

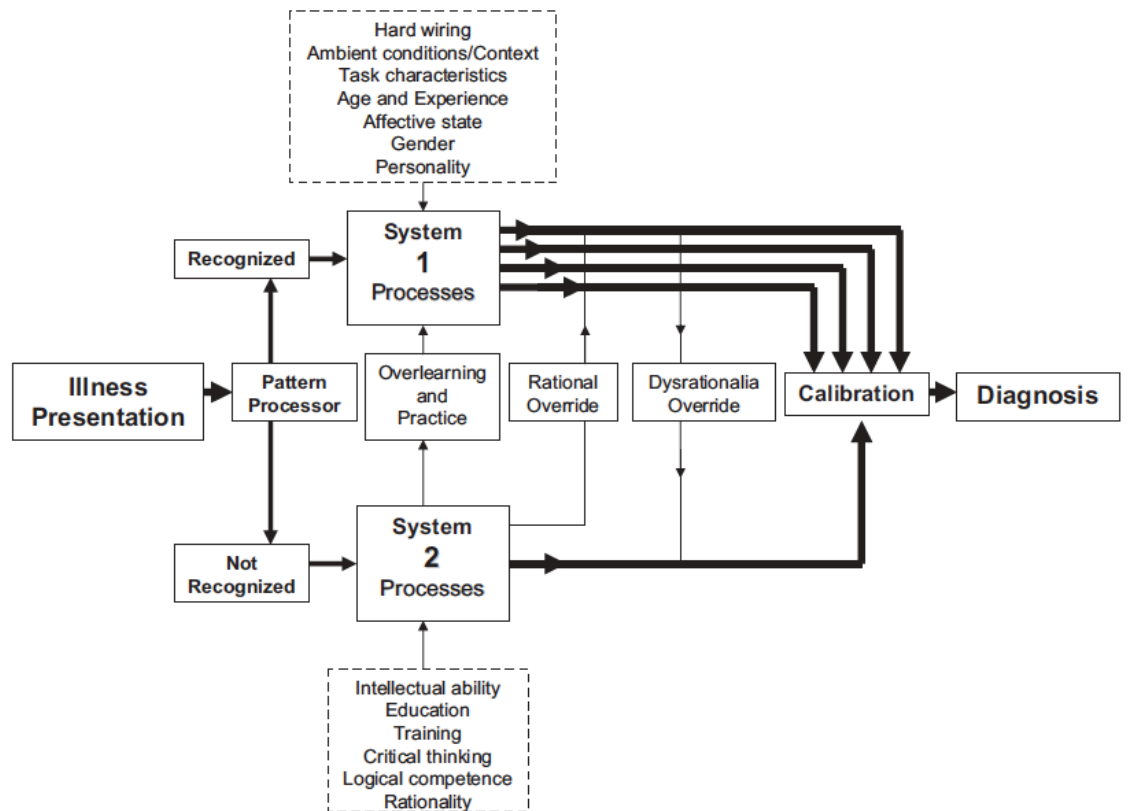
PRIMARY CARE INTERNAL MEDICINE  
Principles and Practice  
*Thinking about Clinical Problem Solving*  
October 22, 2015

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**Workshop Notes**

- Croskerry & Nimmo (2011):  
““How doctors think, reason and make clinical decisions is arguably their most critical skill.”
- Moore (2008): Sir Luke Fildes 1887 painting ‘The Doctor’.
- Montgomery (2006):  
“No matter how solid the science or how precise the technology that physicians use, clinical medicine remains an interpretive practice. Medicine’s success relies on the physicians’ capacity for clinical judgment.”
- Elstein AS. (2009) (Full references are listed below in next section.)  
“It would be good if physicians were as well acquainted with the relevant principles of cognitive psychology as they are with comparable principles in pathophysiology.”(Croskerry & Nimmo, p. 156.)
- Kahneman (2011), Gropman (2007) and Meagher (2011):  
important readings on the topic of thinking about thinking (metacognition).
- Croskerry & Nimmo (2011):  
“Diagnostic errors are frequent and underappreciated. Although the true overall prevalence is unknown, it is estimated to be in the order of 10–15%. ...it is somewhat surprising that [how doctors think, reason and make clinical decisions] is not explicitly addressed in most medical undergraduate curricula.”

- Bakwin (1945):  
 “The mistaken practices and attitudes that have been listed are not isolated phenomena. They are part and parcel of the practice of medicine today, resting on assumptions that permeate daily routines.”
- Croskerry (Acad Med, 2009) model of diagnostic thinking processes that span the intuitive to analytic. Figure 1, p. 1024:



- Drage (2009) Case of eruption post-antibiotic therapy.
- Croskerry (2013) Case of anxiety, depression and intermittent dyspnea.

- Croskerry & Nimmo (2011) Table 1/page 156:

**TABLE 1** Major characteristics of type 1 and type 2 decision-making processes

Characteristic	Type 1	Type 2
Reasoning style	<i>Intuitive</i> Heuristic Associative Concrete	<i>Analytical</i> Normative Deductive Abstract
Awareness	Low	High
Verbal behaviour	None to minimal	Yes
Prototypical	Yes	No, based on sets
Action	Reflexive, skilled	Deliberate, rule-based
Automaticity	High	Low
Speed	Fast	Slow
Channels	Multiple, parallel	Single, linear
Propensities	Causal	Statistical
Effort	Minimal	Considerable
Cost	Low	High
Vulnerability to bias	Yes	Less so
Reliability	Low, variable	High, consistent
Errors	Common	Few
Affective valence	Often	Rarely
Predictive power	Low	High
Hard-wired	May be	No
Scientific rigour	Low	High
Context	Specific	General
Context importance	High	Low

Adapted from Dawson,<sup>19</sup> Croskerry<sup>20</sup> and Evans.<sup>21</sup>

- Factors that influence System 1/Intuitive thinking:

**bias:** (Croskerry & Nimmo, 2001) gender, race, ethnicity, obesity, psychiatric illness, age, socioeconomic status, sexual orientation, substance abuse disorders, chronic and complex illness)

- Croskerry, Singhal, Mamede (2013):

“Numerous studies have shown that diagnostic failure depends upon a variety of factors. Psychological factors are fundamental in influencing the cognitive performance of the decision maker. In this first of two papers, we discuss the basics of reasoning and the Dual Process Theory (DPT) of decision making. The general properties of the DPT model, as it applies to diagnostic reasoning, are reviewed. A variety of cognitive and affective biases are known to compromise the decision-making process. They mostly appear to originate in the fast intuitive processes of Type 1 that dominate (or drive) decision making. Type 1 processes work well most of the time but they may open the door for biases. Removing or at least mitigating these biases would appear to be an important goal.”

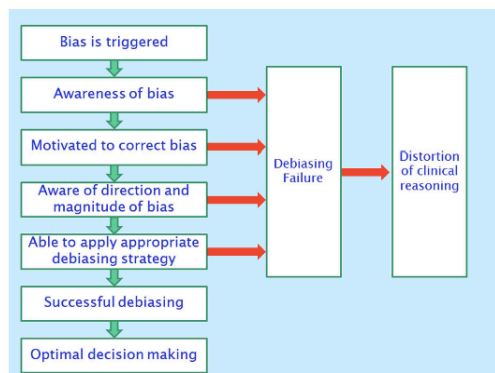
- Croskerry & Nimmo (2011) identifies de-biasing strategies for reducing diagnostic error as well as improving intuitive performance.

**Table 1** High-risk situations for biased reasoning

High-risk situation	Potential biases
1. Was this patient handed off to me from a previous shift?	Diagnosis momentum, framing
2. Was the diagnosis suggested to me by the patient, nurse or another physician?	Premature closure, framing bias
3. Did I just accept the first diagnosis that came to mind?	Anchoring, availability, search satisficing, premature closure
4. Did I consider other organ systems besides the obvious one?	Anchoring, search satisficing, premature closure
5. Is this a patient I don't like, or like too much, for some reason?	Affective bias
6. Have I been interrupted or distracted while evaluating this patient?	All biases
7. Am I feeling fatigued right now?	All biases
8. Did I sleep poorly last night?	All biases
9. Am I cognitively overloaded or overextended right now?	All biases
10. Am I stereotyping this patient?	Representative bias, affective bias, anchoring, fundamental attribution error, psych out error
11. Have I effectively ruled out must-not-miss diagnoses?	Overconfidence, anchoring, confirmation bias

Adapted from Graber.<sup>34</sup> General checklist for AHRQ project. A description of specific biases can be found in Croskerry.<sup>7</sup>

- Croskerry P, Singhal G, Mamede S. (2013):



**Figure 3** Successive steps in cognitive debiasing (adapted from Wilson and Brekke).<sup>35</sup> Green arrows=yes; Red arrows=no

- *“Mindfulness means paying attention in a particular way; (On purpose, in the present moment, and nonjudgmentally.)”*

Jon Kabat-Zinn

**context:** Montgomery (2006):

“Diagnosis and treatment choice...are not simply matters of logic or a patient preference exercised in the moment but a more contextual consideration intertwined with history, identity, culture, and the meaning of an individual’s life.”  
Montgomery, p. 49

(Croskerry (2009):

“One of the major constraints on decision-making is context...”

**emotion:** McConnell & Eva (2012):

“The authors found articles that show that emotion influences various cognitive processes that are involved in the acquisition and transfer of knowledge and skills. More specifically, emotion influences how individuals identify and perceive information, how they interpret it, and how they act on the information available in learning and practice situations.

- Croskerry (2005):
  - “Physicians and caregivers are just as vulnerable to mood alterations as anyone else, yet the impact of affective state on decision making has gained little attention to date.
  - The full range of affective disorders would be expected, as would various emotional dysregulatory influences that might uniquely affect a caregiving role.
  - These various influences may be collectively referred to as affective dispositions to respond (ADRs).”

**heuristics.** Wikipedia:

“...any approach to problem solving, learning, or discovery that employs a practical methodology not guaranteed to be optimal or perfect, but sufficient for the immediate goals.

...mental shortcuts that ease the cognitive load of making a decision. [a rule of thumb, an educated guess, an intuitive judgment, common sense...]”

- Samuels (2010):
  - “Physicians use heuristics or shortcuts in their decision making to help them sort through complex clinical information and formulate diagnoses efficiently.”

- Table from Redelmeier (2005):

*Table. Selected Pitfalls Leading to Missed Diagnoses and Corrective Strategies*

Circumstance and Pitfall	Classic Definition	Corrective Strategies	Clinical Maxims
Availability heuristic	Judging by ease of recalling past cases	Verify with legitimate statistics	Pay attention to base rates: "If you hear hoof beats, think about horses not zebras."
Anchoring heuristic	Relying on initial impressions	Reconsider in light of new data or second opinion	Think beyond the most favored: "If the patient dies unexpectedly, what would it be from?"
Framing effects	Being swayed by subtle wording	Examine case from alternative perspectives	Deliberately consider from another angle: "Let's play devil's advocate . . ."
Blind obedience	Showing undue deference to authority or technology	Reconsider when authority is more remote	Tactfully reconfirm human work (in case of human authority); assess test accuracy (in case of technology)
Premature closure	Espousing narrow-minded belief in single idea	Return to case when refreshed (if clinical pace allows)	Give consideration to extremes: "What's the diagnosis that I don't want to miss?"

- Schiff & Bates (2010):

Leveraging Electronic Clinical Documentation to Decrease Diagnostic Error Rates.	
Role for Electronic Documentation	Goals and Features of Redesigned Systems
Providing access to information	Ensure ease, speed, and selectivity of information searches; aid cognition through aggregation, trending, contextual relevance, and minimizing of superfluous data.
Recording and sharing assessments	Provide a space for recording thoughtful, succinct assessments, differential diagnoses, contingencies, and unanswered questions; facilitate sharing and review of assessments by both patient and other clinicians.
Maintaining dynamic patient history	Carry forward information for recall, avoiding repetitive patient querying and recording while minimizing copying and pasting.
Maintaining problem lists	Ensure that problem lists are integrated into workflow to allow for continuous updating.
Tracking medications	Record medications patient is actually taking, patient responses to medications, and adverse effects to avert misdiagnoses and ensure timely recognition of medication problems.
Tracking tests	Integrate management of diagnostic test results into note workflow to facilitate review, assessment, and responsive action as well as documentation of these steps.
Ensuring coordination and continuity	Aggregate and integrate data from all care episodes and fragmented encounters to permit thoughtful synthesis.
Enabling follow-up	Facilitate patient education about potential red-flag symptoms; track follow-up.
Providing feedback	Automatically provide feedback to clinicians upstream, facilitating learning from outcomes of diagnostic decisions.
Providing prompts	Provide checklists to minimize reliance on memory and directed questioning to aid in diagnostic thoroughness and problem solving.
Providing placeholder for resumption of work	Delineate clearly in the record where clinician should resume work after interruption, preventing lapses in data collection and thought process.
Calculating Bayesian probabilities	Embed calculator into notes to reduce errors and minimize biases in subjective estimation of diagnostic probabilities.
Providing access to information sources	Provide instant access to knowledge resources through context-specific "infobuttons" triggered by keywords in notes that link user to relevant textbooks and guidelines.
Offering second opinion or consultation	Integrate immediate online or telephone access to consultants to answer questions related to referral triage, testing strategies, or definitive diagnostic assessments.
Increasing efficiency	More thoughtful design, workflow integration, and distribution of documentation burden could speed up charting, freeing time for communication and cognition.

- John Murtagh (2011/General Practice 5<sup>th</sup> edition) and his template for diagnostic thinking: **a key strategy**

**What is the most probable diagnosis?**

**What serious disorders must not be missed?**

**What conditions are often missed (pitfalls)?**

**What else can look like this (mimics)?**

**Is this patient trying to tell me something else?**

- Cases discussed
- Summation: Croskerry (2013):  
 “Becoming alert to the influence of bias requires maintaining keen vigilance and mindfulness of one’s own thinking. When a bias is identified by a decision maker, a deliberate decoupling from the intuitive mode is required so that corrective “mindware” can be engaged from the analytic mode.”
- Graber, Kissam, Payne, Meyer (2012):  
 “In conclusion, there is a surprisingly wide range of possible approaches to reducing the cognitive contributions to diagnostic error. Not all the suggestions have been tested, and of those that have, the evaluations typically involved trainees in artificial settings, making it difficult to extrapolate the results to actual practice.”
- *“Mindfulness means paying attention in a particular way;  
 On purpose,  
 in the present moment,  
 and nonjudgmentally.”*  
 Jon Kabat-Zinn
- The Critical Thinking Community: <http://www.criticalthinking.org/>
- Murtagh, redux.

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A very thoughtful paper filled with wisdom and insight about clinical teaching.

Brown P, Roediger H, McDaniel M. *make it stick, The Science of Successful Learning*. The Belknap Press of Harvard University, 2014.

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This paper from the UK reminds us that, “The most challenging aspect of triage, which GPs confront on a regular basis, is diagnosing rare but serious disease.”



The following papers of Pat Croskerry, MD, PhD are part of his extraordinary contributions to our current understanding of thinking about thinking (metacognition). Their richness comes in part from his earlier career as an experimental psychologist and now as Professor of Emergency Medicine at Dalhousie University, Halifax, Nova Scotia, Canada:

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Daniel Kahneman is Professor of Psychology and Public Affairs Emeritus at the Woodrow Wilson School, the Eugene Higgins Professor of Psychology Emeritus at Princeton University, and a fellow of the Center for Rationality at the Hebrew University in Jerusalem. He was awarded the Nobel Prize in Economic Sciences in 2002.

McConnell M, Eva K. *The Role of Emotion in the Learning and Transfer of Clinical Skills and Knowledge*. Academic Medicine, Vol. 87, No. 10 / October 2012.

“The authors found articles that show that emotion influences various cognitive processes that are involved in the acquisition and transfer of knowledge and skills. More specifically, emotion influences how individuals identify and perceive information, how they interpret it, and how they act on the information available in learning and practice situations.”

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“Case 12” Ball/bat/lilly pads

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PRIMARY CARE INTERNAL MEDICINE  
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*Thinking about Clinical Problem Solving*  
October 22, 2015  
C. Hatem

Cases: First Thoughts

1. 35 year-old man with abdominal pain: \_\_\_\_\_
2. 43 year-old woman with persistent cough: \_\_\_\_\_
3. 58 year-old man with bilateral leg erythema: \_\_\_\_\_
4. 23 year-old woman with multiple complaints: \_\_\_\_\_
5. 28 year-old woman with severe headache: \_\_\_\_\_
6. 56 year-old woman with severe fatigue: \_\_\_\_\_
7. 23 year-old man with arm pain & erythema: \_\_\_\_\_
8. 10 year-old boy and his past history: \_\_\_\_\_
9. 21 year-old man with fever and rash: \_\_\_\_\_
10. 65 year-old man with headache and diplopia: \_\_\_\_\_
11. 50 year-old man with chest pain: \_\_\_\_\_
12. Two problems:
  - a. Ball and bat \_\_\_\_\_
  - b. Lilly pads \_\_\_\_\_

## Cases Redux:

1. 35 year-old man with abdominal pain: \_\_\_\_\_
2. 43 year-old woman with persistent cough: \_\_\_\_\_
3. 58 year-old man with bilateral leg erythema: \_\_\_\_\_
4. 23 year-old woman with multiple complaints: \_\_\_\_\_
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9. 21 year-old man with fever and rash: \_\_\_\_\_
10. 65 year-old man with headache and diplopia: \_\_\_\_\_
11. 50 year-old man with chest pain: \_\_\_\_\_
12. Two problems:
  - a. Ball and bat \_\_\_\_\_
  - b. Lilly pads \_\_\_\_\_