How We Think and Pitfalls!

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Five Quick Questions...

- Take a piece of paper and write down your answers to each of these 5 questions...

- You have about 5 seconds for each response
Question 1

- How many turtle doves did my true love send to me on the second day of Christmas?
Question 2

- In 2014, the average time required to complete a CBL case was 15½ hours. How much time should be allowed for the three that are expected next month?
Question 3

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?
Question 4

If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
Question 5

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 of the lake?
Answers

Q1. 2
Q2. $46\frac{1}{2}$ hours
Q3. The ball cost 5 c and the bat $1.05$
Q4. 5 minutes
Q5. 47 days
Cognitive Reflective Test

- Disregard the first 2 questions
- The remaining 3 questions are simple but people perform poorly
- The test distinguishes *intuitive* from *analytical* reasoning
- It tests the *ability to resist first response that comes to mind*
- Of 3,428 people tested, only 17% got all 3 correct
- 33% answered all 3 incorrectly

Shane Fredrick
Session Objectives....

- Introduce dual process reasoning
- Understand some of the cognitive biases in clinical practice
- Recognize the importance of de-biasing strategies
Clinical Reasoning...

- It is the process by which we arrive at a diagnosis: **problem solving or searching for a solution**

- Understanding this process can help identify our shortcomings...help us get better at this process
We have a new way of looking at how clinicians reason...

It can be applied to all decision making in clinical care
Metacognition

System 2

Unconscious
Intuition

System 1
Rapid

Quirk, M 2006; Croskerry, 2009
Two basic types of reasoning...

Type 1 (intuitive)
and
Type 2 (analytical)
(dual process theory)
System 1: Intuition

NON-ANALYTIC

- Relies heavily on EXPERIENCE
- Pattern Recognition
- "Thinking without thinking"
- FAST
- LOW cognitive load
System 1: trust sense of familiarity
System 2: Metacognition

ANALYTIC

Deductive reasoning

"Thinking about one's own thinking"

Logical

SLOW

HIGH cognitive load
System 2: Think it through, then decide
So how do experts think?
Operating characteristics of the model
Two Process Model of Decision Making

Expert

Novice

Type 1 Processes

Pattern Recognition

Rational override

Dysrationalia override

Calibration

Diagnosis

Type 2 Processes

Pattern Recognition

Repetition

Patient Presentation

NOT RECOGNIZED

RECOGNIZED
4 Main Features of the Model

- Repetitive operation of \textbf{Type 2} \rightarrow \textbf{Type 1}
- Type 1 override of Type 2 \rightarrow \textbf{dysrationalia override}
- Type 2 override of Type 1 \rightarrow \textbf{rational override}
- Your brain likes to take the easy way out (\textbf{cognitive miser function})
Patient example...

- Pt presents to the ER with shortness of breath, hypoxia (low oxygen levels in blood), chest pain, tachycardia (pulse rate of 120) and long flight from Japan...

- Dx of pulmonary embolism immediately comes to mind....... **Type 1 reasoning**

- Mental shortcut...
Two Process Model of Decision Making

- Expert
  - Type 1 Processes
    - Pattern Recognition
    - Rational override
    - Dysrationalia override
    - Calibration
    - Diagnosis
  - Type 2 Processes
    - Pattern Recognition
    - Repetition
- Novice
- Expert

- Patient Presentation
- Not Recognized
- Recognized
Rational Override...

- You want to jump to a diagnosis... **pulmonary embolism**

  but you don’t...

- **Type 2 analytical response in this case** might be to consider other possibilities like heart failure, pneumonia, asthma, etc...

- Acts like an **executive control over Type 1**

- Strong in people who are **careful, prudent**
Swallowing saliva...
Would you drink a glass of your own saliva?
The emotion of disgust (Type 1) overcomes rational input (Type 2), a form of dysrationalia override
System 1: Intuition

PITFALLS

- Atypical presentations
- Pattern mistaken for something else
- Strongly influenced by ambient conditions
System 2: Metacognition

PITFALLS

IM PRACTICAL

SLOW
Why did you miss dx past year?

A. It never crossed my mind
B. Paid too much attention on one finding
C. Didn’t listen enough to patient’s story
D. Was in too much of a hurry
E. Didn’t know enough about the disease
F. Let the consultant convince me
G. Didn’t reassess the situation
H. Patient had too many problems at once
I. Was influenced by a ‘similar’ case
J. Was in denial of an ‘upsetting’ diagnosis

G Bordage, Acad Med 1999
Causes of Diagnostic Errors

Cognitive Errors

1. Faulty context assumptions
2. Premature closure
3. Inherent shortcomings of heuristic (intuitive) thinking
4. Affective biases
5. Environmental factors that detract from optimal conditions: distractions, fatigue, stress, workload

Is avoiding errors/biases → Mission Impossible?

Bluegreenblog 2006
Are we all prone to these biases?
Why do we make mistakes/errors?

1. We are humans…

1. Limitations of our experience/knowledge

2. Decisions are made with partial information gathering problems

3. Our brains are designed to be fast, frugal, and correct most of the time (System-1)

4. Thinking (System-2) is slow and difficult, and frequently avoided; System-2 is lazy

5. Competing demands for our time and attention favors System-1 over System-2

Unwillingness to accept the possibility of error
Cognitive Biases: Anchoring Bias

• We tend to rely too heavily on the first piece of information offered when making decisions.

• Failing to adjust this initial impression in the light of later information leads to errors.

• After arriving at a first impression, the tendency to look for evidence that confirms the initial impression, failing to adjust the initial impression in light of all available information.
A 42 y/o female presents with severe abdominal pain after 2 days of binge drinking, also has severe nausea and vomiting.

Why was the ectopic pregnancy misdiagnosed?
- Less suspicion for a pregnancy as patient is 42 y/o
- Who in their sane mind would binge drink while pregnant?
- Ectopic pregnancy can also present with: elevated amylase, elevated, leukocytosis, hematocrit drop, abdominal pain and vomiting.

NPO is ordered as well as IV pain meds and IV fluids.
Patient is admitted to the floor and in the next 5 hours deteriorates and becomes progressively hypotensive until losing consciousness.
CT scan of the abdomen reveals that she has a ruptured ectopic pregnancy!
Cognitive Biases: Confirmation Bias

Confirmation bias: tendency to seek data to confirm (not refute) the hypothesis.

Everything you look for and all that you perceive has a way of proving whatever you believe.
Cognitive Biases: Confirmation Bias

- A woman hires a worker that she thinks highly of, but turns out to be incompetent. She doesn’t notice that everyone else is doing his work for him because she is so impressed that he shows up every day, right on time.

- A sports fan who believes his team is the best only seems to remember the matches they won and none of the embarrassing defeats to inferior opponents.
Mr W is a 51 y/o male with a 7 day history of lower back pain after lifting a heavy box at work.

Presents to the ER complaining of a 10/10 back pain and asking for pain medications and a work excuse.

VS: 150/91, HR 105, T 99.6 F, RR 16.

Nurse states: Mr. W is here again, he comes frequently asking for work excuses. He was here yesterday and was dx with a back muscle strain.

Exam: Paraspinal tenderness, neuro exam is normal.

A new prescription of Percocet is written. Patient is about to be discharged when staff physician notices the fever. He orders a CBC that shows 17 WBC.

A CT scan is done: Paraspinal abscess. (After questioning, patient admits to have recently been using IV drugs).
Cognitive Biases: Diagnostic Momentum Bias

When suggestion gets the best of us
Cognitive Biases: Premature Closure

• Uncritical acceptance of an initial diagnosis and failing to search for information to challenge the provisional diagnosis or to consider other diagnoses.
• Tendency to stop too soon and not order the critical test or gather the critical information.
• One of the most common sources of error.

“When the diagnosis is made, the thinking stops”
Some other Cognitive Biases....

**Availability Bias**: the tendency to weigh likelihood of things by how easily they are remembered.

**Base Rate Neglect**: tendency to ignore the true rate of disease and pursue rare, more exotic diagnoses.

**Representativeness**: tendency to be guided by prototypical features of a disease and miss atypical variants.
Is there any way to avoid these biases?
Cognitive Pills for Cognitive Ill’s

• **Develop Insight**
  • you can’t fix something you are not aware exists: **Metacognition**
  • Step back from immediate problem to examine and reflect on the thinking process

• **Consider Alternatives**
  • Routinely ask yourself “what else might this be?”: **Diagnostic Timeout → Engage system 2**

• **Feedback**
  • What happened to the patient you admitted from the ER?