

Decision making in acute care medicine

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Decision Making in Acute Care Medicine

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*"All Life is
Problem Solving."*

Sir Karl Popper

Introduction

Decision-making is fundamental to the provision of effective medical care. Early in training, health care practitioners (HCPs) are taught a linear, analytical approach to decision-making that works well for the majority of stable patients. This follows an ordered structure: obtaining a patient's history, performing a physical examination, developing a differential diagnosis, ordering investigations and, finally, instituting therapy. For stable patients, this approach maximizes information-gathering and provides time for contemplation. In contrast, during medical crises this strategy is impractical and potentially dangerous. This is especially true if we postpone urgent resuscitation. Accordingly, the provision of emergency care can be challenging for HCPs and perilous for patients.

The goal of this chapter is to allow HCPs to better understand their own decision-making habits and how those habits impact crisis resource management (CRM) in everyday clinical practice. Moreover, in understanding our own decision-making processes we as HCPs may become better able to pass on successful techniques to the next generation of decision-makers.

During a medical crisis, the goal is to maximize patient stability and minimize delays. Diagnosis and therapy should occur concurrently, often at the

expense of diagnostic precision. Data-gathering focuses more on what is immediately available (i.e., vital signs and point-of-care analysis) and less on waiting for diagnostic tests (computed tomography [CT] scans, laboratory results). Similarly, consultations are limited to specific interventions (e.g., intubation, surgery, help with resuscitation) rather than diagnostic opinions. To manage the patient in peril, the team needs to rapidly convert available data (e.g., an increasing heart rate) into usable information (e.g., the patient's condition is worsening) and follow with a logical, expedited response (e.g., bolus fluids). The art of acute care medicine is ensuring that while we do not intervene without sufficient thought, we do not allow uncertainty to cause potentially harmful delays.

As outlined, the concurrent approach used during crises downplays the need to establish an immediate etiologic diagnosis (e.g., streptococcal septicemia). Instead, we often redefine uncertainty by providing broader temporary physiologic or pathophysiologic diagnoses (e.g., hypotension or septic shock). Missing diagnostic details and treatment gaps are filled in later when the medical crisis has abated and when traditional sequential decision-making strategies can be safely used again. The concurrent approach increases the chance that the physician-leader and medical team can stay ahead of a rapidly evolving situation and can simultaneously manage competing priorities.

Beyond the challenges of time-sensitive decision-making, the effective physician-leader must also maximize the effectiveness of the whole team, regardless of high stimulus density and high clinical stakes.¹ This can be done by using well-established CRM principles. These CRM skills are reviewed elsewhere, but include leadership and followership, situational awareness, communication skills, resource utilization and teamwork. Specifically, in this chapter we focus on the theory and practice of effective decision-making as well as the effect that experience, cognitive load and working memory have on decision-making.

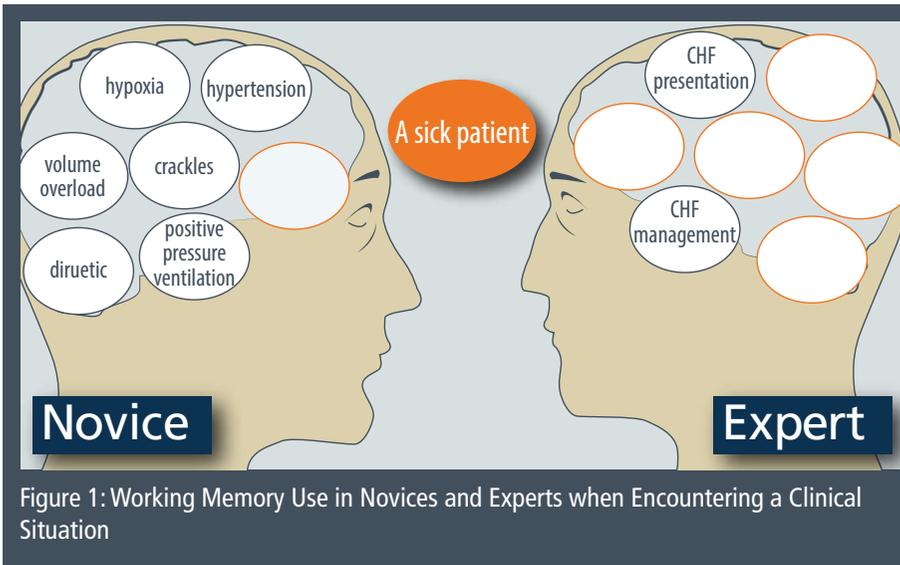
The Fundamentals of Medical Decision-making

Although decision-making in one form or another is important for all HCPs, it is central to clinical doctors, who make the majority of high-stakes decisions. Despite its importance, decision-making is rarely deliberately addressed in traditional medical curricula. Instead, doctors typically gain most of their experience on the job during clinical work. With experience, most eventually become capable decision-makers; however, the process of decision-making — and deliberate strategies to optimize that process — are often not fully appreciated by the decision-makers themselves.²⁻⁴ In other words, clinicians often become unconsciously competent decision-makers.

Over a career, medical decision-makers should commit to honing their intuition and clinical reflexes. However, it may be difficult for HCPs to articulate how or why they make particular decisions.² For example, an experienced physician can quickly identify the deteriorating asthma patient, decide to intubate and begin appropriate therapy. When asked later what made them intervene so quickly, answers might include

“the patient was fatiguing,” or “if I hadn’t, then the patient was going to arrest.” Though true, these judgments are intuitive (or intrinsically tacit) and difficult to relate to for novices. This often makes decision-making difficult to teach.

Understanding decision-making during crises involves addressing the limits of human working memory. We can reliably manage only a finite number of discrete elements of information (approximately seven), and an even smaller number when information-processing is required.^{3,4} For example, for the novice who is managing a patient with congestive heart failure (CHF), these information elements may be as basic as “hypoxemia,” “hypertension,” “crackles,” “volume overload,” “diuretic” and “positive-pressure ventilation.” These six items approach the novice’s working memory capacity. In contrast, for the expert, multiple elements can be integrated into information units or chunks (e.g., “CHF presentation” and “CHF management”). This leaves a larger proportion of working memory available for other tasks. Figure 1 summarizes this important concept.



Educating decision-makers in the art of subconsciously grouping symptoms may facilitate their ability to efficiently recognize the “sick” patient. Of note, the ability to simply recognize a sick patient is every bit as important as acquiring knowledge or mastering manual skills. Accordingly, this subconscious group of symptoms should be central to what is taught to learners during their acute care education.

Models of Decision-making

Decision-making (also called problem-solving in some CRM models) is a complex topic. However, it has been summarized using theoretical models from several professional domains. Two of these models, Gary Klein's Recognition-primed Decision (RPD) Model⁵ and Daniel Kahneman's Dual Process Model (DPM),⁶ provide a foundational understanding of the cognitive processes used by experts.

Recognition-primed Decision-making Model (RPD)

The RPD model⁵ helps explain how successful decision-making can occur in complex, ever-changing, medical environments despite the constraints of human working memory. As outlined, most experienced doctors, when faced with a crisis, do not consciously compare a multitude of options prior to acting. They recognize a clinical situation as typical, which immediately brings to mind a set of expectations, suitable goals and typical courses of action. For example, an experienced physician managing an intubated trauma patient with hypotension and hypoxemia might expedite a lung ultrasound, be confident enough that the patient has a pneumothorax and rapidly decompress the chest. This occurs rapidly not because that physician possesses special knowledge, but rather because he/she is "attuned." In other words, the physician accepts the possibility of tension pneumothorax in all patients with chest trauma and understands the danger of undertreating (more so than over-treating) this diagnosis. The experienced clinician also pattern-recognizes the association between tension pneumothorax, positive-pressure ventilation, hypoxemia and hypotension.

Understanding how, why and what we decide helps to define what makes an effective acute care doctor. Accordingly, they can usually focus quickly on high-yield diagnostic clues (often called "hard signs" or "red flags"), rapidly confirm/refute suspicions, address key dangers, act expeditiously and avoid wasting cognitive resources on extraneous details.⁷ Moreover, they are able to recognize when their initial course of action is flawed and modify their response because they are cognitively dexterous and sufficiently confident. If the plan cannot be easily modified, then the next most plausible course of action is rapidly pursued. This process is then repeated until an acceptable way forward is found.⁸ This sequence of steps forms the basis for the RPD model. Once again, it is in contrast to the traditional analytical approach of linear information-gathering and exhaustive hypothesis generation.

The recognition displayed by the expert physician is analogous to intuition and is central to RPD. A junior doctor may not immediately recognize the previously described cluster of signs and symptoms as a tension pneumothorax. As a result, the novice's decision-making is more analytical and, hence, time-consuming. Despite every good intention, patients can suffer the consequences of delayed decision-making in time-sensitive situations.

Dual-process Model (DPM)

An alternative to the RPD model is the DPM described by Daniel Kahneman. This model conceptualizes thinking and decision-making into System I and System II. System I is involved in intuitive judgments that are fast and automatic. These judgments are relatively effortless and lack a sense of voluntary control.⁹ For example, the experienced clinician who enters a ward and declares within seconds that a patient is “sick” or “not sick” is using System I. These are familiar situations and therefore the physician recognizes a pattern. As such, adept decision-making requires a learner who commits to repeated and regular exposure.

System II is slower and more logical. It is activated when a situation is unfamiliar and therefore deviates from a System I construct. System II replaces fast and relatively effortless intuition with concerted logical reasoning.⁹ For example, the patient with resistant hypotension eventually found to have adrenal insufficiency is likely to have induced a physician’s System II processing. The ability to step back from a crisis and use System II reasoning during the stress of resuscitation is another hallmark of the experienced and effective HCP. Again, this requires regular and repeated exposure — but this behavior can be taught and encouraged. For example, when teaching novices how to make decisions, it is often stressed that it is a dynamic/empiric process: if intuition fails, go back to a more structured approach (e.g., if a patient deteriorates or fails to respond and the problem is not easily identified, go back to “ABC”).

Complementary models

The DPM is supported by psychological literature regarding cognitive errors and biases, whereas the RPD model is supported by expert intuition and decision-making theory. However, these approaches overlap and are better thought of as complementary rather than oppositional. For example, the intuition that informs the RPD model is similar to System I processing within the DPM. Recognition (i.e., intuition, or System I processing) is relatively accurate in experts’ hands, but potentially problematic for novices. The danger of inexperience in the novice or fatigue in the expert is that both could oversimplify (or morph) complex medical problems in order to fit a pattern learned from previous (different) encounters. This cognitive bias is referred to as the simplifying heuristic.⁷

In Situ Decision-making Recognition, Expertise and Cognitive Load

Recognition is key to clinical decision-making. What is less clear is how HCPs develop expertise in recognition. Research suggests that the practice environment needs to provide sufficient valid cues as well as the opportunity to identify such cues.⁷ Accordingly, chaos, distraction and unhelpful team-mates can affect the likelihood of timely

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recognition. Also, as previously outlined, for HCPs to become skilled in resuscitation medicine and to make effective decisions during crises, they need to have sufficient exposure and experience. This can be gained through clinical encounters or well-crafted medical simulations. Alternatively, we need to accept that clinical competence might never be gained. Regardless, it is unfair and illogical to expect HCPs rarely exposed to crisis decision-making to perform at a high level when disaster finally strikes.

Experiments based around operating room emergencies and cases managed by anesthesiology residents suggest that physicians at the resident level exhibit one of four problem-solving approaches.¹⁰ Residents who are “stalled” find it difficult to generate diagnostic possibilities or coordinate their responses. Others are “fixated” and quickly generate a plausible but incorrect diagnosis and have trouble deviating despite alternate cues (so-called “premature closure”). “Diagnostic vagabonds” produce a large number of possibilities but fail to rule them in or out. The “adaptive” group is the most effective. These residents generate a number of plausible diagnoses, rule certain ones out and respond appropriately.

As HCPs gain experience they should become more likely to recognize immediate threats and, therefore, more likely to rapidly intervene. They are also likely to become more comfortable thinking and reacting despite diagnostic uncertainty. In other words, how HCPs process clinical information and make decisions should naturally mature over time. Moreover, the way in which a practitioner solves problems is a prime way by which we can determine whether they are “fit for task,” or in need of further intervention.¹¹

HCPs will mature (or fail to mature) at different rates. The beneficial effect of learning through experience is that it should decrease cognitive load and thereby free up both working memory and higher-level thinking. In contrast,

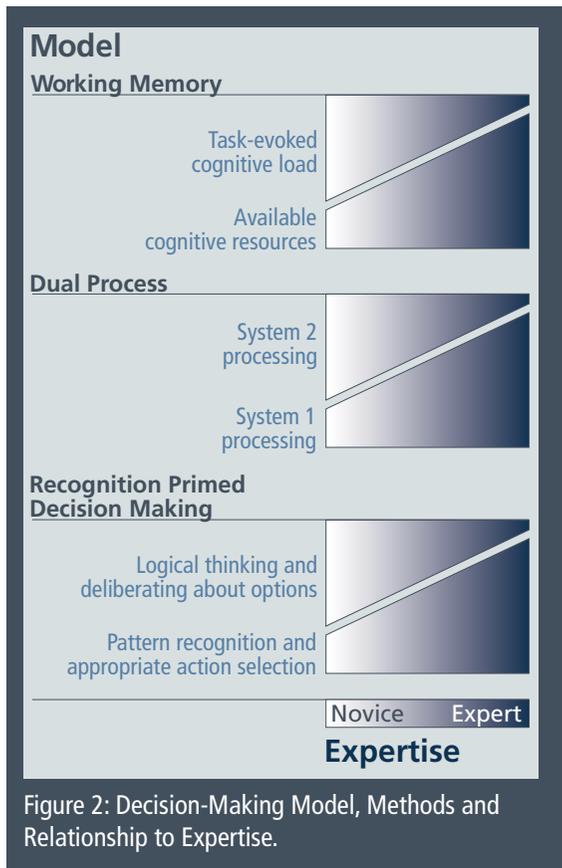


Figure 2: Decision-Making Model, Methods and Relationship to Expertise.

inexperienced acute care HCPs facing challenging medical crises may be too cognitively overloaded to recognize or respond. This results in an inability to consider alternate approaches, clinical exceptions, rare diagnoses, or pre-emptive interventions. It also results in novices being unable to stop and think, unable to perform dexterous procedures and unable to leverage CRM skills, such as communication and leadership (Figure 2). In short, critical decision-making is not innate and therefore should not be left to chance.

Teaching Decision-making

If we accept that experienced physicians, bolstered by regular clinical exposure, are effective crisis decision-makers, then it makes sense to teach the RPD model. Accordingly, Cohen and Freeman¹² have used this model to address critical thinking using clinical cases. In order for teaching to be realistic, clinical information should be presented in an unpredictable sequence (also known as random practice schedule). This method not only mirrors acute care, but also forces learners to critically compare and contrast new data with whatever came before.¹³ For novices, it might be necessary to simplify the cases and provide guidance (or cognitive nudges) that help them recognize what is most relevant and what is most distracting.¹⁴

During instruction, learners should focus on four beneficial activities: creating a story (where all existing evidence is incorporated and explained, and where reasonable assumptions are made despite uncertainty); testing a story (where inconsistencies and uncertainties are identified and the story refined through deliberate testing); evaluating a story (where plausibility is questioned by playing the devil's advocate); and quick testing (where the time available and the consequences of actions are predetermined, thereby encouraging more immediate action if delays are unacceptable).¹⁵

Effective instruction in critical decision-making requires a pre-brief to describe a cognitive-strategy that can steer the decision-making process. It also requires a skilled facilitator who can prompt the learner to self-reflect on his/her developing strategy, with the collegial goal that it be further refined. Prompts should help learners prevent mistakes, challenge their biases and ensure they remain open to other explanations. When learning situations are presented in an unpredictable sequence, the use of retrospective prompts (e.g., were there any similarities between the last two situations?) are more effective than proactive prompts (e.g., are there any similarities between the following two situations?). The combination of random practice schedule and retrospective prompts increases the likelihood that skills are transferred from one situation to the next.¹⁵ In this way, education around decision-making can benefit both practitioners and patients.

Summary

For those responsible for treating acutely ill patients, effective decision-making is a complex, but essential skill. It can take a career to truly master expert decision-making

and should not be left to chance. Despite a substantial body of knowledge about decision-making in non-medical domains, it is rarely taught or coached in medical training programs. Fortunately, there is emerging evidence surrounding decision-making that can be readily adapted to acute care medicine.

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Photo: ©Dr. Robert Arntfeld,
Subject: Ken Parker

This picture is for reflection. How is this healthcare worker feeling: energized or exhausted, terrified or excited? If this was you, would you know when and how to ask for help or relief? Would you be lost in this individual pursuit from everything else or open to engaging with the team? Would you be able to lead, would you be prepared to follow?