Patient safety and diagnostic error

Tips for your next shift

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Case descriptions

Case 1. A 65-year-old woman presents to the emergency department (ED) with tachycardia and shock. She has previously had extensive abdominal surgeries. She is resuscitated and transported quickly to the operating room with a presumptive diagnosis of ischemic bowel. At laparotomy, however, a ruptured spleen secondary to trauma is found. Review of her history reveals that she had fallen the previous evening—an event clearly recorded in the ambulance and nursing ED notes.

Case 2. A 55-year-old woman is referred to the ED by her family physician. She has had fever, chills, and frequent urination. Urinalysis in the office revealed white cells and bacteria, and she was started on oral ciprofloxacin. Today, after receiving 3 doses of the antibiotic, she is weak and unable to sit. She is seen in the ED and noted to have a blood pressure of 80/50 mm Hg and no other remarkable physical findings. She responds to intravenous fluids, and urinalysis confirms evidence of infection again. She is admitted to a general medicine service with presumed urosepsis. In the hospital she does not improve and is eventually diagnosed with a left ureteric renal stone.

What is happening in the above 2 cases? Usually when these types of cases are reviewed at rounds, we quickly check to see whether we were the attending physician and breathe a sigh of relief if we were not. After the cases are reviewed, we all resolve to "keep these facts at the back of our mind" and carry on, with no real insight as to why these diagnostic errors occurred or any strategy to avoid them in the future.

Patient safety has made enormous strides in the past 10 years because of efforts to improve the quality of care received by all patients in the health care system. While most of the research has been conducted in inpatient settings, increasingly attention is being paid to ambulatory settings, such as EDs and family medicine offices. Indeed the ED has been referred to as a "natural laboratory of error,"[1] and emergency medicine as "a practice prone to error."[2] Much of the current effort to make changes has focused on medication errors and drug interactions. Drug delivery systems, computerized physician order sets, pharmacist oversight, and decision-support tools for drug interactions are under active redesign, and will likely have a great effect on patient safety over the next few years.

Despite our public "high tech" image, emergency medicine is fundamentally a diagnostic specialty. A focused history and physical examination, augmented by a few specific investigations, is representative of our daily work, and the chaotic, disruptive, overcrowded work environment inevitably affects our diagnostic performance.

Dual process model

When asked what is required to practise in this setting, most emergency physicians say that excellent clinical reasoning and judgment are distinguishing characteristics. And yet, few of us can define these characteristics other than with some "gestalt." Over the past 15 years, in the cognitive psychology literature, a dual process model of reasoning has emerged that can be used as a template for understanding much of the diagnostic reasoning process that occurs in medicine,[3,4] especially in emergency medicine.[5] The model is schematically illustrated in **Figure 1**.[3]

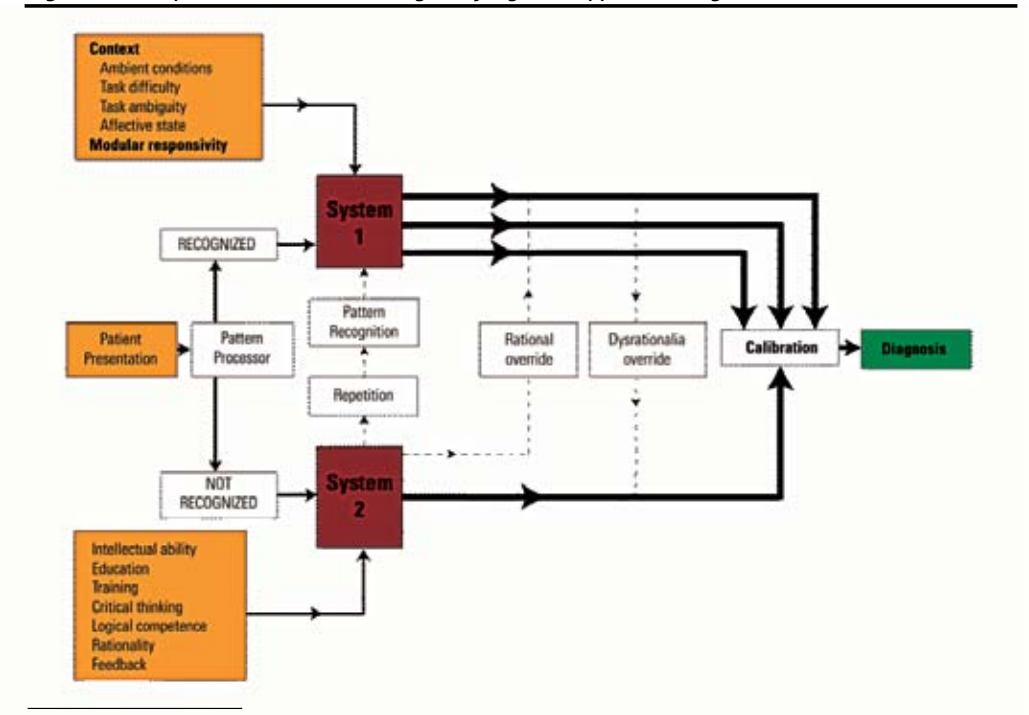
Essentially, the dual process model describes 2 modes of decision making and judgment that depend on pattern recognition. If the initial visual pattern, syndrome, or combination of symptoms and signs is recognized, the system 1 process is engaged automatically. The system 1 process is intuitive and characterized by reflexive, fast, and effortless reasoning. We spend most of our time in this mode; it requires few resources and satisfies most of our requirements. If the pattern is not recognized, the system 2 process is engaged instead. In contrast, it is analytical and characterized by effortful, deliberate, and slow reasoning. These 2 processes are used in science to make sound decisions and judgments that allow us to accomplish complex acts, such as putting people on the moon.

There are 5 important factors to consider with the dual process model:

Repeated practice in system 2 might result in relegation to system 1. This describes what happens when we acquire a particular skill (eg, intubating, applying casts, performing lumbar punctures).

System 2 can override system 1. System 2 might operate as an executive control and reject the output from system 1. This can happen when we impulsively make a snap diagnosis but then reflect and consider other possibilities on the differential; for example, the snap diagnosis of flank pain, nausea, and hematuria is usually ureteral colic, but

Figure 1. Dual process model of thinking and judgment applied to diagnosis



Broken lines indicate considerable interactions between system 1 and system 2.
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system 2 reflection might conjure up other important diagnoses, such as a dissecting abdominal aneurysm.

System 1 can override system 2. This occurs when, despite knowing the best thing to do, the clinician does something else, following an impulse or other idiosyncratic reasoning (eg, most clinical decision rules will outperform the individual physician's judgment, yet they are frequently not used).

Most cognitive and affective errors in reasoning are due to heuristics and biases that affect the system 1 process. System 2 is relatively free of these influences.

Reasoning will invariably try to default to system 1, the most economical and fastest mode. This is referred to as the cognitive miser function. This works most of the time but means we spend a lot of our time in an error-prone mode of reasoning.

Clinicians' common response to presentations on patient safety and diagnostic error is pessimism and discouragement. The question raised is how this information can be incorporated into everyday practice to improve diagnostic abilities and patient care. Increasingly, we are beginning to find answers to these troubling questions.

With an understanding of the dual process model, clinicians can develop insight and awareness, and understand when they need to override or recalibrate system 1 thinking. Recognition of particular cognitive and affective biases when they occur will assist clinicians in knowing when to pause and reflect on their reasoning approaches. During any diagnostic process, an excellent question to ask is the following: What else might this be?

Strategies

Cognitive forcing strategies can be developed to avoid predicable pitfalls, such as anchoring, premature diagnostic closure, diagnostic momentum, and search satisficing.[6]

To improve diagnostic thinking, clinicians should reduce their reliance on memory. The use of clinical decision rules, decision-support tools, and posters with algorithms and drug doses will free up thinking to focus on the diagnostic process.

Working conditions in the ED are chaotic, with multiple interruptions. At times careful thinking is required for a complex patient or high-risk scenario. Often a concentrated effort needs to be made to avoid interruptions during these key thinking processes.

Improving the ambient conditions for both the individuals and the emergency environment is important. Issues such as sleep deprivation, debt, fatigue, and the consequences of shift work can be mitigated by self-awareness, departmental design, and shift scheduling.

The evolving science of simulation can be very helpful in this area. Videotaping realistic scenarios with the ED team allows for review and analysis in a safe setting. There is evidence that this intervention can improve team functioning—an important contribution to diagnostic error.

It is clear that if a clinician has time for reflection, diagnostic ability can improve. The key to this approach in the busy ED environment is to recognize when the system 1 approach is failing or risky, taking perhaps only a few minutes to reflect and recalibrate thinking.

One area of difficulty in emergency medicine is the lack of feedback,[7] which reduces our ability to calibrate our diagnostic thinking process. The usual form of feedback in our specialty is when you begin a shift and a colleague says, "Remember that patient that you saw last week with chest pain who was sent home?" Copies of discharge summaries and clinic notes should routinely be copied to the referring emergency physicians. A robust morbidity and mortality program that does not "lay blame" and includes a cognitive autopsy approach[8] can be very useful.

Case reflections

Case 1. Owing to the past history of surgery, the clinician anchored on the diagnosis of ischemic bowel, discounting the information on the fall because it did not "fit" with the working diagnosis. A moment of reflection or asking what other diagnoses could be relevant could have resulted in a trauma diagnosis. In this particular case the outcome would have been the same because the patient went to the operating room, but in other cases, anchoring can result in poor outcomes.

Case 2. Overreliance on the urinalysis and apparent signs of sepsis, along with a diagnosis from another physician, provided diagnostic momentum, and the clinician did not form an adequate differential diagnosis. This is similar to situations that occur in patient handover—another high-risk area of emergency medicine. It has been recommended that a formal handover process be developed in each ED to reduce potential diagnostic errors.

Conclusion

We believe that clinicians can improve their diagnostic thinking abilities, even in the chaotic emergency environment by recognizing high-risk scenarios; reflecting on the diagnostic process and asking "what else might this be?"; paying attention to shift work and fatigue issues; developing timely feedback processes; and having robust case review processes in their own EDs.

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Competing interests
None declared

BOTTOM LINE

- The emergency department has been described as a "natural laboratory of error."
- Cognitive psychology research provides a dual process model of reasoning that fits well with clinical reasoning in medicine. Most clinical reasoning involves automatic, reflexive pattern recognition known as system 1 processes. When system 1 processes fail, clinicians revert to more effortful, deliberate reasoning known as system 2 processes.
- Most errors in reasoning occur as a result of heuristics and biases that affect system 1 processes. Furthermore, clinical reasoning will invariably default to the more efficient system 1 processes, making us prone to error.
- Cognitive forcing strategies can reduce diagnostic error. Strategies include reducing reliance on memory, greater use of clinical algorithms and decision tools, the use of reflection, and timely feedback.

POINTS SAILLANTS

- On décrit souvent le département d'urgence, comme tout autre milieu de clinique externe engorgé, comme étant un « laboratoire naturel d'erreurs ».
- Les recherches en psychologie cognitive font ressortir un modèle de raisonnement en deux temps qui concorde bien avec le raisonnement clinique en médecine. Le raisonnement clinique comporte, en grande partie, une tendance réflexive et automatique connue sous le nom de processus du système 1. Quand les processus du système 1 échouent, les cliniciens se tournent vers un raisonnement plus délibéré et exigeant sur le plan de l'effort, connu sous le nom de processus du système 2.
- La plupart des erreurs dans le raisonnement se produisent en raison d'heuristiques et de distorsions qui affectent les processus du système 1. De plus, le raisonnement clinique utilisera invariablement par défaut les processus plus efficaces du système 1, nous portant à faire des erreurs.
- Des stratégies de forçage cognitif peuvent être élaborées pour réduire les erreurs de diagnostic. Parmi ces stratégies, on peut se fier moins à la mémoire, utiliser davantage d'algorithmes et d'outils de décisions cliniques, recourir à la réflexion, ainsi qu' à la rétroaction en temps opportun.

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