It Is Time to Use Checklists for Anesthesia Emergencies

Simulation Is the Vehicle for Testing and Learning

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The use of simulation to improve medical training and patient safety has been growing in popularity. Many fully functional health care simulation centers now operate in the United States and throughout the world. Simulation is widely viewed as an important tool for a broad spectrum of education, training, and patient safety applications and particularly for the teaching and study of rare crisis events. However, simulation can also be used to evaluate new patient safety interventions, such as checklists. Many industries, such as the airline industry, manufacturing, food inspection, and pharmaceutical industries, have been using checklists for decades, especially as processes become more complex and the number of routine tasks required exceeds what can realistically be remembered, even by experts.[1,2] Unfortunately, the health care industry has been a late adopter of checklists despite the complex and unpredictable situations often faced in the field. Checklists were initially introduced in anesthesia in the 1980s,[3] although it took more than 10 years for checklists to be introduced in other clinical care areas.[2] In a relatively short time, the reduction in process variability provided by checklists has led to improved outcomes and reduced incidence of central line infections,[4,5] ventilator management, and end of life care.[6,7]

Despite improved patient outcomes resulting from using checklists in general, there is much more to learn about how to develop them, how to use them, and how to train clinicians to use them effectively for managing emergencies.[8] In the case of rare clinical emergencies, such as local anesthesia systemic toxicity (LAST), it is likely impossible to become proficient with the use of checklists in an actual clinical setting. Simulation is the obvious vehicle for training. We see an excellent example of that in a study by Neal et al in this issue of *Regional Anesthesia and Pain Medicine*.[9] Their study evaluated the use of the American Society of Regional Anesthesia's (ASRA's) checklist for managing LAST to improve trainees' technical and nontechnical performance during a simulated LAST crisis event. We learn from this report that there is still much work required to optimize the use of checklists, in anesthesia and elsewhere, and to educate and train practitioners so that checklists are accepted as the cultural norm. Neal et al have demonstrated the usefulness of simulation for this purpose.

The authors randomized trainees who were managing a simulated LAST crisis to either receive the checklist to use during the simulation or not to receive the checklist. They found that trainees who were given the checklist as an aid completed substantially more medical management tasks correctly than those who did not have the checklist. Furthermore, the checklist subjects scored higher in their overall crises management behaviors. These findings are consistent with a very recent study that shows improved adherence to critical management steps with the use of checklists during simulated crisis situations in the operating room.[8]

Neal et al illustrate that checklists can improve performance in the management of LAST. Without the checklist, performance was surprisingly poor; on average, the nonchecklist group completed only 8 of 21 essential tasks for management of a LAST crisis. Yet, even with the checklist, performance was not ideal; the checklist group, on average, performed only 16 of 21 essential tasks. Further deliberate practice,[10] ideally with the use of simulation, is clearly required to improve performance.

Perhaps a more striking finding in this study is that unless it was not reported, none of the 13 trainees in the nonchecklist group asked for a checklist. Each trainee had received the ASRA practice advisory 4 weeks before the study commenced, albeit "without fanfare." Furthermore, a

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Accepted for publication October 11, 2011.
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Dr. Nanji declares no conflict of interest.
Dr. Cooper has no commercial relationships. He is the executive director of a nonprofit educational and research organization from which he derives salary support and which itself is supported by tuitions for fee-for-service simulation-based education of clinicians and simulation educators.
James P. Rathmell, MD, was the acting editor-in-chief of this editorial.

ISSN: 1098-7339
DOI: 10.1097/AAP.0b013e31823e75b2

binder of useful emergency checklists, including the ASRA checklist, was located on every anesthesia cart, a luxury that we suspect many anesthesia departments do not have. So, how is it that none of the participants in the control group requested the checklist or looked for it in the available binder? Combined with other results of this study, we can only conclude that an intensive educational effort is needed to shift the culture in medicine to one in which the use of checklists in emergencies is not only acceptable but also instinctive for the management of LAST and other rare clinical events.

Even if the culture evolves to endorse the routine use of checklists, there is much to learn about how to use them effectively: to instinctively request the checklist, to determine which checklist is required, and to have a defined process for how to use it. For instance, if a team is managing a crisis event, should the same person leading the team actually refer to the checklist or is it more appropriate to assign someone else to this task? Here again, simulation has a clear role for research and practice. This was illustrated in a recent study (in press) by Burden et al.[11] The authors explored the use of a person assigned to read the checklist during a crisis situation and call out management steps for the team. This appointed "reader" improved the effectiveness of checklist use during crisis situations. That is not surprising, as it may be difficult for the crisis leader to simultaneously manage the crisis situation and refer to a checklist that is dense with information.[11]

Neal et al are to be complimented on the design and execution of the current study, especially the clever scenario design, which teased out many issues of interest, and the use of pilot testing to ensure that the scenario worked as intended. One element in the analysis that leaves some questions unanswered is the evaluation and reporting of interrater reliability. We are told that the average overall scores of each rater did not vary by more than 20% to 30%, but exactly what that means is not clear to us. Furthermore, the raters used a consensus process when their independently assessed scores varied by more than 20%. Readers would be better able to interpret the validity of the rating process if we had been told more about how it was done and more specifically how well the raters agreed, such as some measure of interrater reliability that is more specific than just showing the mean rating of each rater. For instance, we cannot tell how the scores varied for individual trainees or for the different checklist items, such as whether there was 1 item that was more challenging to rate than the others were. Such measures are usually given in similar simulation experiments.[8] This omission leaves some question about how obvious each of the individual actions were that caused disagreement among the raters. We doubt that this imperfection had a substantial effect on the study results, in part, because the differences in performance between the 2 groups are so large. But we would not want this way of dealing with interrater reliability to represent best practices for conducting or reporting on performance evaluation in simulation studies.

An additional limitation of the study is that actions in a simulated setting are not always the same as actions in an actual clinical setting. A qualitative assessment of the perceived realism of the simulation by the subjects was missing in this study. However, participants' actions may be affected even if the simulation is relatively physically, conceptually, and emotionally realistic.[12] Thus, it is possible that the lack of appropriate responses, such as not asking for the checklist may, in part, be due to what some refer to as "simulatoritis," or the lack of engagement on one or more levels required to have subjects act exactly as they would in an actual clinical setting. That would not be an explanation for the difference in performance between the experimental and control groups, however.

The report by Neal et al illustrates that health care providers should not be expected to manage rare events well without the use of a cognitive aid, such as the checklist. The successful use of safety checklists by other industries is almost entirely transferable to health care. But, as we also learn from those industries, to be effective, checklists must be carefully developed and tested, and their users must be trained to use them both initially and with periodic reinforcements. Fortunately, in anesthesia, we now have at our disposal many outstanding simulation facilities and investigators to help achieve these goals.

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