Team situational awareness: practitioner-centred design of a safety huddles toolkit

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Abstract. Patients die every year because of failure to recognize early warnings of deterioration. A contributing factor is poor team communication and situational awareness. This paper describes the practitioner-centred design of a safety huddles toolkit. Interviews, observations and collective discussions conducted synchronously (face-face) and asynchronously (virtually) informed decisions to iteratively design the toolkit. The toolkit is designed for continuous adaptation to allow practitioner-led improvement for different clinical specialties. Indicative findings (from 50 teams adopting the toolkit) suggest practitioners find it useful for adopting safety huddles and improving team communication and patient awareness. The adoption of the toolkit has been extended 6 months after project completion.

Keywords. Situational Awareness, safety huddles, human-centred design.

1. Introduction

In recent years, across the whole of the healthcare sector there have been many serious incidents involving the failure of healthcare practitioners to recognise and respond to deterioration in patients, including children. The Royal College of Physicians (RCP) estimated in 2012 that up to 6,000 patients a year die because of this. (RCP, 2012). The deterioration of children in hospital is a well-documented contributing factor which includes: the failure to monitor and observe patients adequately; a failure to recognise the deteriorating patient; a failure of healthcare teams to communicate effectively; and a failure to respond correctly or in a timely manner (Pearson, 2011; National Patient Safety Agency, 2009). The causes are multi-factorial and are not unique to one health care environment, but poor communication and situational awareness always play some role. There is no doubt that communication is challenging among teams in complex, high-pressured and safety critical environments such as healthcare, and sadly ineffective communication is one of the leading contributing causes of medical errors and patient harm (Leonard, Graham and Bonacum, 2004). A feasible intervention has been sought to improve communication, situational awareness and early recognition of the deteriorating patient to help tackle this problem.

1.1 Safety huddles

Safety huddles (see Goldenhar et al, 2015) are identified as a solution to overcome poor communication and improve both individual and team situational awareness. They have received a lot of attention in the quality and safety literature following their successful migration from the aviation industry (e.g. Taylor, 1990) and successful adoption in secondary care in the USA (Goldenhar et al, 2013). They are also advocated by the Institute for Healthcare Improvement (2016) and are reported to improve team effectiveness and so reduce patient harm (Edelson et al, 2008). For these purposes, safety huddles are defined as multi-professional, structured and quick team or group meetings held in the working environment at regular intervals to support reflective learning. They include all team members from Health Care Assistants to Consultants in charge. They give team members a snapshot of what is going on, what is needed and what could be improved upon. This helps improve individual

and team situational awareness by e.g. providing the opportunity to take stock and identify 'watchers' or patients with deteriorating acuity. Such reflection and the improvement of team situational awareness can help to reduce harm (Paul et al, 2010) as an important contributor to a safety surveillance system.

1.2 Situational awareness

Situational awareness is a construct that has been applied usefully to inform systems design in a number of industries including aviation, nuclear power and the oil industry. Despite this success, it is a well-debated construct (see Endsley, 2015) in relation to:

i) Definition (see Stanton et al, 2010);
ii) Measurement (see Salmon et al, 2009 for a discussion, and examples for measuring both individual and team situational awareness across Taylor, 1990; Durso et al, 1998; Golombek et al, 2015; Goldenhar et al, 2015), and;
iii) Identity across disciplines (see Endsley, 2015 for a discussion and Dane, 2011 for an example of application in management).

Situational awareness has drawn a lot of attention in healthcare, with its lack being implicated as a contributing cause of patient deaths. In this case situational awareness is attributed to the individual but, given the reliance on teamwork in healthcare settings and the shared responsibility, team situational awareness is also a necessity.

1.3 This study

As a part of a drive for continuous improvement in patient safety and to mitigate against serious untoward incidents, University Hospitals of Leicester NHS Trust sought to improve communication, situational awareness and team working by implementing safety huddles (sometimes called safety briefings) as part of planned interventions for "operationalising safety" (Vincent et al, 2008).

The Children's Emergency Department and Children's Intensive Care Units manage the most unwell paediatric patients in the hospital. These units have similar themes arising from errors, such as prescribing and the identification of deterioration. There are differences though e.g. in communication, specific medication errors and area-specific processes. General paediatric wards often have patients with a greater complexity but lower acuity and have lower nurse to patient ratios because of this. These differences affect the situational awareness requirements necessary to identify the deteriorating child or maintain optimal patient flow.

Safety huddles are reported to be effective in the literature (Goldenhar et al, 2013) but for effective adoption, it is imperative that they are not forced upon healthcare teams as a management device to improve performance. Such an approach could produce resentment from the adopting teams. So to ensure safety huddles are fit for purpose and to maximise the chance of adoption and diffusion, healthcare practitioners must participate in their design and production and direct the adoption. A latent benefit of such an approach is that it will also encourage team members to work together. A number of reports (Berwick, 2013 and Keogh, 2013) have emphasised the importance of developing a positive, learning organisational culture. Differences in hierarchical status and power dynamics make speaking up and voicing concerns a challenge; these power differences can act as a strong inhibitor to speaking up (Liao et al, 2014). Safety huddles provide an opportunity to overcome these historical hierarchical barriers. They include all grades of healthcare professionals from Health Care Assistant to Consultant, working as a team to identify and prioritise patient acuity and risk.

1.4 Aim and summary

Safety huddles are short multi-professional meetings and include all staff on the ward from housekeeper to the consultant in charge. They improve situational awareness and team communication and as a result it is anticipated that they will contribute to reducing the 6000 deaths associated with the failure to recognise the early warnings of deterioration (Royal College of Physicians, 2012). It is also anticipated that they will create a more supportive culture and environment that improves team and organisational learning.

This paper describes the design and evaluation of the safety huddles Toolkit, designed to roll out safety huddles across different ward and clinical areas in a tertiary children's hospital. The objectives were:

I) To develop an implementation safety huddle toolkit to facilitate healthcare providers to adopt safety huddles using a Human Centred Design approach.

II) To evaluate the adoption of the safety huddle toolkit and the effectiveness of collaboration between human factors and healthcare practitioners.

2. Methods

A project team was formed of six healthcare practitioners (nurses and doctors), two non-healthcare practitioners and two other non-healthcare practitioners employed within the healthcare setting. Only one member of the team had a dedicated human factors background but three other members had knowledge of the subject. The project was conducted in the context of an extremely high-pressured healthcare environment which did not allow the use of co-design workshops for the toolkit.

2.1 Approach

A key tenet of human factors is Human-Centred Design (for further information, see: ISO 9241-210:2010) - ensuring that the design of a product is fit and appropriate for the context of use. In this case the product is the safety huddle and the accompanying toolkit to support diffusion across teams. So a participatory approach was taken, designing 'for and with' the end user (Eason, 1995). This approach reflected the technical knowledge required to structure safety huddles, acknowledged the socio-political environment of healthcare settings, and allowed the engagement with teams necessary to maximise the chance of successful adoption (Eason, 1995). Healthcare practitioners together with knowledge of the environment collected through interviews and observations formed the technical knowledge to underpin the huddle design. The healthcare practitioners who would be adopting the toolkit, participated in the process to help overcome socio-political dynamics, and actively contribute to the design to ensure the outcome would fit with team values.

2.2 Procedure

A number of approaches were used to ensure that the toolkit reflected a human-centred design approach for and with users (Eason, 1995). To provide context for the non-healthcare practitioner members of the team and to inform design, interviews (n=17) were conducted on the wards that would pilot the huddles toolkit. Interviewees included healthcare practitioners from all levels and occupations. The interviews focused on daily routines and working practice, team communication, situational awareness and dynamics. Observations on the wards were also conducted to provide insight into possible approaches for conducting the safety huddles.

Information from the observations and interviews were used with the healthcare practitioners to design the toolkit. The toolkit was then developed through a series of informal face-face group meetings in addition to asynchronous communication using two digital tools. The first was a secure online chat application, the second an online project software package which

contained the project and toolkit documentation. These tools enabled the team to operate virtually and continuously throughout the project and to fit around workload and shift patterns e.g. the clinical part of the team operated across three hospitals, and non-clinical team members operated from remote locations. Permission was granted for the use of both pieces of software in the project. Face-face meetings were used to collectively design the structure and timings of the safety huddles. The digital applications were used to share ideas, and to evaluate initial versions of the toolkit as they were piloted on the wards. Weekly meetings were also held to discuss the evaluation of the latest version of the toolkit. Opportunities to participate in the process through formal and informal discussions with the project team were publicised with the wider multi-professional health care teams adopting the safety huddles. The rationale for design decisions are described as a part of the findings section below. Interviews and a brief questionnaire were used to evaluate the toolkit with individuals that had adopted safety huddles and the toolkit.

3. Findings – the Toolkit

The design of the toolkit is in three parts. The first, 'Explaining Huddles' includes reference to two elements of the toolkit. The second, the 'Huddle Iterative Design Toolkit' details how a Human-Centred Design approach was taken to ensure that safety huddles evolve and improve analogous to Plan Do Study Act cycles (Hignett et al, 2015), including reference to a further element of the toolkit. The third is the evaluation, soliciting commentary from users following their extended use of the toolkit.

3.1 Part 1: Explaining Huddles

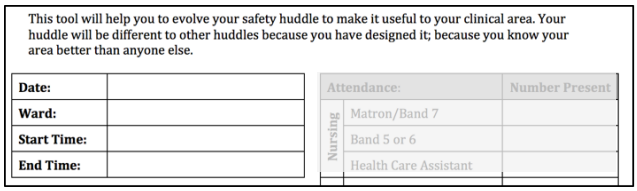
A 'How to get Huddles Started' guide was developed to support adopting teams. A guide to identifying a 'watcher' was also developed given that such patients' acuity means that they are most likely to deteriorate rapidly. These guides are both key components of the Toolkit and help ensure that all team members (including those members without formal medical qualifications) know what signs to look for in deteriorating patients. These elements are available from the authors.

3.2 Part 2: Huddle Iterative Design

The tool contains six main elements designed to encourage reflection on the safety huddles by the team. Early feedback was also provided to the adopting teams by the huddle clinicians to ensure changes were made early to prevent huddles continuing with emerging poor practice such as taking too long or discussing non-pertinent information. The rational for the first five elements is described below and the sixth in the next section:

i) Element 1: Introduction and descriptive data

The introduction (Figure 1) encourages the team to actively reflect on their huddle to improve it through an iterative cycle. It requests a date, ward and time stamp to ensure a record is kept.


This tool will help you to evolve your safety huddle to make it useful to your clinical area. Your huddle will be different to other huddles because you have designed it; because you know your area better than anyone else.

Date:	
Ward:	
Start Time:	
End Time:	

	Attendance:	Number Present
Nursing	Matron/Band 7	
	Band 5 or 6	
	Health Care Assistant	

Figure 1: Element 1 of the Huddle Assessment Tool – introduction and descriptive data.

ii) Element 2: Clinical prompts

The clinical prompts (Figure 2) are designed to remind the team of the purpose of the huddles and are specifically designed for the children's hospital context. These may change for other specialties. The clinical prompts were adapted from the SAFE (situational awareness for

everyone) programme run by the Royal College of Paediatrics and Child Health (RCPCH, 2016) and from research in the Cincinnati Children's Hospital and Medical Centre (Brady et al, 2013) which identified five risk factors associated with preventing deterioration. These are:

1. Even when vital signs are normal family concerns should always be taken seriously.
2. Risks are increased with high-risk therapies and the child is more likely to deteriorate.
3. Elevated early warning scores are an indicator of deterioration but are not always present.
4. Clinician gut-feeling is important: this is where any member of staff senses that the child is not right even when there is no obvious indication, sometimes referred to as 'watchers'
5. When there are concerns about communication with the patient or family members e.g. comprehension issues or they speak a different language to the healthcare team.

Were these elements discussed? Please tick...		
PEWS?	Yes	No
Praise?	Yes	No
Family Concerns?	Yes	No
Who is the sickest?	Yes	No
Who the watchers are?	Yes	No
Future events?	Yes	No
Learning from events?	Yes	No

Attendance:		Number Present
Nursing	Matron/Band 7	
	Band 5 or 6	
	Health Care Assistant	
Medical	Consultant	
	ST 3 or above	
	Below ST3	
Others	Physiotherapist	
	Play Specialist	
	Admin/Ward Clerk	
	Student	
	Other (Please specify)	
Please circle who led the safety huddle		

Figure 2 (left): Clinical prompts for the Huddle (questions must be adapted for another context).

Figure 3 (right): Attendees must be recorded in Huddles (questions must be adapted for another context).

iii) Element 3: Attendees

The requirement to capture attendees acts as a register but also reminds all attendees that everyone in the team is valued and should be invited to the huddles. The intervention and behaviour change literature (Michie, Johnston and Francis, 2008) shows that without periodic reinforcement, there is a danger that historical barriers to team membership around professions may return. The safety huddle lead was also recorded to ensure that this can be rotated. Again, the design of the attendees list must be tailored to each context.

iv) Elements 4 and 5: Huddle design, practice and reflection prompts

These two elements require the team to consider their huddle practice. In Figure 4 we see questions on current huddle practice to support iterative improvements for future huddles. The questions encourage team reflection on who actively participates and whether or not it is considered of value. In Figure 5 we see questions prompting reflection related more to whether the huddle included aspects that should not typically be included in a huddle e.g. discussions of handover. There are also pragmatic questions e.g. whether the huddle started on time and if it extended beyond five minutes (in which case the huddle is at risk of becoming a distraction and burden rather than being of value).

Other questions to ask the team...		
Was it organised?	Yes	No
Did everyone get to speak?	Yes	No
Was it useful?	Yes	No
Was anybody else needed?	Yes	No
Was more info needed?	Yes	No

Did unintended events occur? Please tick...		
Interruption?	Yes	No
Handover discussion?	Yes	No
Irrelevant discussions?	Yes	No
Lasted > 5 minutes?	Yes	No
Unable to start on time?	Yes	No

Figures 4 and 5: Questions related to huddle practice and pragmatics feed directly into an iterative design cycle.

v) Element 6: Team reflection on safety huddles

To ensure team members are asked to consider and reflect on the efficacy of the huddle open-ended questions are also included in the Huddle Assessment Tool (Figure 6).

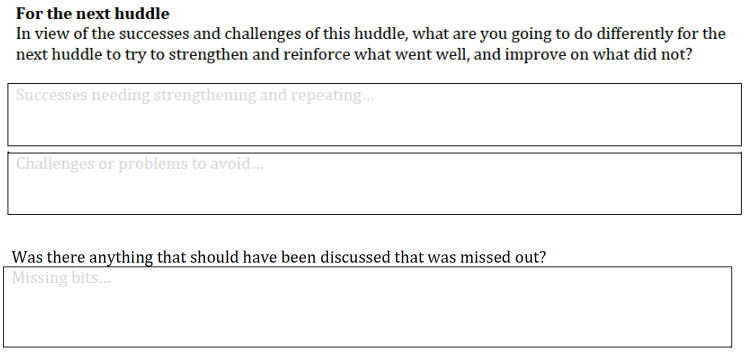


Figure 6: Open ended questions related to the huddles to inform improvement (questions must be adapted for another context).

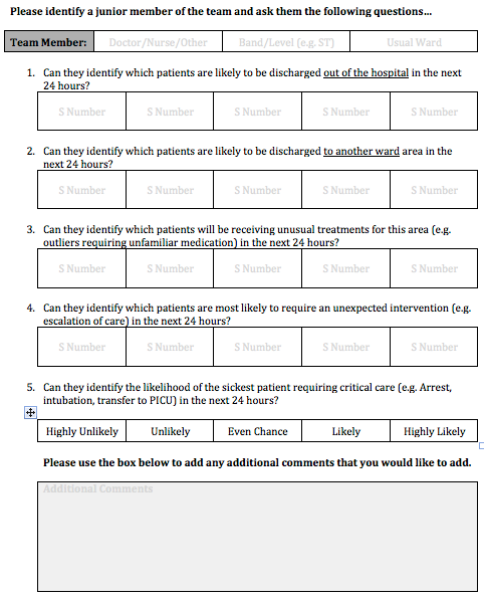
3.3 Part 3: Evaluating safety huddles

Given the complexity of the environment and safety critical nature of the UHL NHS Trust's Children's Hospital and future adopting sites, the measurement and evaluation of improving situational awareness through safety huddles must be done in situ. The arrangements should avoid putting patients at additional risk and should be available continually to allow frequent evaluation of both the toolkit and the huddles.

This in situ approach is contrary to some approaches reported in the situational awareness literature e.g. the freeze approach to measuring situational awareness is commonly utilised in simulations (SAGAT, Endsley and Garland, 2000) but this is not considered appropriate outside of a simulation or non-safety critical setting. The most common approach to measuring SA in situ typically takes one of two forms: Situation Awareness Rating Technique (SART), which requires an observation of task performance (Taylor, 1990); and Situation Present Assessment Method (SPAM), which asks questions in real time (Durso et al., 1998). These approaches were not considered appropriate alone due to the safety critical context interference that direct questioning may pose.

More recent studies of huddles (Goldenhar et al,2013) have not explicitly focused on the measurement of situational awareness but instead on the improvement of patient safety and team performance. These are essentially used as proxies to demonstrate the effectiveness of huddles and therefore improvements in team situational awareness. For example, after implementing huddles, Goldenhar et al (2013) conducted interviews with key stakeholders and focus groups with healthcare practitioners to establish themes related to staff perceptions of huddles. They reported that huddles: improved efficiencies and quality of information sharing; increased levels of accountability, empowerment, and sense of community; which together create a culture of collaboration and collegiality that increases the staff's quality of collective awareness and enhanced capacity for eliminating patient harm. Similarly, Golombek et al (2015) focused on the effectiveness of huddles through informal feedback in situ and formal feedback through interviews and feedback before and after huddles. Meeting minutes and notes collected at the time of the huddles were also evaluated (Golombek et al 2015).

Adopting a quality improvement approach alongside Human-Centred Design could be beneficial as it will ensure the toolkit continually improves (Hignett et al, 2015). However, this requires a continuing mechanism to iteratively evaluate safety huddles. This has been designed into the Toolkit based on posing questions in real time (adopted SPAM method, Durso et al, 1998). There are also no studies published that compare the adoption of safety huddles to patient outcomes. To achieve this for each safety huddle the following questions were incorporated to allow a comparison to real patient outcomes. The questions are based on the nine-item SART questionnaire (Taylor, 1990). The questionnaire was not itself deemed to be feasible in the context of the Children's Hospital given the imperative that Huddles are conducted rapidly and are not onerous. Instead teams were asked to answer the following questions in the huddles. Identify patients: likely to be discharged from hospital in the next 24 hours; likely to be discharged to another ward area in the next 24 hours; who will be receiving unusual treatments for this area e.g. outliers requiring unfamiliar medication, in the next 24 hours? most likely to require an unexpected intervention e.g. escalation of care, in the next 24 hours.



These questions were tailored to the environment of the study. An open text box was also provided for additional comments. These questions, contained in the safety huddle assessment tool for the purposes of the study, may not be necessary if the toolkit was scaled.

Figure 7: Situational Awareness questions to be completed by a junior member of the team (adopted heavily from Taylor, 1990). An open-ended question is included. Question five in the figure above has since been removed. Questions must be adapted to another context.

4. Discussion and Conclusion

This paper describes a safety huddles toolkit designed to roll out safety huddles across different ward and clinical areas in a tertiary children's hospital. The two objectives were successfully completed. First, a safety huddle toolkit was developed using a Human-Centred Design approach. Second, the indicative findings of the adoption of the safety huddle toolkit suggest it is effective and that collaboration between human factors and healthcare practitioners a success.

Overall the team worked very effectively with continuous and motivated participation, and they continue to collaborate. The largest challenge reported by the team was finding time for face-face synchronous meetings. This was overcome by adopting two digital tools. This was novel for the team but a solution that should be explored further for asynchronous human factors' collaborations e.g. to find the best approach for adopting these tools.

Indicative findings from the initial analyses of the evaluation interviews and questionnaire suggest that 49 of the 50 teams who have used the toolkit find it to be useful and in all but one case they felt the toolkit was organised. Verbatim quotes from healthcare practitioners paint a very positive picture of the toolkit:

"Very useful process for the ward to help focus care goals the team have for patients if they

are unstable and helps the overall organisation of the ward, the huddle is successful in my opinion"; "First time taking part in ward 12s huddle. Found it useful in terms of knowing a brief overview of the ward and plans for the day"; "Found the huddle to be very helpful in making all members of the team aware of any concerns or situations that other members may have. Try to get everyone in the same place at the same time"; "Highlight children who are without parents, good for nurses to highlight who doctors need to see first, like watcher."

The indicative findings suggest that healthcare practitioners can use this toolkit to effectively learn to adopt safety huddles. Further evidence of this is that the adoption of the toolkit is continuing six months after this project ended. Evidence of an impact on patient outcomes is not yet available. Evaluation of the safety huddles in relation to the impact on system capacity is ongoing.

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