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MEETING REPORT

Report on 'Safety Engineering in Healthcare': Sixth Annual Simulation Conference, Homerton University Hospital NHS Foundation Trust, 1 December 2016

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Abstract

The Homerton University Hospital NHS Foundation Trust delivered its sixth annual simulation conference, Safety Engineering in Healthcare, on 1 December 2016. A review of the conference is provided in this report.

Keywords: *simulation; patient safety; safety engineering; patient experience; human factors*

Introduction

The Homerton Simulation Conference (#homsim) has become a national showcase for innovations in simulation, patient safety, and human factors since its inception in 2010. The sixth Homerton Simulation Conference entitled 'Safety Engineering and Simulation in Healthcare' followed in the wake of last year's success with a fantastic speaker programme, and attended by an ever-increasing delegate presence. The Homerton Simulation team is one of the most active in London, delivering hospital-, community- and simulation-centre-based training for a large cohort of the multidisciplinary team striving to provide excellent care for our patients. Building on previous success, they assembled a diverse programme on 1 December 2016, with a day that focused on the following key areas: patient safety; simulation; safety engineering; and quality improvement. This conference challenged belief systems that may contribute towards error, enhanced understanding of improvement science and provided practically applicable steps at individual and organizational level to deliver safer patient care.

Session 1: patient safety

Matilda Tristram, Lecturer in Animation and Children's Author

What matters to patients[1]

Matilda Tristram opened the conference to describe, in an honest, passionate and insightful manner, her experiences of being diagnosed with a gastrointestinal malignancy while pregnant at Homerton University Hospital. Presenting panels from her graphic novel, *Probably Nothing*,[2] she shared her feelings about missed early opportunities and the moment she was diagnosed. She recalls with such incredible detail every word said and the mannerisms shown by those charged with her care. The diagnosis came as a great shock and in the context of pregnancy, she was given impossible choices to make, with conflicting information from her oncology and surgical teams. This highlighted the importance of clear multidisciplinary-based approaches, united treatment plans and above all being empathic when this news is delivered. When she commenced chemotherapy she spoke candidly of the boredom that ensues, describing it like 'the worst part-time job imaginable'. However, she reported that writing the comic gave her the opportunity to fill this void and express her thoughts and emotions, distracting from her current reality. She reported an instance of misunderstanding of when to contact the chemotherapy hotline, highlighting that we need to do everything to help our patients understand how and when to access such services.

After 3 months of treatment, she delivered her son by caesarean section, describing the process as like 'somebody rummaging around a handbag'. She had a laparotomy to remove a portion of her large bowel and a temporary stoma, described as the 'hot water bottle resting on her belly'. With understandable anxiety, Tristram was thankfully given the all clear but continued to write about her

experiences of remission and the reversal of her stoma. Care-givers involved in the early misdiagnosis of a patient will understandably be held in compromised regard by our patients and we have a duty to be honest and open following such events. The words she describes used by an overly confident suave anaesthetist served only to instil anxiety in Tristram awaiting her regional anaesthetic. On her recovery, she told of the 'pump action socks' that although aimed to reduce her chance of developing a deep vein thrombosis, in fact plagued her ability to sleep at night. She closed by recounting an experience with a nurse telling her she wasn't 'allowed' to cry but the nurse's own young relative with a cancer diagnosis was entitled to do so. This lack of empathy is understandably etched in her mind, highlighting this misguided and poor choice of words from the nurse.

Her diagnosis was delayed because she was a statistical anomaly and therefore, when initially seen by medical staff, the diagnosis of cancer did not enter their consciousness. Clinicians train through learning patterns, but this education must be flexible for complex decision-making dilemmas present in medicine. Through enhanced understanding of judgement, heuristics and bias, we can potentially process rarer clinical presentations with greater accuracy. Furthermore, empathy in the care that we deliver is crucial for our patients, allowing them to see us as fellow human beings, while healthcare professionals see them as far more than a combination of fascinating multiple pathologies. Her graphic novel gives healthcare professionals a uniquely presented insight into her experience, and a wealth of knowledge from which current and future healthcare professionals can enhance the care they deliver.

Annie Hunningher, Consultant in Anaesthesia, NatSSIPs Lead, Barts Health NHS Trust, London

The National Safety Standards for Invasive Procedures (NatSSIPs): beyond the WHO checklist[3]

First published in September 2015, the National Safety Standards for Invasive Procedures (NatSSIPs) provide a framework to deliver safe care for patients undergoing invasive procedures. Annie Hunningher stated this standard to be a minimum standard, which matters to every patient undergoing these procedures, even though they may not be aware of its existence. They are based on the principles of 'standardize, educate and harmonize', which have been adopted successfully by other industries to reduce harm. The introduction of the WHO Surgical Safety Checklist in 2009 in combination with a refined list of surgical never events did not show the marked reduction in expected incidence of these errors, highlighting the need to look beyond the use of a checklist.[4] The WHO checklist has changed culture and promoted systemic change but its effectiveness depends on the skill with which it is applied. From this came the understanding that human factors and inter-professional team work play a central role in errors that have occurred. Through their understanding, and what has made the WHO checklist a successful safety intervention, work has resulted in 15 standards created to mitigate harm. Hunningher presented these standards as more than sequential steps taken but also organizational standards, allowing for and encouraging the reporting of safety issues and dissemination of information learned from them. Reported never events are thought to be the tip of the iceberg and although their timing may be perceived as random, the reason(s) behind them are very unlikely to be random. We must recognize that healthcare and its delivery are becoming more complex and shift training needs towards a team-based approach that mirrors the care that is delivered. Other high-risk industries, such as the nuclear power industry, would not allow workers to commence without a fully comprehensive induction, and healthcare should learn from this.

Hunningher went on to focus on two areas of the standards: site marking and prosthesis verification. She presented data and accompanying images of the enormous variations in surgical practice in how, when, and the appropriateness with which surgical sites are marked. NatSSIPs set out clear recommendations for site marking, standardizing the process across all specialties, aiming to remove ambiguity wherever possible. She described that in producing a Local Safety Standard for Invasive Procedures (LocSSIP) that was accessible, easy to follow, and shorter, they have seen the standard of site marking increase significantly.

She went on to discuss prosthesis verification and how her institution has learned from the occurrence of associated never events, highlighting that the best people to design system change for prosthesis verification are the teams siting medical implants. Furthermore, the errors that had occurred informed the development of local standards which were disseminated to all multidisciplinary team stakeholders to maximize learning from the event. We must also consider that learning should come not only from never events but also from 'no harm incidents' to further enhance patient care.

In summary, the WHO checklist, although it can reduce error was not sufficient in isolation, and changes in our understanding and training in human factors, culture and the teams in which we deliver care are central to further reducing clinical error.

John Kinnear, Consultant in Anaesthesia and Critical Care Medicine, Southend

Damage limitation – minimizing unintentional harm: complexity, error, team working and human factors[5]

Professor Kinnear delivered an exceptionally eloquent presentation on how we understand error, a science researched over many years in other high-risk industries. Error in healthcare holds complexities that are seldom linear, and he went on to explain how systemic and systematic errors contribute to compromised patient care. The healthcare system in which we operate has become increasingly complex. The environment is often unpredictable and many have little or no opportunity to practice within their immediate sphere of influence. Professor Kinnear went on to describe the task of never event prediction, which is almost impossible. Their occurrence, however, will often come after many latent errors pile up without consequence until it reaches a point of criticality. Human factors play a crucial role in how and why systemic errors occur, and are underpinned by an individual's cognitive limitation.

Systematic error occurs as the result of a flawed decision-making process and we need to understand the architecture of clinical decision making, and build them into safety systems to mitigate error. Heuristics in decision making, for example, may aid in rapid decisions based on pattern recognition, but when these occur in an unpredictable environment, assumptions are likely to end in error.

Solutions to these errors lie in part with the recognition and management of low validity situations by standardizing decision making and using cognitive aids (e.g. checklists). Furthermore, we must train for collective team-based learning and cognitive sharing, through simulation education. This allows for practiced decision making and aims to achieve collective competence for the whole team. He closed stating that beating error is achievable by an expert team, but not an individual expert.

Session 2: simulation

Chris Taylor, ST3 Geriatrics, Newcastle

Improving leadership skills in junior doctors: rapid cycle deliberate practice using simulation[6]

Chris Taylor opened this session by describing how he designed and set up an innovative approach aimed to enhance leadership skills in junior doctors. Up to 80% of healthcare errors occur due to a breakdown in non-technical skills that include communication, leadership and cognitive skills. The public inquiry into the failings at Mid-Staffordshire NHS Foundation Trust, the Francis Report, identified that a lack of leadership contributed towards poor patient outcomes[7]. However, he identified that junior clinical staff receive little non-technical skills training, despite the crucial role they play in medical errors.

During an education fellowship at Whipps Cross University Hospital, Taylor utilized a modified version of the rapid cycle deliberate practice concept in a simulation day focusing on human factors. Brief interactive didactic lectures on principles pertaining to human factors preceded a day of simulated scenarios. The course removed the focus on technical aspects of the simulations during the training day by using the same technical scenario throughout but with increasingly complex non-technical challenges introduced. A structured debrief followed each scenario, focusing on non-technical skills only. He identified that most of the participants had never previously received formal training or feedback on leadership skills. The course was highly commended by participants, citing it as highly relevant to their own practice, and will lead to a change in practice that can unquestionably improve patient care.

Matt Beal, Emergency Medicine SHO, Norfolk & Norwich University Hospital

Effectiveness of medical simulation in teaching medical students critical care medicine[8]

During his Masters in Clinical Education, Matt Beal aimed to identify whether simulation-based education, which has proven efficacy in a large number of professional groups, is effective in medical school education. Simulation education, although a potentially rich mode of teaching, is associated with increased cost and therefore its utility needs to be justified in increasingly financially stretched circumstances. With variability in reported efficacy of simulation in medical students, he postulated this may be in part explained by cognitive load theory. A complex task encountered in simulation can result in short-term memory becoming exhausted and bandwidth limited such that learning is inhibited.

Beal performed a systematic review and subsequent meta-analysis including 15 studies examining the effectiveness of simulation in teaching medical students critical care medicine. This showed that, overall, simulation was a more effective teaching modality than other teaching methods, with high-fidelity simulation more effective than low-fidelity simulation. Interestingly, it also showed that although simulation was more effective at enhancing skills acquisition, it was found to be no better than other teaching methods for knowledge acquisition. Simulation helps us move through Miller's Pyramid, but without that platform of existing knowledge, it may be ineffective, as may be seen in medical students.[9] Those delivering simulation must understand that when targeted

correctly, simulation can be a very effective teaching modality for medical students. However, this may not be universal and requires further investigation to understand the variability in effectiveness of simulation for medical undergraduates.

Laura Graham, Specialist Respiratory Physiotherapist, ACERS (Adult Cardiorespiratory Enhanced and Responsive Service), Homerton University Hospital

In situ simulation in primary care: an AHP-led chronic respiratory simulation programme[10]

Patient interactions with primary care account for most patient interactions with the NHS. The utility of simulation-based education in secondary care delivered both in centre and in situ has been vast, but to date this has not directly translated into the community where most patients are seen. Laura Graham described how with the Adult Cardiorespiratory Enhanced and Responsive Service (ACERS), they have developed a fantastic in situ simulation community-based programme. The environment in which they work is often very challenging, potentially isolating, and difficult to reproduce in a dedicated simulation centre. At the time of inception of this programme, evidence to support in situ primary care training was limited. Graham and colleagues have developed a low-fidelity programme, with scenarios incorporating the acutely unwell patient refusing admission and the disengaged patient, which took place during team meetings. Minimal equipment needs reduced cost significantly, service provision was not affected and the whole team could be involved. Furthermore, latent error identification has led to improved patient care. Reported challenges included staff engagement, but that has significantly improved as the programme has become more developed, and time limitations. This prize-winning programme receives very positive feedback and is planned to be extended soon into other areas in a primary care setting.

Session 3: safety engineering

Maryanne Mariyaselvam, Clinical Research Fellow, Cambridge University Hospitals and Mark Blunt, Consultant in Critical Care, The Queen Elizabeth Hospital, Kings Lynn

Engineered solutions to never events and novel simulation methods[11]

The afternoon sessions began with interesting and relevant talks delivered by Maryanne Mariyaselvam and Mark Blunt. They posed the question of why errors occur in relation to never and serious adverse events and how hospitals should implement preventative measures. It was suggested that re-education, re-retraining and re-writing policies are short-lived improvements, requiring continuous implementation programmes to ensure prevention of never events. This is because these methods are only effective if the clinician remembers and this diminishes over time.

So, why do never events continue to happen? We need to explore both system and human approaches. Ultimately, humans are fallible. We are free agents and make choices. These may not always be the correct ones. In order to ensure we make the correct choices, we need to make the safest approach the easiest approach. To achieve this, there needs to be reduced reliance on the operator not to make mistakes. A change to the system is required – something that absolutely prevents the error from occurring.

Two clinical examples of safety engineering were discussed: an arterial line set with a one-way valve to prevent accidental intra-arterial injection, and a central line insertion pack that requires the guidewire to be used as a 'key' to unlock other components, therefore reducing the risk of guidewire retention. The audience responded positively to these designs; however, the speakers explained that testing novel solutions to rare events is not easy to demonstrate using conventional study trials, owing to the fact that they are rare errors. For rare errors, one needs to force the error in a simulated environment – something that Mariyaselvam and Blunt have done for their designs, demonstrating improved safety.

Finally, we were made aware of some of the challenges to the implementation of safety measures. Changing culture is one of the largest barriers to using novel innovations that can enhance patient safety. Furthermore, there is an inherent irony that cost-saving engineering initiatives that improve patient safety may be a financial disincentive for the Trust in which they are implemented. The speakers were clear to advocate collaboration with industry, with an understanding that when small companies are supported and novel solutions are implemented, it leads to further investment, design and development of innovations to improve patient safety.

Session 4: quality improvement

Victoria Newlands, Head of Quality Improvement, Homerton University Hospital

Homerton improving quality[12]

Victoria Newlands, the Head of Quality Improvement (QI) at Homerton University Hospital, began our final session by outlining Homerton's model for improvement.

She stressed the importance of a working environment that provides a supportive framework for improvement and does not ridicule those improvement projects that fail, as these

are part of a learning process. She explained how staff are involved at different levels of the improvement process: Trust-wide; service led and the individual. At each level, it is imperative that there is a clear objective and to try to make the improvement process as slick as possible. Furthermore, Homerton is trying to build collaborative systems, with people meeting to share their ideas and success stories.

To have a better chance of success, we need to ask the question: what are we trying to achieve? Many people have a list of things that they want to try, however, one needs to define what success is before the investment of time and energy into a specific process. For example, reducing pressure ulcers with the education of residential home staff using non-jargon language has been one of many successful improvement projects initiated by the Homerton in the last 18 months.

Amar Shah, Associate Medical Director for Quality Improvement & Consultant Forensic Psychiatrist, East London NHS Foundation Trust

Building an improvement system and movement Trust-wide[13]

Amar Shah gave an insightful talk on how to build an infrastructure for improvement. He began by highlighting the challenges faced in providing tangible improvement at a local level while overseeing Trust-wide programmes in a diverse area. Trusts must be in a robust financial situation and have stable leadership in order to provide people with the confidence to exercise innovation without fear of failure. In addition, we should also apply meaningful targets to departments, rather than apply national targets everywhere. For example, there is no need to screen for MRSA bloodstream infection in a psychiatry ward because to date this has never occurred.

Shah described how, for most organizations, a sentinel moment occurs that makes the leadership question existing patterns of behaviour. Asking the question about strategy change is half the battle. This has led his organization to shift the power from the top to people on the front line.

Their main principles for improvement projects are as follows:

- Make it meaningful
- Make it possible to achieve the target
- Make it feel like you have contributed to something permanent

Shah described the range of options for people to access QI learning. He has a firm belief that QI must be a team sport for it to be sustainable. To facilitate this, his organization has developed QI coaching roles. Shah then tackled an important question: how do you make time for this? First and foremost, QI must be aligned with the 'day job'. There must be a support structure in place. Furthermore, it is important to streamline your resources and cut back on other projects deemed to be of limited use.

Finally, should there be a 'top down' or 'bottom up' approach to QI? Shah feels that it should be a combination of the two. His organization empowers teams to work on what matters most to them. In his experience, what matters to teams on the front line aligns well with what matters to senior leaders.

Mike Davidge, NHS Elect

Why measurement for improvement is different[14]

The last talk of the session explored how we use data in QI. First, Mike Davidge used an example to demonstrate the power of a time series. As he put it, it told a story of what was happening on the ground, displaying what was going on over a time period and what impact different interventions made. This made people ask why the changes made had failed to result in the desired effect, before arriving at the correct intervention.

Davidge then asked the following question: why do we present data month by month? He used a fascinating example to demonstrate what can be missed if you display your data monthly. When presented monthly, it was not clear why there was a delay in February to admit patients to the stroke ward. However, when the data were observed week by week, it was apparent that there was a significant delay to admission to the stroke ward during a specific week in February – a national UK school holiday.

In conclusion, how often you display your data has an effect on how you look at the results. Davidge's advice: aggregate your data at your peril!

Davidge then discussed other pitfalls in data presentation. We should avoid using bar charts when plotting data over time because the bar is distracting. Avoid using arbitrary cut-offs in red-amber-green charts; they cause the reader to move between benign neglect (green) and blind panic (red).

Finally, Davidge gave the audience his advice on data presentation:

- Use the data to tell a story
- Think about frequency
- Track over time so you can see variations that occur.

Conflicts of interest

No conflicts of interest have been declared.

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