Making a Diagnosis: New Models for Old

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Medical Education Grand Rounds
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Six Quick Questions

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

You have about 10 seconds for each response.
On a standard Pittsburgh fire truck, there are 2 drivers up front, one at the rear and four additional fire-fighters. What is the total personnel required for 5 standard trucks?
How many turtle doves did my true love send me on the 2\textsuperscript{nd} day of Christmas?
In 2008, the average time required to complete a root cause analysis was 15½ hours, how much time should be allowed for the three that are expected next month?
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?
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
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?
Answers

A. 35
B. 2
C. 46½ hours

D. The ball costs 5¢ and the bat $1.05
E. 5 minutes
F. 47 days
Cognitive Reflective Test

- The test distinguishes intuitive from analytical processing
- It tests the 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)
<table>
<thead>
<tr>
<th>Location</th>
<th>Mean CRT score</th>
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<tbody>
<tr>
<td>MIT</td>
<td>2.18</td>
</tr>
<tr>
<td>Princeton</td>
<td>1.63</td>
</tr>
<tr>
<td>University of Michigan</td>
<td>1.18</td>
</tr>
<tr>
<td>Bowling Green University</td>
<td>0.87</td>
</tr>
<tr>
<td>University of Toledo</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>1.24</strong></td>
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Important factors in decision making

• Framing
• Context
Did you hear about the man who fatally shot his wife in the chest and got away with it? Damn those bleeding heart liberal judges and their hugs for thugs.
The accused was an elderly man whose terminal cancer diagnosis filled him with fear that his partner -- bedridden with Alzheimer's would die without his care.
ABC
ZBA
ABC
ZBA
Diagnostic acumen

It is every doctor’s measure of his own abilities; it is the most important ingredient in his professional self-image

Nuland, 1994
Reasoning and decision making underpin diagnostic reasoning
We need to understand how we make decisions
A review of the literature
2005 2006
How then do we make decisions?
Approaches to Decision Making

Intuitive

- Modular responsibility
- Deliberation without attention
- Thin slicing
- Heuristics and biases
- Recognition primed

Analytical

- Hypothetico-deductive reasoning
- Robust Decision Making
- Exhaustion Strategy
- Normative reasoning
- Bayesian reasoning
- Bounded rationality

Reasoning types:

- Intuitive
- Analytical
We have a new way of looking at decision making

It can be applied to all decision making in healthcare
Type 1 and Type 2 processes
(dual process theory)
<table>
<thead>
<tr>
<th></th>
<th><strong>Type 1</strong></th>
<th></th>
<th><strong>Type 2</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(intuitive)</td>
<td></td>
<td>(analytical)</td>
</tr>
<tr>
<td>Cognitive style</td>
<td>Heuristic</td>
<td></td>
<td>Systematic</td>
</tr>
<tr>
<td>Cognitive awareness</td>
<td>Low</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Cost</td>
<td>Low</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Automaticity</td>
<td>High</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Rate</td>
<td>Fast</td>
<td></td>
<td>Slow</td>
</tr>
<tr>
<td>Reliability</td>
<td>Low</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Errors</td>
<td>Usually</td>
<td></td>
<td>Few</td>
</tr>
<tr>
<td>Effort</td>
<td>Low</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Predictive power</td>
<td>Low</td>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Emotional component</td>
<td>High</td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Scientific rigour</td>
<td>Low</td>
<td></td>
<td>High</td>
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</table>
A schematic model for how the systems work together
Context
- Ambient conditions
- Task difficulty
- Task ambiguity
- Affective state

Modular responsivity

RECOGNIZED

Pattern Processor
- Pattern Recognition
- Repetition

TYPE 1 processes

NOT RECOGNIZED

TYPE 2 processes

Intellectual ability
- Education
- Training
- Critical thinking
- Logical competence
- Rationality
- Feedback

Patient Presentation

Rational override

Dysrationalia override

Calibration

Diagnosis
5 Main Features of the Model

- Most errors occur in System 1
- Repetitive operations of System 2 >>> 1
- System 2 override of System 1
- System 1 override of System 2
- Cognitive Miser function
Not just a model
The power of Type 1 processes
United States Senator
Swallowing saliva
Would you drink a glass of your own saliva?
The emotion of disgust (System 1) overcomes rational input (System 2)
Medical System 1 overrides of System 2

- Overconfidence
- Multiple cognitive and affective biases
- Failure to formally acknowledge importance of CDM
- Failure to implement best evidence into clinical practice
- Ignoring clinical decision rules
- Minimizing impact of fatigue/sleep deprivation on performance
- Minimizing impact of time pressures on performance
How may medical decision making be optimized?
The occasional slap might wake some people up
What healthcare decision making needs

- Raise awareness of importance of decision making
- Understand the difference between System 1 and 2 reasoning
- Know operating characteristics of DPT model
- Promote reflective practice
- Teach the main cognitive biases
- Teach the main affective biases
- Promote critical thinking
- Promote use of cognitive aids
- Teach cognitive and affective forcing functions
- Raise awareness of conditions which may compromise decision making (fatigue, sleep deprivation, cognitive overload)
“It sort of makes you stop and think, doesn’t it.”