to less frequent implementation of four of the seven initiatives, whereas a culture with well-perceived hospital management support for patient safety predicted more frequent implementation of four of seven organisational patient safety defences. The authors concluded that the link between patient safety culture and outcomes is not straightforward. Good safety culture might inhibit improvements because there is not a sense of urgency. On the other hand, good safety culture might ensure leadership support for change.⁹⁵

Studies have attempted to examine the mechanisms behind the relationship between safety culture and staff behaviours in more detail. A meta analysis found that psychological climate, especially the perception of organisational attributes, was associated with safety climate. The relationship between safety climate and safety behaviour was partially mediated by organisational commitment and job satisfaction. The relationship between safety climate and occupational accidents was partially mediated by both safety behaviour and general health.⁹⁶

Error reporting

Another key focus of research interest is the relationship between safety culture and the reporting of errors by healthcare staff.

Researchers in Lebanon examined the association between patient safety culture predictors and outcomes. 6,807 staff from 68 hospitals were surveyed. There was a relationship between aspects of safety culture and the number of adverse events reported. Event reporting, communication, patient safety leadership and management, staffing, and accreditation were predictors of positive patient safety culture.⁹⁷

Investigators in Hungary assessed the attitudes of surgical teams at three hospitals regarding committing errors, the impact of errors and safety culture. Safety attitudes were influenced by the work environment. Many staff felt unable to express disagreement and had difficulty raising safety concerns. Staffing levels, the availability of equipment, production pressures, and hectic schedules were concerns. The authors suggest that safety attitudes among team members may impact on their performance and reporting of errors.⁹⁸

Researchers in Israel examined the influence of safety climate on hospital employees' willingness to report errors. 632 staff from across 44 internal medicine, surgery and intensive care departments in three hospitals were surveyed. Three aspects of safety climate were measured: the way employees perceived safety procedures, the safety information flow within departments, and the relative priorities given to safety in the department. The more that staff perceived procedures as suitable and safety information as available, the more willing they were to report treatment errors. The authors concluded that hospitals should take into account the perceptions of personnel regarding safety procedures and information. These perceptions operate differently in various department types.⁹⁹

A review of the impact of incident reporting in critical care found that several factors increase the reporting rate: anonymity, regular feedback about the errors reported, and the existence of a safety climate.¹⁰⁰

Researchers in Canada examined the relationships between leadership, interactional justice, quality of the nursing work environment, safety climate, and patient and nurse safety outcomes. 600 nurses were surveyed. Resonant leadership and interactional justice influenced the quality of the leader-nurse relationship, which in turn affected the quality of the work environment and safety climate. This was associated with decreased reported medication errors, intention to leave and emotional exhaustion. The authors concluded that relationships based on fairness and empathy play an important role in creating positive safety climates, which then influence errors and retention.¹⁰¹

Most of the available evidence suggests a link between safety culture and error reporting. But there are also less positive findings. A team in Korea examined the impact of strategies to improve reporting of errors on nurses' attitudes to reporting errors, patient safety culture, intention to report and reporting rate in hospital nurses. A training programme improved attitudes towards reporting errors and reporting rate, but there was no difference in safety culture.¹⁰² This reinforces findings from other studies which suggest that improvements in processes and outcomes are possible without changes in safety culture.

Turnover

There is some evidence of links between safety culture and staff retention and turnover. One review examined relationships between organisational climate and patient and employee outcomes. 20 studies published between 1995 and June 2007 were included. Most examined hospital nurses. The review focused on generic organisational climate rather than safety climate, but a number of the included studies examined safety issues. Perceptions of processes such as collaboration and autonomy were associated with nurse outcomes, including job satisfaction, turnover and occupational safety. There was some evidence that aspects of organisational climate were associated with patient outcomes, but the results were mixed.¹⁰³

The Comprehensive Unit-based Safety Program (CUSP) has been tested in intensive care units and a surgical unit in the USA. Staff implemented several interventions to reduce safety hazards and improve culture. Before and after analysis found simultaneous improvements in safety climate, teamwork climate and nurse turnover.¹⁰⁴ Again, this is an example of correlations between improved safety climate and other outcomes, rather than a unidirectional causal relationship.

3.2 Injury rates

A number of studies have examined whether safety culture impacts on staff injury rates. In literature about injuries among health professionals, the term 'organisational climate' is sometimes used as a simile for safety culture or climate, especially among studies more than five years old.

One systematic review of 14 studies examined the impact of organisational climate on occupational health outcomes among hospital nurses. Most studies were cross-sectional in design and there was significant variation in definitions between studies. However, all studies found significant associations between specific aspects of hospital organisational climate and adverse staff health impacts such as blood/body fluid exposures, musculoskeletal disorders and burnout.¹⁰⁵

Investigators in the USA examined the effects of staffing levels and organisational climate on the likelihood of needlestick injuries in hospital nurses. Data were collected from 20 hospitals. Nurses from units with low staffing and poor organisational climates were about twice as likely as nurses on well-staffed and better organised units to report risk factors, needlestick injuries and near misses.¹⁰⁶

Another study surveyed 2,287 nurses in 22 US hospitals. Poor organisational climate and high workloads were associated with 50% to 200% increases in the likelihood of needlestick injuries and near misses among hospital nurses.¹⁰⁷

Other researchers in the USA examined the impact of safety climate and other variables on nurse back injuries and needlestick injuries. Data from 281 medical-surgical units in 143 acute hospitals were analysed. Safety climate moderated the relationship between work engagement and conditions on injuries. The authors concluded that positive work engagement and work conditions contribute to enhanced safety climate and can reduce nurse injuries.¹⁰⁸

Researchers in Japan examined the link between safety climate and needlestick injuries among hospital nurses. Various aspects of safety climate were associated with a reduced risk of needlestick injury, such as being involved in health and safety matters and being properly trained in risk control procedures. Nurses working in departments where health and safety information was readily available were more likely to report any injuries they sustained.¹⁰⁹

In Costa Rica, a survey of 1,000 hospital workers found that the safety climate was poor. The two most significant predictors of safety climate were training and administrative support for safety. Safety climate predicted workplace injuries and safety practices.¹¹⁰

Most of these studies are correlational, which means they show that positive safety climate is linked to fewer injuries at one point in time. But this does not necessarily mean that better safety climate led to a reduction in injuries. A case study at one hospital in the USA aimed to test causal relationships. A programme designed to improve safety culture was associated with reduced injury claims, lost time injuries and needlestick injuries over a one-year period.¹¹¹

Similarly, researchers in Australia measured perceptions of safety climate, motivation and behaviour at two time points and examined relationships with hospital staff accident levels over a five-year period. Safety climate predicted changes in individual safety motivation, which in turn was associated with subsequent changes in self-reported safety behaviour and accidents.¹¹²

But there are some caveats. For instance, one study across various industries suggested that the link between safety climate and staff injuries may be related to other contextual factors. Analysts in the USA compared the relationship between safety climate and injury rates using data from 33 companies. Company safety climate was associated with injury rates. However, this relationship no longer existed after controlling for the hazardousness of the specific industry.¹¹³

A meta analysis examined the relationship between safety climate, safety performance (participation and compliance), and occupational accidents and injuries across various industries. Safety climate was linked to employee safety compliance and participation. However, there were weak subsequent links to accident involvement. Only prospective study designs, where accidents were measured following the assessment of safety climate, found relationships.¹¹⁴

Another meta analysis examined relationships between safety climate and injuries across various sectors. Injuries were more predictive of organisational safety climate than safety climate was predictive of injuries. Perceived management commitment to safety was the most robust predictor of occupational injuries.¹¹⁵

4 Summary

4.1 Key points

A number of studies have found links between safety culture and outcomes in other industries such as manufacturing, retail and transport. However, the relationship appears to be less straightforward in healthcare.¹¹⁶

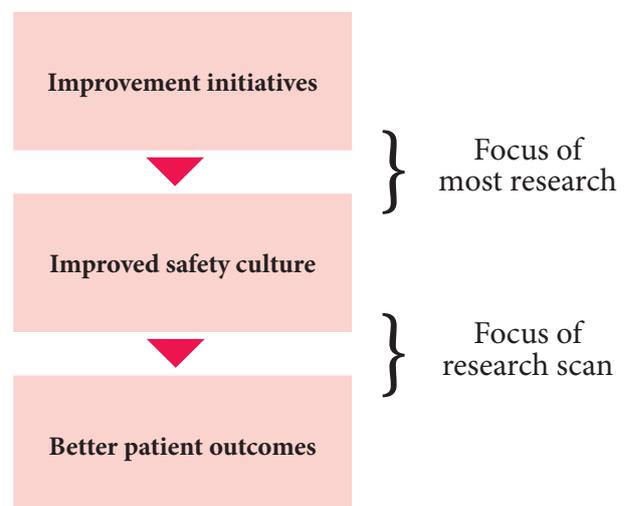
Of the 23 studies that explicitly explored links between safety culture or climate and patient outcomes included in this scan, 10 found a link (43%), six found no relationship (26%) and seven found a potential indirect or simultaneous link (such as when safety culture and patient outcomes improve together as a result of an intervention, 31%). Table 1, on page 19, summarises the key findings from these studies.

Of the 27 studies that explicitly explored links between safety culture or climate and staff outcomes included in this scan, 18 found a relationship (67%), one found no relationship (3%) and eight found complex interlinkages (30%). Table 2, on page 20, summarises the key findings from these studies.

Thus there is some evidence that safety culture impacts on staff outcomes, but less evidence of an impact on patient outcomes, at least not a straightforward link.

Figure 1 illustrates the linear relationship that is often assumed between safety culture and patient outcomes.

Figure 1: Simplistic model of culture and outcomes relationship



The research scan found limited evidence to support this assumed simplistic relationship.

Safety culture or climate surveys are sometimes used as the ‘outcome’ to measure changes from initiatives to improve safety. So the top part of the relationship in Figure 1 is measured (the impact of improvement initiatives on safety culture) and an impact on patient outcomes is merely assumed. This research scan examined the bottom part of the diagram – whether there is a relationship between safety climate and outcomes. The evidence here is mixed. There are almost as many studies suggesting no relationship as those that do suggest a link.

However, there are an increasing number of studies which suggest that safety climate has improved simultaneously with patient outcomes or process measures following an intervention. These studies do not mean there is a causal relationship. In fact, some argue that changes in processes and outcomes need to come first and will then be followed by changes in culture.

Whatever the case, the current evidence does not suggest that a change in safety culture is a necessary precursor for changes in outcomes. It is more likely that there is a complex interrelationship, with changes to processes and patient outcomes having an impact on the way staff think about safety. Thus there is likely to be a two-way relationship between safety culture and patient and staff outcomes, rather than a linear or one-way causal link (see Figure 2).

Figure 2: Reciprocal relationship between culture and outcomes

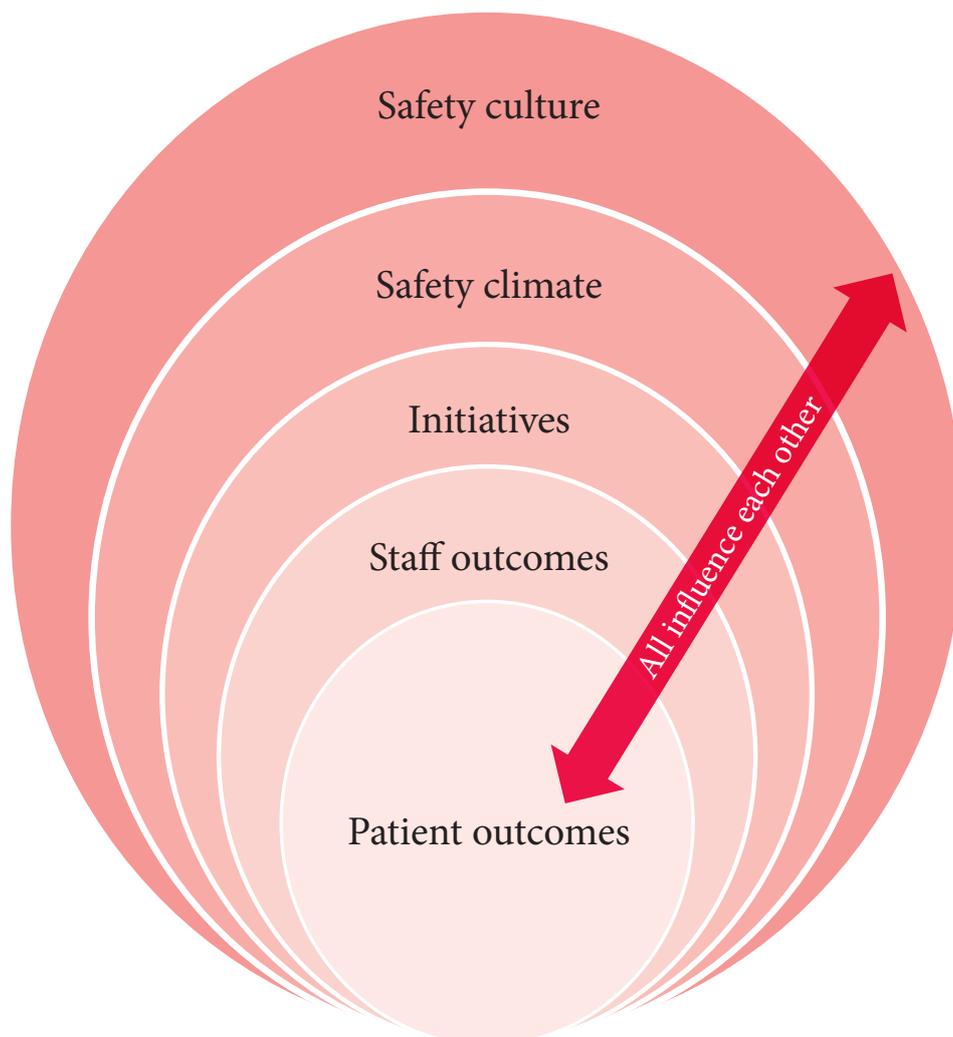


Table 1: Link between safety culture and climate and patient outcomes

Outcome	Studies	Key findings	Relationship
Safety culture			
Adverse events and medication errors	<ul style="list-style-type: none"> • 3 cross-sectional correlation studies from the USA, Canada and Israel • 1 before and after study from the USA 	Better safety culture was associated with fewer adverse events. Safety initiatives also simultaneously improved safety culture and patient outcomes	Positive link
Safety climate			
Readmissions	<ul style="list-style-type: none"> • 1 cross-sectional correlation study from the USA 	Poor safety climate was associated with increased readmissions for heart attacks and heart failure	Positive link
Length of stay	<ul style="list-style-type: none"> • 1 cross-sectional correlation study from the USA 	Reductions in safety climate were associated with increased length of stay	Positive link
Mortality	<ul style="list-style-type: none"> • 1 cross-sectional correlation study from the USA 	Safety climate was not associated with mortality in surgery patients	No link
Complications	<ul style="list-style-type: none"> • 3 before and after studies from the USA • 1 cross-sectional correlation study from the Netherlands 	Improved safety climate was associated with reduced surgical complications in one study but not another. There was no link between safety climate and pressure ulcer rates	Mixed findings
Medication errors	<ul style="list-style-type: none"> • 2 cross-sectional correlation studies from the USA 	Safety climate influenced medication errors and the impact of safety initiatives on medication errors	Positive indirect link
Composite adverse events	<ul style="list-style-type: none"> • 3 cross-sectional correlation studies from the USA and Canada • 4 before and after studies from the USA 	Better safety climate was associated with fewer adverse events or less serious adverse events, but there were conflicting findings. Safety initiatives simultaneously improved safety climate and patient outcomes	Mixed findings
Improved processes and generic outcomes	<ul style="list-style-type: none"> • 1 before and after study from the UK • 2 cross-sectional correlation studies from the UK and USA 	Safety improvement initiatives were associated with enhanced processes, outcomes and safety climate, but safety climate improvements happened simultaneously rather than necessarily causing positive change	Indirect link

Table 2: Link between safety culture and climate and staff outcomes

Outcome	Studies	Key findings	Relationship
Safety culture			
Safety behaviours	<ul style="list-style-type: none"> • 1 before and after study from the USA • 3 cross-sectional correlation studies from China, the Netherlands and USA 	Safety culture impacted on staff safety behaviours, but the link may not be straightforward. Positive safety culture may inhibit as well as motivate safety behaviours	Positive link
Error reporting	<ul style="list-style-type: none"> • 2 cross-sectional correlation studies from Hungary and Lebanon • 1 before and after study from Korea 	Positive safety culture was associated with increased willingness among staff to report errors, but there were complexities	Mixed findings
Injury rates	<ul style="list-style-type: none"> • 1 before and after study from the USA 	Improving safety climate reduced nurse injuries	Positive link
Safety climate			
Safety behaviours	<ul style="list-style-type: none"> • 3 cross-sectional correlation studies from Australia, China and Norway • 1 meta analysis 	Safety culture impacted on staff safety behaviours, but there may be complex relationships involved	Positive link
Error reporting	<ul style="list-style-type: none"> • 2 cross-sectional correlation studies from Canada and Israel • 1 literature review 	Positive safety climate was associated with increased willingness to report errors	Positive link
Staff turnover	<ul style="list-style-type: none"> • 1 literature review • 1 before and after study from the USA 	Safety climate was associated with reduced nurse turnover, but the relationship is not necessarily causal	Indirect link
Injury rates	<ul style="list-style-type: none"> • 1 literature review • 2 meta analyses • 6 cross-sectional correlation studies from Costa Rica, Japan and the USA • 1 before and after study from Australia 	Better safety climate was associated with reduced staff injury rates, although there are some caveats	Positive link

4.2 Caveats

When interpreting the findings it is important to bear in mind several caveats. First, the research scan is not exhaustive. It presents examples of available research but does not purport to represent every study.

Although there are numerous studies about safety culture that may have found links with patient outcomes, the search strategy focused on studies that set out to test this relationship. Studies that may have indirectly found a link were included if identified, but were not the focus of the search.

Conclusions about the link between safety culture and outcomes are problematic because there is a real paucity of research in this area. A number of descriptive articles put forward theories about the link between safety culture and patient outcomes, but the research scan focused on empirical studies, so narrative material was excluded.

However, just because there is limited research on this topic does not mean that there is no link between safety culture and outcomes, merely that this needs further examination.

Conclusions are difficult given that articles define safety culture and safety climate in various ways, use the terms interchangeably, and do not always give details about how culture was measured. Inadequate measurement of safety culture may also impact on observed changes, or lack of change.

Even when findings are positive, there is an issue with generalisation because most of the research has been undertaken in the USA which has significant differences to the UK healthcare context. A relationship found in a US hospital may not necessarily be replicable in UK primary or secondary care.

Even where comparable definitions are used and geographic contexts can be compared, the level of detail reported is sometimes insufficient to consider the links between safety culture and outcomes. Furthermore, most of the research focuses on a hospital context.

The quality of the included studies is also variable. Most research examines one point in time, sometimes at a single site and with limited sample sizes or unspecified statistical power. Most importantly, the research is correlational so it shows that safety culture and patient outcomes may both be positive, but not that one causes the other. A small number of before and after studies show that actively improving culture is associated with improved patient or staff outcomes, but these are in the minority.

Thus, it cannot be assumed that safety culture influences patient outcomes directly. The relationship is likely to be more complex and non-linear, and definitely in need of further exploration.

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The Health Foundation is an independent charity working to continuously improve the quality of healthcare in the UK.

We want the UK to have a healthcare system of the highest possible quality – safe, effective, person-centred, timely, efficient and equitable. We believe that in order to achieve this, health services need to continually improve the way they work.

We are here to inspire and create the space for people, teams, organisations and systems to make lasting improvements to health services.

Working at every level of the healthcare system, we aim to develop the technical skills, leadership, capacity, knowledge, and the will for change, that are essential for real and lasting improvement.

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