

EVALUATION OF EDUCATION AND TRAINING

INTERVENTIONS FOR PATIENT SAFETY

A report by the Centre for Health Policy at Imperial College London, an academic partner to Health Education England and the Commission on Education and Training for Patient Safety

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FOREWORD

Dear Sir Norman,

Since the tragedies of Mid-Staffordshire, the NHS has exhibited a renewed determination to safeguard patient safety. In this critical window of opportunity, we have the duty to make good on our commitment to deliver safer care – we can do this, in part, by arming our current and future staff, through education and training, with the tools they need to succeed.

As an academic partner to HEE and the Commission on Education and Training for Patient Safety, the project team – composed of members from Imperial College London’s Centre for Health Policy – and I took this opportunity to study the innovations taking place in the four corners of our healthcare system; to listen to the voices of patients, carers, students, and NHS staff; and to absorb the experiences of local and international education experts in patient safety. Our findings suggest that effective education and training for patient safety is realised through efforts on two equally important fronts: designing curricula and training interventions based on what we know to work, and shaping a culture which supports safe learning and care.

Collecting high-quality evidence

The challenge will be manifold, and will be led first and foremost by the need to invest in and gather more high-quality evidence. This is not isolated to education and training, but the fact remains: there is too little high-quality evidence being generated on the effectiveness of the training interventions we deliver. With limited evidence, the Commission and HEE will need to rely on the experiences of frontline staff, patients and carers, as well as students and educators, just as we have for this review.

Curricula and training interventions

We set out to listen to the voices of those who have received, led and designed training; immediately, we heard strong themes. Overall, our findings suggest that education and training for patient safety should rely on a mix of delivery methods and contents, with a focus on practical and team-based interventions, to address the varied learning preference and professional needs in the NHS. This finding overlaps with the Commission’s recommendation of creating “life-long learning for patient safety”.

During our review, we were taken back by the level of innovation within the NHS. Scattered throughout our system are exemplary practices of innovative training initiatives. For instance, we found examples of local programmes designed specifically to meet the needs of new trainees and to encourage them to speak out on potential quality and safety improvements. These innovations exemplify the work that is taking place everyday in the NHS to make our healthcare system more responsive.

Shaping the environment for learning and care

Designing and implementing training interventions are only half of what we must concern ourselves with in our mandate to provide safer care. Here, we must also ask the question of how to change the environment and culture of learning and care.

Overwhelmingly, NHS respondents told us that the lack of protected time was the biggest barrier to attending training. Missed training is not simply a lost opportunity to improve the knowledge and skills of our staff; it is also a lost opportunity to demonstrate to those on the front-line that we value and are willing to invest in them.

The Berwick report highlighted the importance of removing blame and changing work conditions to prime our staff for success. We strongly agree with these recommendations as parallel enablers of effective education and training. The fact remains: if we cannot create a culture where safer knowledge, skills, attitudes and behaviours can be embedded, or where change is feasible, the most effective training interventions are but in name only. To fully realise the investment in education and training for patient safety, we must confront and begin to dismantle the environmental and cultural challenges to accessing training and embedding learning outcomes.

The actions derived from the Commission's recommendations, as well as the finding outlined in this report, will reinforce what the NHS has stood for since its establishment – the commitment to our patients that we are here to safeguard their care.

Best,

Ara and the CHP team

EXECUTIVE SUMMARY

OBJECTIVE

In March of 2015, Health Education England (HEE) set out to take stock of “what works” in curricula and training interventions for patient safety to identify ways in which education and training can help to deliver safe care. Imperial College’s Centre for Health Policy (CHP) was identified as an academic partner to the Commission for Education and Training for Patient Safety (the Commission) and HEE. In this role, we sought to understand best-practices in curricula and training interventions for patient safety, including practices within Local Education and Training Boards (LEBTs).

This report summarizes our findings following work undertaken between March and September of 2015. During this time, we:

- Reviewed the literature for evidence on “what works” in education and training for patient safety; and
- Spoke to patients, staff, trainees, medical students and LEBTs; and heard from NHS personnel, national and international experts on education and training for patient safety, local organisations, and patients and carers.

The aim of this report is to share with the Commission and HEE our findings over the past nine months, and specifically:

1. What we have learned from the current evidence base in the literature;
2. What we have heard from NHS personnel, patients and carers, experts on education and training for patient safety, local organisations, and trainees and medical students; and
3. What gaps exist in the evidence?

APPROACH

Our research methodology utilised input from a combination of sources. These sources are outlined in brief below, and are explored in greater detail in the Appendix.

- **“Literature review”**: our “literature review” consisted of three parts, a “review of reviews” of the academic literature on education and training for patient safety, a review of the grey literature on these topics from leading sources in the UK, USA, Canada and Australia, and a “review of reviews” of the academic literature on education and training for safety in industries other than healthcare. Data and analysis derived from this exercise are hereafter referred to as “literature review.”
- **Expert interviews**: roughly 1-hour phone interviews were undertaken with education experts in patient safety from the UK (50% of interviewees), US (15%),

Hong Kong (15%), Canada (5%), Australia (5%), France (5%) and international remit (5%). Data and analysis derived from this channel are hereafter referred to as “expert interviews.”

- **Focus groups:** 1 hour – 1.5 hours independent focus groups were held with patients and carers, staff, trainees and medical students. Data and analysis derived from this channel are hereafter referred to as “focus groups” and referenced by type of focus group (i.e. staff focus group), when necessary.
- **Visits to LEBTs:** representatives from the Commission and Imperial made four visits to LEBTs. The LEBTs visited were the Eastern, Southern, Northern and South Eastern regions. Data and analysis derived from this channel are hereafter referred to as “site visits.”
- **Online surveys:** two online surveys targeted towards NHS respondents and patients and carers were undertaken, which aimed to garner perspectives on “what works” from both groups of participants. A total of 590 NHS respondents submitted responses while a total of 32 patients/carers submitted responses. Data and analysis derived from this channel are hereafter referred to as “surveys” and reference by the type of survey (i.e. NHS personnel surveys), when necessary.
- **Local case studies:** case studies were sent out to local organisations to garner information on currently implemented interventions, their impact and derived lessons. A total of 25 case studies were returned. Data and analysis derived from this channel are hereafter referred to as “local practice.”

OUR FINDINGS

Our findings cover two initial areas for education and training:

1. **Designing effective curricula and training delivery**, exploring what has been shown to work in the literature and what was perceived to be effective by research participants.
2. **Shaping the environment for learning and care**, exploring the challenges to accessing education and training, as well as the challenges to embedding training outcomes and instigating change.

1. Designing effective curricula and training delivery

- a. Gaining clarity on the objectives of education and training for patient safety
 - ☐ Experts perceived the role of education and training for patient safety to have two main objectives: to elicit change within and beyond the individual participant.
 - ☐ At the individual level, experts perceived changes in healthcare providers’ knowledge, skills, attitudes and behaviours – all of which are necessary but not sufficient, if delivered exclusively of each other – to be important objectives.
 - ☐ Beyond the individual, experts agreed that broader changes must also take place at the team and organisational levels across similar learning comes.

b. The effectiveness and perceived effectiveness of current practice

- ☐ While there is some evidence in the literature on the effectiveness of select training methods, namely simulations and team-based learning, the overall quality of the evidence was poor.
- ☐ Surveyed NHS personnel, local organisations and interviewed education experts perceived a range of training methods to be effective, with interactive methods (i.e. simulations and team-based learning) perceived to be the most effective.
- ☐ Aside from curricula and training delivery, surveyed NHS personnel and experts also perceived the quality of the trainer to be an important factor in delivering effective training. Trainers with clinical experience, expertise in quality improvement and knowledge of teaching, further characterized by personal attributes such as “engaging”, “committed” and “inspiring” were perceived to be effective.
- ☐ A potentially wide range of organisational staff can benefit from training on patient safety – from clinical to non-clinical (i.e. security and catering staff), and junior to senior members. Specifically, surveyed NHS personnel and interviewed experts perceived greater involvement of senior members (i.e. senior clinical staff, managers and executives) in training to be valuable, especially for junior members. Lastly, more training targeted towards senior members on the importance of patient safety was also perceived to be valuable.
- ☐ Training interventions targeted towards patient and carers prior to, during and following care was perceived to be valuable by patients and carers. Prior to care, education to build overall health literacy and to prepare the patient for his/her journey through the healthcare system can be considered. During care, visual reminders about safe practise can be utilised to “nudge” providers and patients to remain vigilant about safety, and to precipitate conversations about patient safety. Lastly, following care, community-based and patient-centred programmes can be effective as a source of information and emotional support for patients.
- ☐ Education and training for patient safety was perceived to be valuable if delivered early and frequently throughout a healthcare provider’s career. Early education and training was perceived to be important to instil a life-long awareness for the importance of patient safety; follow-on training, delivered throughout a healthcare provider’s career, was perceived to be important in updating knowledge and skills, but also to reinforce prioritisation of patient safety.
- ☐ Lastly, in terms of curricula, human factors and locally, clinically, professionally, and developmentally relevant content were perceived to be effective by surveyed NHS personnel.

2. Shaping the environment for learning and care

a. Challenges to accessing training interventions

- ☐ Surveyed NHS personnel and interviewed experts perceived challenges to accessing training interventions for patient safety. Main access challenges were:
 - o 1) Training was not offered OR was not offered in time; and
 - o 2) Training was offered AND was offered in time, but not accessed.
 - ☐ Inability to access training is applicable to undergraduate medical education and continued professional development. At the undergraduate level, medical students do not have mandated modules on patient safety. At the continued professional development level, institutional challenges, such as the lack of resources to scale-up training interventions, qualified trainers and access to facilities, contribute to overall access challenges.
 - ☐ When training was available, the majority of surveyed NHS personnel and interviewed experts perceived the lack of protected time to be the main reason for staff forgoing training sessions.
- b. Challenges to embedding learning outcomes and instigating change
- ☐ Even when training interventions were available and were accessed by participants, NHS and LEBT personnel perceived challenges to embedding newly acquired learning outcomes and instigating changes in clinical practice. To this end, the challenges cited were:
 - o 1) Training was accessed but was not embedded in clinical practice; and
 - o 2) Training was accessed but was of unknown effectiveness.
 - ☐ Against the current backdrop of entrenched hierarchies and the culture of silence and blame, staff who have attended training felt powerless and perceived it to be extremely challenging to speak up against unsafe practices. Consequently, training interventions, however effective they may be based on the evidence, may fail to realise their full potential if a culture of safety is not in place.
 - ☐ Collected case studies from local organisations revealed that most organisations do not undertake robust evaluations of effectiveness for the training delivered, especially along level four of the Kirkpatrick framework, training outcomes. Here, the majority of organisations that undertook any type of measurement did so via normal incident reporting channels, which are not robust measures of causality between training and outcomes, and have been found to be underused in previous studies.

BACKGROUND, INTRODUCTION AND FRAMEWORK

Background

Without repeating the tragic events of Mid-Staffordshire, the point now is for the NHS to learn from what happened and to take action against preventable patient harm. In March of 2015, Health Education England (HEE) set out to take stock of “what works” in curricula and training interventions for patient safety. The guiding research objective was to identify, based on a review of the evidence, ways in which education and training can help to deliver safe, person-centred outcomes now and in the future. To facilitate this work, the Commission on Education and Training for Patient Safety (the Commission) was formed, which brought together NHS experts, the public and those responsible for and receiving training in healthcare.

Further to the Commission, Imperial College’s Centre for Health Policy (CHP) was identified as an academic partner to the Commission and HEE. In this role, we worked alongside and independently from the Commission to understand best-practices in curricula and training interventions for patient safety, including practices within Local Education and Training Boards (LEBTs).

This report summarizes our findings following work undertaken between March and September of 2015. The aim of this report is to share with the Commission:

1. What we have learned from the current evidence base in the literature;
2. What we have heard from NHS personnel, patients and carers, patient safety and education experts, local organisations, and trainees and medical students; and
3. What gaps exist in the evidence?

Introduction

The saying goes: “safety first.” In the context of healthcare, patient safety has historically been recognized as a significant area for improvement by healthcare professional, patients, and other actors¹. Despite advancements in our healthcare systems, technologies and models of care delivery, too many heart-breaking stories of error and preventable patient harm are still heard today.

HEE exists to improve the quality of care delivered to patients through education, training and development of the current and future workforce of the NHS². In the area of patient safety, being the commissioning body responsible for relevant education and training, HEE

¹ Pronovost, Peter J et al., Transforming Patient Safety – A Sector-Wide Systems Approach. 2015. Report of the World Innovation Summit for Health Patient Safety Forum 2015.

² Health Education England, Request for Quotation for Evaluation Partner – Evaluation of Education and Training Interventions. 2015.

has significant levers to shape the types of training interventions delivered³. In order to ensure minimum standards are met in commissioned education and training interventions, the following questions are relevant:

- ☐ “What are best-practices in curricula and training interventions for patient safety?” and
- ☐ “Is the commissioning of technically effective training interventions and curricula sufficient to ensure the delivery of safer care?”

Our findings to the former question are explored in subsequent sections of this document and form the bulk of our research output. In a sense, they fell broadly with the technical aspects of training interventions – the how, who, when and what. With respect to the latter question however, we were made aware, early on in our research that bigger challenges were at play – namely, institutional and cultural barriers, and the difficulty of making real changes.

In fact, when patients and carers were posed with the question: “Why do you think adverse events in patient safety happen in healthcare?” Respondents’ answers highlighted the need to work beyond the commissioning of training interventions⁴. Specifically, surveyed patients and carers perceived gaps in education and training, in addition to broader institutional barriers as reasons for adverse patient safety events (Figure 1). Entrenched institutional barriers included system design (i.e. siloed care), organisational culture (e.g. fear of blame) and system constraints (e.g. heavy work loads, understaff establishments).

³ Health Education England, Request for Quotation for Evaluation Partner – Evaluation of Education and Training Interventions. 2015.

⁴ Patient/carers web surveys. 2015. Heelearningtobesafier.org

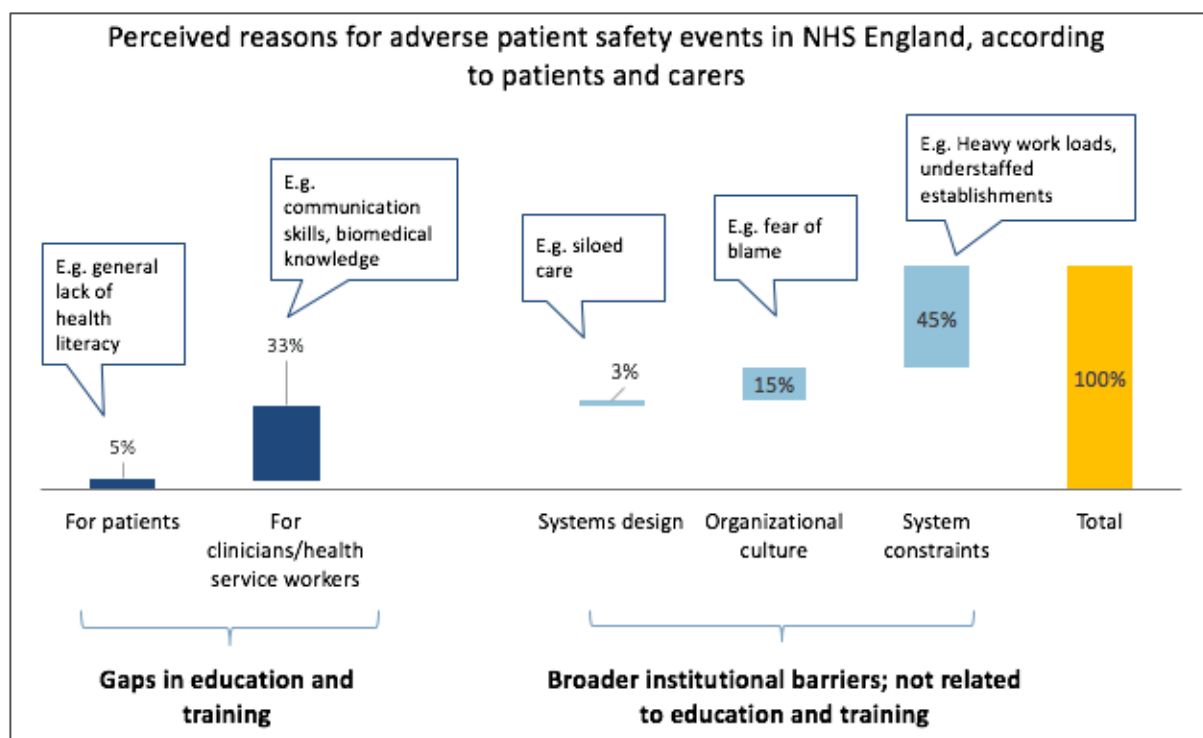


Figure 1 Perceived reasons for adverse patient safety events in NHS England, output from patient and carer survey. Based on responses to the question: "Why do you think adverse events in patient safety happen in healthcare?" A total of 32 respondents answered the survey

Along similar lines, the majority of patients and carers who participated in our survey perceived healthcare staff to be overall adequately trained to provide safe care, but cannot do so because of institutional barriers embedded in the system (Figure 2)⁵.

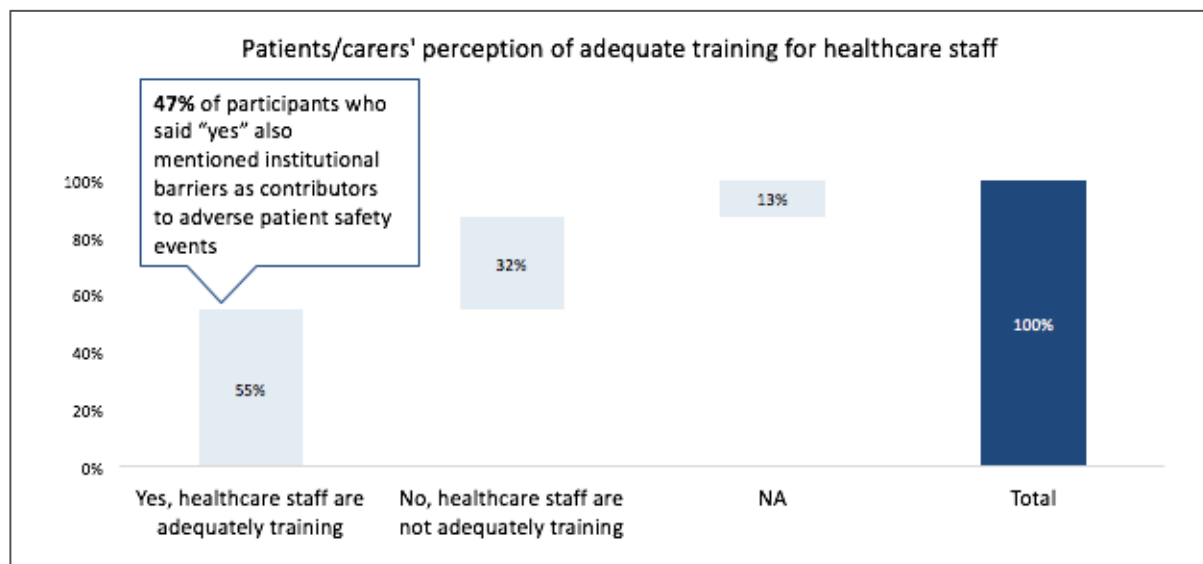


Figure 2 Perceived adequacy of training for healthcare staff to ensure safe patient care by patients and carers. Based on answers to the question "In your opinion, are healthcare staff adequately trained to provide safe care to patients?" A total of 32 respondents answered the survey

⁵ Patient/carers web survey. 2015. Heelearningtobesafier.org.

Lastly, we heard, on our LEBT visits, from those who have participated in training for patient safety in the past, that after having received training, they were limited in what they can change – in terms of the behaviours and attitudes of their teams and organisations – due to cultural and institutional barriers⁶.

We heard many other voices speaking of similar challenges. Collectively, these voices and stories told us that effective education and training for patient safety goes beyond just the technical effectiveness of the training interventions, but also pertains to dismantling embedded cultural and institutional challenges. This knowledge helped to frame the presentation of our findings, which is explained in greater detail in the next section, Frameworks.

Frameworks

Framework to measure effectiveness

The Kirkpatrick Evaluation Model was applied to data collected from our review of the literature and case studies to gauge the overall quality of the evidence. The Kirkpatrick Model, created by Dr. Don Kirkpatrick, defines four levels of training evaluation⁷. In the healthcare context, these levels are:

- ☐ Level 1 - To what degree participants react favourably to the learning event
- ☐ Level 2 - To what degree participants acquire the intended knowledge, skills and attitudes based on the learning event
- ☐ Level 3 - To what degree participants apply what they learned during training when they are at work
- ☐ Level 4 - To what degree targeted outcomes occur as a result of the learning event(s) and subsequent reinforcement

The use of the Kirkpatrick Model allowed us to identify what type of evidence was available, and to what extent they demonstrated the effectiveness of training intervention.

Framework to present findings

Aside from the Kirkpatrick model, we also developed a framework to present our research findings. The framework, at initial level, consists of two themes:

⁶ LEBT visits. 2015.

⁷ Kirkpatrick, Don (1994), Evaluating Training Programs, San Francisco, CA: Berrett-Koehler Publishers, Inc.

1. Designing curricula and training interventions
2. Shaping the environment for learning and care

Designing curricula and training delivery refers to findings on the effectiveness and perceived effectiveness of curricula and training interventions for patient safety. This theme is further split into the following sub-themes:

- The objective of education and training in patient safety ([1a](#)), which reflects findings on “what should effective education and training interventions aim to change?”
- The effectiveness of various training curricula and interventions ([1b](#)), which reflects our findings on “what is effective?” as demonstrated in the literature and “what is perceived as effective?” as relayed by participants and educators. The contents of this section are further split into the following organisation:
 - The current evidence, available in the literature, regarding the effectiveness of various training interventions for patient safety; and
 - Current practices in the NHS and internationally, which reflects findings from our NHS personnel and patient/carer surveys, expert interviews, case studies from local organisations, focus groups with patients/carers, trainees, medical students, and staff, and local LEBTs visits.

Shaping the environment for learning and care summarises our findings on the important cultural and institutional barriers in education and training for patient safety. This theme is further split into two sub-themes:

- Challenges to accessing education and training ([2a](#)), which reflects our findings on the barriers to accessing training interventions for patient safety; and
- Challenges to embedding learning outcomes and instigating change ([2b](#)), which reflects our findings on barriers to translating learning outcomes to clinical practice.

Overall, our framework can be visualized as:

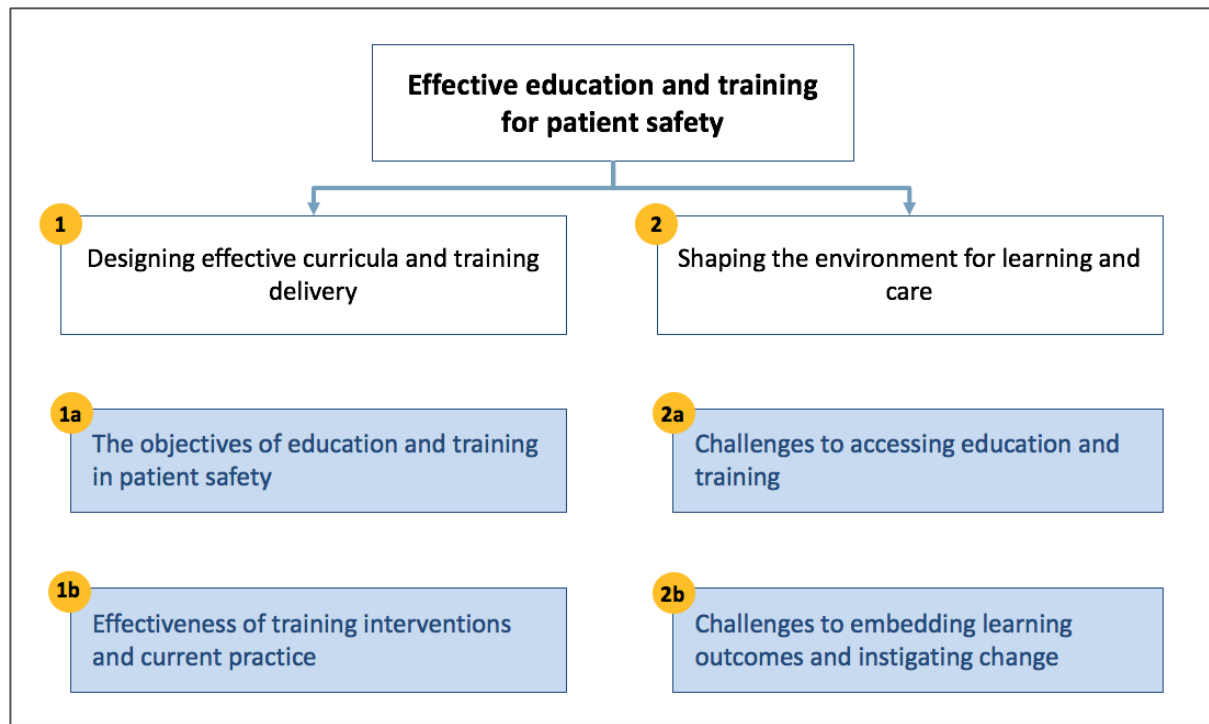


Figure 3 Framework developed for representing findings

We will refer to this visual throughout the Findings section to help track process as we progress through the different domains of the framework.

FINDINGS

1. Designing effective curricula and training delivery

Key take-aways

- Experts perceived the aim of education and training interventions for patient safety to be: changing knowledge, skills, attitudes and behaviours at the individual, team and organizational levels.
- There is some evidence supporting the effectiveness of training interventions for patient safety in the literature, namely simulations and team-based learning. However, the available evidence is of poor quality and does not robustly assess the impact of training interventions on outcomes, level four of the Kirkpatrick Training Evaluation Model.
- NHS personnel and patient safety education experts perceived simulations and group/discussion-based learning to be effective methods of training delivery. Further more, the same participants perceived human factors and contents that are locally-, professionally- and developmentally-relevant to participants to be effective.

As an academic partner to HEE and the Commission on Education and Training for Patient Safety, our main project objective was to identify “what works in curricula and training interventions in patient safety?” In the following section, we outline our findings on:

- The perceived objectives of education and training in patient safety ([1a](#)); and
- The effectiveness of training interventions and current practice, as evidenced in the literature and perceived by NHS personnel, local practice, and national and international experts ([1b](#)).

1a. Objectives for education and training interventions on patient safety

Key take-aways

- Education experts in patient safety perceived education and training interventions to have the aim of changing participants’ knowledge, skills, attitudes and behaviours – all of which are necessary but not sufficient, if delivered exclusive of each other.

In two words, the core aspiration of training interventions for patient safety is to “elicit change”. Digging a little deeper, experts told us that interventions should aim to elicit change within and beyond the individual – in order words, micro and meso-level changes. Within the individual, training interventions should aim to change the knowledge, skills, attitudes and behaviours of participants (Figure 4). Beyond the individual, training interventions should aspire to instigate similar change across the knowledge, skills, attitudes and behaviours of teams and organisations. Clarity on these micro and meso-level objectives were perceived to be essential in the design and delivery of effective training interventions.

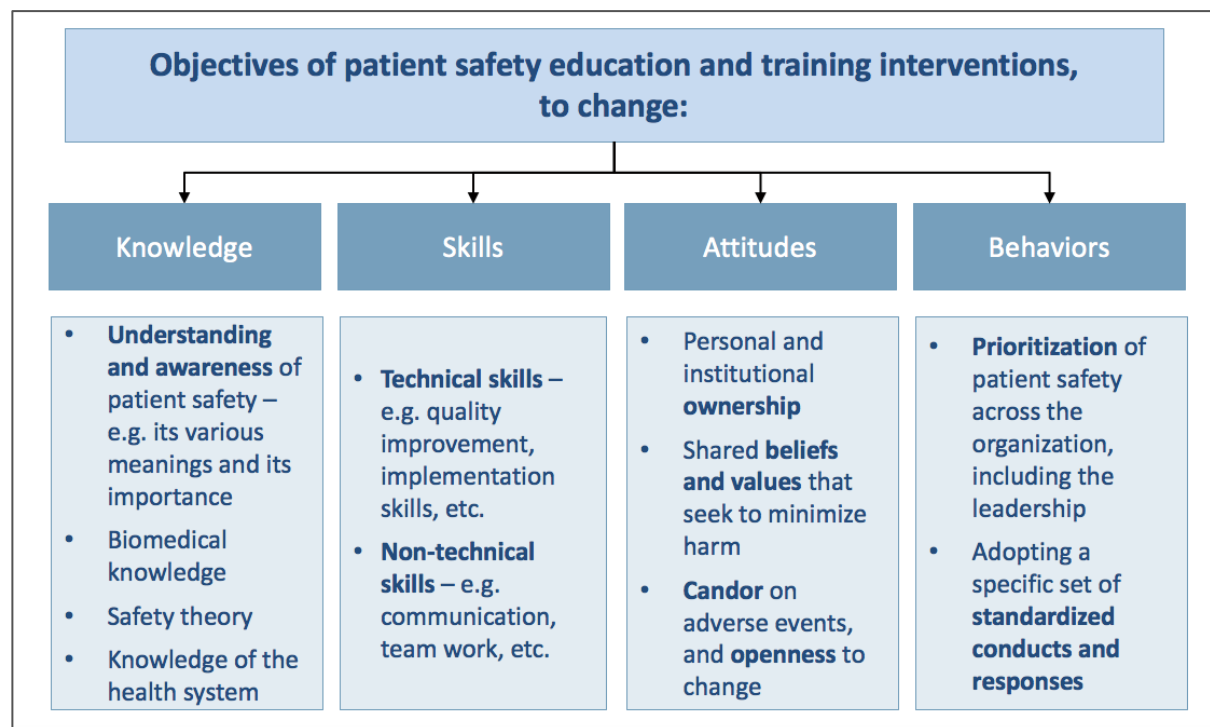


Figure 4 Aspirations of patient safety education and training interventions

Knowledge was perceived to encapsulate two broader areas⁸: 1) awareness of the importance of patient safety and understanding of the various meanings of patient safety, from the perspective of individual patients, carers, administrators, and etc.; and 2) understanding of basic biomedical knowledge, the theory of safety science and knowledge of the design and processes of health and care systems (e.g. where to find and ask for help or how to use the various technologies and processes already embedded in the system).

Skills were also perceived to encapsulate two broader areas⁹: 1) technical and 2) non-technical skills. Technical skills were perceived to be skills which enabled actions, such as quality improvement, implementation skills, and etc. Non-technical skills were perceived included skills which underpinned actions, such as communication, team work and etc. It was stipulated that training on non-technical skills are equally as important as technical skills.

⁸ Expert interviews. 2015.

⁹ Ibid.

Attitudes were perceived to apply to individuals and teams – namely individuals' values and the shared values of the team toward safeguarding patient safety¹⁰. Experts perceived candour on adverse events and openness to change, at the individual and team levels, to be especially important facilitators of change. Without a duty of candour and openness to change, institutional processes, attitudes and behaviours which are not conducive to safe care remain embedded.

Lastly, behaviours were perceived to be the adaptation of a specific set of standardized processes and conducts, at the individual, team and organisational levels, which contribute to safer patient care¹¹. Moreover, experts perceived the prioritization of patient safety to be an important hallmark of behaviour that is conducive to safer care.

¹⁰ Ibid.

¹¹ Ibid.

1b. The effectiveness of various training interventions for patient safety

Key take-aways

- We found the most volume of evidence, defined as the number of academic review articles published which cited evidence of effectiveness, for simulations, followed by team-based training.
 - The observed impact was limited to the first three levels of the Kirkpatrick model; little evidence supported impact on level four, outcomes.
- Overall however, the evidence available in the literature was disparate and of poor-quality to confidently conclude which intervention works best.
- Findings derived from NHS personnel and patients/carer surveys, focus groups with patients/carers, staff, trainee, and medical students, expert interviews, case studies from local organizations and site visits to LETBs (hereafter collectively referred to as research participants) converged with the limited evidence available in the literature.
- NHS personnel perceived training delivered via interactive methods (i.e. simulations and team-based methods) to be effective. Moreover, a large proportion of NHS personnel perceived receiving training via more than one training method to be effective. In terms of curricula, NHS personnel perceived human factors and locally-, professionally- and developmentally-relevant content to be effective.
- Aside from content and pedagogy, research participants also perceived the quality of the trainer to be an important factor in effective learning.
- Lastly, research participants perceived all health and care actors to potentially benefit from some form of training on patient safety. This includes clinical and non-clinical staff, but also patients and carers.

In our review of the academic literature related to education and training in patient safety, our findings showed that simulation and team-based training were interventions with the most number of review citing effectiveness (Figure 5), and were found to be effective across the first three level of the Kirkpatrick model: action, learning and behaviour.

Simulation had the most number of reviews citing positive impact, 7 overall. However, the observed impact was limited to reaction, learning and behaviour; for example, a single review found that it improved the technical performance of clinicians during complex procedures. On the other hand, we did find a single study which combined simulation and teamwork training to report an impact on outcomes (level four).

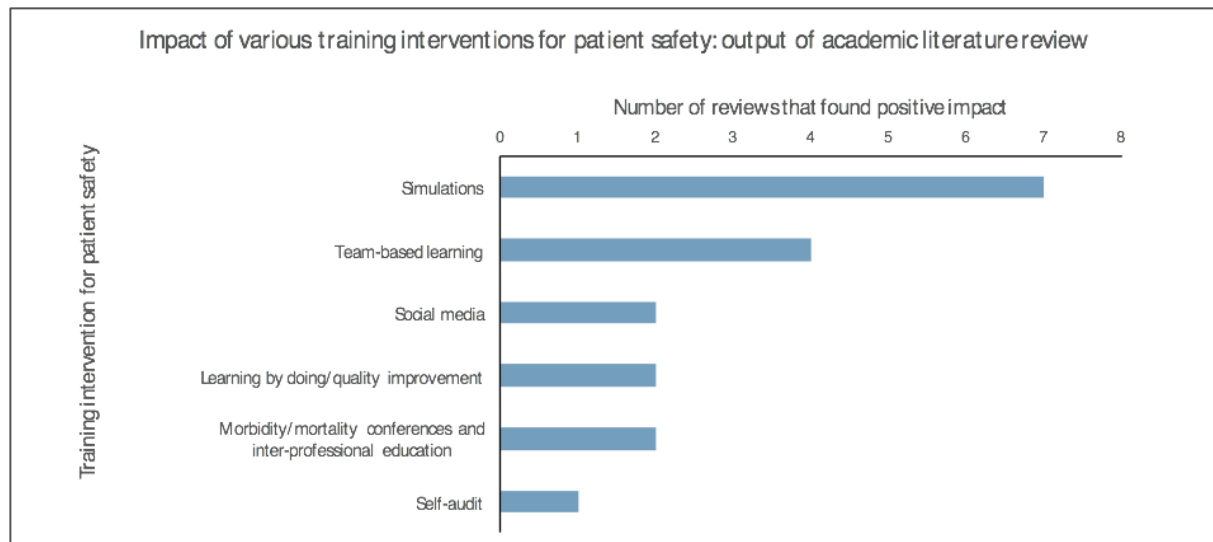


Figure 5 Training interventions and respective number of reviews that found positive impact, outcome of review of academic literature

Team-based learning also had a large number of reviews which showed effectiveness across the first three levels of the Kirkpatrick model. Overall we found three reviews citing positive impact for the intervention, which ranks it as the second highest among interventions shown to have positive impact and according to the number of reviews.

Lastly, we also found some evidence supporting other interventions, namely self-audit, learning by doing, morbidity and mortality conferences, inter-professional education and social media tools and networks. Overall, we found fewer pieces of evidence supporting the effectiveness of these interventions, as measured by the number of reviews citing positive impact for each intervention. Moreover, the depth of impact, i.e. along the Kirkpatrick model, was relatively limited and measured using instruments more prone to bias. For example, self-audit was one of the measurement approaches which yielded positive impact on clinical outcomes (level four). Given the self-reported nature of the measurement approach however, the validity of the conclusion remains uncertain. Similarly, morbidity and mortality conferences and inter-professional education received positive reactions (level one) from participants but no review linked these interventions to impact on learning outcomes, behaviours or patient outcomes. Learning by doing was a common approach used to teach and train clinicians, particularly for quality improvement techniques. There is evidence supporting its impact on clinical improvements and no reports of worsening clinical outcomes. However, the downside to learning by doing is that the process was found to take between 3 and 12 months (sometimes even longer) to complete. Lastly, we found an emerging trend of using of social media tools and networks as a supplement to other teaching methods. While evidence demonstrates positive feedback from students, no review was able to demonstrate improved learning outcomes as a result of its use.

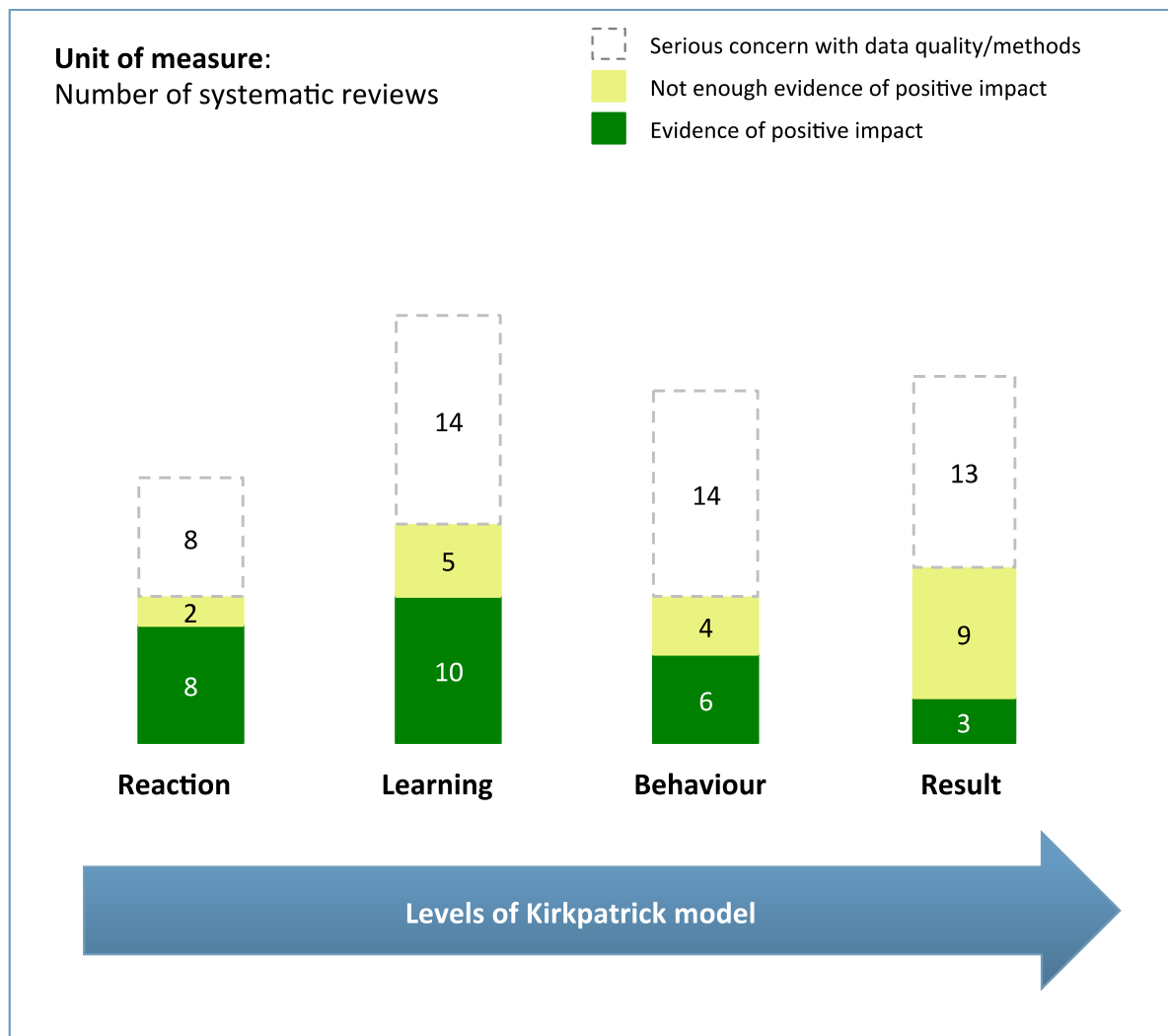


Figure 6 Overview of the application of the Kirkpatrick model to the selected articles

Aside from reviewing academic literature, we also reviewed two other areas of the literature:

- 1) Grey literature on education and training for patient safety in healthcare; and
- 2) Academic literature on safety education interventions in other industries

Overall, the grey literature reinforced our finding that whilst training and education interventions can improve skills and knowledge, there is no conclusive evidence of what types of interventions improve health outcomes or safety. It also underscored our discovery that little has been researched on whether one type of training or education is better than another. Interestingly however, the grey literature did highlight the fact that medical schools and teaching hospital leaders should place the highest priority on creating learning cultures that emphasize patient safety, model professionalism, enhance collaborative behaviour, encourage transparency and value the individual learner. Aside from culture, structure, which enables change for improvements to take place, were cited as important enablers.

<div> <div></div> Not enough evidence of positive impact <div></div> Evidence of positive impact </div>										Impact on dimensions of Kirkpatrick model			
Author	Title	Name of publication	Publication date	Number of citations	Number of studies	Focus	Topic	Type of professionals	Care setting	Reaction	Learning	Behaviour	Results
Jones, Anne C.; Shipman, Scott A.; Ogrinc, Greg	Key characteristics of successful quality improvement curricula in physician education: a realist review	Postgraduate Medical Journal	2015	0	39	Both	Purpose Quality Improvement	Physician	Not specified				
Benetoli, Arcelio; Chen, Timothy F.; Aslani, Parisa	The use of social media in pharmacy practice and education	Research In Social & Administrative Pharmacy	2015	0	24	Curriculum	Social Media	Pharmacist	Not specified				
Vanderbilt, Allison A; Grover, Amelia C; Pastis, Nicholas J; Feldman, Moshe; Granados, Deborah Diaz; Murithi, Lydia K; Mainous, Arch G 3rd	Randomized controlled trials: a systematic review of laparoscopic surgery and simulation-based training	Global Journal Of Health Science	2015	0	21	Training intervention	Simulation	Surgeons	Acute care				
Vincent, Mary Anne; Sheriff, Susan; Mellott, Susan	The Efficacy of High-fidelity Simulation on Psychomotor Clinical Performance Improvement of Undergraduate Nursing Students	Cin-Computers Informatics Nursing	2015	0	8	Training intervention	Simulation	Undergraduate nursing students	Not specified				
O'Dea A., O'Connor P., Keogh I.	A Meta-Analysis of the effectiveness of crew resource management training in acute care domains.	Postgraduate Medical Journal	2014	1	20	Both	Crew Resource Management	Various	Acute care				
Schmidt, Eric; Goldhaber-Fiebert, Sara N.; Ho, Lawrence A.; McDonald, Kathryn M.	Simulation Exercises as a Patient Safety Strategy A Systematic Review	Annals Of Internal Medicine	2013	14	38	Training intervention	Simulation	Physicians	Acute care				
Cartledge, Peter; Miller, Michael; Phillips, Bob	The use of social-networking sites in medical education	Medical Teacher	2013	3	9	Curriculum	Social Media	Various	Not specified				
Lucisano, Karen E; Talbot, Laura A	Simulation training for advanced airway management for anesthesia and other healthcare providers: a systematic review	Aana Journal	2012	6	34	Training intervention	Simulation	Anesthetists and others	Acute care				
Hallenbeck, Virginia J	Use of high-fidelity simulation for staff education/development: a systematic review of the literature	Journal For Nurses In Staff Development	2012	0	20	Training intervention	Simulation	Nurses	Acute care				
Ma, Irene W. Y.; Brindle, Mary E.; Ronskley, Paul E.; Lorenzetti, Diane L.; Sauve, Reg S.; Ghali, William A.	Use of Simulation-Based Education to Improve Outcomes of Central Venous Catheterization: A Systematic Review and Meta-Analysis	Academic Medicine	2011	26	20	Training intervention	Simulation	Medical trainees	Acute care				
Sisk, Rebecca J.	Team-Based Learning: Systematic Research Review	Journal Of Nursing Education	2011	16	17	Training intervention	Team-based learning	Various	Not specified				
Gagliardi, Anna R.; Brouwers, Melissa C.; Finelli, Antonio; Campbell, Craig E.; Marlow, Bernard A.; Silver, Ivan L.	Physician Self-Audit: A Scoping Review	Journal Of Continuing Education In The Health Professions	2011	5	6	Training intervention	Self-audit	Physicians	Acute care				
Wong, Brian M.; Etchells, Edward E.; Kuper, Ayelet; Levinson, Wendy; Shojania, Kaveh G.	Teaching Quality Improvement and Patient Safety to Trainees: A Systematic Review	Academic Medicine	2010	82	41	Both	Quality Improvement + Patient Safety	Medical students and residents	Acute care				
Bal, Gaelle; David, Sandra; Sellier, Elodie; Francois, Patrice	Assessment of morbidity and mortality conferences as a tool for physician education and improvement of quality of care and patient safety: A literature review	Presse Medicale	2010	12	17	Training intervention	Morbidity and mortality conferences	Various	Acute care				
Merien, A. E. R.; van de Ven, J.; Mol, B. W.; Houterman, S.; Oei, S. G.	Multidisciplinary Team Training in a Simulation Setting for Acute Obstetric Emergencies A Systematic Review	Obstetrics And Gynecology	2010	61	8	Training intervention	Simulation + Teamwork	Physicians and nurses	Acute care				
Chakraborti, Chayan; Boonyasai, Romsai T.; Wright, Scott M.; Kern, David E.	A systematic review of teamwork training interventions in medical student and resident education	Journal Of General Internal Medicine	2008	40	13	Curriculum	Teamwork	Medical students and house staff	Not specified				
Hammick, M.; Freeth, D.; Koppel, I.; Reeves, S.; Barr, H.	A best evidence systematic review of interprofessional education: BEME Guide no. 9	Medical Teacher	2007	214	21	Training intervention	Interprofessional education	Various	Not specified				

On the other hand, we found limited evidence from industries other than healthcare (total of 4 articles were identified). While some lessons could be drawn, for example, Crew Resource Management (CRM), a type of team-based learning derived from the aviation industry which appeared to have effects across the first three levels of the Kirkpatrick model, alternative research methods (i.e. not literature review) may be more effective in identifying other lessons.

Consequently, although we did find some evidence supporting the effectiveness of certain training interventions in patient safety, we found significant gaps in the evidence. In the future, improvement can be made by gathering more robust evidence derived from reliable methods of data collection and more uniform approaches to evaluating the effectiveness of training interventions. Moreover, greater efforts to gather evidence on the cost-effectiveness of training interventions may also be beneficial. In our review of the literature, we found no evidence in this area; consequently, it cannot be concluded whether investments in a particular training intervention is of “greater value” than other interventions.

Given the gap in the literature, we utilized other channels to explore the answer to “what works in education and training for patient safety?” This was namely done by speaking with education experts, LEBTs, patients/carers and medical students, as well as seeking written input from NHS personnel, patients/carers and administrators/trainers of local training interventions. Our findings from these sources are presented along the following dimensions:

- [How to deliver](#), which reflects our findings on pedagogy;
- [Who to target](#), which refers to our findings on who should receive training for patient safety;
- [When to deliver](#), which synthesizes our findings on the career stage at which a health service provider should receive training on patient safety and the type of training perceived to be the most appropriate; and
- [What to deliver](#), which shares our findings on curricula design

How to deliver?

NHS personnel generally perceived non-didactic methods, such as simulations and small group discussions, to be effective¹².

Across all settings of care (acute and non-acute settings), simulations received the greatest number of mentions when NHS respondents were asked, “What worked well in your experience with patient safety education and training?” Aside from simulations, other training methods which ranked within the top-five most mentioned were: 2) small groups discussions, experience sharing and face-to-face training; 3) multi-disciplinary training (MDT); 4) practical and interactive learning; and 5) other training methods (such as video,

¹² NHS personnel web survey. 2015.

visual aids and responses which outlined preference for variety in teaching method, but did not specify a particular method) (Figure 8).

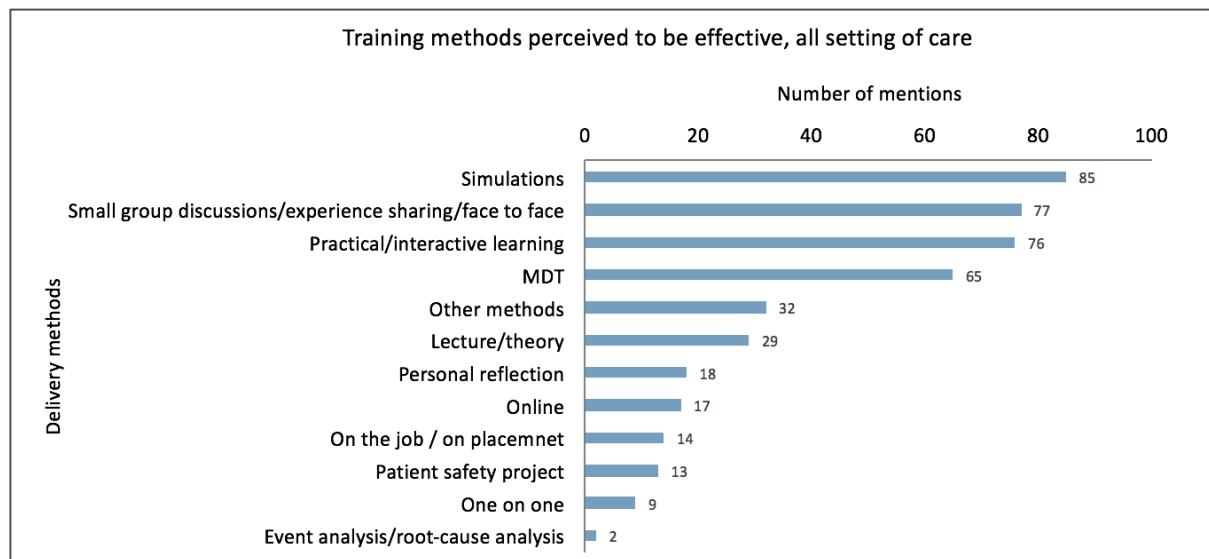


Figure 8 Education and training delivery methods perceived to be effective by NHS personnel across all settings of care. Based on responses submitted to Q2 of NHS personnel web survey: what worked well in your experience with patient safety education and training? Note: other methods of training includes video, visual aides and a stated preference for a variety of training methods with no specific mention of training method

Similarly, we saw the same perceived effectiveness in responses submitted by NHS personnel in non-acute settings, which is defined to be care delivered in hospice or care home, primary or community care, care in peoples' homes, and higher education institutions¹³. The five training methods which received the most mentions were: 1) simulations; 2) small group discussions, experience sharing and face-to-face training; 3) MDT; 4) practical and interactive learning; and 5) online training (Figure 9). For training methods perceived to be the most effective by NHS personnel in non-acute settings of care, the order of training methods perceived to be effective did not differ significant from that which was observed across all settings of care.

¹³ NHS personnel web survey. 2015.

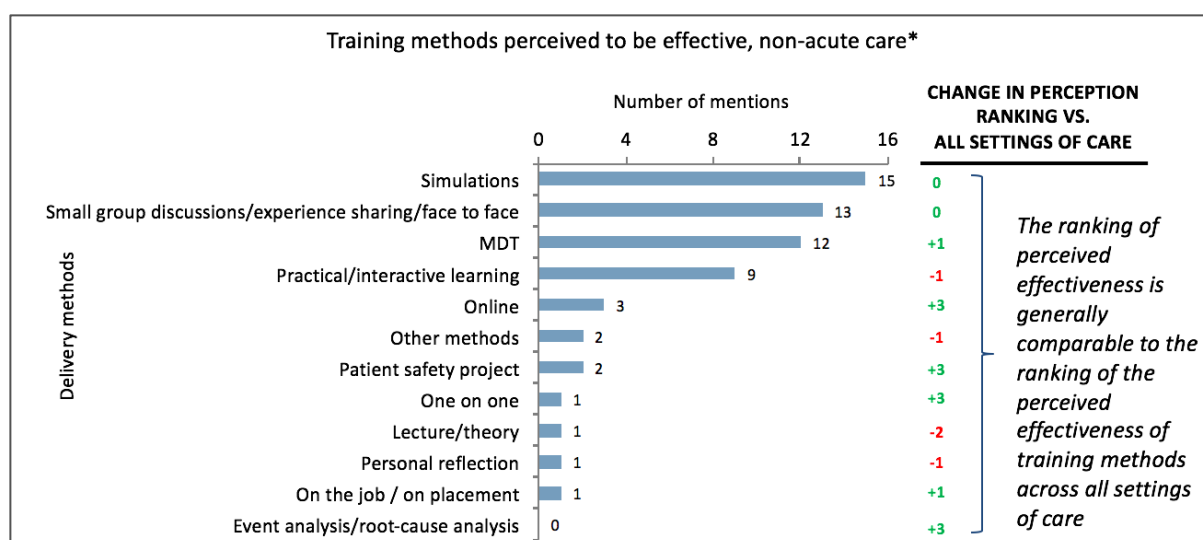


Figure 9 Education and training delivery methods perceived to be effective by NHS personnel in non-acute settings of care, where *non-acute settings of care is defined as: hospice or care home, primary or community care, care in peoples' homes, and higher education institutions. Based on responses submitted to Q2 of NHS personnel web survey: what worked well in your experience with patient safety education and training?

Lastly, local organisations were observed to mostly utilize interactive training methods, namely simulations and group discussion-based learning¹⁴. Other training methods in the top five most mentioned training methods were: 3) interactive/practical training; 4) MDT; and 5) classroom-based teaching (Figure 10).

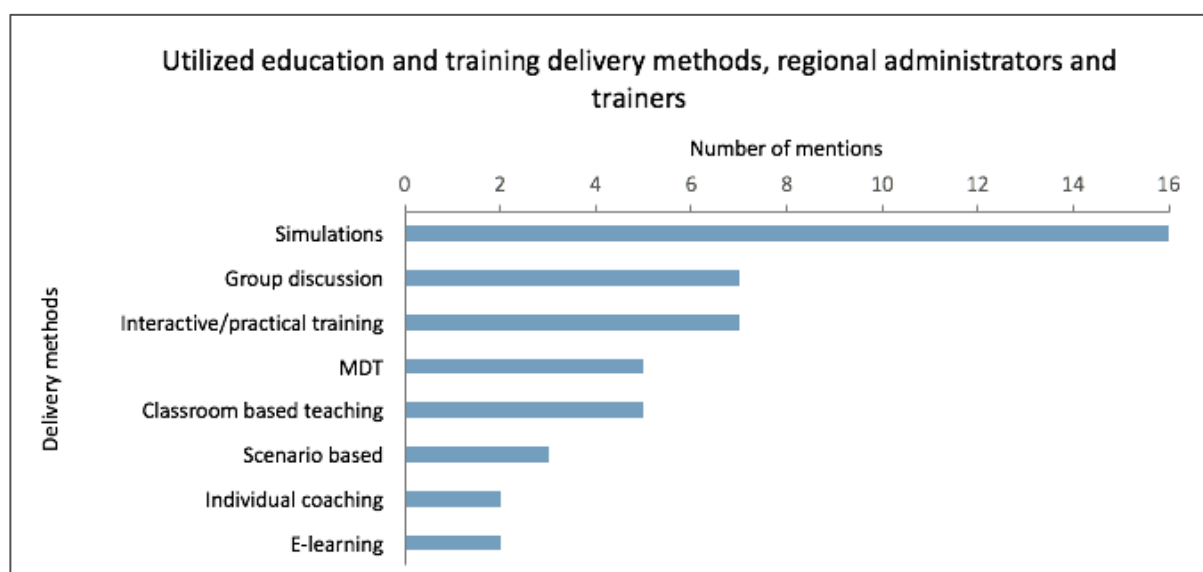


Figure 10 Currently utilized education and training delivery methods, local administrators and trainers. Based on Q3 of Excel cast study template: what teaching/training methods have been utilized. Note: a total of 32 case studies were received, only 25 of them were in Excel template and contained this question. Hence only 25 case studies were used for this analysis

¹⁴ Submitted local case studies. 2015

Interestingly, when we segmented NHS respondents' submission according to formal or informal avenues of education and training, both channels were perceived as effective forms of training¹⁵. In our analyses:

- 1) **Formal** education and training was defined as planned and structured training interventions such as lecture or theory, simulations, small discussion sessions, face to face training and other such training interventions; and
- 2) **Informal** education and training was defined as unplanned and unstructured training interventions such as training while on the job or while on placement, personal reflections, and other similar training avenues.

Although we saw greater support for formal avenues of training intervention, there were also a significant number of responses (roughly ~10% of relevant responses) which perceived informal avenues of training to be effective. We interpreted this finding to mean education and training on patient safety should become a culture within the institutional setting – infusing both formal and informal avenues of training (Figure 11).

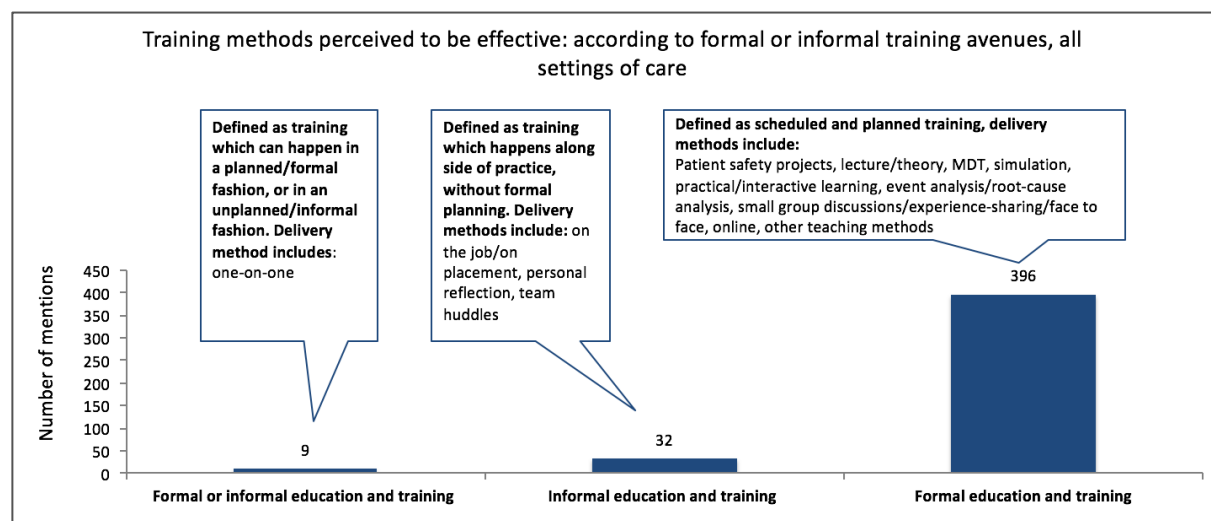


Figure 11 Perceived effectiveness of education for education or training delivered via formal or informal avenues, where formal training is defined to be planned and structured training interventions and informal training is defined to be unplanned and unstructured training interventions. Based on NHS personnel responses to the Q2 of web survey: what worked well in your experience with patient safety education and training?

Aside from single modes of training delivery, NHS respondents also perceived training interventions which involved more than one type of training method to be effective¹⁶. Overall, 60% of responses mentioning preference for a single training intervention while 40% of responses mentioned preference for more than one type of training intervention (Figure 12).

¹⁵ NHS personnel web survey. 2015.

¹⁶ NHS personnel web survey. 2015.

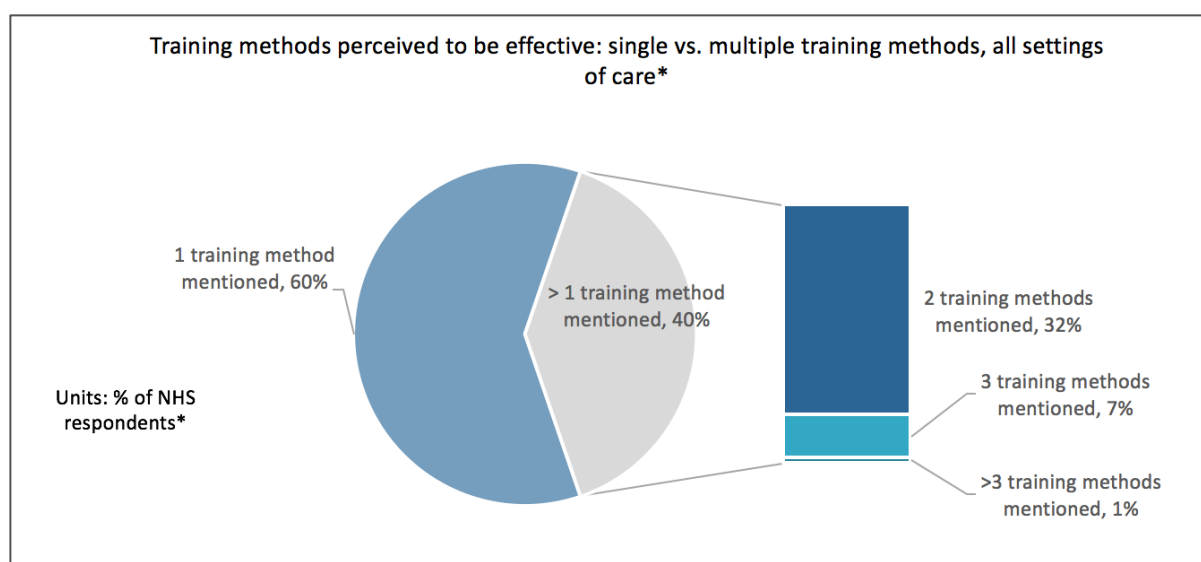


Figure 12 Perceived effectiveness of training methods, as segmented by the number of training methods cited by NHS personnel, across all settings of care. Based on responses to Q2 of NHS personnel survey: "what worked well in your experience with patient safety education and training?" Due to the open-ended nature of this question, not all 590 respondents who participated in the survey submitted answers related to the perceived effectiveness of training methods. A total of 285 relevant responses were analysed for this data point

Within respondents who perceived a combination of two training methods to be effective (32% of respondents), we further identified the perceived effectiveness of interactive-interactive combinations, with interactive training methods defined as either MDT, simulations, practical training, and small group discussions / experience sharing / face-to-face training interventions (Figure 13)¹⁷. Specifically, a combination of simulations and multi-disciplinary training (MDT) was perceived to be the most effective interactive-interactive combination (not depicted in visual below). Other interactive-interactive combinations which were perceived to be effective included group-based learning and interactive/practical learning, as well as group-based learning and MDT (not depicted in visual below). Combinations of formal training interventions, defined as as planned and structured training interventions, were preferred by a greater number of respondents than combinations of formal-informal or informal-informal training interventions (not depicted in visual below).

¹⁷ NHS personnel web survey. 2015.

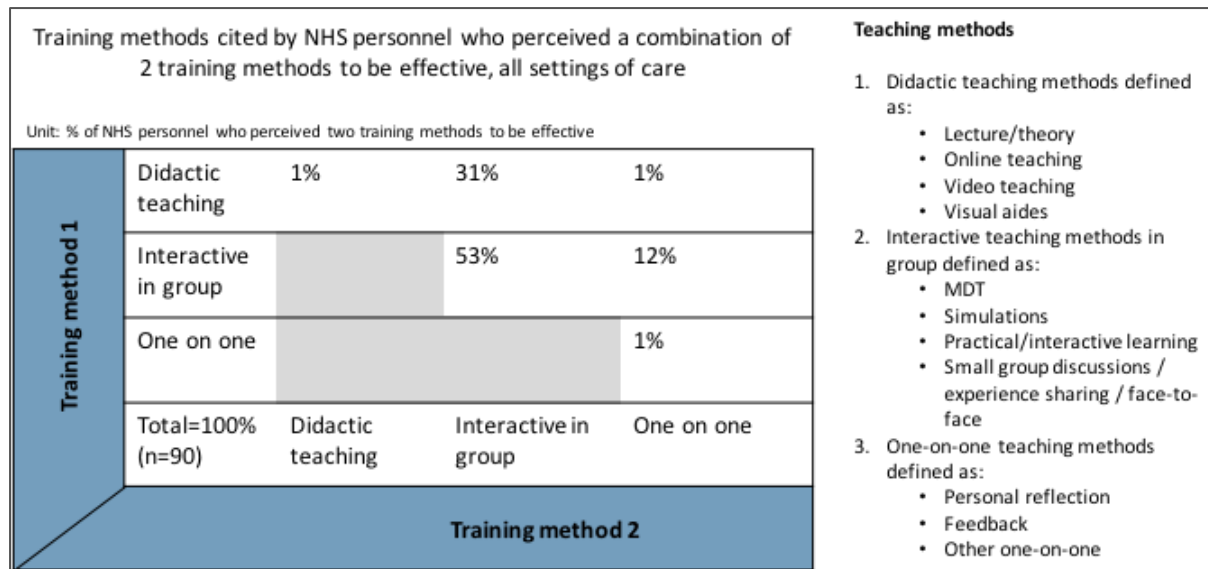


Figure 13 Combinations of training methods cited by NHS personnel who perceived two training methods to be effective, all settings of care. Based on Q2 of the NHS personnel survey: "what worked well in your experience with patient safety education and training?" Note: due to open-ended nature of the question, not all 590 respondents who participated expressed sentiments regarding training method or pedagogy. A total of 289 responses related to training method, of which 90 responses cited preference for 2 training methods

In particular, the results of our survey for NHS personnel revealed a roughly even split between respondents who mentioned online training interventions (i.e. e-learning) and had a positive perception of effectiveness versus those who had a negative perception of effectiveness (Figure 14).

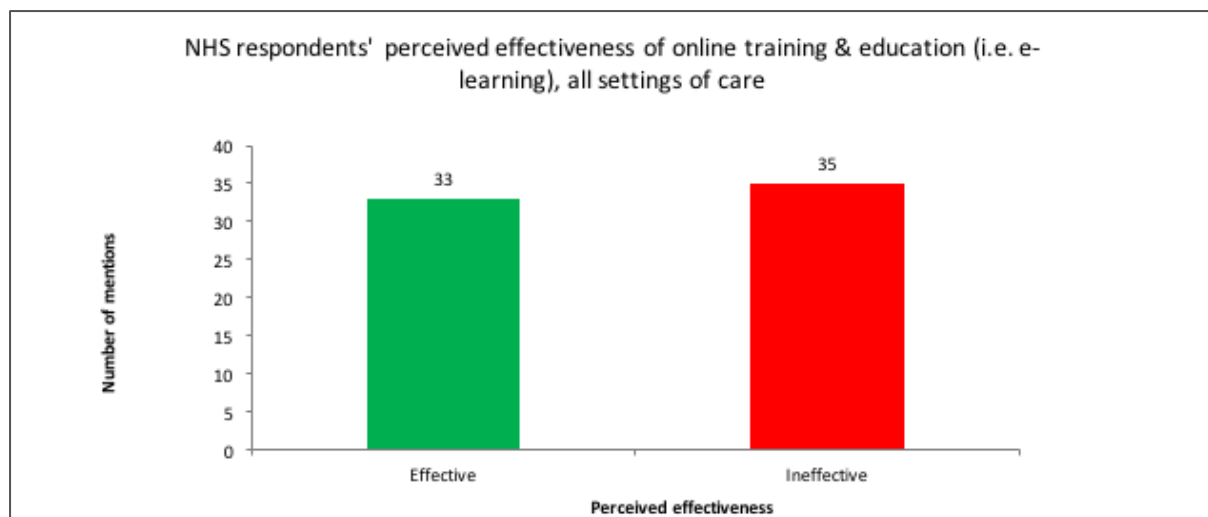


Figure 14 NHS respondents' perceived effectiveness of online training and education (e.g. e-learning), all settings of care. Based on Q2, Q3 and Q4 of NHS personnel survey: What worked well in your experience with patient safety education and training? What could have been improved? and Do you have any other feedback? Respectively

Respondents perceived online-learning to be effective mainly because it was “easy to access” and was a useful supplement to other modes of training. This perception was best encapsulated by the following quote, submitted by an NHS respondent:

“E-learning modules are of particular value for ease of access, but face to face discussions with colleagues and educators/trainers is really useful when discussing incidents/scenarios.”

- NHS respondent

On the other hand, respondents perceived online learning to be ineffective mainly because the accompanying system was “non-friendly to use” or the training method was an ineffective way of imparting lessons on patient safety. These perceptions were best encapsulated by the following quote, again, submitted by an NHS respondent:

“The vast majority of our patient safety education training is now on-line. This is delivered by ESR. This is a dreadful system as it is very non-user friendly...on-line training is one of the worst ways to actually learn anything. It has become a tick box exercise.”

- NHS respondent

Lastly, research participants and interviewed experts perceived the quality of the trainer to be an important attribute in delivering effective education and training for patient safety¹⁸. Research participants perceived high-quality instructors as being characterized by the following attributes:

A high-quality instructor

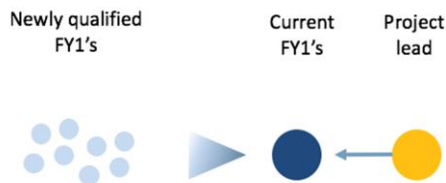


- ☐ **Background and designation:** a practitioner or a partnership between a practitioner and a safety expert. Designation of the trainer as a fellow in education and training is preferred to protect him/her from other clinical commitments which may conflict with training;
- ☐ **Experience:** has clinical experience, experience in quality improvement, and experience in teaching methodologies; and
- ☐ **Personal attributes:** is engaging, committed, dedicated and inspiring.

¹⁸ NHS personnel web survey. 2015. Expert interviews. 2015

To this end, the practice of investing in trainers, otherwise known as “training the trainer” was observed on many accounts in local patient safety education and training initiatives (Exhibit 1 and Exhibit 2).

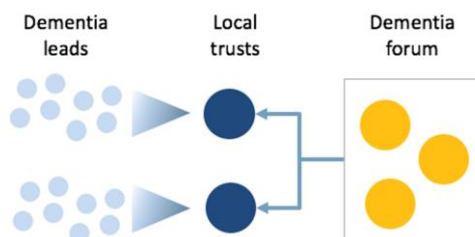
Case study: Asked to See Patient, Health Education North West



The Asked to See Patient initiative, pioneered by HE North West, trains current FY1 doctors to deliver training to newly qualified FY1 doctors during their induction periods. The objective of the training intervention is to equip newly qualified FY1 doctors with the confidence and skills to initiate first-line management for common problems affecting out-of-hours hospitalized patients.

Exhibit 1 Asked to See Patient, Health Education North West. Training current FY1's to train newly qualified FY1's on managing problems affecting out-of-hours hospitalized patients. Based on submitted case study template

Case study: Dementia leads forum and DEALTS, Health Education Thames Valley



Dementia leads from across the Thames Valley region collaborated to shape the final training material (Dementia Education and Learning Through Simulation, DEALTS), followed by training days for dementia leads from various Trust across the region

Exhibit 2 Dementia leads forum and DEALTS, Health Education Thames Valley. Training local dementia leads to use simulation in dementia training. Based on submitted case study template

Who to target?

Research participants perceived staff in all roles – clinical and non-clinical - within a health service organisation to potentially benefit from education and training for patient safety¹⁹. At the health service support staff level, patient safety training was observed to mostly impart basic knowledge, such as the prevention of falls and slips. However, we also observed innovative programs which utilized support staff to a greater capacity. For example, a particular Trust had trained cleaning staff, as part of their comprehensive approach to medicines safety, to collect and report on the number of medication returned on meal trays. This number is then collated and made available by the Catering Manager²⁰.

At the management and executive level, managers and executives' personal involvement in training interventions were perceived to be especially effective, especially for junior doctors²¹. On the other hand, experts perceived training for management and executives on patient safety to be important, but are not being delivered enough currently. Specifically, experts perceived that the de-prioritization of the subject area by management and executives was linked to the de-prioritization of similar training for other staff in the organisation. Consequently, greater patient safety training for management and executives can be considered (Figure 15).

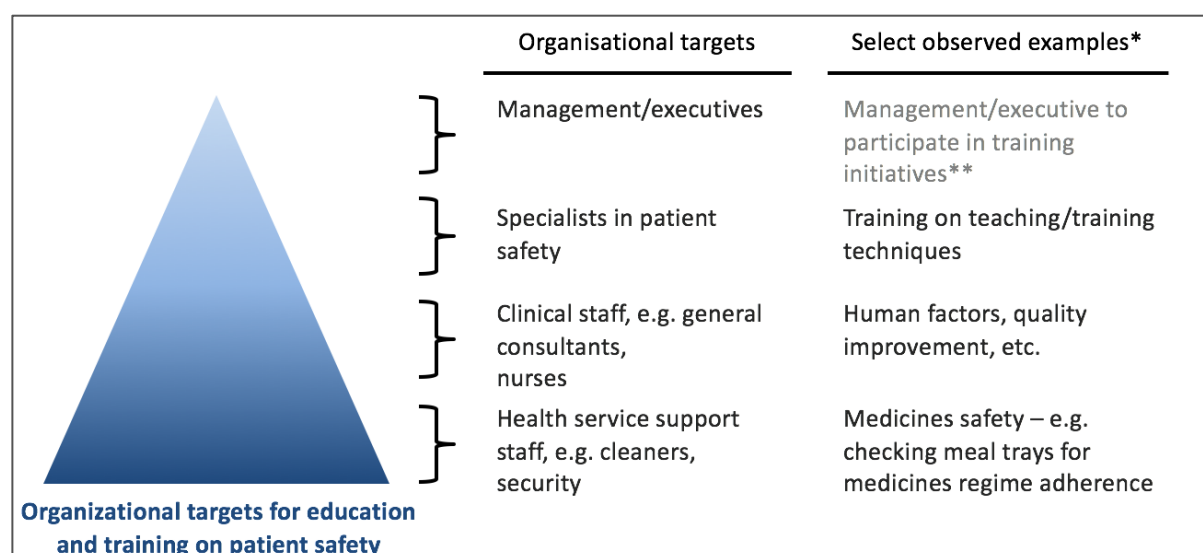


Figure 15 Observed organisational targets for education and training on patient safety. *Not completely exhaustive and representative of current practices, as subject to data and sampling limitations. Based on findings across all sources of qualitative data

Research participants also perceived that education and training for patient safety should be initiated early in a health service provider's career – so as to instil awareness – and continue throughout his/her career – so as to update/refresh the relevant knowledge, skills, attitudes and behaviours (Figure 16)²².

¹⁹ All sources of qualitative data. 2015.

²⁰ NHS personnel web survey. 2015.

²¹ NHS personnel web survey and expert interviews. 2015.

²² All sources of data. 2015.

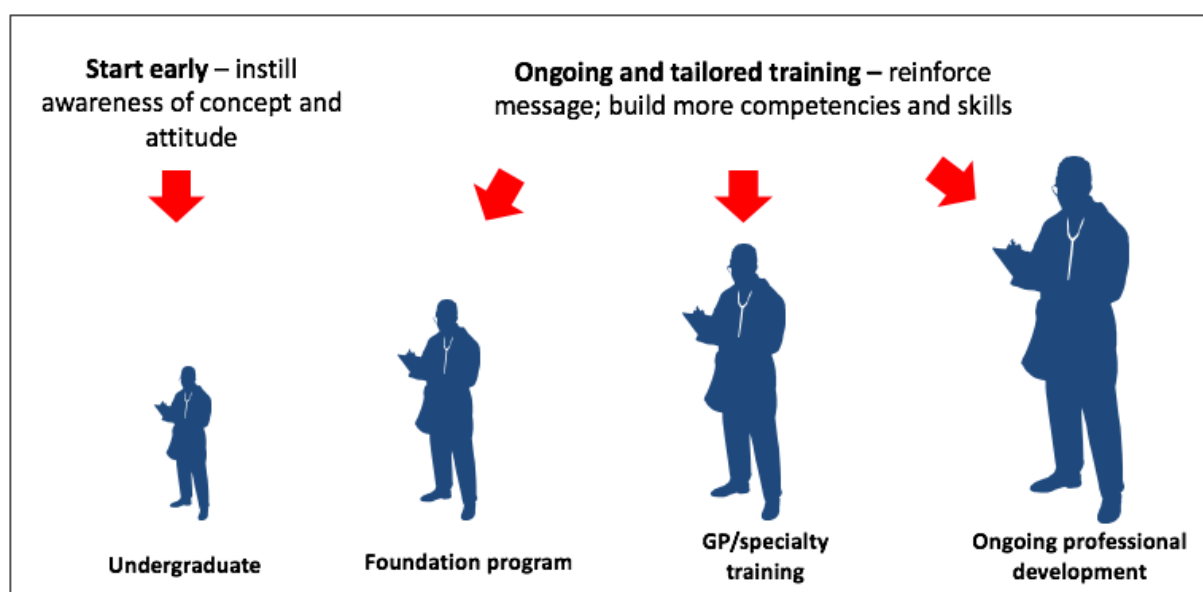


Figure 16 Research participants' perception of early initiation and continued update of education and training for patient safety for health service providers. Based on findings from all sources of qualitative findings.

Aside from training health and care staff, patients and carers perceived patient/carer-focused education and training to be effective²³. In our focus group with patients and carers, patient-oriented education and training were perceived to be useful, especially given the current fragmented nature of care and the increasing number of patients with complex, chronic diseases. From the lessons and experiences relayed to us by patients and carers, we synthesized three areas where patient/carer-focused training on safety could be realized (Figure 17):

1. Prior to care;
2. During care; and
3. Following care and in the community.

Prior to care, efforts to build overall health literacy were perceived to be a useful foundation to enable more active and empowered patients²⁴. Programs can begin with disease-focused education, which may be relevant in preparing patients to engage with the healthcare system. Aside from disease-based content, a broad range of content, such as information on how to find reliable sources of information and the skills to deliver some forms of health and wellness care, can also be considered.

During care, programs such as the Care Navigators Program can be extremely useful to remind patients of the principles of safe practice and their rights²⁵. The Care Navigators Program utilizes Navigators, who are trained members of the community, to help patients and their carers to access care across a wide range of health, social care and voluntary

²³ Patient/carer focus group. 2015.

²⁴ Patient/carer focus group. 2015.

²⁵ Ibid.

sector services in the community. Reminders of the practices and values which contribute to safe care can be extended to include posters, pamphlets and other visual signals or educational materials, available at the setting of care and in multiple languages. These visual cues or educational materials can “nudge” providers and patients to be vigilante about safe care and provide opportunities to initiate a conversation on the general principles of patient safety.

Lastly, following care, community support groups or peer-supported programs centred around “expert patients” were perceived by patients and carers to be important channels of post-care safety information and offer much-needed emotional support²⁶. In this context, patients who are trained and knowledgeable on particular disease areas were perceived to be effective leads for community-based, voluntary programs which aim to impart knowledge of self-care and safety to lesser knowledgeable patients. More importantly however, these community hubs were perceived to be an important source of emotional support for patients in their time of recovery.

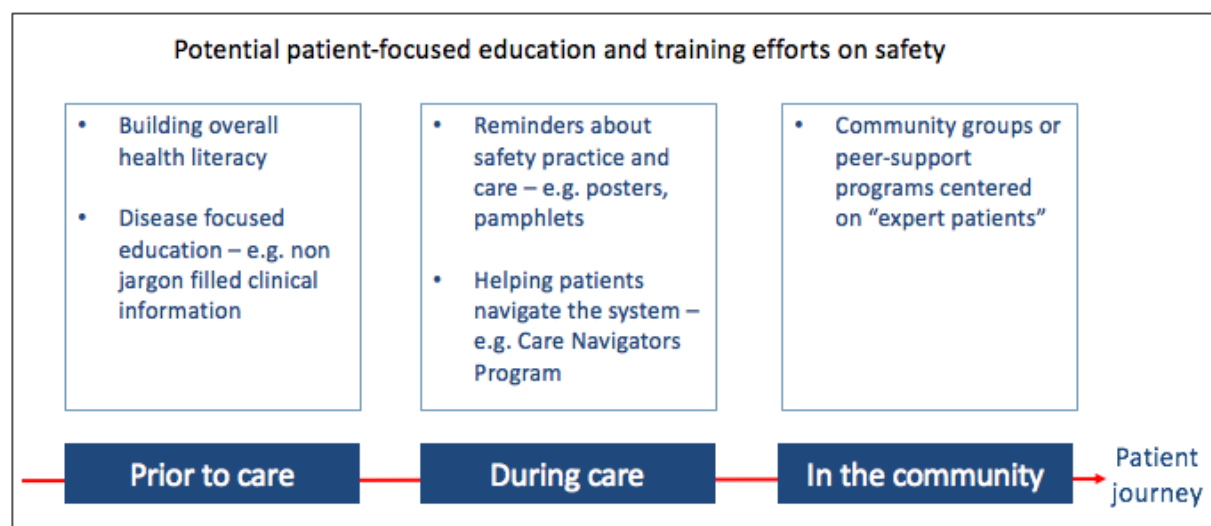


Figure 17 Potential patient-focused education and training efforts on patient safety, according to steps in the patient journey. Based on output from NHS patient and carers’ focus group

When to deliver?

Surveyed NHS personnel and interviewed patient safety education experts perceived education and training for patient safety which starts early in a health service provider’s career and continues throughout his/her career to be effective²⁷. Within this general consensus, a small number of experts perceived the choice of when to initiate training and the type of training delivered at a particular stage of a health service provider’s career to be non-arbitrary. Specifically, a small number of experts perceived (Figure 18):

- Any type of training on patient safety is ineffective, if introduced at a stage where the participant does not yet have a fundamental grasp of biomedical knowledge;

²⁶ Patient/carers focus group. 2015.

²⁷ NHS personnel and expert interviews. 2015.

- Training on the theories underpinning patient safety is best introduced once the participant has some fundamental grasp of biomedical knowledge; and
- Training involving simulations is best introduced once the participant has had some clinical experience.

Patient safety education experts perceived training for patient safety introduced prior to participants having a fundamental grasp of biomedical knowledge to be ineffective²⁸, given that at the time of training introduction, participants are likely to be: 1) subject to a rigorous medical education schedule, which leaves little additional time for the introduction of another topic/module; and 2) unfamiliar with basic theories in medicine and health care to benefit from teaching on patient safety. Lastly, from a practical point of view, experts perceived class sizes for students in this stage of their medical careers to be too large to effectively implement simulation-based training.

Along similar lines, the same experts perceived theory-based training for patient safety to be effective, if introduced once the participants have gained an understanding of the fundamental biomedical knowledge or have had some clinical experience²⁹. At this stage, participants were perceived to have sufficient background to extract more benefit from theory-based training for patient safety.

Once participants have garnered some clinical experience, some experts perceived the introduction of simulations to be effective. A particular expert explained the rationale underlying this perception as³⁰:

“When you look at the [simulation] video tapes, the first years treat the simulation just like it’s just another exercise, they’re kind of looking around and not really taking it seriously. The third years tended to start out that way but as the case gets worse and worse, they start to develop tension in their voice and things like that because they’ve had the experience of these things happen. So even though they know it’s fake, it brings back those experiences to them, so I think there’s just a huge difference in if you had got that body of [clinical] experience under your belt or not”

- Interviewed expert

In addition, simulated training, delivered once the participant has garnered some clinical experience was also perceived to be effective as it is able to correct “bad practices” before they are embedded as habits³¹.

²⁸ Expert interviews. 2015.

²⁹ Expert interviews. 2015.

³⁰ Ibid.

³¹ Ibid.

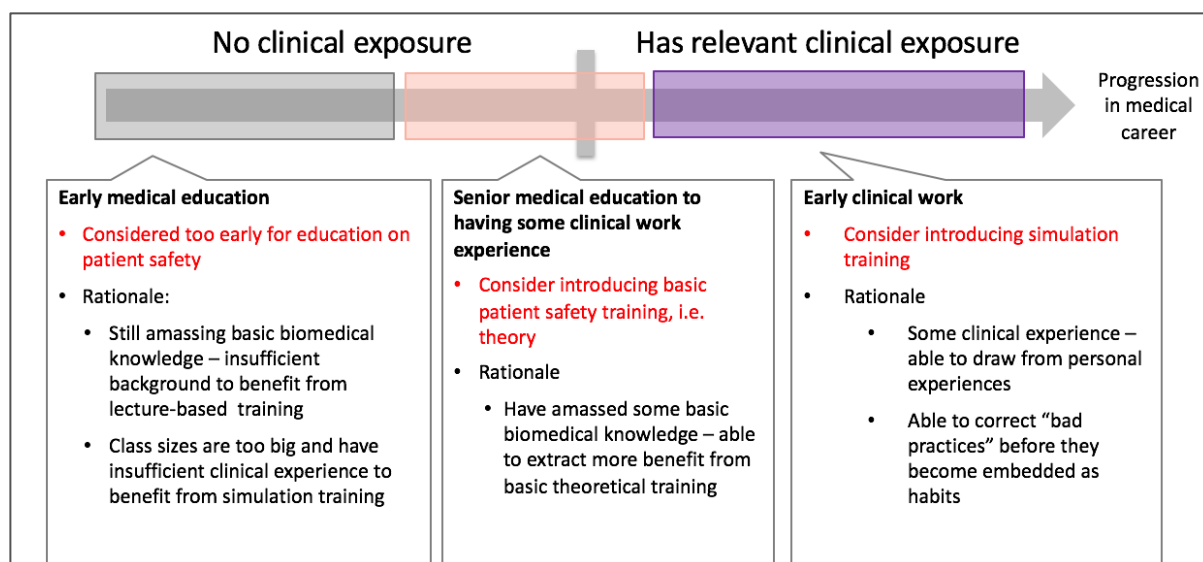


Figure 18 Perceived effectiveness of Introducing training interventions at specific medical career milestones. Based on interview output in 3/20 experts

What to deliver?

Surveyed NHS personnel perceived curricula such as human factors and tailored contents to be effective (Figure 19)³². Aside from human factors and contents which are professionally and developmentally relevant, a significant number of NHS respondents perceived training on systems, which is defined as operational training on structures within the healthcare system (i.e. incident reporting systems, prescribing software) and training on how the healthcare system works overall (i.e. general knowledge of the NHS) to be effective.

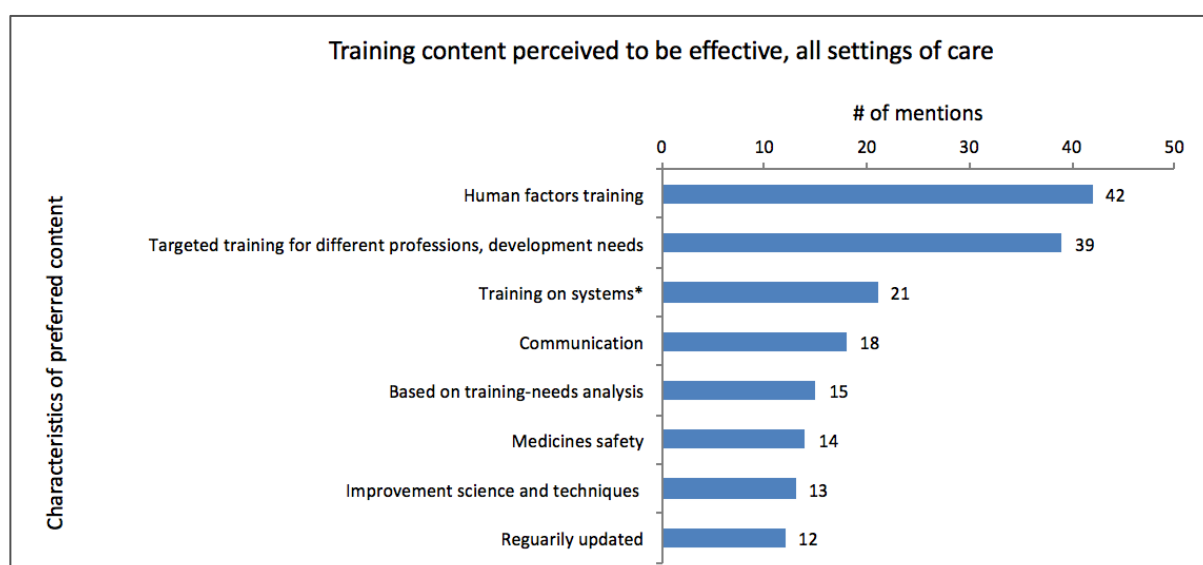


Figure 19 Training content perceived by NHS respondents to be effective, all settings of care. Based on Q2 of NHS personnel survey: what worked well in your experience with patient safety education and training? *Training on systems defined as

³² NHS personnel web survey. 2015.

operational training on structures within the healthcare system, such as incident reporting systems, prescribing software, and how the healthcare system works overall

Surveyed NHS personnel in non-acute settings of care, which are defined to include settings such as hospice/care home, primary/community care, people’s homes and higher education institutions, also perceived similar content to be effective (Figure 20)³³.

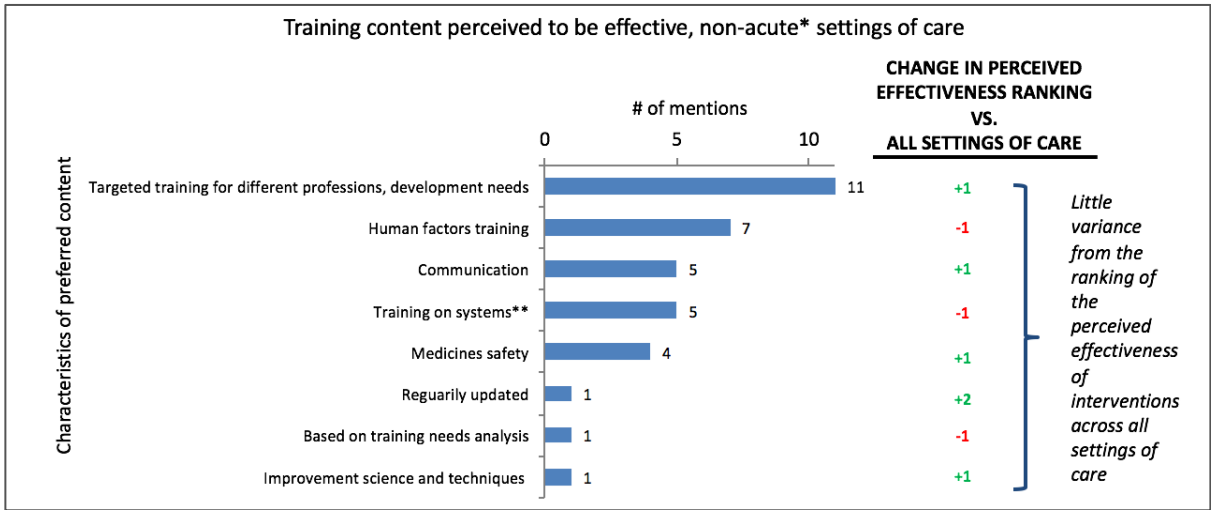


Figure 20 Training content perceived to be effective by NHS personnel, non-acute settings of care. *Non-acute settings of care defined as: hospice/care home, primary/community care, people’s homes, and higher education institutions. **Training on systems defined as training on incident reporting systems, prescribing software, local governance structures, and overall knowledge of the NHS. Based on Q2 of NHS personnel survey: what worked well in your experience with patient safety training

Lastly, aside from preference for specific types of content, overwhelmingly, NHS personnel perceived content that is clinically relevant to be effective (Figure 21)³⁴.

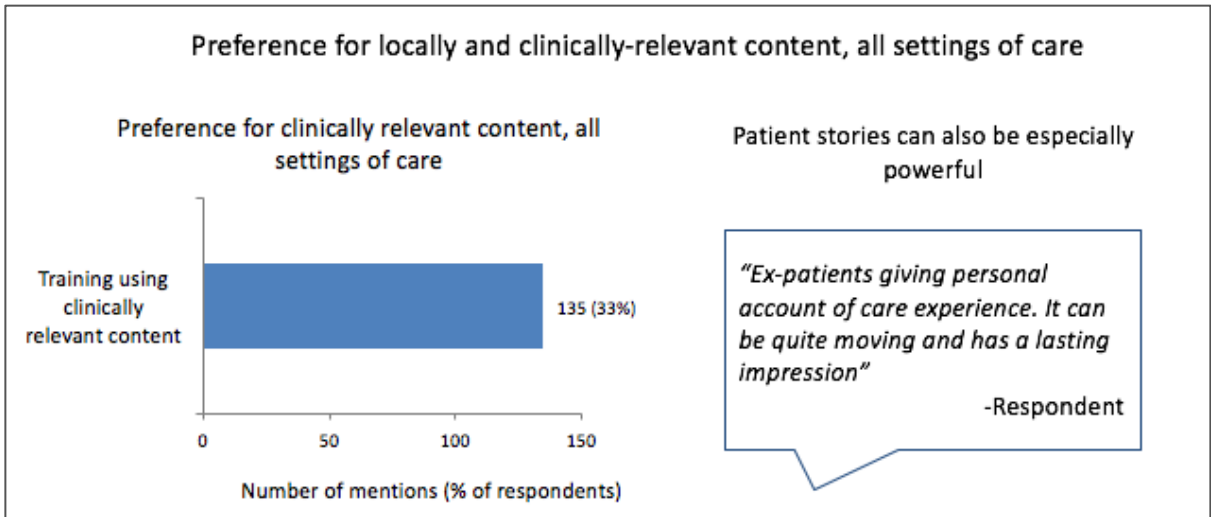


Figure 21 Preference for locally and clinically relevant content, all settings of care. Based on answers to Q2 of NHS personnel survey: What worked well in your experience with patient safety education and training?

³³ Ibid.

³⁴ NHS personnel web survey. 2015.

When taken together, our findings on what is perceived to be effective collectively signal the importance of patient involvement – direct or indirect – as the bedrock of curricula design (Figure 22). Direct involvement can be interpreted as involving patients in the design process or weaving their personal stories into training content. Examples of direct patient involvement was observed for interventions delivered through the Johns Hopkins Safety Institute and The Institute for Patient Safety Excellence, the University of Illinois³⁵. We interpreted indirect involvement to be content built around locally- and clinically-relevant cases, which could be derived from real-life patient safety incident reports, given the appropriate steps have been taken to protect privacy.

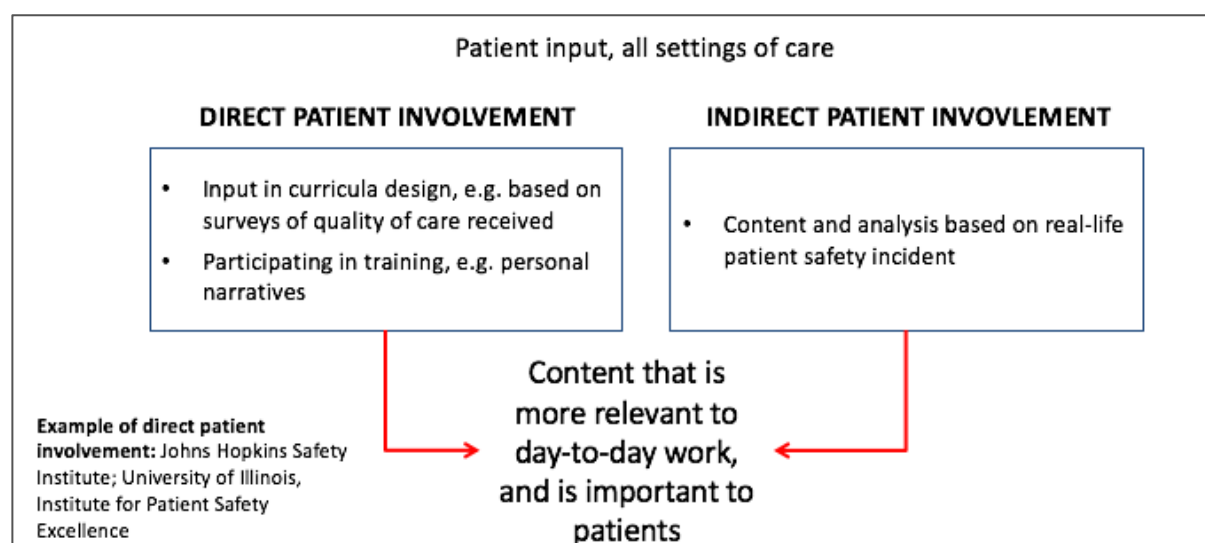


Figure 22 Direct and indirect patient input observed. Based on qualitative data collected from all channels

Throughout the duration of our research, we were taken back by the types of local innovation taking place in the NHS and the diversity of the training interventions being deployed. Two such interventions are highlighted below (Exhibit 3 and Exhibit 4). Full case studies submitted by local organisations can be found in the Appendix. Exhibit 3 & 4 below outline examples of training interventions we encountered.

³⁵ Expert interviews. 2015.

Innovation case study #1: Healthcare team challenge, West Midlands

- **Objective:** to raise student awareness of patient-centred care, and provide a high profile opportunity for students to work in an MDT and on an authentic patient case
- **Intended audience:** senior pre-registration health professions students
- **Training methods:** an educational competition in which MDTs of pre-registration students prepare a management plan for a complex patient case. The case is presented to a panel of senior clinicians and service users who choose an overall winner
- **Training outcomes:**
 - **Level 1 (reaction):** feedback completed by students on the day of the event; showed effective in raising students' awareness of patient centred care and give students the opportunity to consider approach learning as part of MDT
 - **Level 2 (learning):** evaluated by feedback forms completed on the day, before and after surveys based on the Interprofessional Socialisation and Valuation Scale (ISVS). Showed effective in building understanding of the importance of MTD and patient-centred care
 - **Level 3 (behaviour):** not undertaken as it was the first event of its kind in England
 - **Level 4 (outcomes):** not undertaken

Exhibit 3 Example of innovative training intervention for patient safety, based on case study sent by HE West Midlands

Innovation case study #2: EPIFFany, East Midlands

- **Objective:** to increase junior doctors' confidence, prescribing competence, and safe prescribing behaviours
- **Intended audience:** FY1, FY2, and CT levels
- **Educational approach:** four methods delivered across a 4-month rotation:
 - A simulated 'ward round' at the start and end of the placement
 - Face-to-face teaching delivered by pharmacists and clinicians
 - Clinical decision support technologies available on desktops or mobile devices such as smartphones
 - eLearning (or web-based computer-based instruction) for practicing complex problem-solving and decision-making
- **Outcomes:**
 - **Level 1 (reaction):** reactions to educational intervention recorded in the form of diagnostic interviews. Showed effectiveness in improving participants' attitude to work and improved the perception of a supportive learning environment
 - **Level 2 (learning):** learning was recorded through the use of self-regulated learning questions and questionnaire, and prescribing competence. Showed effectiveness in improving patient-clinician interaction, diagnostic decision-making and prescribing skills, and awareness of how to approach similar situations in the future
 - **Level 3 (behaviour):** measured through Attitude To Work and Wellbeing surveys; diagnostic interviews were also used to establish feelings towards the intervention. Showed effectiveness in improving the awareness, confidence and competence of junior doctors
 - **4 (outcomes):** measured by comparing the change in frequency and severity of prescribing errors made in the workplace by junior doctors before and after the intervention. Junior doctors exposed to the educational intervention showed 50% reduction from baseline in the number of prescribing errors made after the intervention was delivered to the junior doctors (total of 16 junior doctors in the intervention arm). The severity of medication errors made by prescribers was also reduced with no lethal errors whilst the intervention was received by junior doctors. Performance gains among FY1 and FY2 doctors' equivalent to gaining an extra 12-months experience. FY1 doctors who received the education were prescribing as well as FY2 doctors in the control group and FY2 doctors who received the education were prescribing as well as CT (core-training) doctors in the control group. Also saw improvement in prescribing for doctors who were not exposed to the training intervention but were in the same cohort as junior doctors who were exposed to the intervention

2. Shaping the environment for learning and care

Key take-aways

- Institutional and environmental challenges affected access to training and the ability to embed learning outcomes in clinical practice.
 - In terms challenges to accessing training, NHS personnel and trainers perceived the lack of protected time as the biggest barrier.
 - In terms of challenges to embedding learning outcomes and instigating change, the entrenches hierarchies, fear of blame, and poor modelling of safe practice were perceived to create an environment which is not conducive to safe learning and care.
- Without addressing the perceived institutional and environmental challenges to accessing training and embedding learning, commissioned education and training interventions, however technically effective, cannot result in the changes needed to ensure safer care.

In the process of answering the question “what works in curricula and training interventions in patient safety?” research participants also expressed perceptions of institutional and environmental challenges to accessing training and embedding learning outcomes in clinical practice. In the following section, we outline our findings on:

- Challenges to accessing education and training ([2a](#)), which describes the perceived challenges pertaining to participants not being able to access training; and
- Challenges to instigating change ([2b](#)), which describes the perceived challenges to implementing learning outcomes in clinical practice.

Overall, the relationship between the challenges to accessing training and embedding learning outcomes and their underlying causes can be summarized in Figure 23. The challenges to accessing training can be traced to:

1. Training is not offered OR is not offered in time, and
2. Training is offered AND is offered in time, but is not accessed.

The challenges to embedding learning outcomes and instigating change can be traced to:

1. Training is offered AND is offered in time, is accessed, but is not embedded in practice; and
2. Training is offered AND is offered in time, is accessed, but is of unknown effectiveness.

Underlying causes to both sets of challenges – accessing training and embedding learning outcomes - were perceived by participants to be³⁶: the lack of undergraduate coverage of

³⁶ All sources of data. 2015.

patient safety curriculum, the lack of high-quality measurement of effectiveness, structural challenges, institutional challenges, and lack of protected time for education and training.

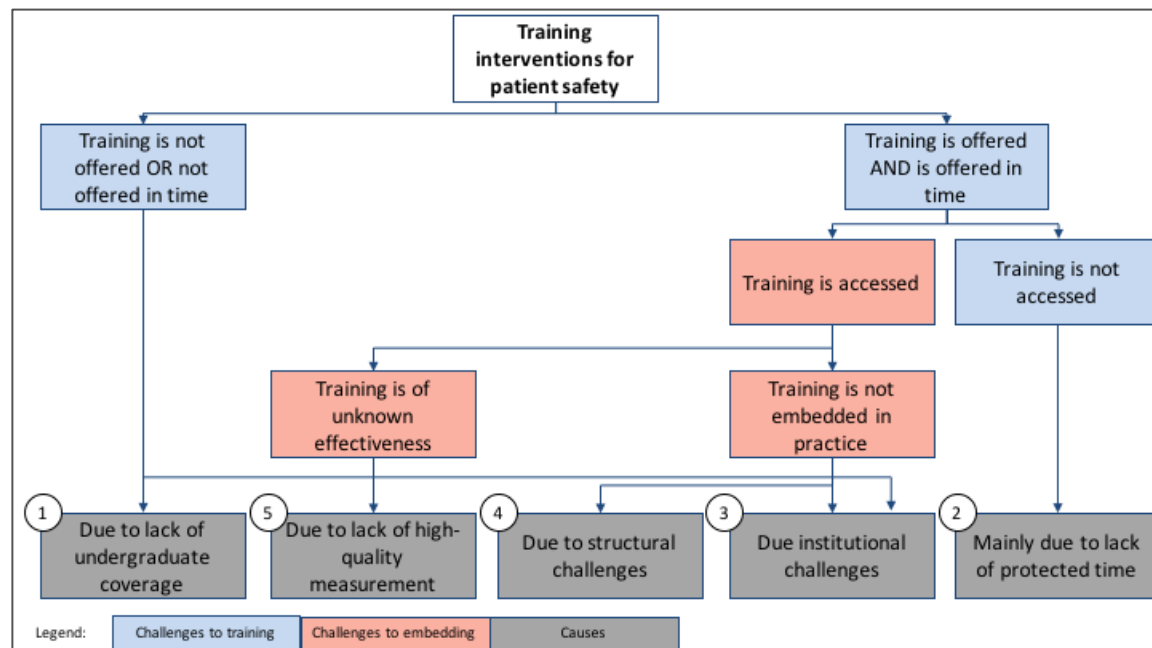


Figure 23 Perceived challenges to accessing training, embedding training outcomes in clinical practice and associated causes. Based on all sources of data

2a. Challenges to accessing education and training

Key take-aways

- Training is not offered OR is not offered in time.
 - At the undergraduate level, medical students and experts perceived the lack of mandatory coverage of patient safety curriculum to limit formal exposure to education and training for patient safety.
 - At the professional development level, access challenges, mainly institutional, were perceived to prevent training from taking place or accessed by participants.
- Training is offered AND is offered in time, but is not accessed.
 - Educators and participants perceived the lack of protected time to be the largest barrier to accessing training that is offered. The lack of protected time was perceived to affect both formal and informal training avenues.

This section discussed our findings on challenges to accessing training, and is further split into two sub-sections:

- [Training is not offered OR is not offered in time](#), which outlines findings on when training interventions are not made available or are not made available in time; and
- [Training is offered AND is offered in time, but is not accessed](#), which outlines findings on when training interventions are made available for participants or are made available in time, but is not accessed by participants for reasons beyond their control.

Training is not offered OR not offered in time

At the **undergraduate medical education level**, little to no mandatory education and training on patient safety is offered³⁷. Medical students we spoke to, as part of our medical students' focus group, relayed that either:

- A formal module on patient safety is not offered at the undergraduate level; or
- A module on patient safety is only offered as an elective at the undergraduate level. Elective modules are not covered in final exams and are therefore not prioritized by students.

Given the lack of mandatory patient safety-related curriculum at the undergraduate level, most medical students we spoke to were unfamiliar with the topic as a field of study,

³⁷ Focus group with medical students. 2015.

practice or something of high-priority. This perception was aptly captured by the following quotes, from undergraduate medical students who participated in our focus group:

“Patient safety modules are not offered at my school at all. Aside from the events - Mid-Staffordshire, Francis, Berwick – I don’t really think it comes up that much as an independent topic...I wasn’t even aware that it’s a field of study.”

- Undergraduate medical student

“[Patient safety education and training] It’s taught as an elective here...nobody ever really shows up for lecture. Why would we? It’s not covered in the exams because it is an elective. There are plenty of other things that need doing.”

- Undergraduate medical student

Along similar lines, patient safety education experts perceived challenges to adding patient safety-related content to an already packed undergraduate curriculum, where the focus is on building foundational biomedical knowledge³⁸. Some experts perceived the lack of representation of patient safety-related content at the undergraduate level as a reflection of the denseness of the undergraduate medical education schedule; other experts perceived this gap to be a reflection of the regulator’s accreditation framework, namely that patient safety education and training are non-core to accreditation. It should be noted however, examples of stand-alone modules on patient safety being added to the undergraduate curricula were observed internationally and within the NHS³⁹.

At the **continued professional development level**, experts and surveyed NHS personnel perceived institutional barriers to play a role in preventing training from taking place or being accessed by participants⁴⁰. For example, a particular UK pharmacy educator we interviewed told us of an experience where fortnightly tip-sheets on prescription safety COULD NOT be sent to all FY1’s and FY2’s because a comprehensive e-mail list DID NOT EXIST for the Trust. Consequently, only some practitioners received the training material⁴¹. Other institutional challenges perceived to be relevant by educators and trainer included: the lack of resources to scale-up training interventions, the lack of qualified trainers, and the lack of appropriate facilities (i.e. simulation centres and other necessary equipment)⁴².

On the other hand, and from the perspective of the participant, some NHS personnel perceived training to be held too infrequently, thereby resulting in: 1) health service

³⁸ Expert interviews. 2015.

³⁹ Expert interviews. 2015.

⁴⁰ Expert interviews and NHS personnel survey. 2015.

⁴¹ Expert interviews. 2015.

⁴² Submitted local case studies. 2015.

workers' skills not updated or reinforced in time, and 2) large time gaps before new joiners are trained, as training frequency could not keep up with staff turnover⁴³.

Lastly, the lack of support from management and executives for education and training on patient safety was perceived to be especially challenging⁴⁴. In this context, education and training on patient safety was cited as the first item to be de-prioritized when resources tightened, i.e. staffing shortages, peaks in patient volumes or funding gaps. This was aptly summarized by the following quotes, submitted by two surveyed NHS personnel:

"The first thing to go when the hospital is very busy is education. It is difficult as the priority for a Trust is its patients. There is practically no slack in the nursing system when things get busy"

- NHS personnel

"As a subject matter expert/ lead, we are not always listened to as to how training is delivered, frequency of training etc. We advise and ultimately, a decision is made at Executive level - this is frustrating as we cannot deliver training to the standards set by ourselves because it has a cost implication"

-NHS personnel

The impact of these high-level decisions to treat training on patient safety as "optional" were mostly felt by front-line health service workers⁴⁵. A submission by a support worker-turned-nurse encapsulated the frustration of working within a system that is perceived to deprioritize the skills of its workforce:

I feel bitterly disappointed that I am unable to attend the days like this [training] due to a staffing crisis in the NHS. I have even struggled to complete my NMC requirements for study this time. If the government wishes us to perform as a private business and profitable organisation then please staff us as one. I know of no current private enterprise with such low staff and inordinately high expectations. The really sad thing is we could actually double our income with one more nurse because we could expand our service- currently we are being crippled by lack of foresight and long term planning. After 20 years in NHS (as support worker then nurse) the general morale is at an all time low, in part, due to not being able to attend days for training. The training days are an important part of patient safety and maintaining staff education but more than that they show staff that the senior management believes we (the staff) are worth training and investing in. Such small details are often lost in big organisations however we are all people who need a little encouragement every now and then.

⁴³ NHS personnel survey. 2015.

⁴⁴ NHS personnel web survey. 2015.

⁴⁵ Ibid.

Training is offered AND is offered in time, but is not accessed

In the case that training is offered and is offered in time, NHS personnel perceived large barriers to accessing the available training, mainly due to the lack of protected time⁴⁶. Specifically, 35% of educators and administrators we spoke to and 23% of surveyed NHS personnel perceived the lack of protected time as a barrier to accessing training (Figure 24). As a point of reference, for surveyed NHS personnel, the next most cited barriers were funding and accessibility, both of which attributed to 9% of relevant responses.

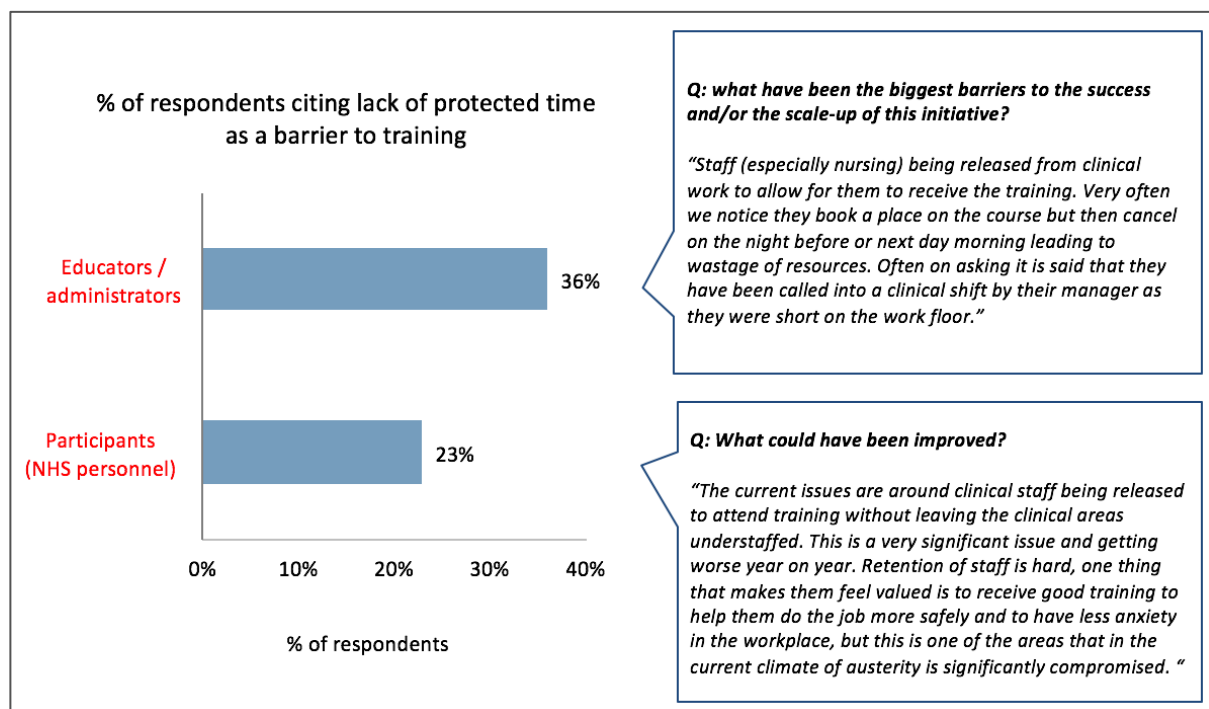


Figure 24 NHS persons' and educators / administrators' perception of the lack of protected time as a barrier to accessing training. For NSH personnel, based on Q3 of NHS personnel training: what could have been improved; for educators/administrators, Based on Q5 of case: what have been the biggest challenges to the success and/or the scale-up of this initiative

Educator/administrators' sentiments on the lack of protected time for education and training and how it affects their work and the overall culture of the work place were aptly captured by the following quotes:

"Staff (especially nursing) being released from clinical work to allow for them to receive the training. Very often we notice they book a place on the course but then cancel on the night before or next day morning leading to wastage of resources. Often on asking it is said that they have been called into a clinical shift by their manager as they were short on the work floor"

⁴⁶ NHS personnel web survey. 2015.

- Educator/administrator

“The current issues are around clinical staff being released to attend training without leaving the clinical areas understaffed. This is a very significant issue and getting worse year on year. Retention of staff is hard, one thing that makes them feel valued is to receive good training to help them do the job more safely and to have less anxiety in the workplace, but this is one of the areas that in the current climate of austerity is significantly compromised”

- Educator/administrator

Along similar lines, surveyed NHS personnel expressed frustration and disappointment that more time is not given to undertake high-quality training, which includes times to undertake training and consolidate learnings during work hours. The following quotations, submitted by surveyed NHS personnel, are in response to the answer “what could have been improved [in your experience with education and training for patient safety]?”

“Time for healthcare workers to be able to undertake the training and education and to consolidate it rather than having to do it in their own time or as quickly as possible with no real consolidation or checking of competency”

- NHS personnel

“We don't have enough time. Everybody is working flat out and demoralized. Patient safety training unfortunately is looked upon as something imposed by "them" on "us", where "they" are sat behind desks with too much time on their hands.”

- NHS personnel

Aside from impacting formal training, which is defined as planned and structured training events, the lack of protected time was also perceived to affect informal training, which is defined as unplanned and unstructured training for patient safety (i.e. personal reflection, mentoring). Specifically, some educators/administrators perceived the quality of the mentorship provided to trainees in the wards to have been negatively affected by staffing and work pressures⁴⁷. Similarly, some trainees perceived themselves to have taken over responsibilities, i.e. administrative duties, otherwise outside of their roles more frequently while on placements⁴⁸.

⁴⁷ NHS personnel web survey. 2015.

⁴⁸ Ibid.

2b. Challenges to embedding learning outcomes and instigating change

Key take-aways

- Training is offered AND is offered in time, is accessed, but is not embedded in practice.
 - Following training interventions, participants perceived it to be extremely challenging to embed learning outcomes in practice, namely to due structural and institutional challenges.
- Ultimately, if training is accessed but learning outcomes are not embedded, change fails to take root.
- Training is offered AND offered in time, is accessed, but is of unknown effectiveness.
 - Overall, submitted local cases studies demonstrated little high-quality measurement programs to determine the effectiveness of training interventions, especially pertaining to level 4 of the Kirkpatrick model, outcomes.

This section discusses our findings on challenges to embedding learning outcomes, and is further split into two sub-sections:

- [Training is offered AND is offered in time, is accessed, but is not embedded in practice](#), which describes structural and institutional barriers which prevent learning outcomes from taking root in clinical practice; and
- [Training is offered AND is offered in time, is accessed, but is of unknown effectiveness](#), which describes findings on the overall lack of high-quality measurement programs for effectiveness, as demonstrated in the submitted local case studies.

Training is offered AND is offered in time, is accessed, but is not embedded in practice

In the event that training is available and attended, participants and experts perceived significant challenges pertaining to embedding learning outcomes in clinical practice.

Specifically, experts perceived structural challenges, namely the design of technologies and some healthcare processes to be barriers to embedding learning outcomes (Figure 25)⁴⁹. For

⁴⁹ Expert interviews. 2015.

example, the design of defibrillators, which is outfitted with an emergency off-button close to where a health service provider's thumb would be, poses a concern if pressed accidentally. In this case, the defibrillator would shut-off for two minutes, potentially wasting previous time in a life and death situation. Experts perceived greater education to impart awareness of ergonomics to be a valuable addition to the patient safety curriculum. Within our interviewed group of education experts, 2/20 cited awareness of ergonomics to be important.

Along similar lines, the handover process was cited by an expert as an example of process design which is not conducive to patient safety⁵⁰. At shift change, nurses and doctors handover separately from each other. In the case of an adverse event however, nurses and doctors must work together to ensure the health and safety of the patient. Here, differential information held by team members could significantly endanger the safety of the patient. While some experts perceived education and training which increase participants' awareness of these environmental factors to be important, a greater number of experts felt it was more important to recognize and re-think the way health systems and processes are designed.

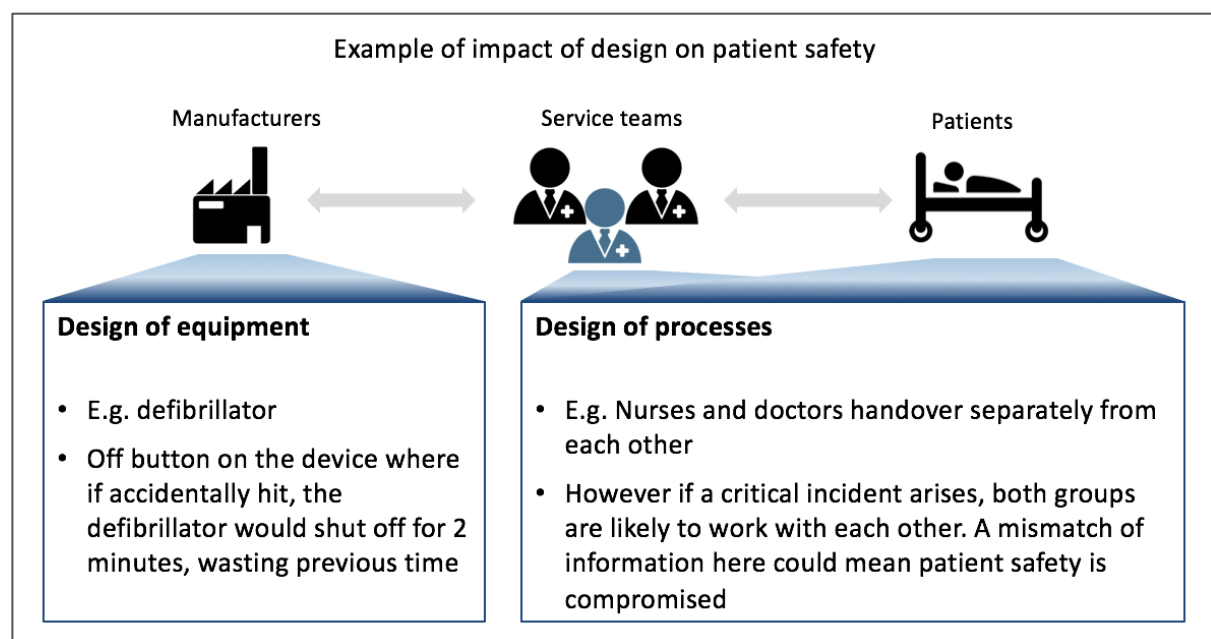


Figure 25 Examples of structural challenges affecting patient safety

Aside from design and inherent structural difficulties, interviewed experts and surveyed NHS personnel perceived bigger challenges – namely the culture of care and the lack of best-practice modelling in everyday clinical settings – to embedding learning outcomes⁵¹.

Experts perceived the modelling of unsafe behaviours by more senior clinicians, otherwise known as the “illegal normal”, as a way of challenging the knowledge, skills, attitudes and

⁵⁰ Expert interviews. 2015.

⁵¹ Expert interviews and NHS personnel survey. 2015.

behaviour gained from training interventions⁵². Ward practice, under various daily pressures, sometimes runs counter to what junior doctors have been taught as “safe” and “right”. Most of the time, the gap between what is suppose to happen versus what actually happens is not acknowledged and discussed; in this context, experts perceived junior doctors to be sent mixed signals on the importance of safe practice. Although not exclusively so, experts perceived senior clinicians to be the most likely modellers of unsafe practice⁵³. In linking this with other findings outlined in earlier sections of the report, namely the perceived large and positive impact executives and management could make on the quality of the training intervention for juniors, the lack of best-practice modelling and positive reinforcements of good practice by senior clinicians, to the extent that it happens in practice, represents a potentially large missed opportunity to deliver particularly effective training on patient safety.

Lastly, the largest proportion of experts and NHS personnel we spoke to and heard from perceived the entrenched hierarchies, and the culture of silence and blame in the NHS to be significant barriers. Surveyed junior doctors expressed the fact that they couldn’t speak up when they witnessed troubling clinical practice in the ward. Furthermore, an expert we interviewed cited a particular example of an initiative to introduce community prescribing which was met with strong objection from local nurses, who felt it was an attempt to target the “weakest group”⁵⁴.

Ultimately and despite the specific type of barrier at play, institutional barriers were perceived to have similar mid-term and long-term outcomes. In the mid-term, high-quality education and training does not take place or non-safe practices are perpetuated, even if training does take place. In the long-term, the message that patient safety is of low importance is being sent and change fails to take root (Figure 26).

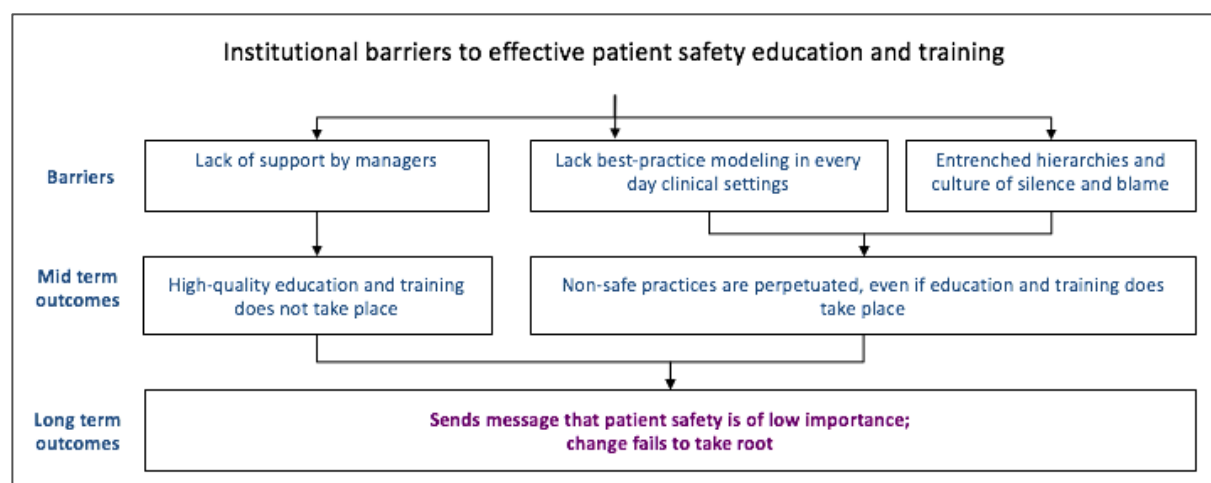


Figure 26 Institutional barriers to effective patient safety education and training. Source: all qualitative avenues of data

⁵² Expert interviews. 2015.

⁵³ Ibid.

⁵⁴ Expert interviews. 2015.

In our research program however, we witnessed many innovative local programs in the NHS which aimed to empower and assist junior doctors to speak up against unsafe practice. One such program is presented in Exhibit 5.

Empowering students to speak up on unsafe practices

- **Objective:** to help local students overcome reluctance to raise concerns about unsafe practice
- **Intended audience:** student doctors
- **Implemented solution**
 - **Specifying when a student is included in patient safety incidents:** local incident reporting system has been modified to include check-box to specify that a student was involved in the incident. When this box is ticked, the details of the incident are automatically sent to the PEF team, who contracts the student and liaise with the relevant departmental team. Additional educational needs are flagged and supplemented to upcoming education and training initiatives. Learning is disseminated to the wider and trust
 - **Seeking feedback at the end of placements:** during end of placement sessions, students are asked about Stop, Start and Continue initiatives in their placements. Stop initiative are defined as examples which contribute to poor care, team work or low-quality learning. Start initiatives are defined as programs that the students may have seen in other departments or trust that could be implemented. Continue initiatives are defined as what the department or trust is doing well and needs to continue. Feedback from end-of-placement sessions are shared with department managers, directorate leads, HEI partners, CQC, NMC and at monitoring events. Students who provided feedback are provided follow-up's which demonstrate how their feedback has contributed to change in the organization. These feedback initiatives are called "You said – We did".

Exhibit 5 Case study of how organisations are empowering students to speak up on unsafe practices

Training is offered AND is offered in time, is accessed, but is of unknown effectiveness

In previous sections of the report ([1b](#)), we discussed the overall limitations of the data in the literature regarding the effectiveness of various training interventions for patient safety. This general finding was reinforced by our analysis of the output we received from the local case studies⁵⁵.

⁵⁵ Local case studies. 2015.

In the case studies collected from local organisations, we found little evidence of high-quality measurement programs for training interventions (Figure 27). Specifically, of the 32 completed templates, 25 had sufficient information to analyse for measurement efforts. Out of the 25 case studies, the majority demonstrated measurement programs along level one and two. Fewer training initiatives were observed to measure effectiveness along level three and four, behaviours and outcomes, respectively. Moreover, for case studies where measurement of training effectiveness was undertaken, self-reported outcomes were most frequently used across levels one to three, while normal incident reporting channels were used most frequently to measure effectiveness at level four, outcomes. Incident reporting channels are often subject to biased reporting, and do not capture a holistic and comprehensive picture of patient safety⁵⁶; furthermore, it is not a robust measure of causality between training and outcomes. Our analysis suggests measurement is not being undertaken for all training interventions, especially at level four, outcomes. Moreover, it suggests that where measurement is undertaken, measurement methodologies are not sufficiently robust, especially for level four, outcomes.

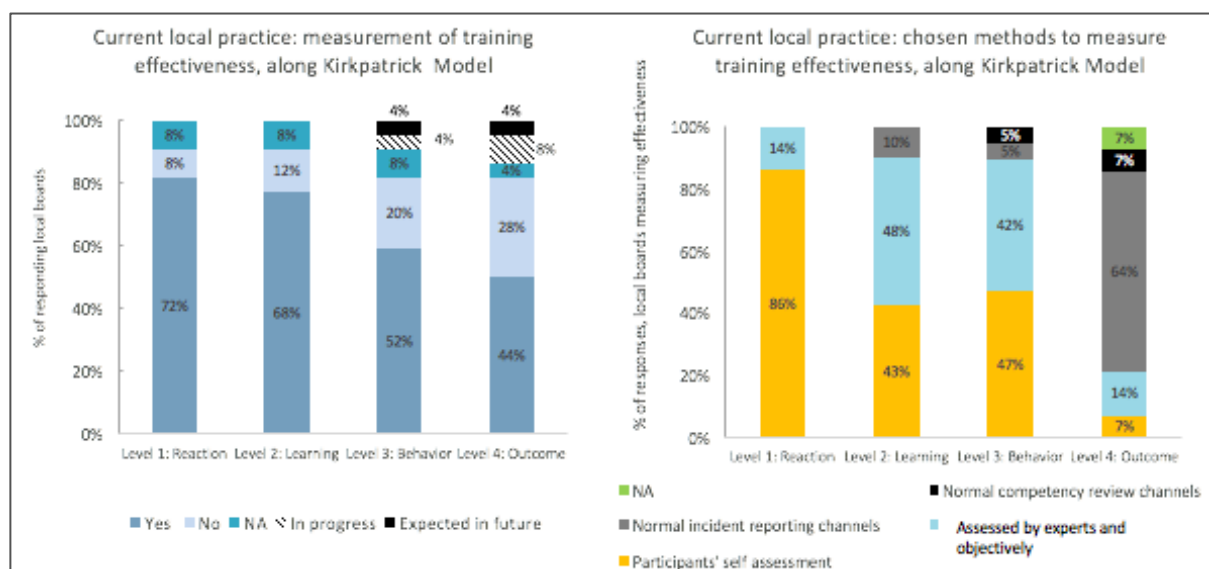


Figure 27 Measurement of effectiveness for implemented training interventions, submitted local case studies. Total of 25 case studies were analysed for output.

⁵⁶ Unpublished work for National Reporting and Learning System (NRLS). Forthcoming in 2015.

POTENTIAL CONSIDERATIONS FOR OBSERVED CHALLENGES

In our research process, we observed many innovative programs and heard the voices of many participants and trainers on what is perceived to be effective training intervention. These programs and perceptions of effectiveness could be references in the process of resolving the barriers we cited in the main body of our report. It should be noted however that no rigorous evidence exists to support their potential success or effectiveness. We share these insights in the hopes that they offer inspiration and some guidance on potential solutions.

Broadly speaking, challenges and potential considerations are as follows:

Area	Potential consideration
<input type="checkbox"/> Trainer quality	<input type="checkbox"/> Investing in programs to train the trainer, e.g. training for elementary school teachers in the US
<input type="checkbox"/> Lack of protected time for training	<input type="checkbox"/> Mandatory training for patient safety
<input type="checkbox"/> Lack of prioritization of training for patient safety by executives/decision-makers	<input type="checkbox"/> Installing accountability structures at the executive level, e.g. a patient safety committee which advises the board of directors of the organisation
<input type="checkbox"/> Lack of access to materials which could inform training, and overlapping efforts to design interventions and curricula <input type="checkbox"/> Locally-based training interventions	<input type="checkbox"/> A sharing platform for materials, innovation and dialogue <input type="checkbox"/> A periodic scanning activity for current practice, “what works” and innovative schemes
<input type="checkbox"/> Lack of robust measurement programs on the effectiveness of training interventions	<input type="checkbox"/> Additional research on metrics and innovative training models and curricula
<input type="checkbox"/> Lack of clinical leadership	<input type="checkbox"/> Engage clinicians to champion patient safety education and training across all settings of care

Trainer quality

Given the importance of teaching quality, investments to strengthen capabilities of the teaching staff are seen in other education-related field. As case study from training

elementary school teachers in the US shows significant investment from identifying core competencies to training and continued development once in the workplace (Figure 26). HEE could consider similar efforts for education staff in patient safety. Other “training the trainer” initiatives are outlined in Exhibit 1 and Exhibit 2.

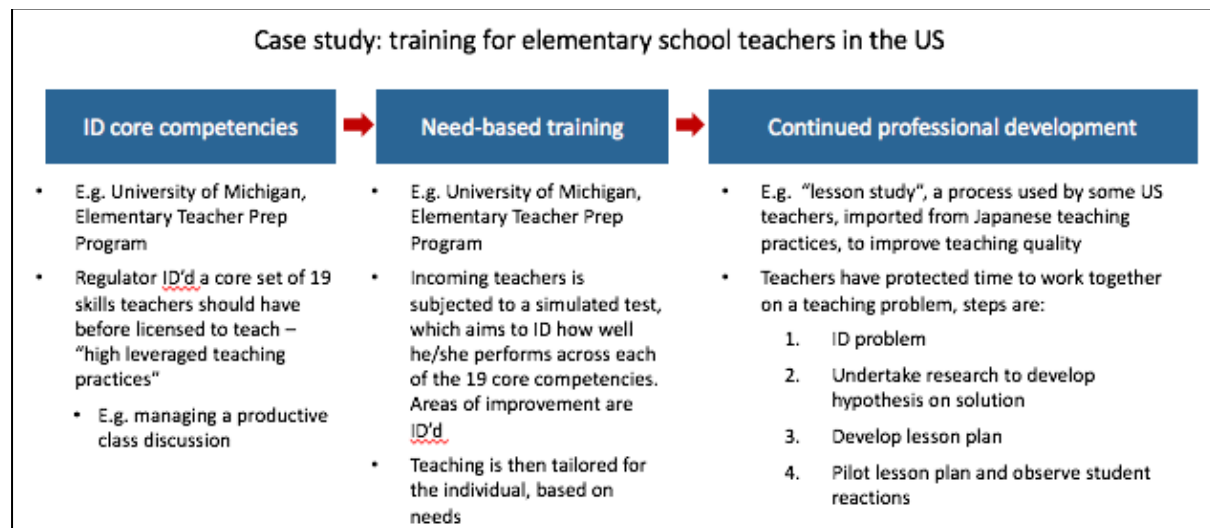


Figure 26 Case study of investing in the quality of the education staff, US elementary school teachers at the University of Michigan. Source: Teaching teachers, a podcast by American Radio Works

Lack of protected time for training

Given the number of NHS personnel and trainers/administrators who perceived the lack of protected time as a barrier to accessing training which was available, HEE and the Commission could consider mandatory training for patient safety. However, according to our research, the decision to do so will require consideration around messaging and program design, as negative sentiments toward mandatory training were observed. In fact, the modifier “tick-box” appeared verbatim in our research 21 times (Figure 27). Consequently, mandatory training may need to be approached with caution.

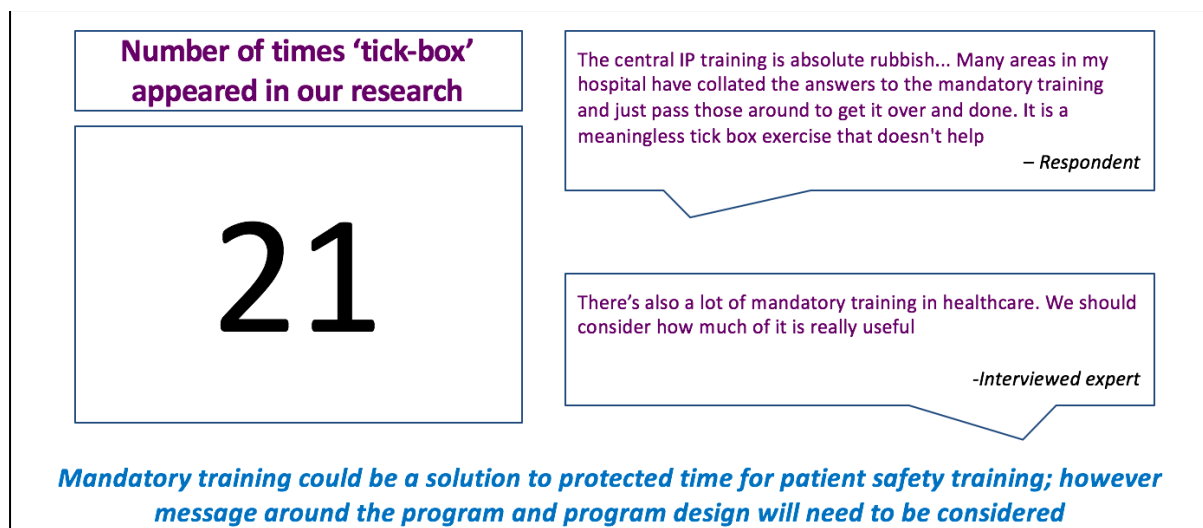


Figure 27 Sentiments toward mandatory training in the NHS

Lack of prioritization of training for patient safety by executives/decision-makers

Accountability structures, pertaining to executive teams, were observed as a tool to help cement the importance of patient safety at the decision-making level, which can help to entrench greater priority for patient safety (Figure 28).

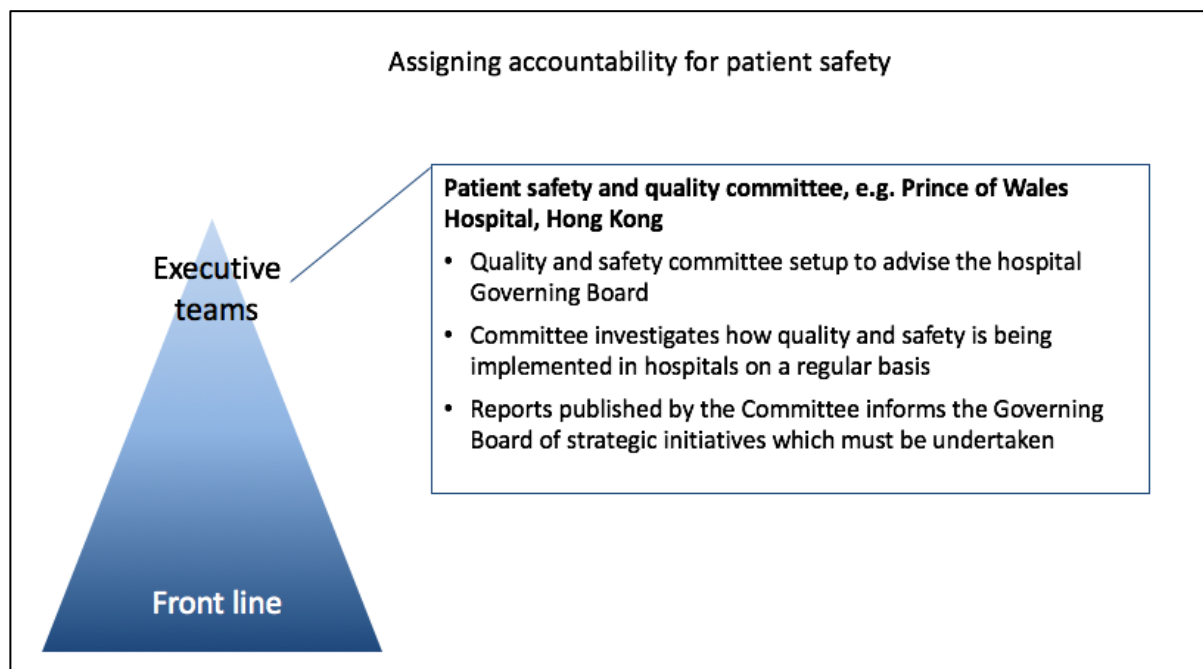


Figure 28 Accountability structures at the decision-making level

Lack of access to materials which could inform training, and overlapping efforts to design interventions and curricula

It may be beneficial for HEE and the Commission to consider an “exchange platform” to facilitate the sharing of materials and experiences, which could help to address some access barriers cited by administrators (Figure 29).

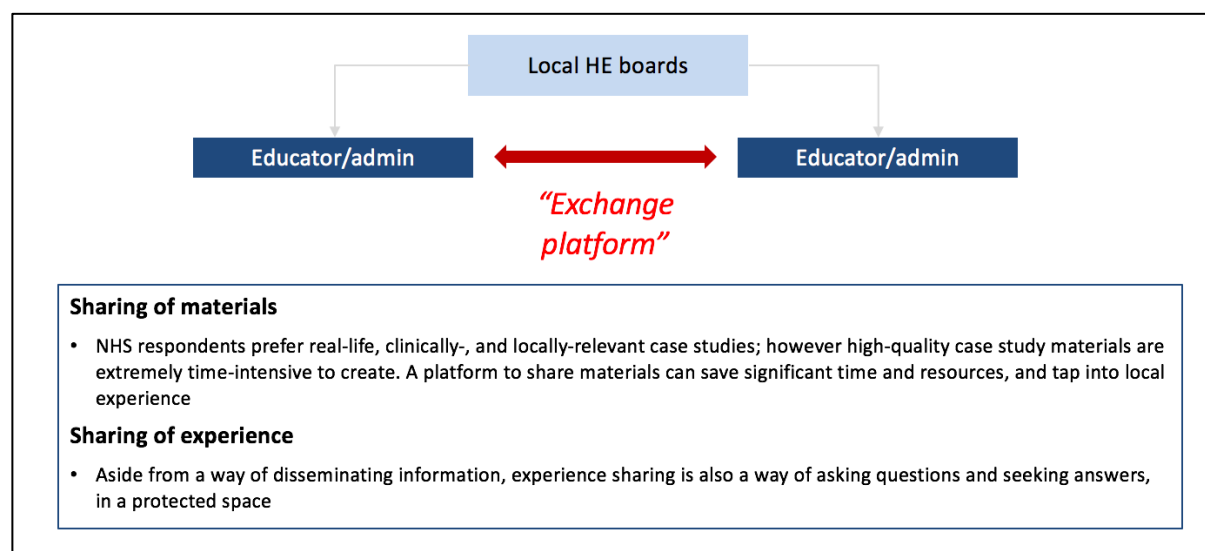


Figure 29 Potential "exchange platform" for administrators/educators of patient safety training

Locally-based training interventions

We saw many inspiring examples of local innovations in our research program. We believe strongly that these innovative programmes should be identified, shared, and scaled-up, if effective. To this end, it may be helpful for an “innovation scanner” to be established, which works with HEE to (Figure 30):

- ☐ Periodically scan for innovative interventions in education and training for patient safety;
- ☐ To help track progress against key policy priorities; and
- ☐ To work with programmes to improve interventions, and prove effectiveness and scale-up, if effective

The potential for an “innovation scanner”



Potential roles

- **Scanning of local activity** – periodic inventory of local activity in education and training for patient safety
- **Reporting of local activity** – summary of local progress against key policy areas, i.e. measurement of effectiveness
- **Identification and scale-up of innovative interventions** – works with HEE to identify innovative interventions, according to a set of objective metrics. Works with administrators to measure, improve and scale-up innovations, if promising

Figure 30 Innovation scanner to identify local innovative programmes

SUMMARY OF FINDINGS

Over the past nine months, we have heard from many voices – voices of experts who have devoted their lives to the field, voices of NHS personnel who have participated in and contributed towards training, voices of trainers who work tirelessly to help craft such interventions and the voices of patients and carers whose lives have been affected by preventable patient harm. Collectively, these voices told us what they perceived to be important and effective in training interventions for patient safety – the training itself, but also the environment and culture of learning and care.

In summary, our key findings across the two main branches, designing effective curricula and training delivery (branch 1) and shaping the environment for learning and care (branch 2) are:

Branch 1: designing effective curricula and training delivery

- ☐ The objective of education and training in patient safety is to change knowledge, skills, attitudes and behaviors at the individual, team and organisational levels.
- ☐ Some evidence which supports the effectiveness of interactive training methods, namely simulations and team-based training, are available in the literature. However, the overall quality of the evidence is poor.
- ☐ Surveyed NHS respondents and experts perceived interactive training methods, namely simulations and multi-disciplinary training, to be effective. This was supported by the finding that surveyed local organisations predominately utilized simulations in training interventions.
- ☐ Curricula that is informed directly or indirectly by patient experiences and local incidents were perceived to be effective.

Branch 2: shaping the environment for learning and care

- ☐ Designing rigorous curricula and training delivery methods is one-half of what must be considered to deliver effective training interventions.
- ☐ Perhaps just as importantly, institutional barriers, such as access to training and the cultural of care, were observed to be barriers.
- ☐ Without addressing these institutional barriers, training is not accessed or not accessed on time, and learning outcomes are not embedded in clinical practice.

APPENDIX

A. Methodology

Our research methods consisted of two domains:

1. A review of the literature on education and training for patient safety; and
2. Qualitative research involving patients, carers, NHS personnel, local HE boards and education experts

The following section describes our research methods across these two domains. More detailed accounts, including questionnaires and surveys used, can be found in **APPENDIX D-G**.

Review of the literature

We conducted a review of systematic and scoping reviews on education and training for patient safety. Our approach consisted of 3 parts:

1. A “review of reviews” of the academic literature on education and training for patient safety
2. A review of the grey literature on these topics, from leading sources in the UK, USA, Canada and Australia
3. A “review of reviews” of academic literature on safety education and training in industries other than healthcare

Regarding our approach for the “review of reviews” of the academic literature, we were guided by the main research question: “What is the evidence available on the most effective education and training interventions and curricula for patient safety?” Article were selected from three core areas: patient safety, quality improvement and additional topics identified by HEE – human factors, raising and responding to concerns, and professionalism. Overall, our search yielded a total of over 190,000 articles, which were narrowed down to 50 articles by applying various exclusion criteria, previously discussed and agreed with HEE (Figure 26).

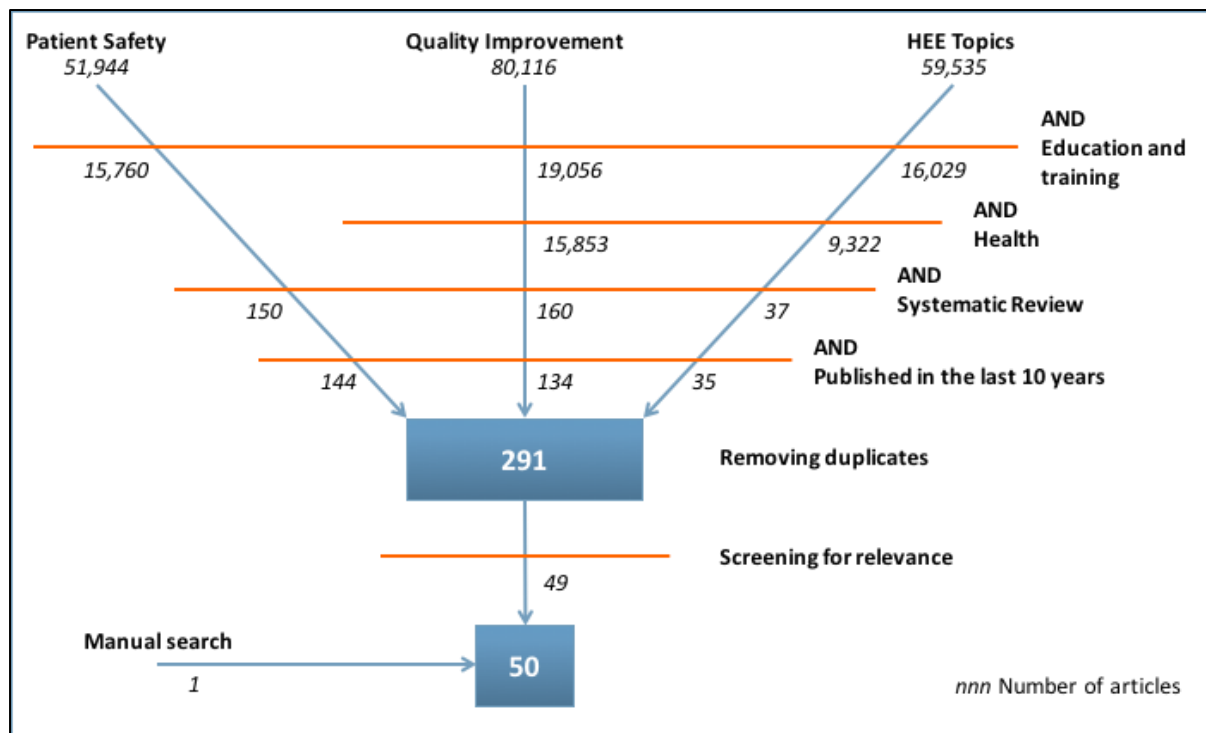


Figure 31 Selection process and criteria for literature review

We analyzed the final 50 articles in the following ways:

- ☐ Considered how many original studies was included in the review and the quality of the data within those studies
- ☐ Evaluated whether the reviews focused on educational interventions or curriculum content and on which elements within those categories
- ☐ Assessed which care settings, specialties, staff groups and educational level they covered
- ☐ Applied the Kirkpatrick Model for Training Evaluation to determine whether the reviews described the impact of educational approaches and whether there was robust evidence of positive impact

Lastly regarding our approach for the “review of reviews” of academic literature on safety education and training in other industries than healthcare, a similar strategy to the healthcare literature was used. Again, we were guided by the research question: “What is the evidence available on the most effective education and training interventions and curricula for safety?” No limitations on industries were imposed. After filtering to remove reviews on healthcare, 106 articles remained, of which only four were relevant for the purposes of our research question. Of the four articles included in our review:

- ☐ One focused on lessons for healthcare from the aviation industry
- ☐ Two focused on the food industry
- ☐ One focused on agriculture

In our analysis of the reviews, we focused on drawing out lessons regarding types of training interventions and their effectiveness across the Kirkpatrick model for healthcare. However, we deemed the majority of reviews to be non-relevant for patient safety in healthcare.

Qualitative research

Aside from our review of literature, we also undertook qualitative research to gather evidence. Research activities mainly included:

1. One-on-one interviews with various education experts, within NHS and international focus (hereafter referred to as “interviews”);
2. Site visits to regional HE boards, including presentations and round-table discussions to share experiences (hereafter referred to as “site visits”);
3. Electronic surveys of NHS personnel and patients/carers on their experiences with education and training for patient safety, and experiences with patient safety in the NHS more broadly (hereafter referred to as “surveys”);
4. Submission of case studies on education and training initiatives for patient safety from local HE boards (hereafter referred to as “case studies”); and
5. Focus groups involving staff, trainee and medical students (hereafter referred to as “focus groups”)

A brief description of our qualitative research activities is summarized below.

A total of 20 interviews were conducted with education experts over the period of May, 2015 to September, 2015. In terms of the experts’ profiles, 50% were UK-based, 15% were US-based, 15% were Hong Kong-based, 5% were Canada-based, 5% were France-based, 5% were Australia-based, and 5% were of international remit. Experts were chosen based on our previous project expertise, their respective areas of focus, and availability. Interviews were roughly 1 hour in length, and were conducted face-to-face where possible and via the phone where not. Interviews were done in a semi-structured fashion, and guided by an interview schedule which was approved by HEE beforehand. Recordings of the interviews, where interviewees agreed to being recorded, were transcribed and key themes for 10 out of 20 interviews were coded using NVivo. Coding was done inductively and not according to a priori framework (i.e our interview schedule); a single CHP fellow undertook independent coding where texts were coded according to its meaning. Codes were then structured in a hierarchical fashion. Coding enabled us to identify common concepts across data sources, without scrutinizing for identical texts. Only 10 of 20 interviews were coded using NVivo as our timeline did not allow for all 20 interviews to be analyzed in this fashion. For the remaining 10 interviews, transcripts were read for additional themes, or evidence that previously established themes were not valid. The interview schedule is available in **Appendix D**.

A total of four separate site visits were made to regional HE boards alongside HEE representatives. These visits consisted of meetings with the following organisations:

1. East region – consisting of Health Education England leads from East of England, East Midlands, and West Midlands regions
2. Southern region – consisting of Health Education England leads the Southwest, Thames Valley and Wessex, and Oxford University Hospital Trust.
3. Northern region – consisting of Health Education England leads from the North East, North West and Yorkshire and Humber regions.
4. South East region – consisting of Health Education England leads from Kent, Surrey and Sussex, North, Central and East London, South London and Northwest London.

During our site visits, representatives from local organisations presented information on local patient safety education and training initiatives, including what worked, what didn't and why. These presentations were followed by open discussion. CHP and HEE representatives in attendance captured notes of key activities manually. Notes were shared and collated subsequently.

Electronic surveys of NHS personnel and patient/carers were undertaken over the periods of June, 2015 to September, 2015 and August, 2015 to October, 2015, respectively. Surveys were designed using SurveyMonkey, and their links were circulated in two ways:

1. Embedding the link to heelearningtobesafef.org, which is a project-specific website designed for the purposes of gathering feedback
2. Direct circulation of the link among HEE and CHP's networks of NHS personnel, patient safety advocacy networks and programs

Overall, 590 NHS respondents and 32 patients/carers submitted surveys. Answers were exported using Excel and analysed for trends. Original survey questions can be found in **APPENDIX E**.

To analyse the surveys, a single CHP fellow reviewed all submitted data twice, with the first review purposed to build general familiarity with the range of responses and the second for coding. Responses were coded (i.e. attributed for general intent, much like with interview transcripts) for meaning in Excel. A large spreadsheet was created where survey responses were row headings and potential attributable meanings were column headings. Under this system, when a submitted response contained content in-line with a particular meaning, a "Y" was entered into the corresponding cell for the meaning (column heading) and the response in question (row heading). In the case that a submitted response conveyed multiple meanings, the particular response was coded for multiple meanings (i.e. more than one "Y" was catalogued for the response). New meanings were added as needed via inserting new columns, and "themes" were built by re-arranging different columns of meanings under a general heading. Separate spreadsheets were used for different survey questions. Aside from coding for meaning, we also made note of individual responses if they were: 1) especially compelling in narrative, and 2) different in meaning versus other responses.

Although the process of translating meaning from survey responses was similar to that of the interview transcripts, we chose to use Excel (rather than NVivo, the standard coding software) because we required more robust data manipulation functions than NVivo was capable of. The coding process was repeated for a total of 2680 survey responses (2360 from NHS personnel and 320 from patients/carers). Non-relevant response (defined as: 1) being not relevant to training or education, 2) incomprehensible, or 3) a blank response) were excluded. Coded responses were then summed by using the COUNTIF function to arrive at the total number of responses expressing a particular meaning. More advanced functions such as CONCATENATE and PIVOT TABLE were used to analyse responses where more than one meaning was attributable to the response. Lastly, we were able to separately draw out sentiments from non-acute NHS staff by cross-referencing the respondent's self-identified role within the NHS (answer to Q1) versus his/her answers to subsequent survey questions.

Patient/carer focus groups were recorded with consent from the participants; transcripts of the focus group were drafted, which allowed for closer scrutiny of the discussion. A similar process was also undertaken for medical students' focus group. For the remaining focus groups, notes were taken manually at the time of the focus groups by CHP and HEE representatives in attendance. Notes were shared and collated afterwards. Original survey questions can be found in **APPENDIX F**.

Aside from regional visits, we also invited local HE boards and trainers to submit case studies electronically. Templates, outlined in Excel, were sent to all organisations who presented at the regional site visits. The template contained a set of 6 questions on intervention objective, design and outcomes according to the Kirkpatrick Model of Training Evaluation. The original case study templates and the list of organisations which submitted completed case studies can be found in **APPENDIX G**.

A total of 25 template case studies were returned. A process of attributing meaning for each submitted response similar to that of the NHS and patient/carer surveys was undertaken. Again, a submitted response was coded for meaning and multiple meanings, if the response warranted as such. New meanings were added if needed, and themes were created by re-arranging columns of data under a broader heading. The coding process was repeated for a total of 350 responses. Non-relevant response (defined as being: 1) not relevant to training or education, 2) incomprehensible, or 3) a blank response) were excluded. Coded responses were then summed under meaning meaning/theme by using the COUNTIF Excel function.

Lastly, a total of 4 focus groups were held involving patients, staff, trainee and medical students.

Limitations in our methodology

Limitations in our methodology can be viewed along the type of research:

1. Review of the literature
2. Qualitative evidence collection and analysis

Our review of the literature was mainly geared towards systematic reviews. Whereas this approach was well suited to the healthcare industry, given the volume of articles available, it yielded very few results for other industries. A review of original studies in safety education and training industries other than healthcare could have yielded more insights.

Moreover, focusing on systematic reviews favours areas of works for which there is already a multitude of studies, whilst reducing the likelihood that novel interventions for which the research evidence is limited will show up in our research results. However, we consider this to be an acceptable compromise in the interest of being able to efficiently scope the main evidence base.

Lastly our key analysis of the review of the literature, plotting the reviews on the levels of the Kirkpatrick model, was completed using the number of systematic reviews as the unit of measure. Given more time, this could have been done using the original studies included in the review. However, we believe that the main findings of our research would not have changed significantly.

Related to the collection of qualitative data, while we received overwhelming number of responses from NHS personnel, we only received 32 responses from patients/carers. Given more time, greater marketing efforts could have increase awareness of and participation in the surveys. Given the relatively lower number of responses from patients/carers, analysis and findings related to these responses should be viewed as directional. Where applicable, this is explicitly noted in our reports and slide decks.

Furthermore, our choice of using Excel to code for meaning across some qualitative data sources could have influenced our findings. However, we do not anticipate this influence to be significant, as the process of attributing meaning, translating them across responses and building themes was undertaken nearly, if not equally, as well in Excel as NVivo. Nonetheless the use of Excel to undertake qualitative research is not as common place, although its use in qualitative research has been previously explored (Meyer, 2009).

Analysis of all qualitative data was undertaken by a sole CHP fellow, which could have introduced a bias in the analysis process. Given more time, a second fellow could have repeated similar efforts and any differences in the data interpretation could have been reconciled. However, we consider this to be an acceptable limitation, given the time constraints of the project.

Lastly, rigorous coding of transcripts from expert interviews was only undertaken for 10 expert interviews. Remaining expert interviews (total of 10), transcripts from patient/carer and medical students' focus groups and notes from LEBT visits were not coded using NVivo. Our choice to do so was because of time limitations in our research process. The lack of rigorous coding for the cited sources above does subject our findings to bias; if given more time, more rigorous analysis of these sources should be undertaken.

B. Review of the literature

Disclaimer

This document is not meant to be a thorough literature review, but rather an time-sensitive exercise to understand the available evidence in education and training interventions for patient safety. Due to the very short timeline (less than 2 months), we had to make some trade-offs in our approach, for example:

- Focus on reviewing systematic reviews
- Single reviewers for the articles included
- Use of number of reviews (rather than original articles contained in them) as unit of analysis
- Core search through main search engines, with quick scan of specialised databases (e.g., for nursing and allied health professionals as suggested by a member of the Commission)
- High-level scan of literature on other industries

Despite these limitations, we are confident in our key findings and the implications for the work of the Commission. As well as the review of academic papers, our findings are similar to those the extensive review performed by the Health Foundation on similar topics.

Executive summary

This document summarises the results of our review of the literature on education and training for patient safety. In addition we scoped the literature on safety in other industries.

Our approach consisted of three parts:

1. A “review of reviews” of the academic literature on patient safety training and education.
2. A review of the grey literature on these topics, from leading sources in the UK, USA, Canada and Australia.
3. A “review of reviews” of the academic literature on safety training and education in industries other than healthcare.

Our findings show that while there is a large volume of literature focused on the healthcare sector compared to other industries, the available evidence:

- Focuses on specific areas and interventions – in particular acute care and simulation.
- Is based on highly heterogeneous approaches for evaluation and often on unreliable data and/or methods.
- Rarely includes comparative analyses of different training and education approaches.
- Does not robustly assess the impact on patient outcomes.

As a consequence, it is extremely difficult to identify specific training and education interventions or curriculum content that are demonstrated to improve patient safety. The evidence showing positive impact on clinical skills and behaviours is marginally better, but still somewhat limited. These conclusions are in line with those of the most relevant non-academic reports that we discovered.

Little could be learned from our scan of the literature on safety education and training in other industries: we found only four systematic reviews (one on the lessons that healthcare can learn from aviation, two from the food industry and one on agriculture).

These findings have significant implications for the Health Education England Commission on Education and Training for Patient Safety:

- The Commission might not be able to base its recommendations on robust scientific evidence of impact on clinical outcomes.
- Findings from interviews and, to a lesser degree, from focus groups and website submission will have to play a critical role in informing recommendations, but they are less reliable sources of evidence.
- The Commission should consider highlighting improvement of the evidence base on education and training in healthcare (and patient safety in particular) as a key priority.

Key findings

The review team searched 14 academic databases, including those suggested by Commission members. To achieve maximum coverage in a short timeframe, we focused on systematic review papers. 50 systematic reviews, covering over 1200 original studies, were initially identified for inclusion in this report.

We evaluated the studies according to whether or not they demonstrated evidence within the four levels of the Kirkpatrick model for evaluation of education and training:

- Level 1: Reaction - measures participants' satisfaction and how they feel about the education and training they have received.
- Level 2: Learning - measures the extent to which participants acquire knowledge, skills and attitudes as intended by the programme.
- Level 3: Behaviour - measures whether the knowledge, skills and attitudes were transferred to the workplace.
- Level 4: Results - Did the learning impact on outcomes.

Of the 50 shortlisted articles, 17 found reliable evidence at any of the Kirkpatrick levels. A common theme of our review was that authors concluded that there is very little robust evidence that the different methods of training cause any improvement on patient safety. It is important to note that the absence of evidence does not mean that education and training is not effective, just that we have yet to find evidence for this.

Patient safety education & training interventions

We reviewed the 17 articles that found reliable evidence of impact at any of the four Kirkpatrick levels in more detail. Interventions that were found to be beneficial in these review papers include the following:

- **Simulation** was the most popular intervention and found to have an impact across the first three levels: reaction, learning and behaviour. For example, a review of simulation as a strategy for improvement of patient safety did find that it improved the technical performance of clinicians during complex procedures. A single study that combined simulation and teamwork training claimed an impact on outcomes (level 4).
- **Team-based learning** was also a popular intervention across the first three levels of Kirkpatrick. Although evidence for its effectiveness was not clear, it scored well on satisfaction rates, as well as knowledge and attitudes of the participants.
 - **Crew resource management (CRM)** is a type of team-based training derived from the aviation industry. CRM also appeared across the first three levels of the evaluation. Participants reacted well to this type of training and it was found to have an effect on knowledge and behaviours.
- **Self-audit** was one of the few approaches that appeared to impact on clinical outcomes (level 4), but this was based only on self-reported outcomes.
- **Learning by doing** is a common approach used to teach and train clinicians particularly for quality improvement techniques. This can be a long process, taking between 3 and 12 months (or even longer) to complete. However, there is evidence of clinical improvements and no reports of worsening clinical outcomes.
- Both **morbidity and mortality conferences** and **inter-professional education** received positive reactions (level 1) from participants but no review linked these interventions to impact on learning outcomes, behaviours or patient outcomes.
- An emerging theme was the use of **social media tools and networks** for education and learning. Use of this approach received positive feedback from students. While this was used to supplement teaching no review was able to offer evidence that the use of social media enhanced traditional educational techniques. This may be an interesting area for future development and research.

Grey literature and other industry findings

The grey literature reinforced our finding that whilst training and education interventions can improve skills and knowledge, there is no conclusive evidence of which types improve health outcomes or safety. It also underscored our discovery that little has been researched on whether one type of training or education is better than another.

The grey literature did highlight the fact that medical school and teaching hospital leaders should place the highest priority on creating learning cultures that emphasise patient safety, model professionalism, enhance collaborative behaviour, encourage transparency and value the individual learner. Medical schools should conceptualise and treat patient safety as a science that encompasses knowledge of error causation and mitigation, human factors

concepts, safety improvement science, systems theory and analysis, system design and re-design, teaming, and error disclosure and apology. Improvement in patient outcomes is likely to be more effective in those organisations with a positive safety culture that has the structure in place to enable changes for improvement to take place.

Many of the topics identified by the competency documents from around the world reflect several essential aspects of patient safety. Some also reflect Health Education England's four themes, i.e. the importance of Continued Professional Development, and raising and responding to concerns, as well as patient safety/human factors and service improvement science. Patient engagement, teamwork, learning from errors and managing risk were the other key areas or domains of competencies which are internationally recognised.

The review of the literature from other industries outside of healthcare found limited evidence (4 articles). While some lessons could be drawn, other methods will be necessary to learn more in this area.

2. Academic literature on patient safety training and education

Approach

We conducted a review of systematic and scoping reviews on patient safety education and training to answer the research question: “What is the evidence available on the most effective education and training interventions and curriculum contents for patient safety?” We selected articles from across three core areas:

- Patient safety;
- Quality improvement; and
- Additional Health Education England topics of focus:
 - Human Factors,
 - Raising and Responding to Concerns and
 - Professionalism⁵⁷

This first step yielded a total of over 190,000 articles. We narrowed down the list by focusing on reviews of education and training published in the last 10 years. We also eliminated duplicates, conducted a hand search and critically assessed the relevance of the articles (see appendix for details on methodology). This process produced an initial list of 50 articles as illustrated in Figure 1 (see appendix 2 for the full list of articles). Details of the search strategy are included in Appendix 1.

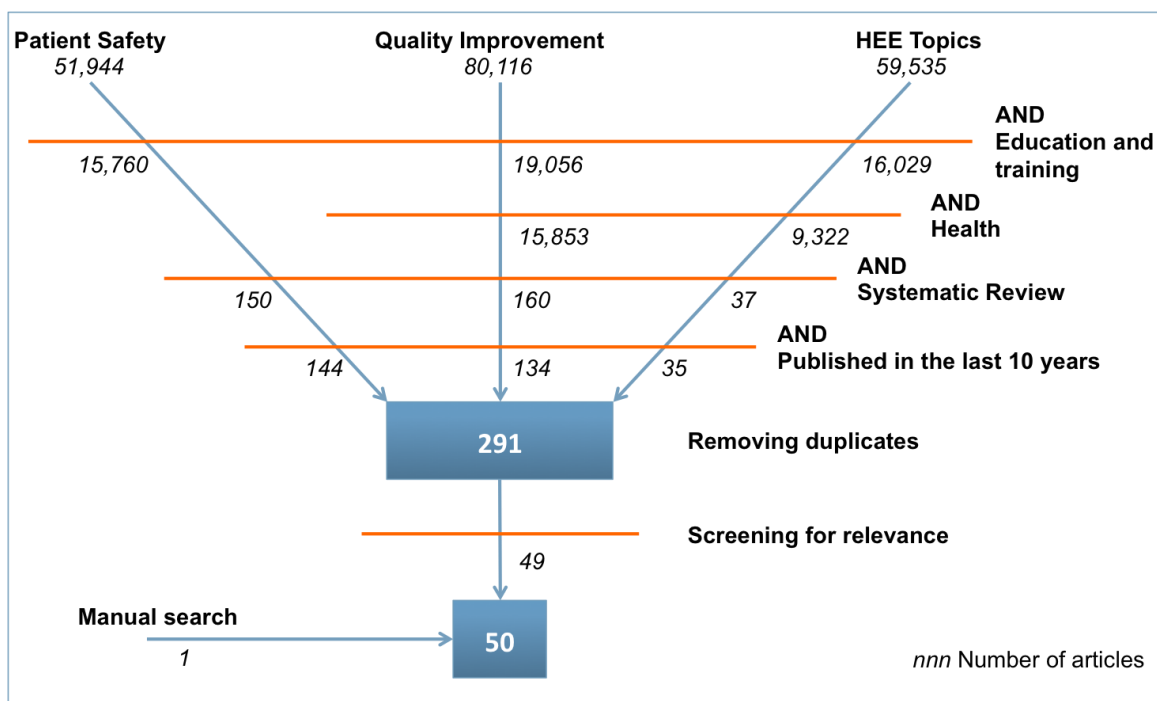


Figure 1: Overview of systematic search strategy based upon combined search facets

⁵⁷ “Professionalism” was added on the advice of a member of the HEE Commission who felt that this term would apply to the education and training of allied health professionals and should be included.

We analysed the articles in the following ways:

- Considered how many original studies they covered and the quality of the data within those studies.
- Evaluated whether they focused on educational interventions or curriculum content and on which elements within those categories.
- Assessed which care settings, specialties, staff groups and educational level they covered.
- Applied the Kirkpatrick Model to determine whether the reviews described the impact of educational approaches (on reaction, learning, behaviour and results) and whether there was robust evidence of positive impact.

Our approach has clear limitations, but we believe it was an appropriate choice considering the time available to conduct the review. We validated the results by selecting “tracers” (identified in our review) and crosschecking to ensure they appeared in our shortlist. We also independently scanned the abstracts of over 700 articles found through a less restrictive search and the key themes of our approach were confirmed.

Findings

The analysis of all 50 papers found a significant prevalence of articles about training interventions rather than curriculum content as illustrated in Figure 2.

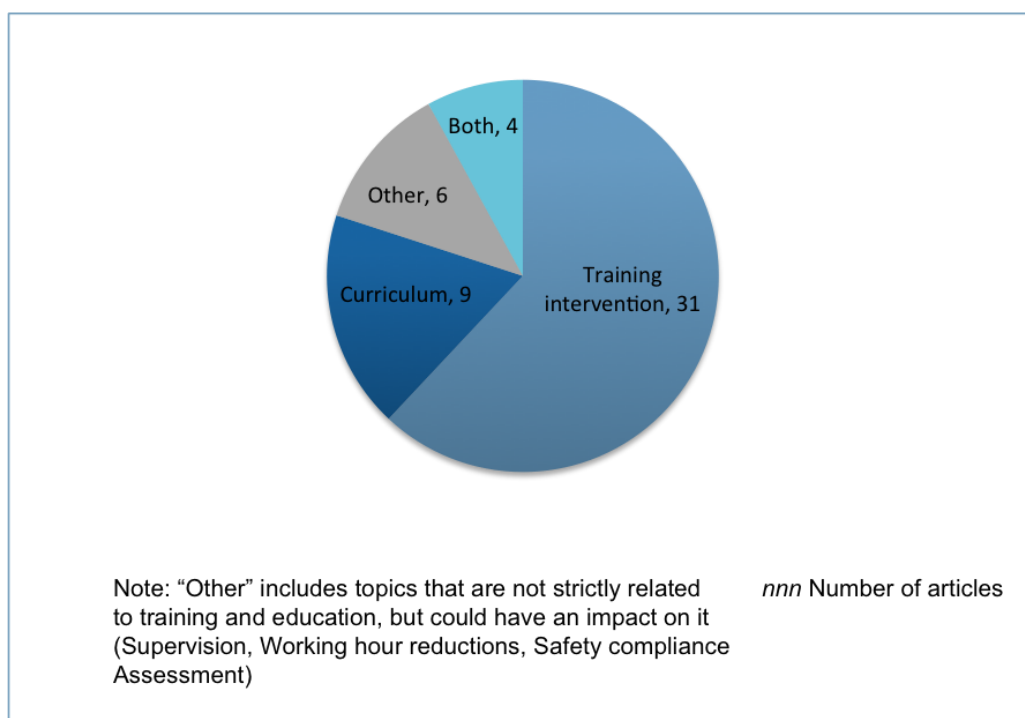


Figure 2: Focus of articles

In terms of topics there was a marked prevalence of articles about simulation (mentioned in 13 reviews), teamwork (4 reviews) and social media (3 reviews). Only two other topics had more than one review conducted about them and these were assessment or self-assessment, and leadership development.

Impact of education on patient outcomes

While conducting this review, we considered the objective that the Commission clearly stated: to provide recommendations based on evidence of impact on patient outcomes. For this reason, we applied the Kirkpatrick model to analyse the results. 46 out of 50 reviews summarised impact in a way that could be categorised within the levels of the Kirkpatrick model. The output is shown in Figure 3 below. It's important to note that several reviews measured more than one level.

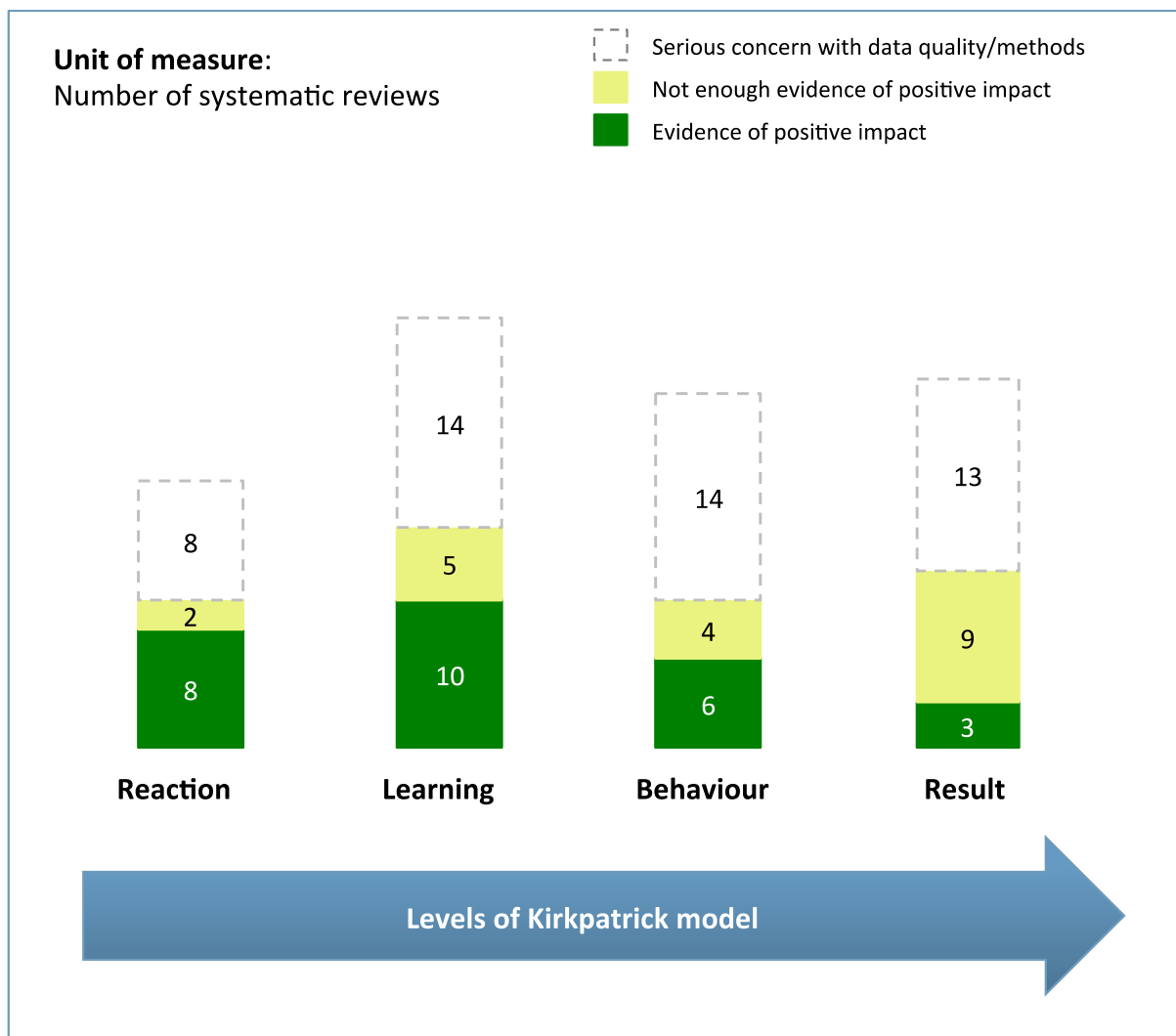


Figure 3: Overview of the application of the Kirkpatrick Model to the selected articles

Around half of reviews highlighted the poor quality of evidence available, in terms of data or methods of analysis. Only three found evidence of impact on outcomes that they deemed

acceptable. However, in one case the outcomes were self-reported and in another the conclusion was based on just one original study.

Level of impact

Of the 50 articles, 46 assessed whether an impact was found for the interventions under consideration in a way that was consistent with the Kirkpatrick model. However, of those 18 expressed significant concerns about the quality of data and methodologies in the articles they covered and 17 articles found reliable evidence of impact. These are analysed in more detail below.

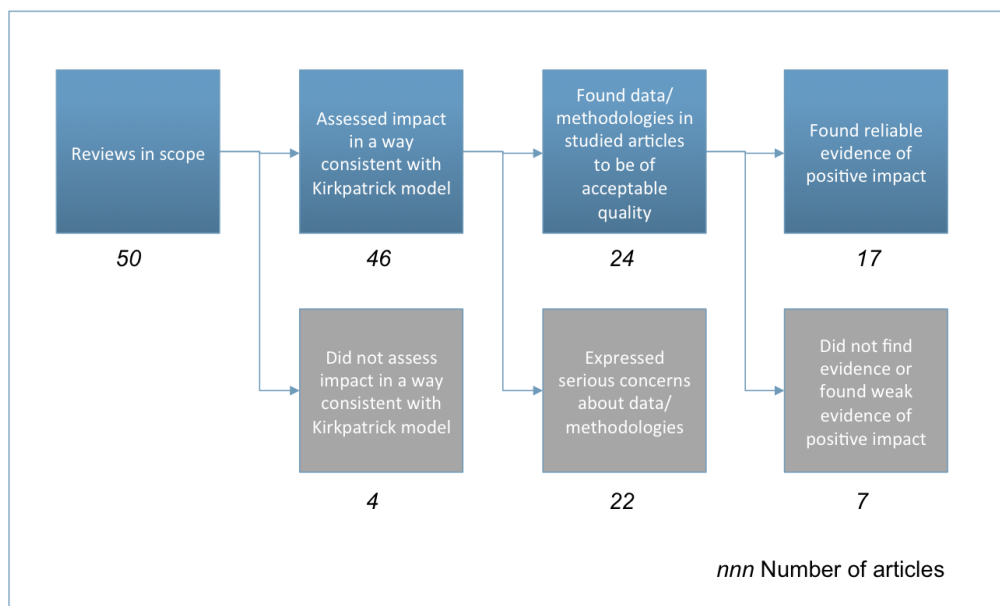


Figure 4: Selection of articles that found reliable evidence of positive impact

The 17 articles were analysed using the Kirkpatrick model as described below and an overview is included in the table at the end of this section.

1. Reaction

Level one of the Kirkpatrick model measures participants' satisfaction and how they feel about the education and training they have received. Positive reactions to patient safety education and training are important because trainees need to be actively engaged in the programme and feel as though the content was relevant in order to improve learning and retention of knowledge.

There are six intervention areas that were highlighted as generating positive reactions from trainees and post-graduate health professionals:

- **Simulation:** a review on high fidelity simulation training with trainee nurses found positive results for improved confidence, knowledge about role/role clarity and that nurses liked participating in simulation training.
- **Team-based learning (TBL):** although the evidence for its effectiveness is unclear, a systematic review of the literature across nursing and medical education found that students are generally satisfied with team-based learning and engagement is higher in TBL classes.
- **Morbidity and mortality conferences:** a review of morbidity and mortality conferences for physicians found good levels of participation across a wide variety of types of meeting organisation.
- **Crew resource management:** a meta-analysis of 20 different types of crew resource management training within acute medical teams found that participants reacted positively to this type of training.
- **Inter-professional education:** a systematic review of 21 evaluations of inter-professional education found that it is generally well received and enables learning of knowledge and skills for collaborative working.
- **Social media:** two papers found that the use of social media tools and networks for education and learning received positive feedback from students. The studies covered medical education and pharmacy education. Neither review was able to offer evidence that the use of social media was better or worse than traditional educational techniques or had an impact on learning, behaviours or results.

2. Learning

The second level of the Kirkpatrick model measure the increase in knowledge or capability as it relates to the course content. The goal is for participants to learn the material, develop the necessary skills and be confident about what they have learned. Methods to evaluate learning include pre- and post-assessments and practical exercises either in the classroom or in the workplace. For formal teaching at both undergraduate and postgraduate levels this is normally part of the programme assessments.

Overall, there were eight reviews that found positive correlations between patient safety education and training and learning. These reviews covered six different types of intervention:

- **Simulation:** three of the reviews discussed the positive impact of simulation training on learner outcomes within specific training situations. These included laparoscopic surgical training for medical students and in residency programmes; airway training for anaesthesia amongst medical, nursing, allied health professionals and students; and central venous catheterisation simulation training. One additional study found evidence that high fidelity simulation training for undergraduate nurses had a positive impact on psychomotor clinical performance.
- **Team based learning (TBL):** a systematic review of the literature across nursing and medical education found that students generally scored higher in examinations for

team based learning compared with case-based group discussion, although neither control groups or random assignation were used in many of these studies.

- **Simulation & teamwork:** one review assessed the impact of simulation and teamwork training for multidisciplinary teams in an acute obstetric emergency setting and found a positive impact on learning outcomes.
- **Teamwork:** a systematic review of teamwork training in medical student curricula (including content, educational methods, evaluation design and outcomes measured) found improvements in knowledge and attitudes of the participants.
- **Quality improvement & patient safety:** a review of teaching quality and improvement and patient safety to students found that curricula were well accepted by medical students and residents and that most curricula demonstrated improved knowledge by participants in these areas.
- **Crew resource management:** the meta-analysis of crew resource management training found a large effect on participant's knowledge of teamwork and coordination within acute medical teams.

3. Behaviour

The third level of the Kirkpatrick model evaluates whether or not the skills and knowledge that have been taught during education or training have been transferred to the workplace. It can be particularly difficult to directly attribute changes in patient safety behaviours to educational or training programmes. However, the reviews found positive relationships between six different types of intervention and behaviours.

- **Simulation:** the review on simulation of laparoscopic surgical skills found an impact on patient safety behaviours in practice. However the study of airway training for anaesthesia amongst medical, nursing, allied health professionals and students found no link to changes in behaviour. A further review of simulation exercises as a strategy for improving patient safety did conclude that simulation interventions improved the technical performance of individuals and clinicians during complex procedures.
- **Simulation & teamwork:** the review that assessed the impact of simulation and teamwork training for multidisciplinary teams in an acute obstetric emergency setting also found a positive impact on practical skills, communication and team performance.
- **Teamwork:** the systematic review of teamwork training in medical student curricula found improvements in knowledge and attitudes of the participants.
- **Self-audit:** a scoping review of physicians' use of self-audit as a mechanism for stimulating performance and safety standards did find improvements in compliance with care delivery guidelines. Although findings were self-reported and not externally evaluated, the Kirkpatrick model does consider self-reporting as a valid approach to identifying programme effectiveness at this level.

- **Crew resource management:** the meta-analysis of crew resource management training found a large effect on participant's patient safety behaviours.

4. Results

Level four of the Kirkpatrick approach is the hardest to measure as it aims to understand whether or not the education or training intervention had an impact on outcomes or results. In total, only two types of intervention were found to have an influence on patient safety outcomes: self-audit and simulation with teamwork training. Reviews of simulation, teamwork and crew resource management did not find or measure any direct impact on patient safety outcomes. In fact, many of the authors concluded that there is very little evidence that the different methods of training have any improvement on patient safety.

- **Self-audit:** physicians who took part in studies on self-audit reported that this approach did improve patient outcomes. As with the impact on behaviours (outlined above), these improvements were self-reported, but the Kirkpatrick model does consider self-reporting to be valid at this level.
- **Simulation & teamwork:** the review that assessed the impact of simulation and teamwork training for multidisciplinary teams in an acute obstetric emergency setting reported improvements in perinatal outcomes. However, this was only in one of the eight studies that were reviewed.
- **Quality improvement training:** one review of 39 studies (Jones *et al*, 2015) claims to have established a link between quality improvement education and clinical interventions with clinical improvements. The list of clinical and educational interventions is unclear from the paper but it does state that programmes can be successful by teaching QI in the clinical setting.

Author	Title	Name of publication	Publication date	Number of citations	Number of studies	Focus	Topic	Type of professionals	Care setting	Impact on dimensions of Kirkpatrick model			
										Reaction	Learning	Behaviour	Results
Jones, Anne C.; Shipman, Scott A.; Ogrinc, Greg	Key characteristics of successful quality improvement curricula in physician education: a realist review	Postgraduate Medical Journal	2015	0	39	Both	Purpose Quality Improvement	Physician	Not specified				
Benetoli, Arcello; Chen, Timothy F.; Aslani, Parisa	The use of social media in pharmacy practice and education	Research In Social & Administrative Pharmacy	2015	0	24	Curriculum	Social Media	Pharmacist	Not specified				
Vanderbilt, Allison A; Grover, Amelia C; Pastis, Nicholas J; Feldman, Moshe; Granados, Deborah Diaz; Muriithi, Lydia K; Mainous, Arch G 3rd	Randomized controlled trials: a systematic review of laparoscopic surgery and simulation-based training	Global Journal Of Health Science	2015	0	21	Training intervention	Simulation	Surgeons	Acute care				
Vincent, Mary Anne; Sheriff, Susan; Mellott, Susan	The Efficacy of High-fidelity Simulation on Psychomotor Clinical Performance Improvement of Undergraduate Nursing Students	Cin-Computers Informatics Nursing	2015	0	8	Training intervention	Simulation	Undergraduate nursing students	Not specified				
O'Dea A., O'Connor P., Keogh I.	A Meta-Analysis of the effectiveness of crew resource management training in acute care domains.	Postgraduate Medical Journal	2014	1	20	Both	Crew Resource Management	Various	Acute care				
Schmidt, Eric; Goldhaber-Fiebert, Sara N.; Ho, Lawrence A.; McDonald, Kathryn M.	Simulation Exercises as a Patient Safety Strategy A Systematic Review	Annals Of Internal Medicine	2013	14	38	Training intervention	Simulation	Physicians	Acute care				
Cartledge, Peter; Miller, Michael; Phillips, Bob	The use of social-networking sites in medical education	Medical Teacher	2013	3	9	Curriculum	Social Media	Various	Not specified				
Lucisano, Karen E; Talbot, Laura A	Simulation training for advanced airway management for anesthesia and other healthcare providers: a systematic review	Aana Journal	2012	6	34	Training intervention	Simulation	Anesthetists and others	Acute care				
Hallenbeck, Virginia J	Use of high-fidelity simulation for staff education/development: a systematic review of the literature	Journal For Nurses In Staff Development	2012	0	20	Training intervention	Simulation	Nurses	Acute care				
Ma, Irene W. Y.; Brindle, Mary E.; Ronksley, Paul E.; Lorenzetti, Diane L.; Sauve, Reg S.; Ghali, William A.	Use of Simulation-Based Education to Improve Outcomes of Central Venous Catheterization: A Systematic Review and Meta-Analysis	Academic Medicine	2011	26	20	Training intervention	Simulation	Medical trainees	Acute care				
Sisk, Rebecca J.	Team-Based Learning: Systematic Research Review	Journal Of Nursing Education	2011	16	17	Training intervention	Team-based learning	Various	Not specified				
Gagliardi, Anna R.; Brouwers, Melissa C.; Finelli, Antonio; Campbell, Craig E.; Marlow, Bernard A.; Silver, Ivan L.	Physician Self-Audit: A Scoping Review	Journal Of Continuing Education In The Health Professions	2011	5	6	Training intervention	Self-audit	Physicians	Acute care				
Wong, Brian M.; Etchells, Edward E.; Kuper, Ayelet; Levinson, Wendy; Shojania, Kaveh G.	Teaching Quality Improvement and Patient Safety to Trainees: A Systematic Review	Academic Medicine	2010	82	41	Both	Quality Improvement + Patient Safety	Medical students and residents	Acute care				
Bai, Gaelle; David, Sandra; Sellier, Elodie; Francois, Patrice	Assessment of morbidity and mortality conferences as a tool for physician education and improvement of quality of care and patient safety: A literature review	Presse Medicale	2010	12	17	Training intervention	Morbidity and mortality conferences	Various	Acute care				
Merien, A. E. R.; van de Ven, J.; Mol, B. W.; Houterman, S.; Oei, S. G.	Multidisciplinary Team Training in a Simulation Setting for Acute Obstetric Emergencies A Systematic Review	Obstetrics And Gynecology	2010	61	8	Training intervention	Simulation + Teamwork	Physicians and nurses	Acute care				
Chakraborti, Chayan; Boonyasai, Romsai T.; Wright, Scott M.; Kern, David E.	A systematic review of teamwork training interventions in medical student and resident education	Journal Of General Internal Medicine	2008	40	13	Curriculum	Teamwork	Medical students and house staff	Not specified				
Hammick, M.; Freeth, D.; Koppel, I.; Reeves, S.; Barr, H.	A best evidence systematic review of interprofessional education: BEME Guide no. 9	Medical Teacher	2007	214	21	Training intervention	Interprofessional education	Various	Not specified				

3. Review of the grey literature on patient safety education and training

Approach

The review of the grey literature identified some relevant reports that confirmed the insights from our “review of reviews”, i.e. that there is not a robust evidence base to identify the most effective patient safety and training interventions. While some of the reports we selected don’t review the evidence, we present them here as their recommendations might be helpful evidence for the work of the Commission.

Findings

We reviewed the following four reports: QI training for health professionals (Health Foundation 2012); Can patients be teachers? (Health Foundation 2011); Unmet Needs: Teaching Physicians to Provide Safe Patient Care (Report of the Lucian Leape Institute Roundtable on Reforming Medical Education); and Key findings and recommendations on Education and training in patient safety (Patient Safety & Quality of Care Working Group of the European Commission). All acknowledge the importance of education and training at all levels to improve safety and quality.

We also reviewed documents relating to patient safety competencies provided by the WHO curriculum guide, the Canadian Patient Safety Institute (2008), the Australian patient safety education framework (2006) and a systematic review, which looked at tools assessing patient safety competencies of health care professionals (Okuyama et al, 2011).

Key findings and recommendations include the following:

- Training in quality improvement can improve skills and knowledge of health professionals and may be associated with short-term improvements in care processes.
- Few studies have examined the evidence for the impact of education and training in on health outcomes, safety or resource use.
- There is little research on whether or not one type of training is more successful (e.g. classroom based vs. online learning) or whether formal/classroom education is more/less effective than on-the-job training.
- There is strong evidence that patient involvement has short-term benefits for all involved, including learners, educators, institutions and patients/users (though involvement of patients, carers or their families in Medical education, PG Education and CPD is patchy).
- There are few studies that explore the long-term benefits of patient/user involvement on health professional behaviour or health outcomes and good quality research is required in the future. In particular the European commission recommend that we find constructive, feasible and effective ways to include the perspective of patients when developing the curricula on patient safety.

Medical school and teaching hospital leaders should place the highest priority on creating learning cultures that emphasise patient safety, model professionalism, enhance

collaborative behaviour, encourage transparency and value the individual learner. Medical schools should conceptualise and treat patient safety as a science that encompasses knowledge of error causation and mitigation, human factors concepts, safety improvement science, systems theory and analysis, system design and re-design, teaming, and error disclosure and apology.

4. Academic literature on safety training and education in industries other than healthcare

Approach

It appears that the overwhelming majority of the articles published on the topic of safety education and training focus on the healthcare industry. To conduct our search, we started with a very similar strategy to the healthcare literature. We linked search terms, including safety, training and education and focused on systematic review articles. We filtered to remove papers on healthcare and of the resulting 106 articles; only four were relevant to this review:

- One focused on lessons for healthcare from the aviation industry
- Two focused on the food industry
- One focused on agriculture

While expanding the search beyond systematic reviews could identify more results, the findings suggest that the overall volume of the literature outside the healthcare industry is limited. Given the interest of the Commission to learn from other industries, the following approaches could be considered:

- Conduct selected interviews with experts from other industries (doable within the scope of the project).
- Conduct a literature review focused on original studies rather than systematic reviews.
- Conduct a broader interview study with experts from other industries.

Findings

Four articles were selected through the process, one about lessons for healthcare from the aviation industry, two about the food industry and one about the agriculture industry.

- Wauben, Linda S. G. L.; Lange, Johan F.; Goossens, Richard H. M. Learning from Aviation to Improve Safety in the Operating Room - a Systematic Literature Review *Journal Of Healthcare Engineering* 2012; 3(3):373–390.
- Lehtola MM, Rautiainen RH, Day LM, Schonstein E, Suutarinen J, Salminen S, et al. Effectiveness of interventions in preventing injuries in agriculture--a systematic review and meta-analysis. *Scand J Work Environ Health*. 2008 Oct;34(5):327–36.

- Medeiros CO, Cavalli SB, Salay E, Proença RPC. Assessment of the methodological strategies adopted by food safety training programmes for food service workers: A systematic review. *Food Control*. 2011 Aug;22(8):1136–44.
- Soon JM, Baines R, Seaman P. Meta-analysis of food safety training on hand hygiene knowledge and attitudes among food handlers. *J Food Prot*. 2012 Apr;75(4):793–804.

The main findings were as follows:

- The review of lessons that can be learned from the aviation industry focused specifically on an approach to reducing error in the operating room. The study found that interpersonal and technical skills can be provided through simulation but no direct evidence linked these methods to improvements in safety.
- The two studies on hand washing found that training had a significant impact on knowledge, skills, attitudes and behaviours. Interactive media and ‘hands on’ activities were the most positively received by participants. Refresher training and long term reinforcement of behaviours were also thought to be beneficial.
- In the study on safety in agriculture, education was found to have no impact on decreasing the rate of injuries. Financial incentives had some impact on safety outcomes and legislation had contradictory results.

5. Discussion and conclusion

In summary, our main findings are as follows:

- The literature has a clear focus on the acute setting and simulation is a highly studied topic.
- The majority of reviews assessed impact in a way consistent with the Kirkpatrick model.
- The quality of the evidence available is questionable: half of the reviews that assessed impact expressed serious concerns about the robustness of data and methodologies.
- The reviews with data or information of sufficient quality did not find evidence of impact on patient outcomes. However, several studies found positive impact at other levels (e.g. on learning outcomes or reaction to learning), in particular for simulation.
- Other interventions that show promise are teamwork training, self-audit, morbidity and mortality conferences, team-based learning, crew resource management, inter-professional education and use of social media.
- Assessment of technical or wider healthcare competencies are already included in the curricula of the various healthcare disciplines and integrating a patient safety element could be introduced.

A common theme of our review of the range of sources was that authors concluded that there is very little robust evidence that the different methods of training have any improvement on patient safety. It is important to note two points: that the absence of evidence does not mean that education and training is not effective, just that we've yet to find evidence for this.

One obvious explanation is that we know there are many factors that affect patient outcomes, ranging from the general aspects of the healthcare system itself, to the treatment being provided through teams and individuals to the patients themselves in terms of their condition, comorbidities and preferences. It is difficult to attribute improvements in outcomes to one part of the whole process, be it a specific training intervention or curricula. We're aware that the working environment needs to be receptive for individuals or groups who have undergone training to make changes that could improve outcomes for patients.

We anticipate that this is likely to be more effective in those organisations with a positive safety culture that has the structure in place to enable changes for improvement to take place. This was particularly emphasised by the Lucian Leape Institute Roundtable on Reforming Medical Education report. The Health Foundation also identified the need for a

central repository of successful innovations and interventions with materials for all stakeholders.

Limitations

We recognise the following limitations in our approach:

- Focusing upon reviews favours areas of work for which there is already a multitude of studies, whilst reducing the likelihood that novel interventions for which the research evidence is limited will show up in our search results. At this stage, however, we consider this to be an acceptable compromise in the interests of being able to efficiently scope the main evidence base within our areas of interest.
- Even in the areas where the volume of literature is highest, focusing on systematic reviews might exclude articles published in recent years. While this certainly happened, 17 of the reviews we considered were published between 2014 and 2015, thus reducing the effect of this issue.
- Our key analysis, plotting the reviews on the levels of the Kirkpatrick model, was completed using the number of systematic reviews as the unit of measure. Given more time, this could have been done using the original studies included in the reviews. However, we believe that the main findings of our research would not have changed significantly.

Implications

The main implication of this review for the Commission is that the aim of issuing recommendations based on evidence of impact on outcomes does not seem to be achievable. Moreover, we suggest that the Commission consider a call for the improvement of the evidence base. This could be achieved by promoting further research in this field and by endorsing the systematic adoption of scientific measurement and evaluation of education and training initiatives.

The consequence for the Imperial College team as academic partner of the Commission is that we will need to rely on other approaches (primarily the interviews and focus groups) to provide valuable information on interventions for patient safety education and training.

With the benefit of more time, we consider that the literature review may be refined, particularly if we choose to submit it for publication. We could perform some of the analyses at the level of original studies (as synthesised in the reviews), instead of on the review papers, and examine original articles published recently. However, we believe that this will not add significant insights for the Commission, but simply improve the rigour of our research.

6. References

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Health Foundation. Quality improvement training for healthcare professionals [Online]. [Accessed on 2015 Jun 1]. Available from: <http://www.health.org.uk/publications/quality-improvement-training-for-healthcare-professionals>

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National Patient Safety Foundation. Unmet Needs:Teaching Physicians to Provide Safe Patient Care [Online]. [Accessed on 2015 Jun 1]. Available from: <http://www.npsf.org/?page=unmetneeds>

- Okuyama A, Martowirono K, Bijnen B. Assessing the patient safety competencies of healthcare professionals: a systematic review. *BMJQS* 2011;20:991-1000
- O'Malley G, Perdue T, Petracca F. A framework for outcome-level evaluation of in-service training of health care workers. *Human Resources for Health*. 2013;11:50
- Steinert Y, Mann K, Centeno A, Dolmans D, Spencer J, Gelula M, Prideaux D. A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME Guide No. 8. *Medical Teacher*. 2006; 28(6):497–526
- Walton MM, Shaw T, Barnett S, Ross J. *Developing a national patient safety education framework for Australia*. *Qual Saf Health Care* 2006;15:437-442
doi:10.1136/qshc.2006.019216
- WHO (World Health Organisation) Patient Safety Curriculum Guide: Multi-professional Edition. World Health Organization 2011

Review of the literature, Appendix 1: Methods

Academic literature on patient safety training and education

Given the requirement for a rapid scoping review of the education and training literature related to key thematic areas of interest for HEE, we adapted aspects of conventional systematic review methodology to deliver a high-level, systematic scan of the evidence base. Due to the likely heterogeneity of educational interventions and the predicted large volume of relevant primary research, we chose to focus our initial scan of the literature on existing systematic review articles, as a means of synthesising lessons from a large volume of empirical work that has been reviewed by previous authors. We complemented our focus upon secondary sources with non-limited systematic searches designed to estimate the volume of primary literature available across a number of key thematic areas relevant to our review aims.

As with any rapid evidence scan, a number of compromises have been made in order to quickly scope this area of work and we emphasise that this is not an exhaustive review of primary empirical research. It is, however, designed to sample and describe the prominent areas of existing work in education and training for patient safety that other reviewers have focused upon and therefore serve as a platform for development.

Search strategy

We used concept crossing as a search strategy in which a number of search “facets” representing key themes relative to our review aim are combined (triangulated) in the search to focus in on the target area of interest. An overview of the search strategy is depicted in Figure 1 below and in the main body of the document. Within each search facet, we developed search terms using truncation and search syntax, to ensure that the search was sensitive to as broad a range of potentially relevant literature as possible.

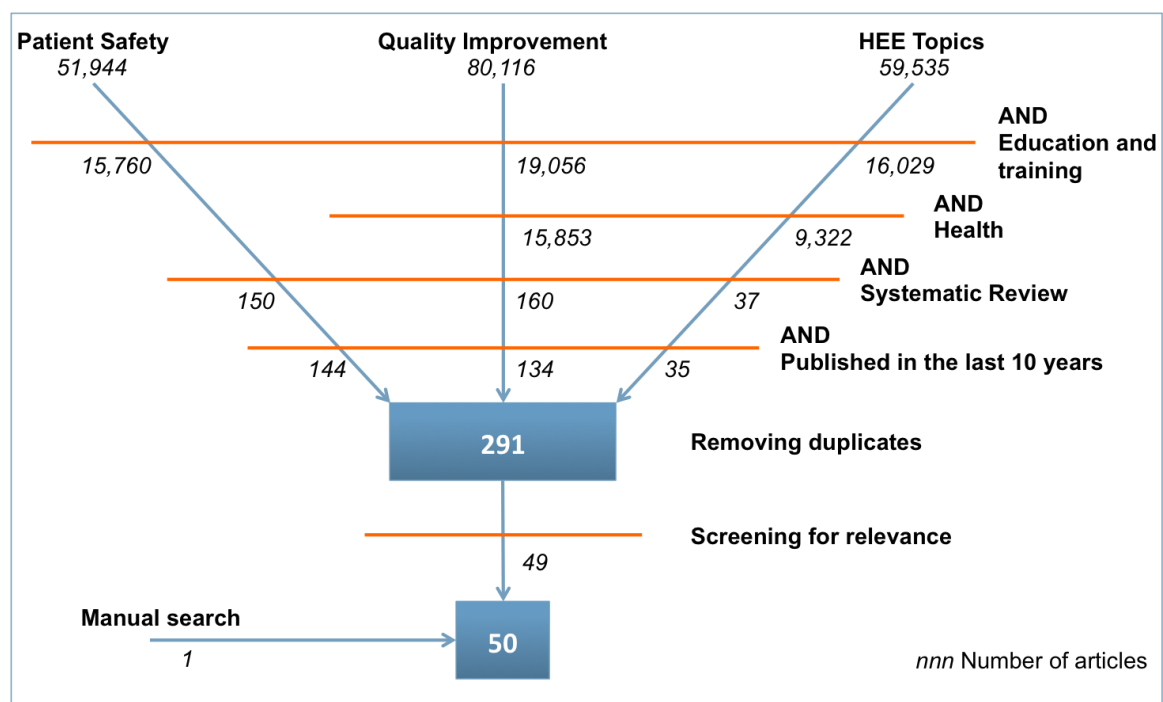


Figure 2: Overview of systematic search strategy based upon combined search facets

We selected the articles in the following way:

1. We defined three thematic facets based upon the key areas of focus of Patient Safety, Quality Improvement, Human Factors, Raising and Responding to Concerns and Professionalism.
2. The results in each facet were combined first with the search for Education and Training.
3. For each theme, we refined the search using the term “health”, “clinic*”, “medic*” or “nurs*” to eliminate articles focused on other industries.
4. We also applied an additional filter to identify review papers, searching for the terms “systematic review”, “meta-analysis” or “systematic literature review”.
5. We limited the focus to the last 10 years.
6. After eliminating duplicates, this approach generated a long list of 291 articles that were exported to an Excel file to allow for easier analysis.
7. We further screened for relevance of the articles, critically assessing whether they were truly systematic reviews and were indeed focused on training and education. This approach reduced the set to 49 reviews.
8. An additional paper was added after a hand search to double check our results, bringing to total set of papers for review to 50.

For steps 1-4 the search was conducted within “Topic”, which in the Web of Science search engine includes:

- Title
- Abstract
- Author Keyword
- Keywords Plus (keywords added by Web of Science editors)

The table below provides further details on the search terms and selection criteria:

Search components	Search terms
Patient safety	(patient safety) or (safe care) or (safer care) or (patient harm)
Quality improvement	(quality improve*) or (service improve*) or (improvement science)
HEE topics	(human factors) or (raising concern*) or (responding to concern*) or (recognising concern*) or (professionalism)
Education and training	(educat*) or (train*) or (curric*) or (teach*) or (learn*)
Health	(health) or (clinic*) or (medic*) or (nurs*)
Last 10 years	Selected years were: 2006, 2007, 2008, 2009, 2010, 2011,

	2012, 2013, 2014, 2015
Systematic review	(systematic review) or (systematic literature review) or (meta-analysis)
Relevance	Key criteria were: whether the articles were actually systematic reviews or meta-analyses; whether the articles focused on education and training. Articles were not eliminated if patient safety or quality improvement were not the specific focus.

The searches were run in the Web of Science interface, which includes the following databases:

- Web of Science™ Core Collection
 - Science Citation Index Expanded with Cited References (1970–)
 - Social Sciences Citation Index Expanded with Cited References (1970–)
 - Arts and Humanities Citation Index with Cited References (1975–)
 - Conference Proceedings Citation Index - Science edition (1990–)
 - Conference Proceedings Citation Index - Social Science + Humanities edition (1990–)
- MEDLINE®
- Current Contents Connect®
- BIOSIS Citation IndexSM
- CABI

Validation

In order to assess the validity of the search, we looked for the presence of three exemplar or tracer review articles in the results, which had been identified from hand searches prior to the systematic search and flagged as potentially of high relevance to the review:

1. Wong BM, Etchells EE, Kuper A, Levinson W, Shojania KG. Teaching quality improvement and patient safety to trainees: a systematic review. *Acad Med*. 2010;85(9):1425-39.
2. Nie Y, Li L, Duan Y, Chen P, Barraclough BH, Zhang M, Li J. Patient safety education for undergraduate medical students: a systematic review. *BMC Med Educ*. 2014;14:11:33.
3. Gordon M, Darbyshire D, Baker P. Non-technical skills training to enhance patient safety: a systematic review. *Medical Education*. 2012; 46: 1042-1054.

Our search strategy identified all three articles.

We also scanned the titles and abstract of 781 articles selected with a less structured approach in PubMed⁵⁸. We also conducted hand searches of titles and abstracts within Embase and PsychInfo and found no additional papers or themes to add to our shortlist for review.

Hand searches

It is rare that a systematic search strategy approaches perfection in its capacity to elicit the target literature of interest and despite the steps we have outlined above a volume of relevant literature will have been excluded due to the design on the search and variations in the language used in the bibliographic records. For this reason we additionally conducted hand searches using Internet resources, reference lists and knowledge of the subject matter area; as described above, we searched also in:

- PubMed
- Embase
- PsychInfo
- Allied and Complementary Medicine Database (AMED)
- Applied Social Science Index and Abstracts (ASSIA)
- British Education Index (BEI)
- British Nursing Index (BNI)
- Cumulative Index of Nursing and Allied Health (CINAHL)
- Education Resources Information Centre (ERIC)

The following additional paper was identified as adding significant insights to our result set and added:

- Kirkman, Matthew A; Sevdalis, Nick; Arora, Sonal; Baker, Paul; Vincent, Charles; Ahmed, Maria The outcomes of recent patient safety education interventions for trainee physicians and medical students: a systematic review Bmj Open 2015

Analysis

The 50 articles were analysed and tagged on the following dimensions:

- Whether they focused on a type of educational/training intervention, curriculum content or both.
- The main topic of the article.

⁵⁸ Searching for Patient Safety OR Quality Improvement AND (Education OR Training) AND Review in the PubMed database.

- Whether they analysed the impact of the intervention/content on dimensions consistent with those in the Kirkpatrick Model (reaction, learning, behaviour, results) and whether the impact they found was consistently positive.
- Whether the review expressed significant concerns about the data and methodologies in the studies it covered.
- What profession(s) the review focused on.
- What care setting(s) the review focused on.

The key analysis was mapping impact of the studies across the dimensions of the Kirkpatrick model, as it provided the best assessment of the strength of the evidence, including on patient outcomes.

Limitations

We recognise the following limitations in our approach:

- Focusing upon reviews favours areas of work for which there is already a multitude of studies, whilst reducing the likelihood that novel interventions for which the research evidence is limited will show up in our search results. At this stage, however, we consider this to be an acceptable compromise in the interests of being able to efficiently scope the main evidence base within our areas of interest.
- Even in the areas where the volume of literature is highest, focusing on systematic reviews might exclude articles published in recent years. While this certainly happened, 17 of the reviews we considered were published between 2014 and 2015, thus reducing the effect of this issue.
- Our key analysis, plotting the reviews on the levels of the Kirkpatrick model, was completed using the number of systematic reviews as the unit of measure. Given more time, this could have been done using the original studies included in the reviews. However, we believe that the main findings of our research would not have changed significantly.

Review of the grey literature on patient safety education and training

To supplement the academic publications we performed a high level search of grey literature, focusing on the sources that we believe to be most relevant:

- The Health Foundation
- The King's Fund
- Nuffield Trust
- Institute of Medicine (US)
- Institute of Healthcare Improvement (US)
- National Patient Safety Foundation (US)

We performed a brief review of other reports that might be relevant e.g. White Papers and reviews. The following reports are the most relevant:

- The Health Foundation (August 2012) Quality Improvement Training for Healthcare Professionals
- The Health Foundation (October 2011) Can patients be teachers?
- Report of the Lucian Leape Institute Roundtable on Reforming Medical Education: Unmet Needs: Teaching Physicians to Provide Safe Patient Care
- Education & Training in Patient Safety Subgroup of the Patient Safety & Quality of Care Working Group of the European Commission: Key findings and recommendations on Education and training in patient safety

Academic literature on safety training and education in industries other than healthcare

Search strategy

We followed a similar strategy to the review of literature on patient safety education and training. We started with the very broad concept of safety and then narrowed down the list by focusing on education and training and on systematic reviews. We then selected only research areas other than healthcare. Of the resulting 106 articles, only four papers were relevant to this review. The overwhelming majority of the articles were still about healthcare, with a few on non-professional safety training (e.g., for road safety).

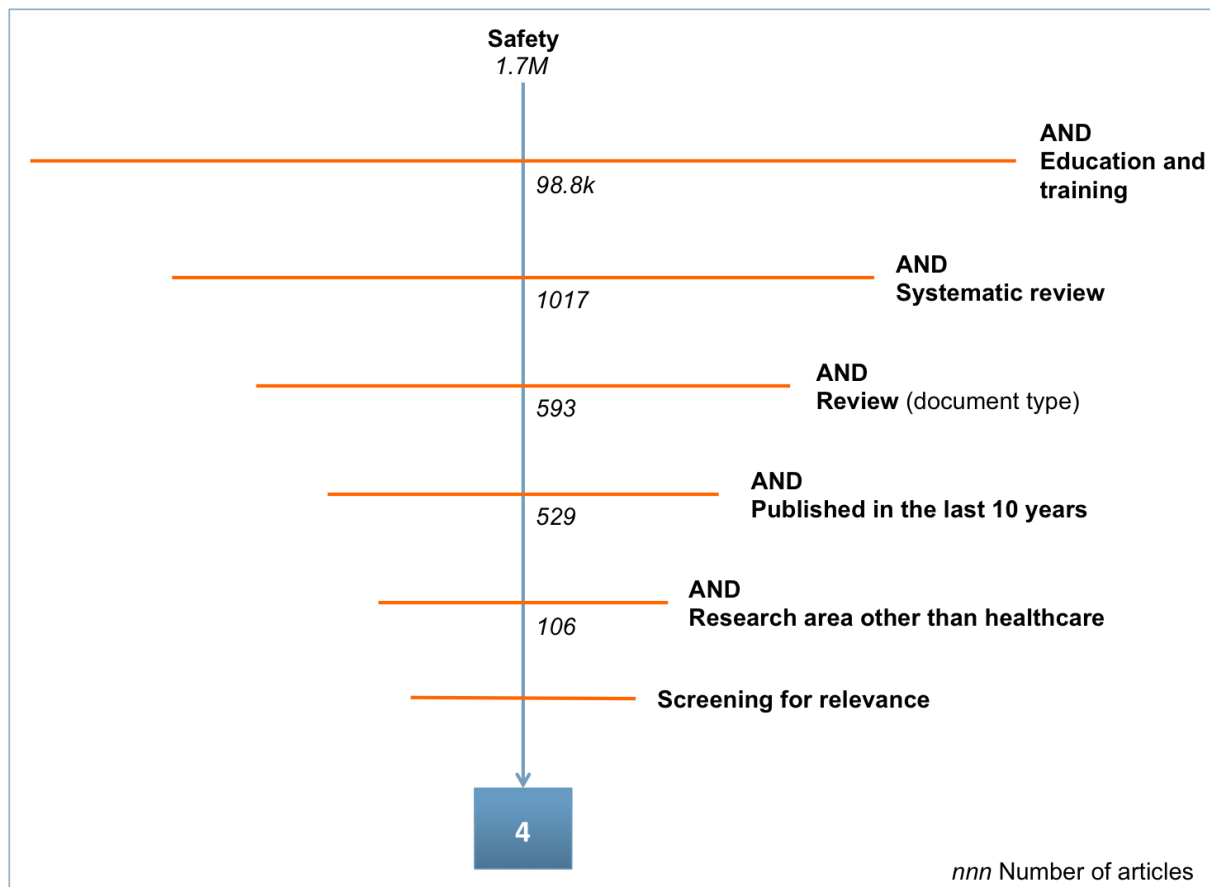


Figure 6: Overview of systematic search strategy

For all steps except the selection of reviews (search was completed within “Review type”) and of research areas (within “Research areas”) all searches were conducted within “Topic”, which in the Web of Science search engine includes:

- Title
- Abstract
- Author Keyword
- Keywords Plus (keywords added by Web of Science editors)

The table below provides further details on the search terms and selection criteria:

Search components	Search terms
Safety	(safety)
Education and training	(educat*) or (train*) or (curric*) or (teach*)
Systematic review	(systematic review) or (systematic literature review) or (meta-analysis)
Review	Selected as “Document type”
Last 10 years	Selected years were: 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015
Research areas	Non-healthcare research areas selected to refine the search within Web of Science
Relevance	Key criteria were: whether the articles were actually systematic reviews or meta-analyses; whether the articles focused on professional education and training; whether the articles focused on industries other than healthcare

The searches were run in the Web of Science interface, which includes the following databases:

- Web of Science™ Core Collection
 - Science Citation Index Expanded with Cited References (1970–)
 - Social Sciences Citation Index Expanded with Cited References (1970–)
 - Arts and Humanities Citation Index with Cited References (1975–)
 - Conference Proceedings Citation Index - Science edition (1990–)
 - Conference Proceedings Citation Index - Social Science + Humanities edition (1990–)
- MEDLINE®
- Current Contents Connect®
- BIOSIS Citation IndexSM
- CABI

Analysis

Four articles were selected through the process and were analysed to identify the industry of focus as well as to synthesise their main findings that could be relevant for the project.

Limitations

Given the limited time available, our search strategy was geared toward systematic reviews. Whereas this approach was well suited to the healthcare industry, given the volume of articles available, it yielded very few results in this case. While this certainly attests to the limited literature available on safety training and education in industries other than healthcare, a review of original studies could have yielded additional interesting insights.

Appendix 2: List of the 50 articles included in the review on patient safety education and training

Abbas MR, Quince TA, Wood DF, Benson JA. Attitudes of medical students to medical leadership and management: a systematic review to inform curriculum development. *Bmc Medical Education*. 2011 Nov 14;11:93.

Ahmed N, Devitt KS, Keshet I, Spicer J, Imrie K, Feldman L, et al. A Systematic Review of the Effects of Resident Duty Hour Restrictions in Surgery Impact on Resident Wellness, Training, and Patient Outcomes. *Annals of Surgery*. 2014 Jun;259(6):1041–53.

Bal G, David S, Sellier E, Francois P. Assessment of morbidity and mortality conferences as a tool for physician education and improvement of quality of care and patient safety: A literature review. *Presse Medicale*. 2010 Feb;39(2):161–8.

Benetoli A, Chen TF, Aslani P. The use of social media in pharmacy practice and education. *Research in Social & Administrative Pharmacy*. 2015 Feb;11(1):1–46.

Boonyasai RT, Windish DM, Chakraborti C, Feldman LS, Rubin HR, Bass EB. Effectiveness of teaching quality improvement to clinicians - A systematic review. *Jama-Journal of the American Medical Association*. 2007 Sep 5;298(9):1023–U39.

Brunckhorst O, Challacombe B, Abboudi H, Khan MS, Dasgupta P, Ahmed K. Systematic review of live surgical demonstrations and their effectiveness on training. *British Journal of Surgery*. 2014 Dec;101(13):1637–43.

Cartledge P, Miller M, Phillips B. The use of social-networking sites in medical education. *Medical Teacher*. 2013;35(10):847–57.

Chakraborti C, Boonyasai RT, Wright SM, Kern DE. A systematic review of teamwork training interventions in medical student and resident education. *Journal of General Internal Medicine*. 2008 Jun;23(6):846–53.

Cheraghi-Sohi S, Bower P. Can the feedback of patient assessments, brief training, or their combination, improve the interpersonal skills of primary care physicians? A systematic review. *Bmc Health Services Research*. 2008 Aug 21;8:179.

Cheston CC, Flickinger TE, Chisolm MS. Social Media Use in Medical Education: A Systematic Review. *Academic Medicine*. 2013 Jun;88(6):893–901.

De Blacam C, Vercler CJ. Teaching Ethics and Professionalism in Plastic Surgery A Systematic Review. *Annals of Plastic Surgery*. 2014 Apr;72(4):484–8.

Dedy NJ, Bonrath EM, Zevin B, Grantcharov TP. Teaching nontechnical skills in surgical residency: A systematic review of current approaches and outcomes. *Surgery*. 2013 Nov;154(5):1000–8.

Dietz AS, Pronovost PJ, Mendez-Tellez PA, Wyskiel R, Marsteller JA, Thompson DA, et al. A systematic review of teamwork in the intensive care unit: What do we know about teamwork, team tasks, and improvement strategies? *Journal of Critical Care*. 2014 Dec;29(6):908–14.

Farnan JM, Petty LA, Georgitis E, Martin S, Chiu E, Prochaska M, et al. A Systematic Review: The Effect of Clinical Supervision on Patient and Residency Education Outcomes. *Academic Medicine*. 2012 Apr;87(4):428–42.

Frampton GK, Harris P, Cooper K, Cooper T, Cleland J, Jones J, et al. Educational interventions for preventing vascular catheter bloodstream infections in critical care: evidence map, systematic review and economic evaluation. *Health Technol Assess*. 2014 Feb;18(15):1–365.

Frich JC, Brewster AL, Cherlin EJ, Bradley EH. Leadership Development Programs for Physicians: A Systematic Review. *Journal of General Internal Medicine*. 2015 May;30(5):656–74.

Gagliardi AR, Brouwers MC, Finelli A, Campbell CE, Marlow BA, Silver IL. Physician Self-Audit: A Scoping Review. *Journal of Continuing Education in the Health Professions*. 2011 FAL;31(4):258–64.

Gjeraa K, Moller TP, Ostergaard D. Efficacy of simulation-based trauma team training of non-technical skills. A systematic review. *Acta Anaesthesiologica Scandinavica*. 2014 Aug;58(7):775–87.

Gordon M, Darbyshire D, Baker P. Non-technical skills training to enhance patient safety: a systematic review. *Medical Education*. 2012 Nov;46(11):1042–54.

Gordon M, Findley R. Educational interventions to improve handover in health care: a systematic review. *Medical Education*. 2011 Nov;45(11):1081–9.

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Appendix 3: Abstracts of the 17 articles that found reliable evidence of positive impact

Vanderbilt, Allison A; Grover, Amelia C; Pastis, Nicholas J; Feldman, Moshe; Granados, Deborah Diaz; Murithi, Lydia K; Mainous, Arch G 3rd Randomized controlled trials: a systematic review of laparoscopic surgery and simulation-based training Global Journal Of Health Science 2015

INTRODUCTION: This systematic review was conducted to analyze the impact and describe simulation-based training and the acquisition of laparoscopic surgery skills during medical school and residency programs.

METHODS: This systematic review focused on the published literature that used randomized controlled trials to examine the effectiveness of simulation-based training to develop laparoscopic surgery skills. Searching PubMed from the inception of the databases to May 1, 2014 and specific hand journal searches identified the studies. This current review of the literature addresses the question of whether laparoscopic simulation translates the acquisition of surgical skills to the operating room (OR).

RESULTS: This systematic review of simulation-based training and laparoscopic surgery found that specific skills could be translatable to the OR. Twenty-one studies reported learning outcomes measured in five behavioral categories: economy of movement (8 studies); suturing (3 studies); performance time (13 studies); error rates (7 studies), and global rating (7 studies).

CONCLUSION: Simulation-based training can lead to demonstrable benefits of surgical skills in the OR environment. This review suggests that simulation-based training is an effective way to teach laparoscopic surgery skills, increase translation of laparoscopic surgery skills to the OR, and increase patient safety; however, more research should be conducted to determine if and how simulation can become apart of surgical curriculum.

Jones, Anne C.; Shipman, Scott A.; Ogrinc, Greg Key characteristics of successful quality improvement curricula in physician education: a realist review Postgraduate Medical Journal 2015

Purpose Quality improvement (QI) is a common competency that must be taught in all physician training programmes, yet, there is no clear best approach to teach this content in clinical settings. We conducted a realist systematic review of the existing literature in QI curricula within the clinical setting, highlighting examples of trainees learning QI by doing QI. **Method** Candidate theories describing successful QI curricula were articulated a priori. We searched MEDLINE (1 January 2000 to 12 March 2013), the Cochrane Library (2013) and Web of Science (15 March 2013) and reviewed references of prior systematic reviews. **Inclusion criteria** included study design, setting, population, interventions, clinical and educational outcomes. The data abstraction tool included categories for setting, population, intervention, outcomes and qualitative comments. Themes were iteratively developed and synthesised using realist review methodology. A methodological quality tool assessed the biases, confounders, secular trends, reporting and study quality. **Results** Among 39 studies, most were before-after design with resident physicians as the primary population. Twenty-one described clinical interventions and 18 described educational interventions with a mean intervention length of 6.58 (SD=9.16) months. Twenty-eight reported successful clinical improvements; no studies reported clinical outcomes that worsened. **Characteristics of**

successful clinical QI curricula include attention to the interface of educational and clinical systems, careful choice of QI work for the trainees and appropriately trained local faculty. Conclusions This realist review identified success characteristics to guide training programmes, medical schools, faculty, trainees, accrediting organisations and funders to further develop educational and improvement resources in QI educational programmes.

Vincent, Mary Anne; Sheriff, Susan; Mellott, Susan The Efficacy of High-fidelity Simulation on Psychomotor Clinical Performance Improvement of Undergraduate Nursing Students Cin-Computers Informatics Nursing 2015

High-fidelity simulation has become a growing educational modality among institutions of higher learning ever since the Institute of Medicine recommended that it be used to improve patient safety in 2000. However, there is limited research on the effect of high-fidelity simulation on psychomotor clinical performance improvement of undergraduate nursing students being evaluated by experts using reliable and valid appraisal instruments. The purpose of this integrative review and meta-analysis is to explore what researchers have established about the impact of high-fidelity simulation on improving the psychomotor clinical performance of undergraduate nursing students. Only eight of the 1120 references met inclusion criteria. A meta-analysis using Hedges' g to compute the effect size and direction of impact yielded a range of -0.26 to +3.39. A positive effect was shown in seven of eight studies; however, there were five different research designs and six unique appraisal instruments used among these studies. More research is necessary to determine if high-fidelity simulation improves psychomotor clinical performance in undergraduate nursing students. Nursing programs from multiple sites having a standardized curriculum and using the same appraisal instruments with established reliability and validity are ideal for this work.

Benetoli, Arcelio; Chen, Timothy F.; Aslani, Parisa The use of social media in pharmacy practice and education Research In Social & Administrative Pharmacy 2015

Background: Social media is becoming increasingly ubiquitous. It has significant potential as a health communication and educational tool, and may provide a medium for the delivery of health-related services. Objectives: This systematic review aimed to investigate the use of social media in professional pharmacy practice and pharmacy education, and includes an evaluation of the research designs utilized. Methods: Medline, Embase, PubMed, IPA, and CINAHL databases were broadly searched for peer-reviewed research studies about pharmacy and social media (SM). The search was restricted to years 2000 to June 2013, with no other restrictions applied. Key words used were within three concept areas: "social media" and "pharmacist or student" and "pharmacy." Results: Twenty-four studies met the inclusion criteria. SM was broadly addressed as a general concept in 3 of the 24 studies. The other 21 studies investigated/used specific SM tools. Fourteen of those addressed social networking sites (SNS), four wikis, two blogs, and one Twitter. The studies' foci were to describe SM use ($n = 17$ studies) by pharmacist, pharmacy educators, and pharmacy students and investigate usage related topics (such as e-professionalism and student-educator boundary issues); or the use of SM as an educational tool in pharmacy education ($n = 7$). Pharmacy students were the subject of 12 studies, pharmacists of six, and faculty members and administrators of four. Survey methods were used in 17 studies, alone or with an additional method; focus groups were used in two; interviews in one; and direct observation of social media activity in seven. Results showed that SM in general and SNS in particular were used mainly for personal reasons. Wikis, Facebook, and Twitter were used

as educational tools in pharmacy education with positive feedback from students.
Conclusion: Research investigating the use of SM in the practice of pharmacy is growing; however, it is predominantly descriptive in nature with no controlled studies identified. Although some studies have used SM to deliver and enhance pharmaceutical education, none have focused on the delivery of pharmacy services through SM.

O'Dea A.; O'Connor P.; Keogh I. A Meta-Analysis of the effectiveness of crew resource management training in acute care domains. Postgraduate Medical Journal 2014

The healthcare industry has seen an increase in the adoption of team training, such as crew resource management (CRM), to improve teamwork and coordination within acute care medical teams. A meta-analysis was carried out in order to quantify the effects of CRM training on reactions, learning, behaviour and clinical care outcomes. Biases in the research evidence are identified and recommendations for training development and evaluation are presented. PUBMED, EMBASE and PsychInfo were systematically searched for all relevant papers. Peer reviewed papers published in English between January 1985 and September 2013, which present empirically based studies focusing on interventions to improve team effectiveness in acute health care domains, were included. A total of 20 CRM-type team training evaluation studies were found to fulfil the a priori criteria for inclusion in the meta-analysis. Overall, CRM trained participants responded positively to CRM (mean score 4.25 out of a maximum of 5), the training had large effects on participants' knowledge ($d=1.05$), a small effect on attitudes ($d=0.22$) and a large effect on behaviours ($d=1.25$). There was insufficient evidence to support an effect on clinical care outcomes or long term impacts. The findings support the premise that CRM training can positively impact teamwork in healthcare and provide estimates of the expected effects of training. However, there is a need for greater precision in outcome assessment, improved standardisation of methods and measures, and more robust research design. Stronger evidence of effectiveness will require multi-level, multicentre, multispecialty and longitudinal studies."

Schmidt, Eric; Goldhaber-Fiebert, Sara N.; Ho, Lawrence A.; McDonald, Kathryn M. Simulation Exercises as a Patient Safety Strategy A Systematic Review Annals Of Internal Medicine 2013

Simulation is a versatile technique used in a variety of health care settings for a variety of purposes, but the extent to which simulation may improve patient safety remains unknown. This systematic review examined evidence on the effects of simulation techniques on patient safety outcomes. PubMed and the Cochrane Library were searched from their beginning to 31 October 2012 to identify relevant studies. A single reviewer screened 913 abstracts and selected and abstracted data from 38 studies that reported outcomes during care of real patients after patient-, team-, or system-level simulation interventions. Studies varied widely in the quality of methodological design and description of simulation activities, but in general, simulation interventions improved the technical performance of individual clinicians and teams during critical events and complex procedures. Limited evidence suggested improvements in patient outcomes attributable to simulation exercises at the health system level. Future studies would benefit from standardized reporting of simulation components and identification of robust patient safety targets. Ann Intern Med. 2013;158:426-432. www.annals.org

Cartledge, Peter; Miller, Michael; Phillips, Bob The use of social-networking sites in medical education Medical Teacher 2013

Background: A social-network site is a dedicated website or application which enables users to communicate with each other and share information, comments, messages, videos and images. Aims: This review aimed to ascertain if "social-networking sites have been used successfully in medical education to deliver educational material", and whether "healthcare professionals, and students, are engaging with social-networking sites for educational purposes". Method: A systematic-review was undertaken using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Eight databases were searched with pre-defined search terms, limits and inclusion criteria. Data was extracted into a piloted data-table prior to the narrative-synthesis of the Quality, Utility, Extent, Strength, Target and Setting of the evidence. Results: 1047 articles were identified. Nine articles were reviewed with the majority assessing learner satisfaction. Higher outcome measures were rarely investigated. Educators used Facebook, Twitter, and a custom-made website, MedicineAfrica to achieve their objectives. Conclusions: Social-networking sites have been employed without problems of professionalism, and received positive feedback from learners. However, there is no solid evidence base within the literature that social-networking is equally or more effective than other media available for educational purposes.

Lucisano, Karen E; Talbot, Laura A Simulation training for advanced airway management for anesthesia and other healthcare providers: a systematic review Aana Journal 2012

We studied the current literature on human patient simulation for preparing anesthesia and other healthcare providers for advanced airway management. A systematic review was conducted of articles published between 1990 and 2009 on advanced airway management for patients undergoing anesthesia and patients who are not. The search used 4 electronic databases: Cumulative Index to Nursing & Allied Health Literature, MEDLINE, PsycINFO, and Web of Science. We included 34 articles in the analysis; 15 were experimental or quasi-experimental designs, 8 descriptive studies and reports, and 11 analyses of equipment or technique evaluations using simulation. The majority of the studies included simulation education evaluation for a variety of medical, nursing, and allied health providers and students. Only 6 studies addressed the use of simulation as an educational or evaluation tool to enhance training of anesthesia providers in difficult airway management. Those studies included analyses of different types of training and the perceived value of simulated training, and evaluations of equipment. Few studies have analyzed the effects of this modality on trainer skills and patient safety. There is a clear need for well-designed studies to examine these effects.

Hallenbeck, Virginia J Use of high-fidelity simulation for staff education/development: a systematic review of the literature Journal For Nurses In Staff Development : Jnsd : Official Journal Of The National Nursing Staff Development Organization 2012

Currently, high-fidelity simulations (HFS) are widely used in nursing education and are being introduced into acute care to assist with orientation programs, continuing education, certification courses, and staff development. In a review of the literature, many articles were found that describe HFS and its advantages and how to use the technology. But, there are few research studies to support the use. Upon completion of a review of the literature and an analysis of utility, the data do not clearly show that HFS is the best practice for the

orientation and education of staff nurses. Overall, HFS is recognized as a safe way to learn, and most nurses like participating in HFSs. However, before the healthcare industry continues on this journey of widespread adoption of HFSs, more research needs to be done to show that the increased skills and knowledge of the nurse obtained through simulation does translate into safer patient care and better patient outcomes.

Ma, Irene W. Y.; Brindle, Mary E.; Ronksley, Paul E.; Lorenzetti, Diane L.; Sauve, Reg S.; Ghali, William A. Use of Simulation-Based Education to Improve Outcomes of Central Venous Catheterization: A Systematic Review and Meta-Analysis Academic Medicine 2011

Purpose Central venous catheterization (CVC) is increasingly taught by simulation. The authors reviewed the literature on the effects of simulation training in CVC on learner and clinical outcomes.

Method: The authors searched computerized databases (1950 to May 2010), reference lists, and considered studies with a control group (without simulation education intervention). Two independent assessors reviewed the retrieved citations. Independent data abstraction was performed on study design, study quality score, learner characteristics, sample size, components of interventional curriculum, outcomes assessed, and method of assessment. Learner outcomes included performance measures on simulators, knowledge, and confidence. Patient outcomes included number of needle passes, arterial puncture, pneumothorax, and catheter-related infections.

Results: Twenty studies were identified. Simulation-based education was associated with significant improvements in learner outcomes: performance on simulators (standardized mean difference [SMD] 0.60 [95% CI 0.45 to 0.76]), knowledge (SMD 0.60 [95% CI 0.35 to 0.84]), and confidence (SMD 0.41 [95% CI 0.30 to 0.53] for studies with single-group pretest and posttest design; SMD 0.52 [95% CI 0.23 to 0.81] for studies with nonrandomized, two-group design). Furthermore, simulation-based education was associated with improved patient outcomes, including fewer needle passes (SMD -0.58 [95% CI -0.95 to -0.20]), and pneumothorax (relative risk 0.62 [95% CI 0.40 to 0.97]), for studies with nonrandomized, two-group design. However, simulation-based training was not associated with a significant reduction in risk of either arterial puncture or catheter-related infections.

Conclusions: Despite some limitations in the literature reviewed, evidence suggests that simulation-based education for CVC provides benefits in learner and select clinical outcomes.

Sisk, Rebecca J. Team-Based Learning: Systematic Research Review Journal Of Nursing Education 2011

Team-based learning (TBL) is an active learning method developed to help students achieve course objectives while learning how to function in teams. Many faculty members have adopted TBL because it is a unique teaching method, but evidence about its effectiveness is unclear. Seventeen original studies on TBL are presented in this systematic review of research. The studies include descriptive, explanatory, and experimental research published from 2003 to 2011 in the nursing, medical, education, and business literature. Generally, students are satisfied with TBL and student engagement is higher in TBL classes. Evidence also exists that students in TBL classes score higher on examinations. However, further high-quality experimental studies are needed to confirm that TBL positively affects examination

scores and other learning outcomes and to determine whether TBL produces students who have the ability to function well in groups.

Gagliardi, Anna R.; Brouwers, Melissa C.; Finelli, Antonio; Campbell, Craig E.; Marlow, Bernard A.; Silver, Ivan L. Physician Self-Audit: A Scoping Review Journal Of Continuing Education In The Health Professions 2011

Introduction: Self-audit involves self-collection of personal performance data, reflection on gaps between performance and standards, and development and implementation of learning or quality improvement plans by individual care providers. It appears to stimulate learning and quality improvement, but few physicians engage in self-audit. The purpose of this study was to identify how self-audit has been operationalized; factors influencing self-audit conduct and outcomes, including program design; and issues warranting further research.

Methods: A systematic review of quantitative and qualitative studies was undertaken. Two individuals independently reviewed searches of indexed literature databases, tables of contents, and references of eligible studies. Data were extracted and tabulated to describe the nature and impact of self-audit programs.

Results: Six studies evaluated the impact of self-audit programs. No program was based on a model or theory that informed its design. All studies showed improved compliance with care delivery guidelines and/or improved patient outcomes, although these findings were largely self-reported. Programs varied so features associated with benefit could not be identified.

Discussion: Overall there is a need for guidance on all aspects of self-audit for both participants and leaders. This guidance would be useful to educators, professional associations, and medical certification bodies to plan, develop, implement, evaluate, and support self-audit programs. Further research should aim at developing training programs and tools that address and evaluate a variety of competencies across different disciplines using more rigorous research designs, including both quantitative and qualitative approaches.

Wong, Brian M.; Etchells, Edward E.; Kuper, Ayelet; Levinson, Wendy; Shojania, Kaveh G. Teaching Quality Improvement and Patient Safety to Trainees: A Systematic Review Academic Medicine 2010

Purpose: To systematically review published quality improvement (QI) and patient safety (PS) curricula for medical students and/or residents to (1) determine educational content and teaching methods, (2) assess learning outcomes achieved, and (3) identify factors promoting or hindering curricular implementation.

Method: Data sources included Medline (to January 2009), EMBASE, HealthSTAR, and article bibliographies. Studies selected reported curricula outlining specific educational content and teaching format. For articles with an evaluative component, the authors abstracted methodological features, such as study design. For all articles, they conducted a thematic analysis to identify factors influencing successful implementation of the included curricula.

Results: Of 41 curricula that met the authors' criteria, 14 targeted medical students, 24 targeted residents, and 3 targeted both. Common educational content included continuous QI, root cause analysis, and systems thinking. Among 27 reports that included an evaluation,

curricula were generally well accepted. Most curricula demonstrated improved knowledge. Thirteen studies (32%) successfully implemented local changes in care delivery, and seven (17%) significantly improved target processes of care. Factors that affected the successful curricular implementation included having sufficient numbers of faculty familiar with QI and PS content, addressing competing educational demands, and ensuring learners' buy-in and enthusiasm. Participants in some curricula also commented on discrepancies between curricular material and local institutional practice or culture.

Conclusions: QI and PS curricula that target trainees usually improve learners' knowledge and frequently result in changes in clinical processes. However, successfully implementing such curricula requires attention to a number of learner, faculty, and organizational factors.

Merien, A. E. R.; van de Ven, J.; Mol, B. W.; Houterman, S.; Oei, S. G. Multidisciplinary Team Training in a Simulation Setting for Acute Obstetric Emergencies A Systematic Review Obstetrics And Gynecology 2010

OBJECTIVE: To perform a systematic review of the literature on the effectiveness of multidisciplinary teamwork training in a simulation setting for the reduction of medical adverse outcomes in obstetric emergency situations.

DATA SOURCES: We searched Medline, Embase, and the Cochrane Library from inception to June 2009. The search strategy contained medical subject heading terms ("patient care team" and "patient simulation" and "obstetrics" or "gynecology" and "education" or "teaching") and additional text words ("teamwork," "simulation," "training").METHODS OF STUDY SELECTION: Studies describing and evaluating teamwork training programs with simulation models for labor ward staff in acute obstetric emergencies were selected. The search revealed 97 articles.

TABULATION, INTEGRATION, AND RESULTS: All studies were assessed independently by two reviewers for methodological quality using the quality assessment of diagnostic accuracy studies (QUADAS) criteria. Only eight articles assessed the effect of teamwork training in a simulation setting. Four of them were randomized controlled trials and four were cohort studies. The only study that reported on perinatal outcome showed an improvement in terms of 5-minute Apgar score and hypoxic-ischemic encephalopathy. The seven other studies showed that teamwork training in a simulation setting resulted in improvement of knowledge, practical skills, communication, and team performance in acute obstetric situations. Training in a simulation center did not further improve outcome compared with training in a local hospital.

CONCLUSION: Introduction of multidisciplinary teamwork training with integrated acute obstetric training interventions in a simulation setting is potentially effective in the prevention of errors, thus improving patient safety in acute obstetric emergencies. Studies on its effectiveness and cost-effectiveness are needed before team training can be implemented on broad scale. (Obstet Gynecol 2010;115:1021-31)

Bal, Gaele; David, Sandra; Sellier, Elodie; Francois, Patrice Assessment of morbidity and mortality conferences as a tool for physician education and improvement of quality of care and patient safety: A literature review Presse Medicale 2010

Background: In France, national incentives promote the development of morbidity and mortality conferences (M&MC) in hospitals.

Objective: A systematic literature review was performed to investigate the effectiveness Of M&MC as well as how they were conducted and how participants experienced them.

Database: [lie review was coined out by searching the MEDLINE Grid PASCAL databases and included articles in English and French. The following keywords were used. mortality, morbidity, conference, rounds, review, meetings, committee.

Study selection: Two independent reviewers selected oil original studies describing or evaluating M&MC and published from 1st January 2002 through 31st December 2008. Results > we analyzed 17 articles, of which I I reported structured interviews, 3 analyzed M&MC minutes, 2 monitored indicators, Grid I described observations of M&MC. They showed good physician participation and a wide variety of types of meeting organization. Attendance by paramedical staff, the number of cases covered per meeting, and case selection criteria affected their content Studies of the efficacy of M&MC were fore and concerned specific topics (digestive endoscopy and childbirth) Study limitations > Both the methods end the objectives of studies analyzing M&MC ore heterogeneous.

Conclusion: The published studies viewed M&MC as a valuable tool for physician education and quality assurance, but the factors associated with their effectiveness require further study,

Chakraborti, Chayan; Boonyasai, Romsai T.; Wright, Scott M.; Kern, David E. A systematic review of teamwork training interventions in medical student and resident education Journal Of General Internal Medicine 2008

BACKGROUND: Teamwork is important for improving care across transitions between providers and for increasing patient safety.

OBJECTIVE: This review's objective was to assess the characteristics and efficacy of published curricula designed to teach teamwork to medical students and house staff. **DESIGN:** The authors searched MEDLINE, Education Resources Information Center, Excerpta Medica Database, PsychInfo, Cumulative Index of Nursing and Allied Health Literature, and Scopus for original data articles published in English between January 1980 and July 2006 that reported descriptions of teamwork training and evaluation results.

MEASUREMENTS: Two reviewers independently abstracted information about curricular content (using Baker's framework of teamwork competencies), educational methods, evaluation design, outcomes measured, and results.

RESULTS: Thirteen studies met inclusion criteria. All curricula employed active learning methods; the majority (77%) included multidisciplinary training. Ten curricula (77%) used an uncontrolled pre/post design and 3 (23%) used controlled pre/post designs. Only 3 curricula (23%) reported outcomes beyond end of program, and only 1 (8%) > 6 weeks after program completion. One program evaluated a clinical outcome (patient satisfaction), which was unchanged after the intervention. The median effect size was 0.40 (interquartile range (IQR) 0.29, 0.61) for knowledge, 0.38 (IQR 0.32, 0.41) for attitudes, 0.41 (IQR 0.35, 0.49) for skills and behavior. The relationship between the number of teamwork principles taught and effect size achieved a Spearman's correlation of .74 ($p = .01$) for overall effect size and .64 ($p = .03$) for median skills/behaviors effect size.

CONCLUSIONS: Reported curricula employ some sound educational principles and appear to be modestly effective in the short term. Curricula may be more effective when they address more teamwork principles.

Hammick, M.; Freeth, D.; Koppel, I.; Reeves, S.; Barr, H. A best evidence systematic review of interprofessional education: BEME Guide no. 9 Medical Teacher 2007

Background and review context: Evidence to support the proposition that learning together will help practitioners and agencies work better together remains limited and thinly spread. This review identified, collated, analysed and synthesised the best available contemporary evidence from 21 of the strongest evaluations of IPE to inform the above proposition. In this way we sought to help shape future interprofessional education and maximize the potential for interprofessional learning to contribute to collaborative practice and better care.

Objectives of the review: To identify and review the strongest evaluations of IPE. To classify the outcomes of IPE and note the influence of context on particular outcomes. To develop a narrative about the mechanisms that underpin and inform positive and negative outcomes of IPE. Search strategy: Bibliographic database searches as follows: Medline 1966 - 2003, CINAHL 1982 - 2001, BEI 1964 - 2001, ASSIA 1990 - 2003 which produced 10,495 abstracts. Subsequently, 884 full papers were obtained and scrutinized. In addition, hand searching (2003 - 5 issues) of 21 journals known to have published two or more higher quality studies from a previous review. Topic definition and inclusion criteria: Peer-reviewed papers and reports included in the review had to be formal educational initiatives attended by at least two of the many professional groups from health and social care, with the objective of improving care; and learning with, from and about each other. Data collection, analysis and synthesis: Standard systematic review procedures were applied for sifting abstracts, scrutinizing full papers and abstracting data. Two members of the team checked each abstract to decide whether the full paper should be read. A third member was consulted over any discrepancies. Similarly, each full paper was read by at least two members of the team and agreement sought before passing it to one member of the team (SR) for data abstraction. Other members of the team checked 10% of the abstraction records. Coding into a Statistical Package for Social Scientists (SPSS) data base led to collection of different outcome measures used in the primary studies via the common metric of an adapted Kirkpatrick's four-level model of educational outcomes. Additionally, a narrative synthesis was built after analysis of primary data with the 3-P model (presage-process-product) of education development and delivery. Headline results: Government calls for enhanced collaboration amongst practitioners frequently leads to IPE that is then developed and delivered by educators, practitioners or service managers. Staff development is a key influence on the effectiveness of IPE for learners who all have unique values about themselves and others. Authenticity and customization of IPE are important mechanisms for positive outcomes of IPE. Interprofessional education is generally well received, enabling knowledge and skills necessary for collaborative working to be learnt; it is less able to positively influence attitudes and perceptions towards others in the service delivery team. In the context of quality improvement initiatives interprofessional education is frequently used as a mechanism to enhance the development of practice and improvement of services.

Appendix 4: Synthesis of other relevant reports from the grey literature

Health Foundation (2012): Quality Improvement Training for Healthcare Professionals

Summary

- There is no standard approach or definition of quality improvement in education and training.
- Research suggests that training in quality improvement can improve skills and knowledge of health professionals and may be associated with short-term improvements in care processes.
- Few studies have examined the evidence for the impact of education and training in on health outcomes, safety or resource use.
- There is little research on whether or not one type of training is more successful (e.g. classroom based vs. online learning) or whether undergraduate education is more/less effective than on-the-job training.

The report

Published by the Health Foundation in August 2012, this report is a high level scan of the evidence focusing on the following two questions:

1. What types of training about formal quality improvement techniques are available for health professionals?
2. What evidence is there about the most effective methods for training clinicians in quality improvement?

The authors searched for all research published between 1980 and 2011 and contacted 60 higher education institutions and other organisations (in the UK and internationally) to obtain course curricula. They found over 5,000 papers, which they reduced to around 300 for review.

Types of training

The report summarises the core categories of quality improvement content that they found in their review and the different types of training for quality improvement to healthcare professionals. Few studies have compared one type of training with another so it is not possible to compare learning strategies. Similarly, there is little evidence as to whether or not formal education before qualification is better than on-the-job learning.

Content area	Types of training
Methods for Quality Improvement	<ul style="list-style-type: none"> • PDSA Cycles • Total quality management <ul style="list-style-type: none"> ○ Root cause analysis ○ Systems thinking • IHI Improvement Model • CANDO • Six Sigma • LEAN
Core competencies that relate to quality improvement	<p>US: Accreditation Council for Medical Education:</p> <ul style="list-style-type: none"> • Practice-based learning and improvement • Systems-based practice <p>Quality & Safety Education for Nurses:</p> <ul style="list-style-type: none"> • Patient centred care • Teamwork and collaboration • Evidence based practice • Quality improvement • Safety • Informatics
Standards	<ul style="list-style-type: none"> • Some educators have used ISO9000 standards to help develop educational strategies for quality improvement. • Royal Colleges have set standards that include quality improvement and audit.
Safety	<ul style="list-style-type: none"> • Some quality improvement curricula use safety as a primary focus. • Some training postulates that adverse events are caused by human error and failures in organisational/administrative processes – steps should be taken to reduce variation (similar to quality improvement cycles).
Other	<ul style="list-style-type: none"> • No standard approach or definition of quality improvement. • Quality improvement can be applied at a range of levels (behavioural, system, organisational, healthcare system,

	<p>public health system or community-wide).</p> <ul style="list-style-type: none"> • Quality improvement often identifies training as one of the solutions.
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Most effective approaches

The report found that there was little published evidence about the effectiveness of quality improvement training. Some studies concluded that continuing medical education had little impact on improved care. For example:

“...a randomised trial with 47 rural and small community hospitals in the US compared quality improvement education to a control group... There were no significant differences in processes or clinical outcomes between hospitals that took part and those that did not.”
(p.27, Health Foundation, 2012)

However, other studies did conclude that formal education was positively associated with changes in care delivery and improvements in processes of care. Factors that were associated with these successes include:

- Sufficient number of teachers familiar with quality improvement
- Addressing competing educational demands
- Ensuring buy-in and enthusiasm from learners

The impact of training on patient outcomes is unclear. This may be due to the fact that outcomes are not measured systematically and a wide variety of measures are used.

The Health Foundation (October 2011): *Can patients be teachers?*

This report was based on a literature review of case studies (including telephone interviews) and a web-based survey of medical and dental schools.

Key findings:

- Involvement of patients, carers or their families in medical education, postgraduate training and continuing professional development is ‘patchy’.
- Examples of patient involvement in education are often isolated within the broader curriculum.
- Patient involvement in education is low on the agenda of leaders in health professional education.
- There is strong evidence that patient involvement has short-term benefits for all involved, including learners, educators, institutions and patients/users.
- There are few studies that explore the long-term benefits of patient/user involvement on health professional behaviour or health outcomes and good quality research is required in the future.
- There is a need for a central repository of successful innovations and interventions with materials for all stakeholders.

**Report of the Lucian Leape Institute Roundtable on Reforming Medical Education (2010):
*Unmet Needs, Teaching Physicians to Provide Safe Patient Care***

This White Paper is a summary of a discussion on the shortcomings of patient safety medical education in the US and what it should look like in the future. The report made several recommendations, which are worth including in full here for the reference of the Commission.

- Medical school and teaching hospital leaders should place the highest priority on creating learning cultures that emphasise patient safety, model professionalism, enhance collaborative behaviour, encourage transparency, and value the individual learner.
- Medical school deans and teaching hospital CEOs should launch a broad effort to emphasise and promote the development and display of interpersonal skills, leadership, teamwork, and collaboration among faculty and staff.
- As part of continuing education and on-going performance improvement, medical school deans and teaching hospital CEOs should provide incentives and make available necessary resources to support the enhancement of faculty capabilities for teaching students how to diagnose patient safety problems, improve patient care processes, and deliver safe care.
- The selection process for admission to medical school should place greater emphasis on selecting for attributes that reflect the concepts of professionalism and an orientation to patient safety.
- Medical schools should conceptualise and treat patient safety as a science that encompasses knowledge of error causation and mitigation, human factors concepts, safety improvement science, systems theory and analysis, system design and re-design, teaming, and error disclosure and apology.
- The medical school experience should emphasise the shaping of desired skills, attitudes and behaviours in medical students that include, but are not limited to, the Institute of Medicine and Accreditation Council for Graduate Medical Education (ACGME)/American Board of Medical Specialties (ABMS) core competencies—such as professionalism, interpersonal skills and communication, provision of patient-centred care, and working in interdisciplinary teams.
- Medical schools, teaching hospitals, and residency training programs should ensure a coherent, continuing, and flexible educational experience that spans the four years of undergraduate medical education, residency and fellowship training, and life-long continuing education.
- The LCME should modify its accreditation standards to articulate expectations for the creation of learning cultures having the characteristics described in Recommendation 1 above; to establish patient safety education—having the characteristics described herein—as a curricular requirement; and to define specific terminal competencies for graduating medical students.
- The ACGME should expand its Common Program Requirements to articulate expectations for the creation of learning cultures having the characteristics described in Recommendation 1; to emphasize the importance of patient safety-

related behavioural traits in residency program faculty; and to set forth expected basic faculty patient safety competencies.

- The LCME and the ACGME should direct particular attention to the adequacy of the patient safety-related preparation of graduating medical students for entry into residency training.
- A survey of medical schools should be developed to evaluate school educational priorities for patient safety, the creation of school and teaching hospital cultures that support patient safety, and school effectiveness in shaping desired student skills, attitudes, and behaviours.
- Financial, academic, and other incentives should be utilized to leverage desired changes in medical schools and teaching hospitals that will improve medical education and make it more relevant to the real world of patient care.

Education & Training in Patient Safety Subgroup of the Patient Safety & Quality of Care Working Group of the European Commission (April 2014): *Key findings and recommendations on Education and training in patient safety*

This report outlines a series of recommendations based on review of reported initiatives of education and training in patient safety, illustrated with examples and experience from 27 European countries. The report recommends that education and training in patient safety should:

- Be introduced and implemented in the curricula for healthcare workers and managers in every Member State
- Be on all levels of healthcare professionals and managers learning and development
- Be based on previous European project and WHO work in building/developing curricula
- Find constructive, feasible and effective ways to include the perspective of patients when developing the curricula on patient safety.
- Use curricula adaptable to each country – cannot be a static programme.

Summary of patient safety competency documents

We also reviewed documents relating to patient safety competencies provided by the WHO curriculum guide, the Canadian Patient Safety Institute (2008), the Australian patient safety education framework (2006) and a systematic review which looked at tools assessing patient safety competencies of health care professionals (Okuyama et al, 2011).

The topics of the WHO curriculum guide topics are as follows:

1. What is patient safety?
2. Why applying human factors is important for patient safety
3. Understanding systems and the effect of complexity on patient care
4. Being an effective team player
5. Learning from errors to prevent harm

6. Understanding and managing clinical risk
7. Using quality-improvement methods to improve care
8. Engaging with patients and carers
9. Infection prevention and control
10. Patient safety and invasive procedures
11. Improving medication safety

They were based on and reflect both the Canadian competency domains and the evidence based Australian Patient Safety Education Framework. Both are outlined below.

The Canadian patient safety competencies framework identified 6 domains:

Domain 1: Contribute to a Culture of Patient Safety

Domain 2: Work in Teams for Patient Safety

Domain 3: Communicate Effectively for Patient Safety

Domain 4: Manage Safety Risks

Domain 5: Optimize Human and Environmental Factors

Domain 6: Recognize, Respond to and Disclose Adverse Events

The Australian framework identified the following areas and topics:

- **Communicating** effectively (Involving patients and carers as partners in healthcare, Communicating risk, Communicating honestly with patients after an adverse event (open disclosure), Obtaining consent, and Being culturally respectful and knowledgeable)
- Identifying, preventing and managing **adverse events** and near misses (Recognising, reporting and managing adverse events and near misses, Managing risk, Understanding healthcare errors, and Managing complaints)
- **Using evidence and information** (Using best available evidence-based practice, and Using information technology to enhance safety)
- **Working safely** (Being a team player and showing leadership, Understanding human factors, Understanding complex organisations, Providing continuity of care, and Managing fatigue and stress).
- **Being ethical** (Maintaining fitness to work or practice, and Ethical behaviour and practice).
- **Continuing learning** (Being a workplace learner, and Being a workplace teacher).
- **Specific issues** (e.g. Preventing wrong site, wrong procedure and wrong patient treatment, and Medicating safely)

A systematic review of assessment tools used the six Patient safety domains identified by the Canadian framework. The authors also used Miller's four competency levels: 'knows', 'knows how', 'shows how' and 'does'. The authors identified 34 assessment tools for

medical and nursing professions. Twenty of these tools assessed Miller's highest two levels ('shows how' and 'does'). Most of these higher levels assessed the skills of working in teams, risk management, and communication. Trainees' level of knowledge on patient safety was measured as follows: assessment of knowledge (or the 'knows' level), application of this knowledge using case management (or the 'knows how' level), and performance (or the 'shows how' level).

While the focus of this document was on the education and training in patient safety, we thought it worth including this small section on specific content, competencies and their measurement or assessment.

C. Expert interview guides

Topic	Key points/questions
1. Background	<p>We're conducting a project for Health Education England to inform their priorities for education and training.</p> <p>We're interested in your views on what makes effective education and training in quality and safety in healthcare, including where the priorities lie for future development in this area.</p> <p>The interview will be flexible according to your area of expertise and please feel free to contribute anything that seems relevant, in addition to the questions I might ask.</p> <p>Our scope is broad and we are interested in education and training across all of the following:</p> <ul style="list-style-type: none"> - healthcare disciplines - undergraduate, postgraduate and continuous professional development - Experience in the UK and outside the UK - Health care and non-health care industries
2. Interviewee area of expertise and experience of developing education/training interventions	<p>Establish relevant area of expertise:</p> <p>What is your profession and area of practice? (if educator are they also in clinical practice) Special interest(s)?</p> <p>Define topic of teaching/educational experience: (i.e. level and discipline group – if relevant, e.g. staff training, medical schools, UG/PG; CPD). Experience within any specific programmes, projects or courses. Possible areas:</p> <ul style="list-style-type: none"> • Patient safety theory, interventions and practices • Quality improvement theory and methods • Human factors and teamwork • Dr/Patient interaction or patient-centred care • Management education/leadership development <p>Define level of training and discipline of learner, e.g.: Undergrad, Postgrad, CPD; Specialties/professional group</p> <p>Define role of expert: e.g. course designer, delivery, strategy, etc.</p> <p>Obtain overview of programmes/course content, relevant to understanding the expert's perspective.</p>
	The following questions may be linked to specific programmes

	agreed/defined previously (i.e. within the experts' experience).
Topic content and learning objectives	<p>Generally, how do you present the concept of patient safety* to novices and learners?</p> <p>Why? What considerations need to be taken into account regarding the learner's perspective?</p> <p>What do you see is the contribution of your area of expertise in patient safety* to training and education in healthcare?</p> <p>What in your view are we trying to achieve from teaching and training in patient safety *? What are the important learning outcomes?</p> <ul style="list-style-type: none"> • What <u>skills</u> should students/participants acquire/ develop in order to practice safely after graduation/training? • What <u>knowledge</u> should students/participants acquire / develop in order to practice safely after graduation/training? • What <u>attitudes</u> should students/participants acquire/ develop in order to practice safely after graduation/training? • What <u>behaviour</u> should students/participants acquire/ develop in order to practice safely after graduation/training? • What about other patient safety or quality outcomes? <p>What are the challenges of teaching patient safety (or communicating patient safety ideas to different professional groups) - e.g. trainees vs clinicians vs nurses vs managers and senior leaders?</p> <p>What features of training/education are important within your area and why?</p> <ul style="list-style-type: none"> ○ What are the key areas of knowledge and skills that healthcare professionals need to develop? ○ What are the most important topics? ○ What is currently taught on this? ○ How could it be improved? ○ (Best mode of delivery? Innovative modes of delivery?) <p>Do you think current training and education is adequate to ensure delivery of safe and high quality care?</p> <p>[probe to define any gap between current and desirable practice]</p> <p>What specific attitudes would you seek to change or develop through education and training?</p> <ul style="list-style-type: none"> ○ And behaviours? <p>What are your views on whether we should be teaching patient safety theory or practice (or a balance of both, and to whom)?</p>

	<p>Do you think that patient safety and QI are complementary? What is the relationship between them and how should they be linked in education and training?</p> <ul style="list-style-type: none"> • What do you think about the balance and emphasis placed upon quality and safety in current curricula and training? • What about other aspects, e.g. human factors, improvement science, implementation science, risk management, QI methods, team training, simulation, etc. • How does teaching/training at UG level differ from formal PG level teaching and CPD or other teaching?
Future priorities of patient safety* education and training.	<p>In terms of improving quality and safety in healthcare, what do you see as the most important priorities for training and education? <i>If appropriate:</i> Check for each level/discipline/area as established above</p> <p>What can be achieved through education and training and what should be achieved through other means?</p> <p>What would be the highest impact priority area, do you think, for current future education/training interventions?</p> <p>Do you think that any specific curriculum areas should be dropped or strengthened?</p> <p>Are there any areas of theory/practice/methods/innovation that should be focused upon in the future? Have you encountered any examples that you thought were particularly innovative? e.g.</p> <ul style="list-style-type: none"> • Inter-professional learning • Use of simulation • Mentoring and learning by doing vs classroom-based teaching • Online and distance learning vs vocational training <p>[Elicit as many examples as possible from interviewees]</p> <p>Aside from the topic content/curriculum, are there any other areas of education/training policy that should be strengthened in future? e.g.</p> <ul style="list-style-type: none"> Evaluation of training interventions Links to fitness to practice framework Communication and advertising (increasing appeal) Mandatory/certification Funding and resources Training the trainers Quality of education and training

	<p>What do you see as the challenges and barriers to effective education and training? How can these be overcome?</p> <p>What message would you give to HEE and policy makers concerning effective education and training within your area?</p>
Evaluation of education and training	<ul style="list-style-type: none"> • How do you think we should measure and evaluate outcomes from education and training? • Can training in patient safety* influence patient outcomes? [probe to elicit <i>how, which patient outcomes</i> in particular and <i>how do we know/measure this.</i>] • What is the role of feedback to learners? Do you think we give enough feedback?
Further question(s)/ comments	<ul style="list-style-type: none"> • Do you have anything to add about any of the topics discussed? Please feel free to get in touch with any additional thoughts after the interview if you wish. • Can you recommend anyone else whom might be able to provide a useful perspective on these topics?

D. NHS personnel online survey questions

1. How have you been involved in patient safety education and training? (e.g. as a healthcare worker, trainee, an educator, family member, carer or patient)
2. What worked well in your experience with patient safety education and training?
3. What could have been improved?
4. Do you have any other feedback or suggestions?

E. Patient/carer online survey questions

1. Please indicate whether you are a family member or carer
2. Why do you think adverse events in patient safety happen in healthcare?
3. What do you think are the main challenges for healthcare staff in ensuring safer patient care?
4. Do you think there are gaps in healthcare staff skills and behaviour which can compromise patient safety? If yes, what are these gaps?
5. In your opinion, are healthcare staff adequately trained to provide safe care to patients?
6. What role do you think patients, families and carers can play in improving patient safety?
7. In your past interactions with the healthcare system, did you feel adequately involved and informed as a patient, family member or carer? (Being involved and informed can be thought of as taking part in conversations to better understand the illness, information on different treatment options, having a role in deciding which treatment is right, and gaining knowledge on how to manage the disease at home)
8. Do you know of any innovative examples where patients are being involved in the design and delivery of education and training programs to improve patient care and patient safety? If yes, please share details.
9. Patient stories can be a powerful learning tool for healthcare staff and to improve patient safety. Please share any links to patient stories online or through other channels that you think we should be aware of.
10. In the case that you are willing, we would like to follow-up with some of you to glean more details related to your experiences. Leaving this information is completely optional

F. Case study template

Description

What is the name of the initiative?	
In which location/organisation did this initiative begin?	
Please list the names, roles and contact details of the people involved in the organisation of this initiative	
Please provide a brief description of the initiative	

Questions

1) What are the specific learning objectives of the intervention?	
2) Who is the intended audience for this initiative?	
3) What teaching/training methodologies have been used?	
4) What, if any, funding has this initiative received and from whom?	
5) What have been the biggest barriers to the success and/or the scale-up of this initiative?	

6) What are the intended outcomes of this intervention and how have they been monitored? - Please fill out the table below
Note: this question is structured according to the four levels (reaction, learning, behavior, outcome) of the Kirkpatrick Model, a standard approach to evaluate education and training interventions.

	Intended outcomes	Approach to monitoring
Reaction - Participants' satisfaction and how they feel about the education and training they have received.		
Learning - Extent to which participants acquire knowledge, skills and attitudes as intended by the programme.		

Behavior - Whether the knowledge, skills and attitudes were transferred to the workplace.		
Outcome - Whether patient outcomes were impacted by the intervention.		

Organisations which returned the case study

Case study templates, partially or fully filled were received from the following organisations. Please note that responses from local organisations were sent to HEE, who then forwarded response to the Centre for Health Policy. It's possible that not all submitted responses were forwarded and therefore included for analysis.

Number	Name of initiative	Organisation
1	Student Quality Ambassadors	North West Region
2	Simulation based training in Trauma & Orthopaedic Survey	Department of Orthopaedics 7 Education Acadmey, Barts Helath NHS Trust
3	In situ simulation training for trauma teams	Bart's Health
4	Patient Safety Academy - Safety and Quality Improvement Training	Patient Safety Academy (PSA) - Oxford Academic Health Sciences Network
5	Critical event team training	Critical care directorate, James Cook University Hospital
6	Health Care Team Challenge	HE West Midlands
7	ATSP - "Asked To See Patient"	Health Education North West (formerly North West Deanery)
8	Anaesthesia Simulation Programme	Barts & The London School of Anaesthesia UCL Partners (North East and North Central)
9	YMET (Yorkshire Maternity Emergency Training)	HEYH
10	Interdisciplinary Induction and Preceptorship Project	Oxford University Hospitals NHS Trust, Oxfordshire
11	Maudsley Simulation	

12	The PreMieRE Project. Preventing Mistakes by Reviewing Errors: The Extended M&M	University Hospitals of Leicester NHS Trust
13	EPIFFany (Effective Performance Insight for the Future): Improving clinical attitude, competence and confidence towards a safety culture	Health Education East Midlands (at the time of funding Health Education Innovation Cluster).
14	Breaking down barriers and driving up collaborative quality improvement and safety in dementia education and training across the Thames Valley.	Thames Valley House, 4630 Kingsgate, Oxford Business Park South, Oxford, OX4 2SU
15	HSEW e-induction for junior doctors	Began in the Royal United Hospitals in Bath, and has been extended to hospitals in the HESW footprint
16	Master Classes in Human factors and safety	Northumbria University in partnership with NHS Trusts
17	Core Medical Training- Full immersion simulation and Procedural training days for CT1 &2	Pan- UCLP initiative to provide equitable training for all core medical trainees across the sector
18	Neonatal Emergencies Team Training Simulation (Nets) Course	London Neonatal Transfer Service, The Royal London Hospital, Barts Health
19	MATCH (Multidisciplinary Action Training in Crises and Human Factors)	Royal London, Barts Health
20	Establishing a Faculty of Patient Safety	Health Education North East
21	frailty academy project	The HENCEL funded frailty academy was set up by UCL Partners, together with key partners across the Barking and Dagenham, Havering and Redbridge (BHR) health economy, and London Ambulance Service (LAS).
22	Regional Nursing, Midwifery and Allied Health Pilot Simulation Faculty Development Programme	Northumbria University North East Simulation Network

23	Simulation - Improving Patient care and developing skills for the future	Cambridge University Health Partners
24	Human Factors "culture carrier" initiative	Cheshire and Wirral Partnership NHS Foundation Trust
25	Developing the HCA (Health Care Assistant) role to improve the safety and quality of care to patients with diabetes in the community setting	Worcestershire Health & Care NHS Trust

