Intensive Care Med (2019) 45:505–507
https://doi.org/10.1007/s00134-018-5353-z

WHAT'S NEW IN INTENSIVE CARE

Intensive care medicine in 2050: preventing harm

Chris Beet[1*], Dominique Benoit[2] and Julian Bion[3]

© 2018 Springer-Verlag GmbH Germany, part of Springer Nature and ESICM

Introduction

The Institute of Medicine's seminal report in 2000 [1] made patient safety a fundamental policy imperative for all developed health systems. There is no doubt that considerable progress has been made to reduce patient harm, with events such as catheter-related bloodstream infections in the ICU [2] now regarded as preventable adverse events rather than inevitable consequences of critical illness. We consider here current challenges in avoiding patient harm in intensive care and potential developments over the next 30 years, with a particular focus on behavioural aspects of improving safety and reliability of care for patients with, or at risk of, critical illness.

Current challenges to preventing harm

Decision support: from data to information

Avoiding harm starts with knowing who, and how, to treat. The ancient Egyptian physician-priest who wrote the Edwin Smith surgical papyrus [3] understood the challenge of diagnostic and prognostic uncertainty and how easy it is to make things worse. He classified clinical problems as "A disease I will treat; a disease with which I will contend; a disease not to be treated". Diagnostic accuracy still depends substantially on clinician experience and expertise, while prognostic accuracy derived from large data sets remains limited to population, not individual, outcomes. Ageing populations and multimorbidity compromise physiological reserve and require us to distinguish earlier and more accurately those patients for whom invasive treatment would be appropriate from those in whom it would merely add burdens, not benefits. This requires developments in converting data into information and information into action, while communicating risks of harms or benefits to patients and families, and to society as a whole, in terms they understand.

Staff well-being, empowerment, team-working

Staff well-being is vital for patient safety. There is an association between fatigue, discontent, and burnout and poorer health care provider performance at an individual and team level [4]. Communication skills development within and between teams have not kept up with other advances in practice [5], potentially posing risks to patient safety, particularly in the multidisciplinary environment of the ICU, where we expend significant effort on coordinating care between different specialist teams [6].

Individual versus system responsibility

The characterisation of safety in health care as being either a matter for single individuals or as a systems problem fails to recognise that in most cases it is of course both. Patients expect individual clinicians and managers to be accountable for their actions, but the system in which they work must also provide the tools to do the job. As part of the human factors approach, individual physicians need to accept standardisation of best practice supported by scientific evidence, or by consensus where evidence is lacking, allowing professionals to work off-protocol by exception, not randomly. Adherence to standardised best practice in sepsis management has improved, but reliability rates are still at a level that most industries would regard as profoundly unsafe [7].

Learning in complex systems

Reporting and learning from error are fundamental for safe systems and well adopted in the airline industry. By contrast, in health care, clinical engagement is variable, perhaps reflecting a view that reporting adverse events

*Correspondence: chris.beet@icloud.com
[1] University Hospitals Coventry and Warwickshire NHS Trust, Coventry, UK
Full author information is available at the end of the article

Springer

does not result in generalisable improvements, or concerns about punitive consequences, or fatigue [8]. Health systems rely on the resilience of staff, who often have to employ 'workarounds' to bypass well-meaning but ineffective 'improvements' introduced without consideration of the wider context [9]. Root cause analysis, though an important tool for characterising pathways to patient harm, fails to consider the denominator—the opportunity for error and those multiple occasions when the same actions produced a good outcome. Patient safety initiatives need to supplement the focus on learning from errors with "a concerted effort to enable things to go right more often" [10], including for example the approach described by 'Learning from Excellence' [11]. A national system with responsibility for coordinating and diffusing safety information is essential, since diffusing responsibility across all actors (individual clinicians, hospitals, governments, professional organisations, equipment manufacturers, the pharmaceutical industry) results in difficulty in attributing responsibility and accountability to any one of them [12].

Looking to the future

So what is our vision for the future of intensive care medicine? In the next 30 years, we expect to see a progressive reduction in patient harm fostered by developments in technology, changes in behaviour by clinicians and their employing organisations, and closer collaboration between health care services and better-informed patients and the public.

Technological advances will include internet-enabled wearable monitoring and miniaturised point-of-care diagnostics, which will allow earlier identification of patients at risk of deterioration throughout the health care system. This will permit earlier intervention by rapid response (critical care outreach) teams. Fast total body imaging and minimally invasive body fluid analysis will provide 'signatures' at the cellular and whole organ level that distinguish normal tissues from those with structural damage, inflammation, ischaemia, or malignancy with a high degree of certainty. Combined with the algorithm-based interpretation of high-quality dynamic clinical data sets derived from many millions of patients [13], these approaches will minimise delay and error in diagnosis and provide the physician with Bayesian treatment pathway options with updated probabilities according to response to treatment. These improvements will allow near-real-time detection of deviation from predefined pathways with automated warnings accompanied by treatment recommendations; failure-to-rescue events consequently will become rare.

We also anticipate much higher precision in the measurement of patient's physiological reserve, frailty, and biological senescence with more advanced personalised prediction models [14]. These data will inform the development of interactive decision-support tools created using coproduction techniques [15] to allow patients and carers to explore the consequences of choosing different care pathways and enable them to understand better the balance of burdens versus benefits of life-sustaining treatments and the consequences of their choices. Integrated care systems will allow these discussions to take place in the community or early on during hospitalisation, enabling family doctors to interact with intensive and palliative care physicians when additional guidance is required.

Ergonomics and human factors will improve care processes by focusing on the interfaces among patient, equipment, and clinician. A proportion of direct care delivery, particularly in smaller and remote centres, may be supported by a combination of telemedicine and robotic devices. Respiratory support settings, fluid balance, and vasoactive drug selection and delivery rates will be proposed and monitored by algorithms integrating clinical and physiological information: lung-protective ventilation and time-sensitive fluid-loading will be the norm. Departures from protocolised care or pre-defined clinical pathways will be audited, linked to outcomes, trends analysed, and learning reports directed to individual clinicians, encouraging a shift from a reactive to a proactive approach to patient safety. Clinician-reported harm events or near misses will be tagged, analysed, and reported in real time across organisations.

Reflective learning will become integrated into routine care-quality activities such as morbidity and mortality meetings, debriefings, handovers, time out, and Schwartz rounds [16] so that we can analyse individual and team behaviours with the same objectivity as technical components of care. This will include the relationship between front-line care and 'backroom' managerial and organisational support, providing a whole-pathway view of care quality. Patient and family engagement in quality improvement will promote shared learning, leading to fewer complaints about poor communication, more effective care delivery, and less post-traumatic stress for survivors. Training in reflective learning based on the COM-B framework [17] will lead to reduced burnout and staff turnover, with significant gains in patient safety. The focus on excellence will ensure that excellence is not only recognised and celebrated, but also disseminated in 'excellence reports' for emulation and propagation across organisations together with those relating to error and harm.

Whether this optimistic view of the future will come to fruition is critically dependent on forming close partnerships with our patients and their families. They are close observers of health care delivery—underutilised social

science foot soldiers. Their experiences provide a rich source of material for quality improvement, and they are our most powerful advocates. If we can achieve that by 2050, we will have transformed critical care forever.

Author details
[1] University Hospitals Coventry and Warwickshire NHS Trust, Coventry, UK. [2] Ghent University Hospital, Ghent, Belgium. [3] University of Birmingham, Birmingham, UK.

Received: 17 January 2018 Accepted: 21 August 2018
Published online: 3 September 2018

References

1. Kohn LT, Corrigan JM, Donaldson MS (2000) To err is human: building a safer health system. Institute of Medicine (US) Committee on Quality of Health Care in America. National Academies Press, Washington DC
2. Bion J, Richardson A, Hibbert P, Beer J, Abrusci T, McCutcheon M, Cassidy J, Eddleston J, Gunning K, Bellingan G, Patten M, Harrison D, Matching Michigan Collaboration & Writing Committee (2013) 'Matching Michigan': a 2-year stepped interventional programme to minimise central venous catheter-blood stream infections in intensive care units in England. BMJ Qual Saf. 22(2):110–123. https://doi.org/10.1136/bmjqs-2012-001325
3. U.S National Library of Medicine (n.d) An Ancient Medical Treasure at Your Fingertips. https://www.nlm.nih.gov/news/turn_page_egyptian.html. Accessed 07 July 2018
4. Garrouste-Orgeas M, Flaatten H, Moreno R (2016) Understanding medical errors and adverse events in ICU patients. Intensive Care Med 42:107–109. https://doi.org/10.1007/s00134-015-3968-x
5. Weller J, Boyd M, Cumin D (2014) Teams, tribes and patient safety: overcoming barriers to effective teamwork in healthcare. Postgrad Med J 90:149–154. https://doi.org/10.1136/postgradmedj-2012-131168
6. Van den Bulcke B, Piers R, Jensen HI et al (2018) Ethical decision-making climate in the ICU: theoretical framework and validation of a self-assessment tool. BMJ Qual Saf. https://doi.org/10.1136/bmjqs-2017-007390 **(Epub ahead of print)**
7. Levy MM, Rhodes A, Phillips GS, Townsend SR, Schorr CA, Beale R, Osborn T, Lemeshow S, Chiche JD, Artigas A, Dellinger RP (2014) Surviving Sepsis Campaign: association between performance metrics and outcomes in a 7.5-year study. Intensive Care Med 40(11):1623–1633
8. Pannick S, Sevdalis N, Athanasiou T (2016) Beyond clinical engagement: a pragmatic model for quality improvement interventions, aligning clinical and managerial priorities. BMJ Qual Saf. 25(9):716–725
9. Dixon-Woods M, Martin P (2016) Does quality improvement improve quality? Future Hosp J 3(3):191–194
10. Braithwaite J, Wears RL, Hollnagel E (2015) Resilient health care: turning patient safety on its head. Int J Qual Heal Care. https://doi.org/10.1093/intqhc/mzv063
11. Learning from Excellence—a call to learn from what goes well in healthcare. https://learningfromexcellence.com/. Accessed 6 Mar 2018
12. Dixon-Woods M, Pronovost PJ (2016) Patient safety and the problem of many hands. BMJ Qual Saf 25:485–488. https://doi.org/10.1136/bmjqs-2016-005232
13. DeepMind Health (2018) Helping clinicians get patients from test to treatment, faster. https://deepmind.com/applied/deepmind-health/. Accessed 07 July 2018
14. Ferrario M, Cambiaghi A, Brunelli L et al (2016) Mortality prediction in patients with severe septic shock: a pilot study using a target metabolomics approach. Sci Rep 6:20391. https://doi.org/10.1038/srep20391
15. Batalden M, Batalden P, Margolis P et al (2016) Coproduction of healthcare service. BMJ Qual Saf 25:509–517. https://doi.org/10.1136/bmjqs-2015-004315
16. Chadwick RJ, Muncer SJ, Hannon BC, Goodrich J, Cornwell J (2016) Support for compassionate care: quantitative and qualitative evaluation of Schwartz Center Rounds in an acute general hospital. JRSM Open. https://doi.org/10.1177/2054270416648043
17. Michie S, van Stralen MM, West R (2011) The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implement Sci 6:42. https://doi.org/10.1186/1748-5908-6-42