Decision making in Acute Medicine: A Time to Think?

Graham Nimmo
Consultant Physician in Intensive Care Medicine and Clinical Education
Western General Hospital
Edinburgh
Clinical world:
Messy “Flesh and blood CDM” James Reason
Clinical decision making

• Who does it?

• How is it done?

• Why is it important?

• What affects it?

• Can we improve it?
All of us: all of the time
Decision making

• Who does it?

• How is it done?

• Why is it important?

• What affects it?

• Can we improve it?
How well do we make decisions?
TITANIC SINKS FOUR HOURS AFTER HITTING ICEBERG; 866 RESCUED BY CARPATHIA, PROBABLY 1250 PERISH; ISMAY SAFE, MRS. ASTOR MAYBE, NOTED NAMES MISSING
**Doing Clinical Decision Making: the cognitive literature**

- Experiential-inductive
- Bounded rationality
- Heuristic
- Pattern recognition
- Hard wired response
- Thin slicing
- Unconscious thinking theory

- Hypothetico-deductive
- Unbounded rationality
- Normative reasoning
- Robust CDM
- Acquired, critical, logical thought
- Multiple branching/arborisation
- Deliberate, purposeful thinking
Decision making

• Who does it?

• How is it done?

• **Why is it important?**

• What affects it?

• Can we improve it?
Understanding Clinical Decision Making
Two hours on call on a Tuesday evening
CDM: audit 1

- CVC required in Haematology: where? Who? When?
- Oesophageal doppler figures: treatment?
- Vancomycin result: infusion dose and rate?
- Death certificate: diagnosis?
- Reduced BP: fluids and noradrenaline?
- Borderline conscious level? extubate
CDM: audit 2

- What to say to a family?
- Adjust ventilator settings x 2
- Background fluids
- Noradrenaline dose
- Start B-blocker?
- NIV settings
- Fluids vs urine output
CDM: audit 3

- Food trolley
- Remove CVC?
- Admission: handover, story, diagnosis, problems, NG? (varices)
- Feeding?
- SAH reduced GCS intubate and scan
- Colleague unwell: cover?
- CXR CVC
CDM : audit 4

- A referral ? admit
- Ward: staff member crying
- Antibiotic choice
CDM: audit 5

- CXR Quinton, HF anticoagulant
- New password Apex CIS
- Transfuse?
- Intubate?
- Access, monitors, drugs, who does what, tube, ventilation
- CT head: Neurosurgeon discussion
CDM: an empirical *typology*

- ‘House-keeping’: fluids, nutrition, insulin
- Maintaining safety: physiology; *urgency*; accuracy; prioritisation and planning
- Organ *support*
- Diagnosis and definitive *treatment*
- Prognosis, end of life care: *delayed* CDM?
- Professional: regarding colleagues
A specific clinical decision: Diagnosis

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

Nuland 1994
Claims Data: High-severity Cases

Top allegation categories for all cases is Diagnosis Error

N=584 high-severity PL cases asserted 1/1/02-8/31/07.
Total Incurred-aggregate of expenses, reserves, and payments on open and closed cases.
### CRICO Cases Closed: Allegations by Close Year

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis-related</td>
<td>15</td>
<td>22</td>
<td>15</td>
<td>22</td>
<td>17</td>
<td>91</td>
</tr>
<tr>
<td>Medical Treatment</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Medication-related</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Safety and Security</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Breach of Confidentiality</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>OB-related Treatment</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Surgical Treatment</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Communication</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Violation of Rights (other)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Number of Cases</strong></td>
<td>22</td>
<td>25</td>
<td>22</td>
<td>28</td>
<td>24</td>
<td>121</td>
</tr>
</tbody>
</table>

N=121 CRICO outpatient PL cases closed 2005-2009 naming general medicine staff/fellow physicians (excl. Hospitalists) and excluding ED locations.
Causes of diagnostic error
Arch Int Med, Graber 2004

- No fault errors 7%
- System related error 19%
- Cognitive Error 28%
- Only System and cognitive error 46%
Table 1. Most Frequently Missed Diagnoses Among 583 Physician-Reported Cases of Diagnostic Error

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary embolism</td>
<td>26 (4.5)</td>
</tr>
<tr>
<td>Drug reaction or overdose</td>
<td>26 (4.5)</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>23 (3.9)</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>19 (3.3)</td>
</tr>
<tr>
<td>Acute coronary syndrome</td>
<td>18 (3.1)</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>18 (3.1)</td>
</tr>
<tr>
<td>Stroke, including hemorrhage</td>
<td>15 (2.6)</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>13 (2.2)</td>
</tr>
<tr>
<td>Fracture, various types</td>
<td>13 (2.2)</td>
</tr>
<tr>
<td>Abscess, various locations</td>
<td>11 (1.9)</td>
</tr>
<tr>
<td>Pneumonia, including type</td>
<td>10 (1.7)</td>
</tr>
<tr>
<td>Aortic aneurysm/dissection</td>
<td>9 (1.5)</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>9 (1.5)</td>
</tr>
<tr>
<td>Depression</td>
<td>9 (1.5)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>8 (1.4)</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>8 (1.4)</td>
</tr>
<tr>
<td>Anemia</td>
<td>6 (1.0)</td>
</tr>
<tr>
<td>Bacteremia</td>
<td>6 (1.0)</td>
</tr>
<tr>
<td>Metastatic cancer</td>
<td>6 (1.0)</td>
</tr>
<tr>
<td>Spinal cord compression</td>
<td>6 (1.0)</td>
</tr>
</tbody>
</table>
Importance of CDM

• Ubiquitous in clinical practice

• May result in good or poor outcomes

• Difficult to measure: especially diagnostic error

• Exposes a need for metacognition thus……
We need to understand how we think…
Exercise 1

Look at the next slide and ask yourself:

• “Which beach would I rather be on?”
A or B?
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>91%</strong></td>
<td></td>
</tr>
<tr>
<td><strong>9%</strong></td>
<td></td>
</tr>
</tbody>
</table>
Exercise 2

• What is the diagnosis?
Exercise 2
What is the diagnosis?

1. Psoriasis
2. Pityriasis rosea
3. Shingles
4. Pemphigus
5. Sutton’s syndrome
What is the diagnosis?

1%  
1%  
1%  
96%  
1%  
1%
Exercise 3

• What is the diagnosis?
What is the diagnosis?

1. Pneumococcal septicaemia
2. Cryoglobulinaemia
3. Meningococcal septicaemia
4. Microscopic polyarteritis
5. Staphylococcus Aureus septicaemia
What is the diagnosis?

1. Pneumococcal septicaemia
2. Cryoglobulinaema
3. Meningococcal septicaemia
4. Microscopic polyarteritis
5. Staphylococcus Aureus septicaemia

3%
6%
82%
8%
2%
• [http://www.improvediagnosis.org/](http://www.improvediagnosis.org/)

• Society to improve diagnosis in medicine
Dual Process Theory

Type 1 and Type 2 thinking processes
# System 1 thinking: intuitive

<table>
<thead>
<tr>
<th>Cognitive style</th>
<th>Heuristic: shortcuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive awareness</td>
<td>Low</td>
</tr>
<tr>
<td>Cost</td>
<td>Low</td>
</tr>
<tr>
<td>Automaticity</td>
<td>High</td>
</tr>
<tr>
<td>Rate</td>
<td>Fast</td>
</tr>
<tr>
<td>Reliability</td>
<td>Low</td>
</tr>
<tr>
<td>Errors</td>
<td>Usually</td>
</tr>
<tr>
<td>Effort</td>
<td>Low</td>
</tr>
<tr>
<td>Predictive power</td>
<td>Low</td>
</tr>
<tr>
<td>Emotional component</td>
<td>High: “gut reaction”</td>
</tr>
<tr>
<td>Scientific rigour</td>
<td>Low</td>
</tr>
<tr>
<td>Cognitive style</td>
<td>Systematic</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Cognitive awareness</td>
<td>High</td>
</tr>
<tr>
<td>Cost</td>
<td>High</td>
</tr>
<tr>
<td>Automaticity</td>
<td>Low</td>
</tr>
<tr>
<td>Rate</td>
<td>Low</td>
</tr>
<tr>
<td>Reliability</td>
<td>High</td>
</tr>
<tr>
<td>Errors</td>
<td>Few</td>
</tr>
<tr>
<td>Effort</td>
<td>High</td>
</tr>
<tr>
<td>Predictive power</td>
<td>High</td>
</tr>
<tr>
<td>Emotional component</td>
<td>Low</td>
</tr>
<tr>
<td>Scientific rigour</td>
<td>High</td>
</tr>
</tbody>
</table>

**System 2 thinking: analytical**

**Diagnosis**

- History: full
- Examination: complete
- Investigations
- Differential Dx
- Treatment
- Refine diagnosis
Fortunately there is a simple schematic model of how the systems work together
Hard wiring
Ambient conditions/Context
Task characteristics
Age and Experience
Affective state
Gender
Personality

Type 1 Process

Pattern Recognition
Repetition

Type 2 Process

Dysrationalia override

Calibration

Decision/Dx

Patient Presentation

Pattern Processor

RECOGNIZED

NOT RECOGNIZED

Education
Training
Critical thinking
Logical competence
Rationality
Feedback
Intellectual ability

Croskerry Acad Med 2008
CDM literature and dual process theory

**Intuitive**
- Experiential-inductive
- Bounded rationality
- Heuristic
- Pattern recognition
- Hard wired response
- Thin slicing
- Unconscious thinking theory

**Analytical**
- Hypothetico-deductive
- Unbounded rationality
- Normative reasoning
- Robust CDM
- Acquired, critical, logical thought
- Multiple branching/arborisation
- Deliberate, purposeful thinking
Main features of DPT model

- Toggle function
- 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
Clinical decision making

• Who does it?

• How is it done?

• Why is it important?

• What affects it?

• Can we improve it?
Non-Technical Factors

- Team working
- Situation awareness
- Task management
- Cognition
- Critical thinking
- Clinical reasoning
Patient safety and human factors

• “We define human factors as: the study of all the factors that make it easier to do the work in the right way.”

• “Note that human factors is not as directly about “humans” as the name might suggest.”

• Clinical decision making?
• Diagnosis?
CDM relies on....

- Dual process theory
- Context, affect, human factors
- Cognitive dispositions to respond
- Cognitive forcing strategies
- Metacognition and critical thinking
<table>
<thead>
<tr>
<th>Aggregate bias</th>
<th>Gender bias</th>
<th>Psych-Out Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anchoring</strong></td>
<td>Hindsight bias</td>
<td>Representativeness</td>
</tr>
<tr>
<td>Ascertainment bias</td>
<td>Multip. Alternatives</td>
<td>Search satisficing</td>
</tr>
<tr>
<td>Availability</td>
<td>Omission bias</td>
<td>Sutton’s Slip</td>
</tr>
<tr>
<td>Base rate neglect</td>
<td>Order effects</td>
<td>Triage-Cueing</td>
</tr>
<tr>
<td>Commission bias</td>
<td>Attribution error</td>
<td>Unpacking principle</td>
</tr>
<tr>
<td>Confirmation bias</td>
<td>Overconfidence</td>
<td>Vertical line failure</td>
</tr>
<tr>
<td>Diagnosis momentum</td>
<td>Playing the odds</td>
<td>Visceral bias</td>
</tr>
<tr>
<td>Fixation bias</td>
<td>Posterior prob.</td>
<td>Ying-Yang Out</td>
</tr>
<tr>
<td>Gambler’s Fallacy</td>
<td>Premature closure</td>
<td>Zebra retreat</td>
</tr>
</tbody>
</table>
HINDSIGHT

Those really were the droids you were looking for.
Affective biases

• Interpersonal conflict
• Stress and fatigue lead to irritability, intolerance, and other mood changes that influence judgment
• Temperament
• Activity level
• Motivation
• Diurnal phase in some individuals more than others
Improving clinical decision making?

- Raise awareness of importance of decision making
- Know operating characteristics of DPT model
- Educate and train intuition
- Promote reflective practice and timely feedback
- Teach the main cognitive biases
- Teach the main affective biases
Timely Feedback?
Improving clinical decision making

- Encourage informed toggling
- Promote use of cognitive aids
- Teach cognitive and affective forcing functions
- Raise awareness of conditions which may compromise decision making
Cognitive Forcing Strategies

First pants, THEN your shoes
Any questions?

"It sort of makes you stop and think, doesn’t it."