Crisis checklists in emergency medicine: another step forward for cognitive aids

Yun-Yun K Chen,[1] Alexander Arriaga[1,2,3]

[1]Department of Anesthesiology, Perioperative and Pain Medicine, Brigham and Women's Hospital, Boston, Massachusetts, USA
[2]Center for Surgery and Public Health, Boston, Massachusetts, USA
[3]Ariadne Labs, Boston, Massachusetts, USA

Correspondence to
Dr Alexander Arriaga, Anaesthesia, Brigham and Women's Hospital, Boston, MA 02115, USA;
aarriaga@post.harvard.edu

Accepted 20 March 2021
Published Online First 25 March 2021

► http://dx.doi.org/10.1136/bmjqs-2020-012740

To cite: Chen Y-YK, Arriaga A. *BMJ Qual Saf* 2021;**30**:689–693.

A saying often attributed to George Bernard Shaw is 'The single biggest problem in communication is the illusion that it has taken place.' While it has been debated who originally made this statement, this expression has been used across several industries in different ways.[1–4] Communication is an essential aspect of patient safety. One could argue for expanding this proverb to emphasise the importance of recognising that communication at key moments is intrinsically valuable: the biggest problems in communication are the illusion that it has taken place and the assumption that it is not necessary.

Over the past 100 years, cognitive aids for crisis events during patient care have been called for, developed, refined and examined.[5–12] While much of this literature comes from high-risk industries and medical simulation, there is increasing supporting evidence from healthcare on how these tools can act as cognitive aids in clinical settings. Regarding terminology, we cite a review article on emergency manuals (EMs): 'EMs are context-relevant sets of cognitive aids, such as crisis checklists, that are intended to provide professionals with key information for managing rare emergency events. Synonyms and related terms include crisis checklists; emergency checklists and cognitive aids, a much broader term, although often also used to describe tools for use during emergency events specifically.'[13] Published accounts from healthcare professionals who experienced real-life events have described the power of these tools to prevent errors of omission, commission and lapses in communication.[14–18] These events can be both common in large health systems and rare at the level of the individual clinician.[10] It is also hard to predict when they will occur. These attributes create a meaningful role to study crisis checklists, EMs and other cognitive aids using medical simulation, particularly in healthcare settings (such as the emergency department (ED)) where they have been understudied.

In this issue of *BMJ Quality and Safety*, Dryver *et al* make a major contribution to the expanding scope of these evidence-based tools into the realm of emergency medicine.[19] In a simulation-based multi-institutional, multidisciplinary randomised controlled trial on the use of medical crisis checklists in the ED, the authors evaluated resuscitation teams in performing indicated emergency interventions during simulated medical crisis events (eg, anaphylactic shock, status epilepticus), with or without access to a crisis checklist for that scenario. Emergency medicine resuscitation teams, comprised of physicians (mainly residents), nurses, nursing assistants and medical secretaries, participated in these simulations. They took place during the teams' clinical shift in the ED setting, with access to their usual equipment, medications and cognitive aids. The checklist for each scenario was displayed on large wall-mounted or television screens and outlined possible interventions to consider during the management of that particular crisis, including for instance medications with their indication, contraindication and risks as well as dose and route of administration. The authors found, among other findings, a notable and significant difference in the median percentage of indicated emergency interventions when the checklists were available: 38.8% without checklist access and 85.7% with checklist access ($p<0.001$). They also found that the vast majority of participants (94%) agreed that they would use the checklists

if faced with a similar case during actual patient care. Consistent with findings from prior studies in the *New England Journal of Medicine* (studying operating room teams) and the *Journal of Critical Care* (studying intensive care unit teams), Dryver *et al* have demonstrated yet another setting (the ED) where crisis checklists, EMs and other critical event cognitive aids may be beneficial.[10 20]

The study should be interpreted in the context of its study design, strengths and limitations. The study was conducted using in situ simulation, that is, the performance of medical simulation in a clinical care area pertaining to the events being studied. When done safely, this method provides opportunities for participants to practise the management of critical events in the actual location where they may encounter them during actual patient care situations.[21–23] It is also a multi-institutional study that involved two EDs from an academic centre: one from a rural community hospital, and one from a large community hospital. The checklists were tailored to the medications available at each institution's ED location as opposed to a generic pocket-card cognitive aid. The value of such local customisation has been noted across several publications on crisis checklists and EMs, also highlighting the broader factors to consider (in addition to medication details) such as the medium used (eg, paper vs digital, tablet vs computer), device models and settings (eg, transcutaneous pacemakers settings, defibrillator settings), and methods to call for help (eg, local emergency phone numbers).[10 12 24]

This study focused on the presence or absence of a readily displayed checklist with a medical crisis made readily apparent from the simulated scenario's introduction. It was not aimed to evaluate the ability of teams to correctly diagnose the critical event of interest. While the authors note that this allowed the simulations to focus on treatment, other studies on crisis checklists/EMs have intentionally included scenarios where the diagnosis was unclear or not within the EM available.[10 25] One simulation-based study that included scenarios not within the EM available showed variable usage of the EMs ('with some teams not using the [emergency manual] at all') and variable impact on team performance.[25] Future studies on the use of ED crisis checklists by resuscitation teams may want to factor in the complexity of an undifferentiated medical scenario, where a patient may present with an unknown diagnosis, or where a clinical presentation may be confounded by comorbidities.

Not only the range of care settings expands where cognitive aids are considered beneficial when dealing with crisis situations, ongoing work also extends the use of such tools temporally: (1) preventing the crisis and/or its manifestations from occurring in the first place, and (2) dealing with the aftermath of the crisis event. The WHO Safe Surgery Saves Lives Surgical Safety Checklist is a well-known example of the first category, containing a set of evidence-based processes of care meant to be carried out at key pause points during surgery. This tool includes a pause-point to allow anticipated critical events to be reviewed, as well as processes that could lead to a critical event if missed (eg, reviewing allergies, confirming counts are correct towards the end of a procedure).[26] A systematic review of articles describing the actual use of surgical safety checklists found that they were associated with increased detection of potential safety hazards, decreased surgical complications and improved staff communication.[27] Regarding the second category, dealing with the aftermath of a crisis, critical event debriefing is a long-standing practice that has been noted for its potential benefits to healthcare professionals at the individual, team and systems level.[28–33] It can help mitigate the negative impact of crisis events on healthcare providers, offer opportunities for education and learning, and serve as a vehicle to identify systems gaps in overall quality and safety.[33 34] Something as simple as a well-timed drop of WATER (Welfare check, Acute/short-term corrections, Team reactions and reflection, Education, and Resource awareness/longer term needs), the beginnings of a cognitive aid in itself, can have a meaningful ripple effect if used when indicated (figure 1). Several cognitive aids for various forms of debriefing have been described. The Promoting Excellence And Reflective Learning in Simulation (PEARLS) debriefing tool was developed based on experiences in medical simulation.[35] Versions of PEARLS have been adapted for healthcare debriefing and systems-focused debriefing.[32 36] The Debriefing In-Situ Conversation after Emergent Resuscitation Now tool was developed in the study of resuscitations at a paediatric ED.[37] An adapted version was created during the COVID-19 pandemic for end-of-shift debriefing in EDs (Debriefing In Situ COVID-19 to Encourage Reflection and Plus-Delta in Healthcare After Shifts End).[38] There is a large body of literature from medical simulation and other disciplines supporting critical event debriefing.[33 34] Considerations to avoid psychological iatrogenic effects from debriefing (such as customisation to local culture and available resources/debriefing training) have been noted.[33 34 39] Future research, both via simulation and after real events, can help inform ways to improve the quality and frequency of debriefing after the very events that have been studied with crisis checklists and EMs.[40]

When translating these interventions from medical simulation to the point of care, there are many lessons to be learnt from the implementation sciences. Editorials and perspective pieces have called for checklists to be viewed within a broader sociocultural or sociotechnical context, including factors such as team training and thoughtful implementation.[41 42] Original research on team training initiatives that include surgical safety checklists has been associated with

Potential elements for debriefing just after a perioperative event include (but are not limited to):

1. Welfare check:
   - Assessing if team members are ok to continue providing care
2. Acute/Short-term corrections:
   - Matters to be addressed before next case?
   - Clinical/patient care needs?
3. Team Reactions and Reflection:
   - Summarize case and listen to team member reactions
   - Plus/Delta: Matters that went well and matters that could be improved
4. Education:
   - Lessons learned from the event and the debriefing
5. Resource Awareness and longer-term needs:
   - Improve awareness of local peer-support and employee assistance resources
   - Assess if any follow-up needed (e.g. safety/QI report)

While a drop of water may seem small in time and space, it can have a substantial ripple effect.

Figure 1 Elements to consider for debriefing just after a perioperative critical event. These elements are not meant to be comprehensive. Customisation to local culture and available resources is essential.[33 34] The responsibility for interpretation/application lies with the reader. Image: Restivo D. Water Drop impact on water surface. Available at https://commons.wikimedia.org/wiki/File:Water_drop_impact_on_a_water-surface_-_(5).jpg. Accessed 13 Feb 2021. With permission via Creative Commons CC BY-SA 2.0 License (https://creativecommons.org/licenses/by-sa/2.0/legalcode). QI, quality improvement.

improved patient outcomes.[43] Crisis checklists and EMs are substantially less effective if they are sitting in a drawer collecting dust during an emergency. To minimise the likelihood of this happening, it is important that their implementation is approached with the same rigour as all good quality improvement work: including conducting a needs assessment, customising the cognitive aids, obtaining key stakeholder buy-in, establishing implementation champions, developing training programmes, evaluation and ongoing measurement and iterative improvement, which all have been well described.[11 44 45] As another example of an implementation framework, the Consolidated Framework for Implementation Research is composed of five major domains: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved and the process of implementation.[46] Another popular example is the plan–do–study–act model.[47 48] Specific to crisis checklists and EMs, Goldhaber-Fiebert and Howard proposed four vital elements for widespread and successful implementation: create, familiarise, use and integrate.[11 12] Agarwala *et al* reported an institutional case study of perioperative EM implementation that centred around three goals: (1) place EMs in every anaesthetising location, (2) create interprofessional engagement and (3) demonstrate that a majority of anaesthesia clinicians would use the EMs in some way within the first year.[49] Factors such as leadership support and dedicated time to train staff can be essential.[45 50 51] More successful implementation of crisis checklists and EMs has been reported when institutions used these tools to assist both during the management of the critical events and in debriefing after critical events.[45] An association between the quality of implementation and improved outcomes has similarly been seen with routine surgical safety checklists.[52 53] There is also value in research that considers not only whether the tool is used, but also how implementation and training strategies can be leveraged to improve thoughtful adherence to the items on the checklist and avoid issues from going unnoticed.[54–56] For critical event debriefing, there is potentially a wide gap between principle and practice. Studies across different medical disciplines have reported that debriefing after critical events takes place only a fraction of the time.[34 57 58] Barriers mentioned in studies and other publications include competing clinical priorities, lack of debriefing training, interpersonal dynamics and leadership buy-in.[33 34 37 58–61] Several of these barriers potentially overlap with the goals of implementing crisis checklists, and there may be synergy in viewing prevention, crisis events and their aftermath within a continuum.

At a fundamental level, many of the cognitive aids discussed in this editorial are designed to both improve cognition and foster interdisciplinary communication about essential best practices at key moments in time. There should not be an illusion that this communication is already taking place or an assumption that it is not necessary. There also should not be a fallacy that these critical event cognitive aids are simply 'memory aids'. Growing evidence of EMs during real-time use has described providers reporting the use of these tools associated with decreased stress, improved teamwork, a calmer atmosphere and better care.[14 16] There is active work, including collaboration with expertise from the Human Systems Integration Division from the National Aeronautics and Space Administration, exploring how to optimise critical event cognitive aid design relative to the high cognitive load and other

factors intrinsic to a crisis.[62–66] Emerging research has explored whether it is beneficial to have a crisis checklist reader role, separate from the crisis event leader, when resources allow.[13 67]

Future work on cognitive aids for medical crises should not only address whether they are present, but also how they are designed, used, simulated and implemented towards the most successful outcomes, and its effect on communication. As the scope of patient safety efforts surrounding crisis management continues to expand, there is value in thinking both spatially and temporally via both medical simulation and real events.

Twitter Alexander Arriaga @alexarriaga1234

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests Y-YKC is the recipient of a departmental seed grant for a project in regional anaesthesia and acute pain medicine at her primary institution. AA is the recipient of a mentored research training grant from the Anesthesia Patient Safety Foundation (APSF) and the Foundation for Anesthesia Education and Research (FAER); he is the recipient of a Career Development Award from the Center for Diversity and Inclusion of the Brigham and Women's Hospital; and he is a member of the Patient Safety Editorial Board for the American Society of Anesthesiologists and Question Editor for the American Board of Anesthesiology, where he receives a stipend for work that is otherwise done in a volunteer capacity.

Patient consent for publication Not required.

Provenance and peer review Commissioned; internally peer reviewed.

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