Diagnostic Error in Health Care

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The Health Care Improvement Foundation
Partnership for Patient Care Annual Leadership Summit
Nine Quick Questions

Take a piece of paper and write down your answers to each of these 9 questions

You have about 10 seconds for each response
On a standard Philadelphia fire truck, there are 2 drivers up front, one at the rear and three additional fire-fighters. What is the total personnel required for 5 standard trucks?
Two identical bottles, one empty and the other filled with XXX strong ale, are simultaneously dropped from a height of 20 feet.

Which hits the ground first?
A: the ball follows a parabola travelling forward as it falls
B: the ball drops straight downwards from the point of release
C: The ball moves backwards and downwards
A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball.

How much does the ball cost?
Which is correct?

(a) The Earth moves around the Sun
(b) The Sun moves around the Earth
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
In a study 1000 people were tested. Among the participants there were 5 engineers and 995 lawyers. Jack is a randomly chosen participant of this study.
Jack is 36 years old. He is not married and is somewhat introverted. He likes to spend his free time reading science fiction and writing computer programs

Which is most likely? a. Jack is an engineer  
   b. Jack is a lawyer

De Neys & Glumicic, 2008
In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake?
A: The ball continues in a straight line when the string breaks
B: The ball follows a curved path when the string breaks
C. The ball follows some other trajectory when the string breaks
Answers

A. 30
B. Both hit at the same time
C. (A) The ball follows a parabola forward
D. The ball costs 5¢ and the bat $1.05
E. (a) The Earth moves around the Sun
F. 5 minutes
G. Jack is a lawyer
H. 47 days
I. (A) The ball goes straight
So how much can we trust intuition?
Cognitive Reflective Test
(items D, F, H)

• The test distinguishes intuitive from analytical processing
• It tests your ability to resist first response that comes to mind
• Of 3428 people tested only 17% got all 3 correct
• 33% answered all three incorrectly

Frederick 2002 (MIT)
The Capacity to Reflect

Leads to:

• Mindfulness
• Less impulsivity in decision making
• More thinking about how you think
• Increased likelihood of bias detection
• Improved clinical decision making
What is Mindfulness?

Nonjudgmental awareness of the present moment
Zen and the art of health care?
PATIENT SAFETY HAS BEEN A TOPIC OF CONSIDERABLE interest over the last decade, with evidence showing that medical errors are responsible for substantial morbidity and mortality. There has been significant progress in understanding, identifying, and addressing errors at a system level; however, the performance of individual clinicians remains a crucial and
Case 1

- A 4-year-old boy, no significant medical history and no history of asthma presented to the PED in the winter with acute-onset respiratory distress. The triage nurse noted increased work of breathing, decreased air movement, and wheezing. He was placed on nebulized albuterol by facemask over 1 hour.

- The intern documented subcostal retractions and minimal wheezing and reported to the supervising pediatric emergency medicine fellow that he was ‘‘too tight to hear wheezing because of poor air movement.’’ Oxygen saturation was 88% in room air, RR was 40, and HR was 150. He was normotensive and afebrile. A chest x-ray (CXR) was completed.

- Before it was read, the child developed progressively severe respiratory distress and became obtunded. He was emergently intubated.

- The preintubation CXR showed a soft tissue density in the midtrachea. He was tracheally intubated. He was subsequently taken to the OR. Rigid bronchoscopy revealed a macerated, partially chewed hotdog fragment in the right main stem bronchus, which was removed. The child was admitted to the PICU and recovered without further complications

Park et al, Ped Emerg Care 2014
Case 2

- A 12-year-old girl, with a history of asthma, complained of shortness of breath and chest pain shortly after beginning a basketball game. Despite using her inhalers, she appeared to be worsening and an ambulance was called. She was given nebulised albuterol by facemask and immediately taken to the nearby PED. On arrival she deteriorated further, stopped breathing and had a cardiac arrest.

- Chest compressions were initiated immediately and she was intubated. Despite prolonged efforts by the resuscitation team she did not respond and all further efforts were ceased after an hour.

- At autopsy she was found to have a tension pneumothorax.
Case 3

- A 6-month-old ex-35-week premature male infant with several days of nasal congestion and 1 day of increased work of breathing and wheezing. His mother reported no improvement with albuterol nebulizer treatments at home. PMH: 1 week in NICU at birth and discharged home on albuterol. His temperature at triage was 38, HR 175, RR 50, blood pressure of 78/66, and 100% SpO2 in room air. O/E fussy, bilateral expiratory wheezing and mild subcostal retractions. No murmur, rub, or gallop. He had no rash. Diagnosed as reactive airway disease exacerbation, and started on a nebulized albuterol treatment.

- During the evaluation, the patient developed worsening tachypnea and tachycardia. He became pale with poor pulses and delayed capillary refill. His liver was palpated several centimeters below the right costal margin. He was tracheally intubated, and fluid resuscitation for decompensated shock was instituted. Chest x-ray revealed an obscured right heart border. An electrocardiogram showed wide complex tachycardia, and he underwent synchronized cardioversion.

- The presumptive diagnosis was myocarditis. After fluid resuscitation, he was initiated on dopamine and admitted to ICU. He survived to discharge.

Park et al, Ped Emerg Care 2014
Two main areas of decision making in medicine

Making the diagnosis
+Treating the patient
How well do we do?
Legal outcome by critical incident

CMPA Data: 347 legal actions closed 2005 - 2009

Number of patients

Perform  Comm  Diagnosis  Admin  Medication  Conduct
Legal outcome by critical incident

CMPA Data: 347 legal actions closed 2005 - 2009

Number of patients
Diagnostic Failure

15\%
Estimated number of preventable hospital deaths due to diagnostic failure annually in the US

40,000 – 80,000

Leape, Berwick and Bates JAMA 2002
Diagnostic Failure

- Highest in EM, FM, IM
- Lowest in visual specialties
- 30% of preventable deaths in UK due to diagnostic failure
- 40-80,000 deaths annually in US due to diagnostic failure
- 50% of closed ED claims in USA
- 67% of claims against UK Family Docs
- Of 122 closed cases
  - 48% resulted in serious harm
  - 39% in death
It is likely that *most of us* will experience at least one diagnostic error *in our lifetime*, sometimes with devastating consequences.
Origins of diagnostic error in 100 patients

(Graber et al 2004)

- Cognitive Error Only: 28%
- System-Related Error Only: 19%
- No-Fault Factors Only: 7%
- Both System-Related And Cognitive Factors: 46%
Mostly, it’s not what we don’t know, it’s how we think

We need to know more about how we think…
How then do we think, reason and make decisions?
Decision Making

Intuitive (System 1)
- Fast
- Informal
- Subjective
- Context-dependent
- Qualitative
- Flexible

Rational (System 2)
- Slow
- Formal
- Objective
- Context-independent
- Quantitative
- Rigourous
Dual Process Theory
THINKING, FAST AND SLOW
DANIEL KAHNEMAN
WINNER OF THE NOBEL PRIZE IN ECONOMICS

2011
Type 1 and Type 2 processes
(dual process theory)
Pattern Recognition

Repetition

Executive override

Irrational override

Calibration

Diagnosis

Type 1 Processes

Type 2 Processes

Pattern Recognition

Repetition

Patient Presentation

RECOGNIZED

NOT RECOGNIZED

Pattern Processor

T
Life is about learning the basic patterns
Getting medicine is not easy
A centipede was happy – quite!
Until a toad in fun
Said, "Pray, which leg moves after which?"
This raised her doubts to such a pitch,
She fell exhausted in the ditch
Not knowing how to run

Katherine Craster 1871
Initial percept or problem -> Pattern Processor

Pattern Processor -> Expertise

Expertise -> System 1

System 1 -> Calibration

System 1 -> Decision

System 1 -> Proficiency

Proficiency -> Competence

Competence -> Advanced Beginner

Advanced Beginner -> Novice

Novice -> System 2

System 2 -> NOT RECOGNIZED

NOT RECOGNIZED -> System 2

System 2 -> Calibration

Calibration -> Decision
Axial view of fMRI activation of the brain as a function of practice over 60 minutes

*Hill and Schneider, 2006*
How much of our time is in System 1?
‘Cognitive thought is the tip of an enormous iceberg. It is the rule of thumb among cognitive scientists that unconscious thought is 95% of all thought – this 95% below the surface of conscious awareness shapes and structures all conscious thought’

Lakoff and Johnson, 1999
High Risk Situations

- Cognitive overloading
- Interruptions/distractions
- Fatigue
- Stress
- Sleep deprivation/sleep debt
- Negative mood
- Influence of medications, drugs, alcohol
So, we have to learn how best to deal with System 1
United States Senator
Swallowing saliva
Would you drink a glass of your own saliva?
The emotion of disgust (Type 1) overcomes rational input (Type 2)
So how do we become better decision makers in Health Care?
You aren’t thinking hard enough, so try harder
Is trying harder going to work?
The occasional slap might wake some people up
Special Section: Open Forum

The Ethical Imperative to Think about Thinking

Diagnostics, Metacognition, and Medical Professionalism

MEREDITH STARK and JOSEPH J. FINS

Abstract: While the medical ethics literature has well explored the harm to patients, families, and the integrity of the profession in failing to disclose medical errors once they occur, less often addressed are the moral and professional obligations to take all available steps to prevent errors and harm in the first instance. As an expanding body of scholarship further elucidates the causes of medical error, including the considerable extent to which medical errors, particularly in diagnostics, may be attributable to cognitive sources, insufficient progress in systematically evaluating and implementing suggested strategies for improving critical thinking skills and medical judgment is of mounting concern. Continued failure to address pervasive thinking errors in medical decisionmaking imperils patient safety and professionalism, as well as beneficence and nonmaleficence, fairness and justice. We maintain that self-reflective and metacognitive refinement of critical thinking should not be construed as optional but rather should be considered an integral part of medical education, a codified tenet of professionalism, and by extension, a moral and professional duty.

Keywords: medical decision making; medical ethics; professionalism; medical education; medical error; diagnostic error; patient safety; cognition; judgment; metacognition

No longer an option...
Improving diagnosis in Health Care
Report release in September 2015

‘The critical thinking in understanding the common causes of cognitive errors can be and should be taught to all health professionals, particularly physicians, nurse practitioners and physician’s assistants who will be in a primary diagnostic role and who will work in the diagnostic process

George Thibault MD
“It sort of makes you stop and think, doesn’t it.”
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