Beyond ATLS: Demystifying the Expert Resuscitationist

Steven Lai, MD*; Ashika Jain, MD; Jessica Mason, MD; Andrew Grock, MD

*Corresponding Author. E-mail: slai.emed@gmail.com.

Editor's Note: *Annals* has partnered with EM:RAP, enabling our readers without subscriptions to EM:RAP to enjoy their commentary on *Annals* publications. This article did not undergo peer review and may not reflect the view and opinions of the editorial board of *Annals of Emergency Medicine*. There are no financial relationships or other consideration between *Annals* and EM:RAP, or its authors.

> In pretty much every area, a hallmark of expert performance is the ability to see patterns in a collection of things that would seem random or confusing to people with less developed mental representations. In other words, experts see the forest when everyone else sees only trees.[1]
>
> —Anders Ericsson, PhD

ANNALS CASE

A 23-year-old woman involved in a high-speed motor vehicle crash is 6 minutes away from the emergency department. And, by the way, she's hypotensive, has altered mental status, and has obvious trauma to her head, chest, and abdomen. After the "Avengers assemble" announcement, a team of nurses, technicians, and physicians meets in the trauma bay to prepare for what is sure to be a complicated, high-pressure, high-stakes case. Obviously, an expert resuscitationist is needed. If you aren't an expert yet, what can you do to get yourself there? This month's article, "Getting Inside the Expert's Head: An Analysis of Physician Cognitive Processes During Trauma Resuscitations," looks for some answers.

HOW DO YOU KNOW WHETHER YOU'RE AN EXPERT?

By nature, resuscitations are dynamic, complex, high-stakes events. The high volume of stimuli is denser than a gluten-free bran muffin. Decisions are made rapidly on limited information. Even the black belts of resuscitation medicine are stressed in these high-pressure scenarios.[2-4]

So how does an expert navigate the chaos, recognize the pertinent information, and make quick decisions under stress? In remembering yourself as an intern, it's likely you have already come a long way.

What does it take to become an expert? There must be repetitive exposure and constructive adaptation. In other words, learners must experience the scenario again and again, each time learning from mistakes, adapting, and improving. Through these experiences, learners improve their awareness of the situation and become more efficient and effective at anticipating what critical actions and pitfalls might arise. This "spidey sense," or "clinical gestalt," that expert resuscitationists tend to have may be unconscious. However, this "superpower" is deeply rooted in repeated exposure to innumerable resuscitations and polished over time by both reflection and analysis of their outcomes.[5-7] These experiences form a network of automatic or unconscious connections that permit experts to pick out subtle details and anticipate what might happen in the next few minutes, allowing them to always be a little bit ahead of the action!

Another way to explain the keen pattern recognition of experts is the idea of system 1 and system 2 cognition. System 1 is intuitive and reflexive, involving rapidly making decisions based on unconscious pattern recognition. In contrast, system 2 is analytical and problem solving, requiring active critical thinking. This makes system 2 much slower and effortful.[6,8]

According to Croskerry and Norman[9] (experts on experts!), "the effortless pattern recognition that characterizes the clinical acumen of the expert physician is made possible by accretion of a vast experience (the repetitive use of System 2 analytic approach) that eventually allows the process to devolve to an automatic level." Bottom line? Experts shift a lot of system 2 to system 1. With all that system 1 running in the background, the mind of the expert is more available to detect subtle cues, as

well as think more strategically and globally about the resuscitation at hand.[2,3,5,9-11]

WITH THIS IN MIND, HOW CAN ONE START TO BECOME AN EXPERT RESUSCITATIONIST?

As the article this month by White et al[12] points out, expert resuscitationists seem to have several specific, common traits they all share. Amid a chaotic resuscitation, they are keenly aware of how to get critical actions done, as well as recognize and focus on the most important actions and stimuli. They are comfortable managing uncertainty and have the foresight to anticipate the next steps.[3] For your educational pleasure, we grouped these abilities into the following stages of a resuscitation: foresight and planning, filter and synthesis of data, execution of plan, anticipation of contingencies, and after-event analysis.

FORESIGHT AND PLANNING

Expert resuscitation team leaders begin a successful resuscitation even before the patient arrives through mental rehearsal. In their minds, they anticipate the clinical course, critical actions, and potential complications as they await their patient's arrival. Mental rehearsal as a group (ie, a huddle) can also boost team performance.[13-16]

What is important to cover as a group? The team leader may discuss role delegation, potential diagnoses, an initial plan, and possible outcomes.[2,3] Talking through these things as a group decreases cognitive demand on individuals, and also helps to build trust and improve efficiency. Think of yourself as Captain America strategizing with the Avengers before a conflict.

Another potential pitfall is the gap between strategy (ie, knowing the plan) and logistics (ie, knowing how the plan is executed).[3] For example, you know you will need to intubate, but there is no intravenous access. You need to provide bag-valve-mask ventilation for the patient while working on a line, preparing intubation medications for the patient's estimated weight, and preparing the airway equipment. All of this is done in the midst of the primary survey! There is both a strategy and an awareness of the logistic issues to achieve that strategy. Some things that help are equipment checks, live practice, mental rehearsal, and in situ simulation (not too different from the X-Men's Danger Room).

FILTERING DATA AND SYNTHESIZING THE SITUATION

The physical position of the team leader in the room is also key to managing the rapid influx of stimuli.[2] In the ideal location, the expert is central to all incoming data, but can also see the entirety of the situation, coordinate logistics, and ensure that critical actions are accomplished. That position may be at the head of the bed or the foot of the bed, or it may change during the resuscitation, according to the clinical scenario at hand.

Expert resuscitation team leaders avoid the mistake of tunnel vision. Overfocus on a specific task prevents you from seeing the entire situation, and then important information gets missed.

With experience, expert resuscitationists are able to recognize familiar patterns and develop cognitive shortcuts that filter rapidly incoming data and allow them to pay selective attention to high-yield information.[5,8-11] Developing this skill can definitely be tricky. One strategy is to analyze where you focused your brain power during a resuscitation. This can occur after the resuscitation in self-reflection or in a debriefing with the team.

Another method to decrease these demands is cognitive offloading. This can be done by delegating tasks and using external memory tools. Delegating tasks to a trusted team member allows the team leader to focus on the whole situation. For example, Dr. Banner secures the airway, Dr. Strange performs focused ultrasonography, and Mr. Stark obtains intravenous access. This allows the team leader to focus on the entire situation instead of getting bogged down in the myriad details.

External memory tools also help with cognitive offloading. For example, the Broselow tape or telephone applications provide precalculated weight- or age-based doses of medications and equipment sizes. Studies on checklists from both anesthesia and emergency medicine have suggested these cognitive aids reduce omissions, reduce time to perform tasks, and improve performance.[17,18] Selective attention and cognitive offloading are invaluable tools to minimize the cognitive burden and mitigate the problem of high decision density.[2,13]

Experts rely on unconscious processing of a slew of data to form impressions within seconds of seeing a patient. One pitfall is to completely rely on this instinctive process. Experts regularly analyze system 1 for dissonance between their intuitive conclusions and the patient in front of them—and this is done in real time. When perceiving inconsistencies, experts must switch to the slower, more effortful type 2 thinking. In critical moments, expert resuscitationists ultimately trust their intuition (system 1), but not blindly.

ANTICIPATE AND ACT

Despite vast experience and mental rehearsal, the expert resuscitationist has to manage uncertainty and anticipate

the unexpected.[9-11,13,15,16] One helpful trick is a "defensive pessimism" mind-set when approaching resuscitations. Despite the best planning, resuscitations can take unexpected twists. Discussing these possibilities ahead of time can decrease the stress and uncertainty. Through effective communication, troubleshooting as a group, and using the group's shared cognition, this mental workload can be distributed and problems can be tackled more effectively.

The team leader should also be able to prioritize critical actions and maintain temporal awareness. For these critical actions to happen in parallel, he or she must understand the logistics and limitations of the system to efficiently diagnose and treat the patient, as well as decide the patient's disposition.[2,3]

AFTER-EVENT ANALYSIS

The term "expert" traditionally refers to individuals with increased experience. However, in medicine the gap between expert and novice is blurred. Ericsson[1] popularized the concept that part of what makes an expert is real-world experience or rehearsal coupled with focused reflection, assessment, and review. Deliberate practice strengthens mental representations.[15,16] Difficult airway? Practice in your mind and in the simulation laboratory, and then reflect, assess, and review your actual patient encounters.

Deliberate practice and mental rehearsal allow experts to fine-tune their technique and approach. Over time, this leads to improved anticipation, inferential reasoning, processing of a large volume of data, and efficiency.[1,7,15,16] Incorporating deliberate practice regularly into your postresuscitation plan can guide you on your path to becoming an expert.

So when your medical Avengers assemble for a trauma resuscitation, consider the above tips and tricks and propel yourself toward expertise!

Author affiliations: From the Department of Emergency Medicine, UCLA–Olive View Medical Center, Sylmar, CA (Lai); the Department of Emergency Medicine, University of California, Los Angeles, Los Angeles, CA (Lai, Grock); the Ronald O. Perelman Department of Emergency Medicine, New York University, New York, NY (Jain); the Department of Emergency Medicine, University of California, San Francisco–Fresno, Fresno, CA (Mason); and the Division of Emergency Medicine, Greater Los Angeles VA Healthcare System, Los Angeles, CA (Grock).

REFERENCES

1. Ericsson KA. Peak: secrets from the new science of expertise. p. 63.
2. Hicks C, Petrosoniak A. The human factor. *Emerg Med Clin North Am.* 2018;36:1-17.
3. Weingart S. EMCrit podcast 49: the mind of a resus doc: logistics over strategy. 2011. Available at: https://emcrit.org/emcrit/mind-resus-doc-logistics/. Accessed June 21, 2018.
4. Clarke JR, Trooskin SZ, Doshi PJ, et al. Time to laparotomy for intra-abdominal bleeding from trauma does affect survival for delays up to 90 minutes. *J Trauma.* 2002;52:420-425.
5. Bereiter C, Scardamalia M. *Surpassing Ourselves: An Inquiry Into the Nature and Implications of Expertise.* Chicago, IL: Open Court Publishing Company; 1993:77-120.
6. Morgenstern J. Cognitive theory in medicine: a brief overview. First10EM blog, September 14, 2015. Available at: https://first10em.com/cognitive-overview/. Accessed June 21, 2018.
7. Tversky A, Kahneman D. Judgment under uncertainty: heuristics and biases. *Science.* 1974;185:1124-1131.
8. Kahneman D. *Thinking, Fast and Slow.* Canada: New York, NY: Doubleday; 2011.
9. Croskerry P, Norman G. Overconfidence in clinical decision making. *Am J Med.* 2008;121(5 suppl):S24-S29.
10. Croskerry P. From mindless to mindful practice—cognitive bias and clinical decision making. *N Engl J Med.* 2013;368:2445-2448.
11. Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. *Acad Med.* 2003;78:775-780.
12. White MR, Braund H, Howes D, et al. Getting inside the expert's head: an analysis of physician cognitive processes during trauma resuscitations. *Ann Emerg Med.* 2018;72:289-298.
13. Lorello GR, Hicks CM, Ahmed SA, et al. Mental practice: a simple tool to enhance team-based trauma resuscitation. *CJEM.* 2016;18:136-142.
14. Petrosoniak A, Hicks CM. Beyond crisis resource management: new frontiers in human factors training for acute care medicine. *Curr Opin Anaesthesiol.* 2013;26:699-706.
15. Ericsson KA, Krampe RT, Tesch-Römer C. The role of deliberate practice in the acquisition of expert performance. *Psychol Rev.* 1993;100:363.
16. Ericsson KA. Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Acad Med.* 2004;79(suppl):S70-S81.
17. Long E, Fitzpatrick P, Cincotta DR, et al. A randomised controlled trial of cognitive aids for emergency airway equipment preparation in a paediatric emergency department. *Scand J Trauma Resusc Emerg Med.* 2016;24:1-7.
18. Marshall SD. Use of cognitive aids during emergencies in anesthesia: a systematic review. *Anesth Analg.* 2013;117:1162-1171.