A proactive approach to harm prevention: identifying latent risks through *in situ* simulation training

Latent risks are hazards or deficiencies in the clinical systems, the environment or the provider team that can have significant impact on patient care. *In situ* simulation training can be a very effective way of identifying these latent risks and thus improving patient safety. This report describes an ongoing programme of *in situ* simulation training in paediatrics and neonatology within Yorkshire and Humber and reviews the impact of this project in identifying latent risks.

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Key points

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1. *In situ* simulation is an effective way of multidisciplinary team training to improve patient safety, which allows multidisciplinary learning in the actual working environment.
2. It is feasible to conduct large scale simulation training across a region.
3. It is possible to identify latent risks that may otherwise be missed.
4. Identified latent risks should be fed back to local and regional risk management bodies.

Background

Patient safety is a key focus of the current healthcare system. The question is how can we use multidisciplinary *in situ* simulation to identify and correct preventable errors before they cause harm to our patients?

In situ simulation is a critical tool[1,2] that exposes learners to the complexity of clinical settings without the hazards of real life. It is a team-based simulation strategy that occurs on actual patient care units using equipment and resources from the unit and involving members of the local healthcare team.[3] It has frequently been described as 'crash testing the dummy'.[4] *In situ* simulation recreates stressful critical events in a safe environment, involving highly realistic scenarios requiring complex decision making and interaction with multiple personnel.[5] Besides enhancing participants' technical and non-technical proficiencies, the most valuable benefit of *in situ* simulation is perhaps the opportunity to evaluate system competence and identify latent risks that predispose to medical error[4,6] These can be hazards and deficiencies in the clinical systems, the environment or the provider team that are not readily apparent. *In situ* simulation therefore serves both purposes of improving patient safety and providing educational benefits.

Latent risks originally defined in the aviation safety industry, are conditions or threats that result from 'decisions made or by positions taken by organisations as a whole, where the damaging consequence may lay dormant for some time and only become evident when local triggering factors overcome the organisation's defence'.[7] In medicine, latent risks can be either due to medical, equipment, environmental or human performance factors. These may be factors that have been present in the system for a while, often recognised but long tolerated. It is when multiple factors or errors simultaneously come together that an adverse incident becomes increasingly likely, as described in Reason's Swiss cheese model.[7] Latent risks can have a significant impact on patient safety and, will have a negative impact on patient care.[4] Effective strategies to mitigate these risks are to change the way we train, change policies and procedures through *in situ* simulation to make it more difficult for people to make mistakes and easier to recognise and recover from those that will occur.

Methods

A programme of *in situ* simulation training in paediatrics and neonatology has been set up across 10 hospitals in the Yorkshire and Humber region since 2013 with the support from Yorkshire and Humber Children and Neonatal Simulation Network (YHCaNS). The hypothesis was that the implementation of *in situ* simulation-based training in an actual clinical environment would promote the identification of latent risks and system issues. Ultimately, the aim was to improve the safety of care of patients.

At every *in situ* simulation session delivered around the region, a 'latent risk identification form' (**FIGURE 1**) is

completed. Latent risks identified are divided into medication, equipment, environment/staffing and training categories. This allows documentation of the latent risk identified and details of what has been done to rectify the risk. The form uses a risk assessment matrix recommended by National Patient Safety Agency (NPSA)[8] to identify the level at which the risk should be managed in the trust, assign priorities for remedial action, and determine whether risks are to be accepted, on the basis of the risk score. Latent risk identification forms are filled in by a member of the faculty during or after each *in situ* session conducted. Information collected from the forms is then collated and fed into the local hospital risk management processes. Through this reporting system, action plans are put in place to rectify the risk.

Structured scenarios with predetermined learning objectives are used in the *in situ* training. The scenarios are often chosen to directly relate to a recent incident to ensure the relevance of the training. Both high and low fidelity simulators are used in the sessions. Sessions are conducted either planned or on *ad hoc* basis where simulation training will be carried out in an unannounced fashion using the in house crash call system. All participants involved are actual members of staff working in the particular unit/hospital.

Analysis

Latent risks identified during each *in situ* simulation session are described and categorised qualitatively as per categories stated above therefore no formal statistical analysis was performed. Results are presented as descriptive frequencies.

Results

In the 12-month period of enrolment (February 2013 to January 2014), a total of 246 individuals from multidisciplinary backgrounds participated in the 34 simulation sessions conducted across 10 hospitals in Yorkshire and Humber (**TABLE 1**). A total of 60 latent risks were identified (**TABLE 2**):

- 8 medication risks
- 20 equipment risks
- 5 environment/staffing risks
- 27 training/knowledge gap risks.

This resulted in an identification rate of 1.76 risks for every *in situ* simulation performed.

Of the 60 latent risks identified:

- 19 (32%) were classified as extreme risk in terms of magnitude of severity
- 28 (47%) were considered high risk
- 9 (15%) were moderate risk
- 4 (6%) were classified as low risk.

All of the identified risks were immediately fed back to individual hospital risk management processes.

Discipline of participant	Total number (%)
Consultant	11 (5)
Paediatric registrar	46 (19)
A&E registrar	5 (2.0)
Paediatric senior house officer	65 (26)
A&E senior house officer	6 (2)
House officer	9 (4)
Advanced nurse practitioner	2 (1)
A&E nurse	6 (2)
Theatre nurse	2 (1)
Neonatal nurse	62 (25)
Paediatric nurse	18 (7)
Student nurse	6 (2)
Medical student	8 (3)
Total	246

TABLE 1 The distribution of participants by discipline.

Recurring themes were noted, such as lack of knowledge regarding obtaining O negative blood in an emergency, lack of knowledge of the resuscitation unit and lack of familiarisation with thermo-regulation strategies in preterm babies (**TABLE 3**). Many of the risks identified

	Risk identified	Datix incident report	Risk score*	Action taken
Medication				
Equipment				
Environment/staffing				
Training				

***Risk score = consequence score x likelihood score**

		Consequence score				
		1 No harm	2 Minimal harm	3 Moderate harm	4 Major harm	5 Catastrophic
Likelihood score	5 Almost certain	5	10	15	20	25
	4 Likely	4	8	12	16	20
	3 Possible	3	6	9	12	15
	2 Unlikely	2	4	6	8	10
	1 Rare	1	2	3	4	5

Risk score: 1-3 Low risk 4-6 Moderate risk 8-12 High risk 15-25 Extreme risk

FIGURE 1 The latent risk identification form.

would be highly unlikely to be reported through the usual risk management processes.

Discussion

Each *in situ* simulation session resulted in the identification of at least one latent risk. A range of latent risks are being picked up through *in situ* simulation that would have otherwise been missed or highly unlikely to be reported through usual risk management processes, which may potentially have detrimental effect on patient safety.

With the data collected it is clear that there are common themes to these risks – many of which would normally be expected to form part of any hospital basic training. So far the recurring themes have included lack of knowledge regarding obtaining O negative blood in an emergency and lack of knowledge of the use of the resuscitation unit. This information was fed back immediately to the local teams involved so that change could be implemented at a local level. A full and supportive debrief also took place straight after the session for all staff involved in the scenario.

This project has demonstrated the feasibility of implementing *in situ* simulation on a large scale across the region despite many cultural and logistic challenges and barriers previously perceived. It provides both patient safety and educational benefits even with the use of low fidelity simulators. With the benefits in mind, *in situ* simulation has stimulated local healthcare providers and organisation-wide interest in further development of the simulation programme.

As this project is conducted at 10 different hospitals across Yorkshire and Humber, it is a challenge to influence individual hospital risk management processes to take up the proposed remedial actions for each of the latent risks presented. Collection of such data is currently ongoing. However, feedback is given to the local provider's education and training board to allow the local provider to learn from these events.

Conclusion

In situ simulation is an effective and valuable tool with the potential to improve patient safety through the identification of latent risks in a high risk environment. *In situ* simulation also improves accessibility to simulation and allows multidisciplinary team training. The feasibility of conducting *in situ* simulation training on a large scale basis across a region is demonstrated, despite the perceived challenges. It is recommended that identified latent risks should be fed back to local risk management processes in order for remedial actions to be taken. In the future, the authors aim to investigate the culture of individual hospitals/organisations in response to latent risks identified through *in situ* simulation, and present further findings on remedial actions taken for identified latent risks.

Latent risk category	Examples of risk	Remedial action
Medication	Adult emergency drug preparations in neonatal emergency drug box	Fed back through local clinical risk management meeting and pharmacy
	Confusion caused by different preparations of adrenaline in emergency drug box	
	Critical medication such as IV salbutamol not available on ward	
Equipment	Wrong battery/no battery in laryngoscope causing delay in intubation	Incident reported through Datix reporting system
	Poor emergency box design	Renewal of emergency box design
	Suboptimal position of infant T-piece resuscitator, which resulted in staff not checking positive pressure given to patient	Position of infant T-piece resuscitator at eye level
Environment/ staffing	Cold delivery room for preterm delivery	Fed back through local clinical risk management meeting and labour ward. Posters designed and focused training delivered
	Sharing of equipment between two resuscitation rooms in A&E	Redesign of resuscitation rooms
	Neonatal nurse not routinely attending crash call	Highlighted staffing issue and potential risk of de-skilling staff
Training	Lack of knowledge regarding storage of emergency O negative blood	Incorporated teaching on location of emergency blood into induction training
	Lack of familiarisation with transport incubator	Transport incubator to be removed as mode of transport for patient between labour ward and neonatal unit until staff are trained
	Lack of knowledge of emergency drug doses	Resuscitation algorithm with drug doses to be made available on every crash trolley

TABLE 2 Examples of latent risks and remedial actions.

Recurring themes
Lack of familiarisation with location of nearest O negative blood storage
Lack of knowledge of resuscitation unit
Lack of familiarisation with thermoregulation strategies for preterm infants
Poor design of emergency box
Lack of familiarisation with content of emergency box

TABLE 3 Recurring themes identified during the simulation sessions.

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