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Seeing The Wood From The Trees

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Seeing The Wood From The Trees

An Introduction to Teaching and Learning Clinical Reasoning Skills

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Objectives

- 1. Define clinical reasoning and explain why it is important in medical education
- 2. Describe the theoretical models of clinical reasoning
- 3. Reflect on clinical reasoning in your own clinical practice
- 4. Apply the theoretical models to common teaching techniques
- 5. Develop teaching and learning of clinical reasoning skills in your learning environment

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Introductions

Objectives

- **1. Define clinical reasoning and explain why it is important in medical education**

What is Clinical Reasoning?

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"Thinking and decision making associated with clinical practice"

Higgs & Jones, 2008

What is Clinical Reasoning?

"Thinking and decision making associated with clinical practice"

Higgs & Jones, 2008

What is Clinical Reasoning?

"The process of attempting to structure meaning from a mass of confusing data and experiences occurring within a specific clinical context and then making decisions based on this understanding"

Can you give examples where/when you engage in clinical reasoning in your day-to-day practice?

Discourses

- Reasoning as a Skill

"Charge nurse thinks it would be better if the lady with jaundice and hepatomegaly went to the last gastro bed in the hospital"

- Reasoning as a Process

"Lets think logically about what diagnosis is most likely here"

- Reasoning as Purpose Orientated

"Can you come and assess this patient with shortness of breath?"

- Reasoning as an Outcome

"I think the reason your short of breath is you have pneumonia"

- Contextualized Reasoning

"The man with the pneumonia seems critically unwell, I think I had best phone ITU"

Young et al (2016)

Diagnostic Reasoning

- **Reasoning as a Process**

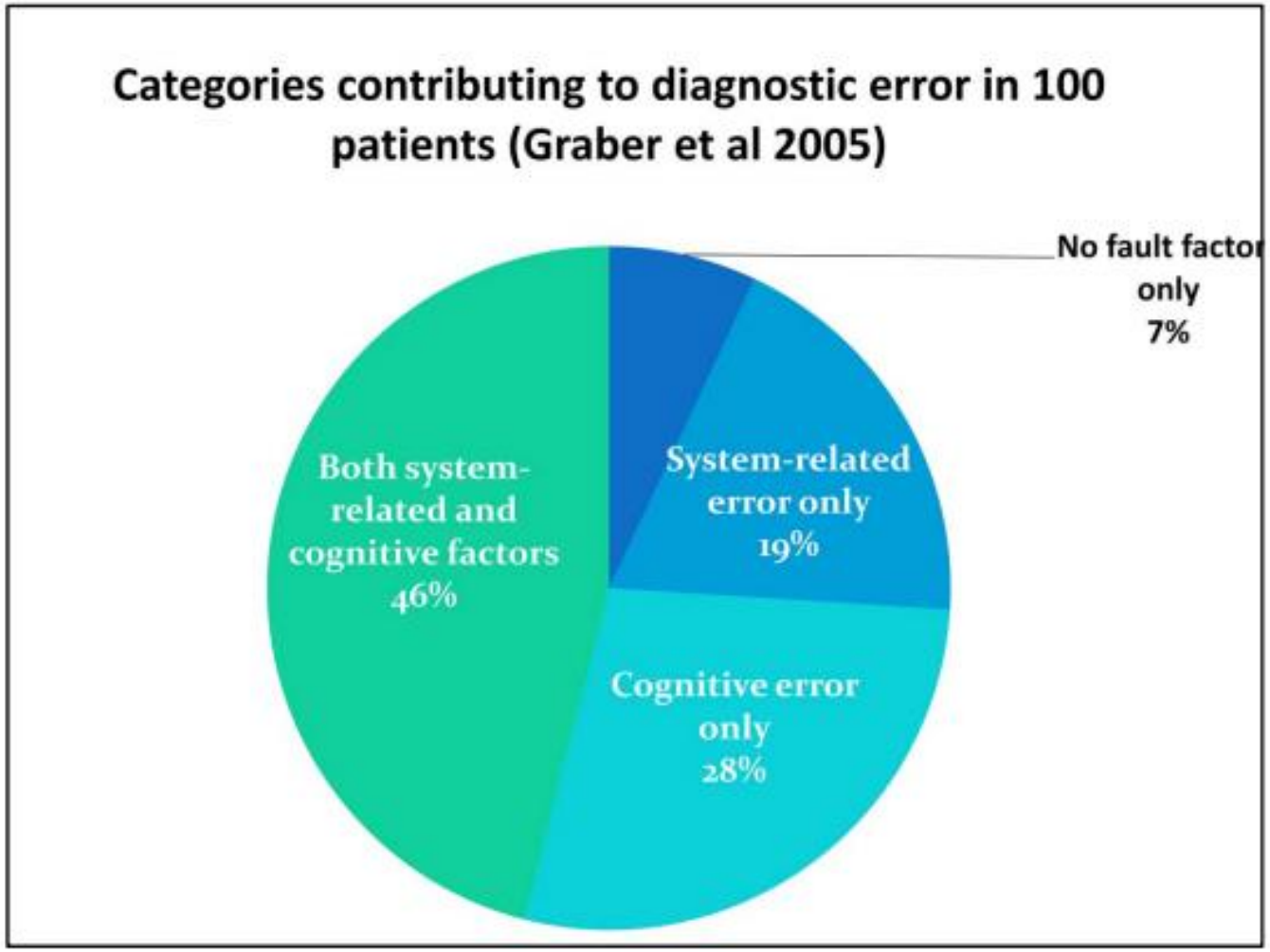
"Lets think logically about what diagnosis is most likely here"

Young et al (2016)

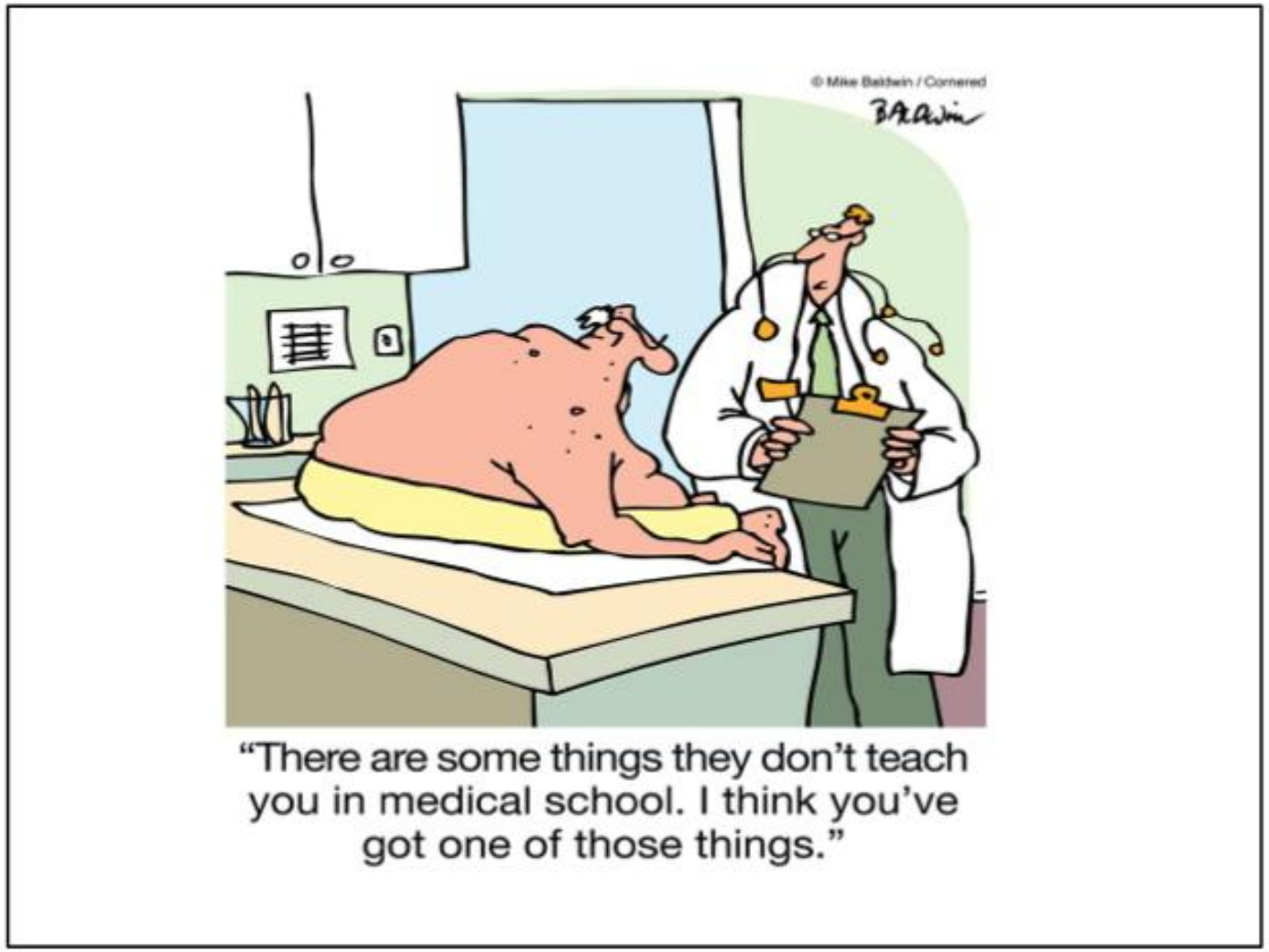
What is Diagnostic Reasoning Important?

Why is Diagnostic Reasoning Important?

- Diagnostic errors are common and result in substantial patient morbidity and mortality.
- It helps us understand how we think during the diagnostic process.
- If we understand the process then it makes it easier to remediate diagnostic error and teach it well to limit the harm incurred.


Categories contributing to diagnostic error in 100 patients (Graber et al 2005)
No fault factor only 7%
System-related error only 19%
Cognitive error only 28%
Both system-related and cognitive factors 46%

Can you give examples where/when diagnostic error was caused by cognitive failure rather than systems failure?


© Mike Baldwin / Cornered
"There are some things they don't teach you in medical school. I think you've got one of those things."

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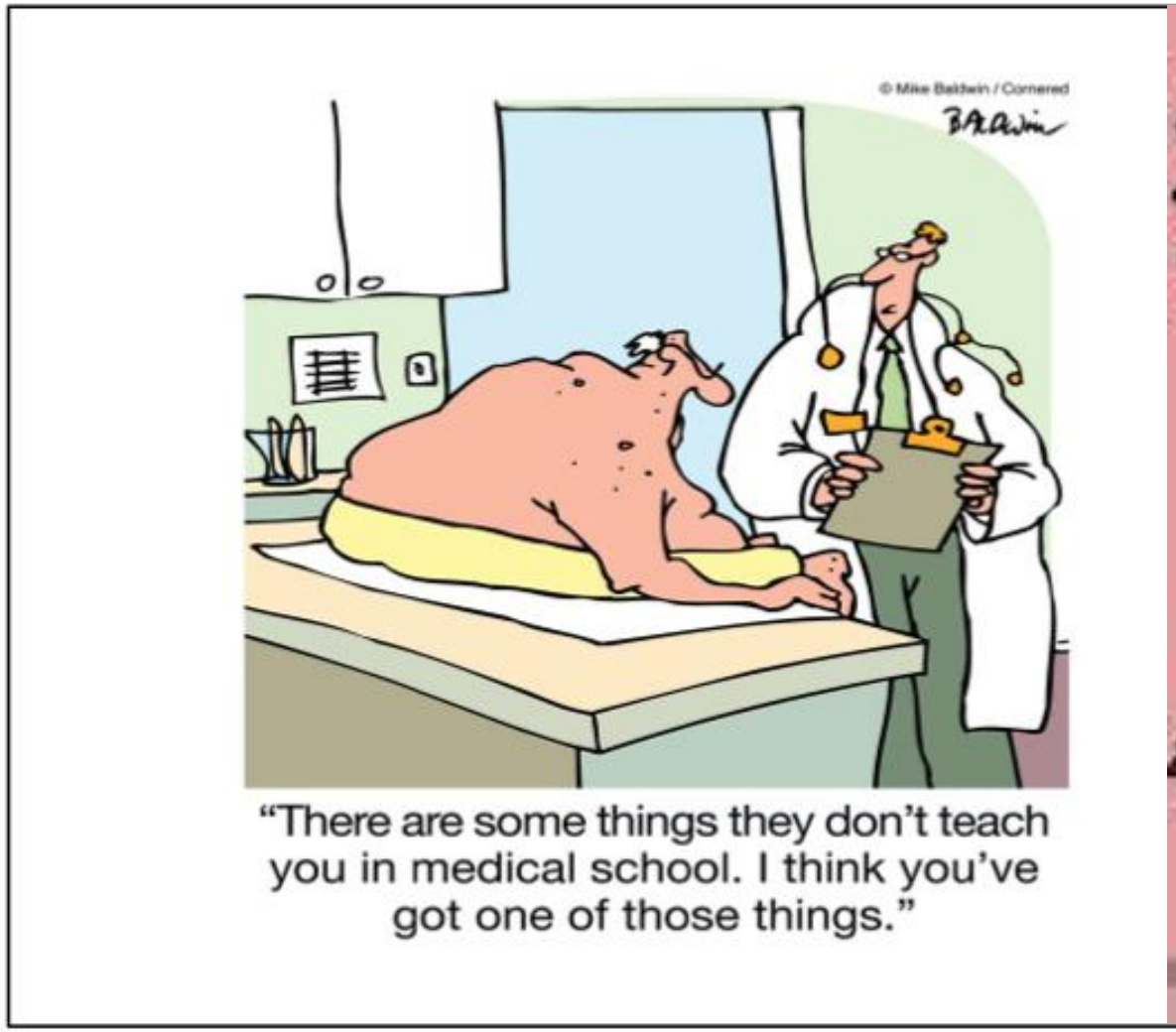

"Impaired vision, bloated abdomen, cold hands...they could be symptoms of a severe peanut allergy."

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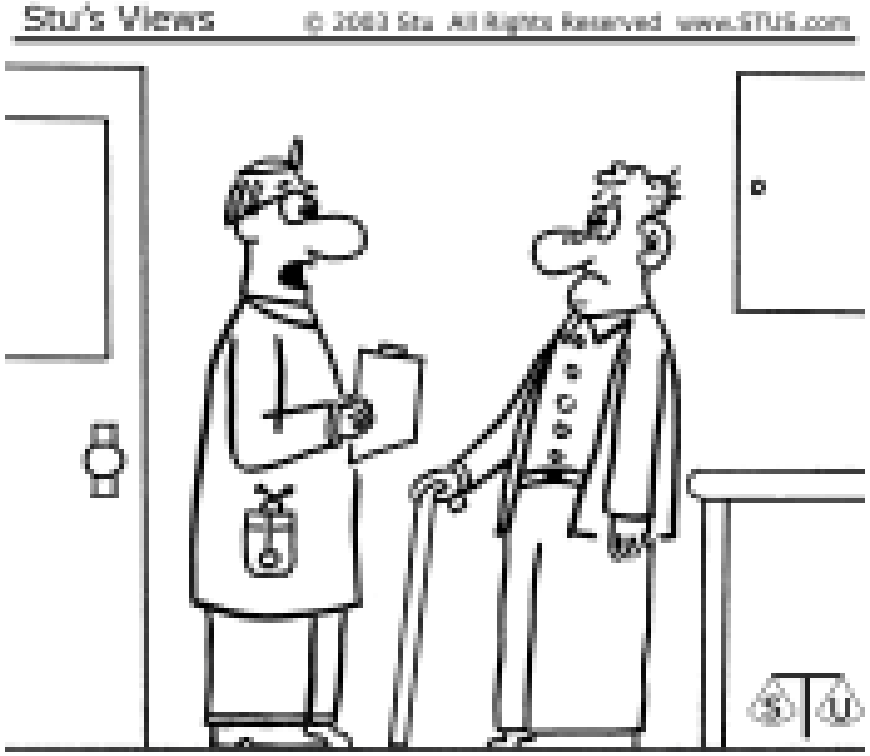
"Impaired vision, bloated abdomen, cold hands...they could be symptoms of a severe peanut allergy."



"I'm stumped.
We'll have to wait for
the autopsy."

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- **2. Describe the theoretical models of clinical reasoning**

Models of Clinical Reasoning

- **Dual-Process Theory**
  - Script Theory
  - Cognitive load theory
  - Hypothetico-deductive reasoning

Dual-Process Theory

Croskerry, 2009

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“Mini-Quiz”

Take a piece of paper, take 8 seconds and write down your answers to each of these three questions…

A bat and a ball cost £1.10 in total. The bat cost £1.00 more than the ball. How much does the ball cost?

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?

Now we'll go back and you can check your answers…

Write down if you think your original answer is correct?

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

A bat and a ball cost £1.10 in total. The bat cost £1.00 more than the ball. How much does the ball cost?

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:

1. 5 pence
2. 5 minutes
3. 47 days

Dual Process Theory

- Two types of ‘minds’ or ‘thinking’:
  - **Type 1**: Fast, **Intuitive** Thinking
  - **Type 2**: Slow, **Analytical** Thinking

Intuitive	Analytical
Experiential-inductive	Hypothetico-deductive
Bounded rationality	Unbounded rationality
Heuristic	Normative reasoning
Gestalt/pattern recognition	Robust decision-making
Modular responsivity	Critical, logical thought
Recognition-primed	Multiple branching
Unconscious thinking	Deliberate, purposeful

From Croskerry (2009) Academic Medicine 84:1022-1028.

Cognitive feature	Intuitive/heuristic	Analytical/systematic
Capacity	High	Limited
Automaticity	High	Low
Rate	Fast	Slow
Effort	Lower	Higher

After Croskerry (2009) Academic Medicine 84:1022-1028.

Cognitive feature	Intuitive/heuristic	Analytical/systematic
Capacity	High	Limited
Automaticity	High	Low
Rate	Fast	Slow
Effort	Lower	Higher
Cognitive awareness	Low	High
Reliability	Lower	Higher
Errors	More	Fewer
Scientific rigor	Lower	Higher
Users	Experts	Experts & Novices

After Croskerry (2009) Academic Medicine 84:1022-1028.

How can experienced clinicians spend so much time in Type 1 thinking?

Script Theory

Schank & Abelson, 1977

Script Theory

- Proposes model of how we store and retrieve specialist information

- In medical context implies knowledge is stored into illness ‘scripts’ linking clinical and pathophysiologic information to broad categories regarding:
  - Broad Diagnostic Categories (e.g Rheumatological Disease)
  - Specific Diseases (Rheumatoid Arthritis)
  - Individual Patients (Mrs Jones)

- Experts have highly organized knowledge and a large library of ‘scripts’.

Illness Scripts

- Ask and answer **3 questions** to orgranise knowledge about disease into Ilness Scripts

1. Who gets it: epidemiology and risk factors

2. How it present with respect to time: temporal pattern (ie. Onset, duration, constant/intermittent, and pattern of progression).

3. How is presents with respect to key features: symptoms and physical examination findings

Table 5-3. Example of Compare-and-Contrast Grid for Diseases Causing Polyarthritis

Disease	Who Gets It (Epidemiology and Risk Factors)	How It Presents With Respect to Time	Clinical Manifestations on Presentation
Rheumatoid arthritis	Women (younger or older ages); men (older) Ratio of women to men, 2–3:1 Most present between ages 40 and 75 y	Typically gradual onset, insidious and chronic (years, at least >6 weeks)	Inflammation of joints (red, warm, swollen, painful) Involvement of small joints of hands and feet; sometimes involves larger joints (wrists, knees, shoulders, cervical spine), but *not* lumbar or thoracic spine Morning stiffness (>30–60 min to resume full activity after prolonged rest) Extra-articular manifestations uncommon at presentation Exam with synovitis, later joint deformation with subluxation
Systemic lupus erythematosus	Typically women, ages 20–45 y Risk factors include African American ethnicity and countries with indigenous African population, family history,	Can present acutely or more insidiously; can be persistent and progressive or intermittent with flares	Migratory, symmetric joint pain and swelling with mild inflammatory changes (tender, swollen PIP) Extra-articular manifestations common (malar rash, mucocutaneous ulcers, alopecia, fatigue, fever, cardiopulmonary or renal involvement) Exam without joint deformity
Osteoarthritis	Common, especially if age >60 y; affects most people to some extent by age 70 y Risk factors are obesity, trauma, and overuse (sports or work-related) Ratio men: women, 1:1, equally; men may develop earlier	Chronic, progressive; can have acute flares	Typically not inflammatory Pain worse with movement or activity, improved by rest and simple analgesics "Gel effect": short-term stiffness after short periods of inactivity Reduced range of movement on examination Joint deformation with bony changes

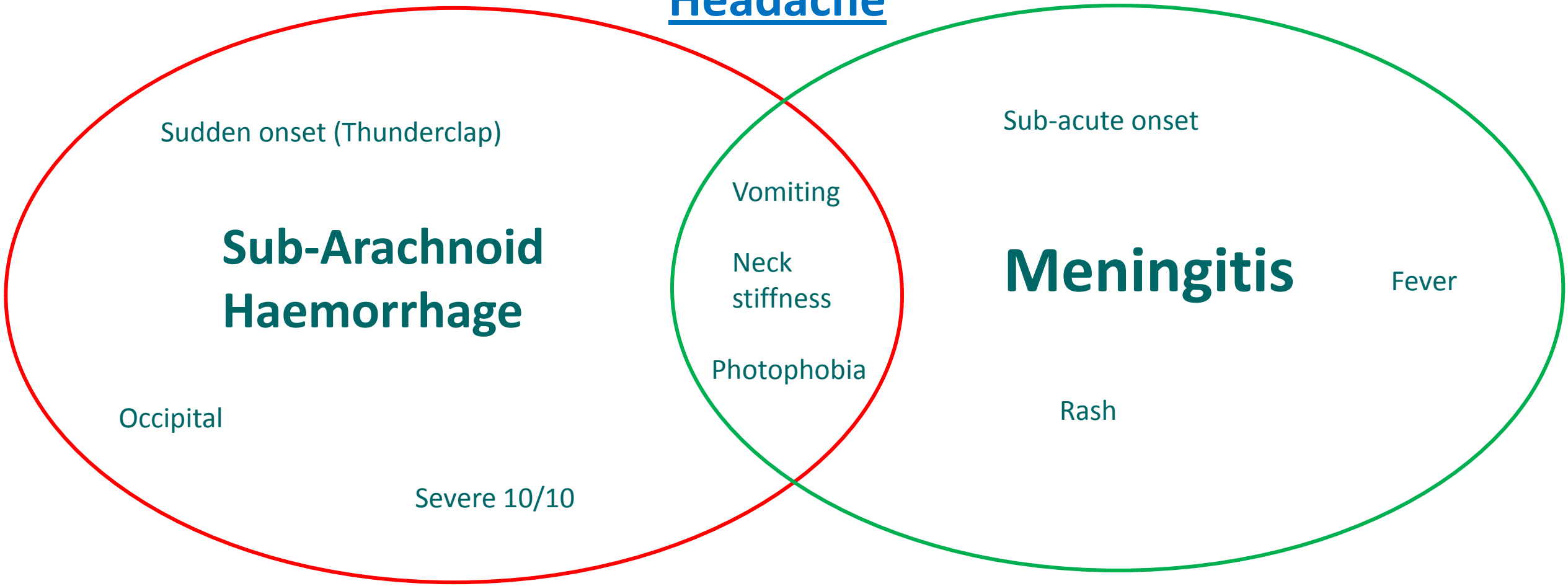
PIP = proximal interphalangeal joint.

Trowbridge, Rencic and Durning, 2015

A 30 year woman presents with a headache, what features predict meningitis?

Comparing and Contrasting Illness Scripts

Headache



Cognitive Load Theory

Schank & Abelson, 1977

Cognitive Load Theory

Another information processing theory that focusing on limited human cognitive architecture.

- *Short term working memory can only process so pieces of information at one time*
- *Depending on the field this will vary between 4+/-2 or 7+/-2*
- *Explains why PINs, Passcodes and Telephone numbers are 4-7 digits long*
- *While RAM is limited LTWM is potentially endless*

How can clinicians engage in Type 2 thinking?

Hypothetico-deductive Reasoning

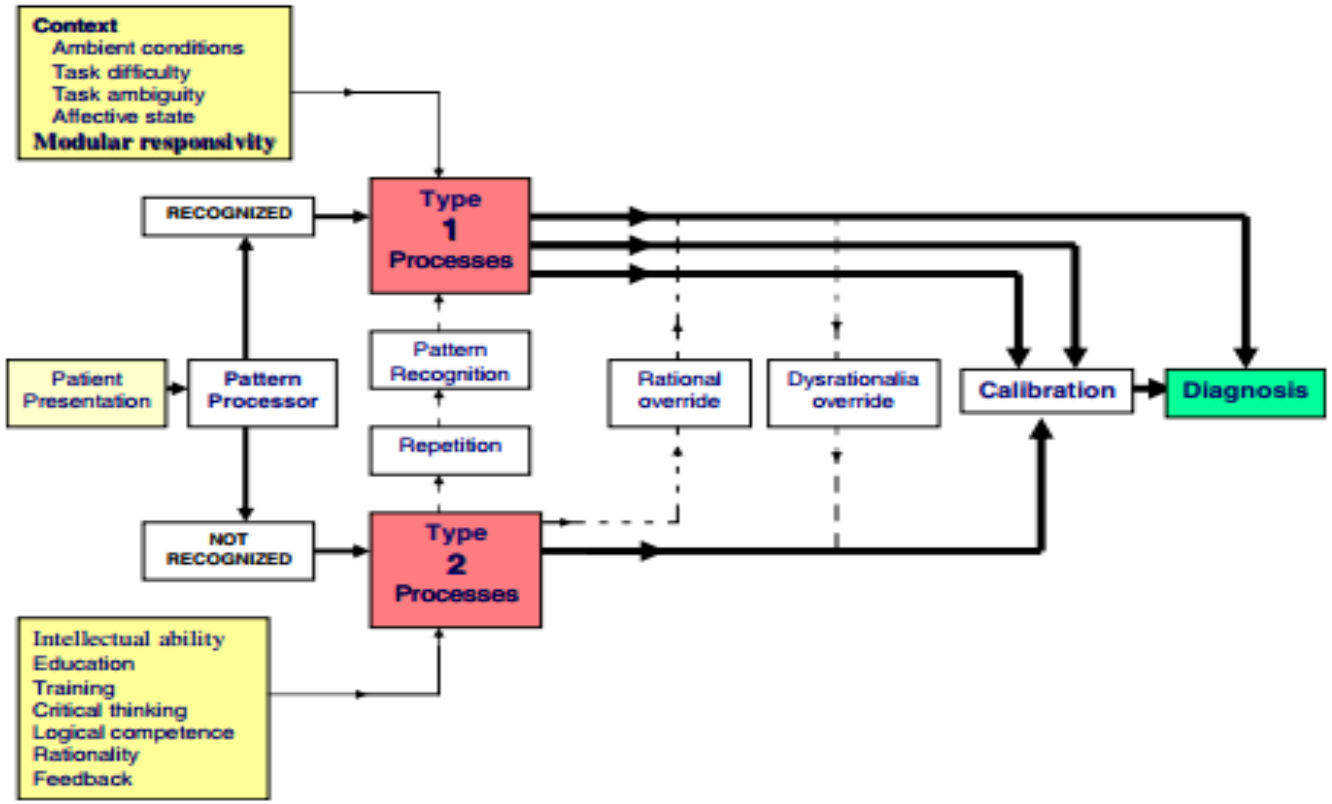
Clinicians generate hypotheses and arguments are made based on patients' complaints.

- *Premise 1: In Disease A, Finding B Occurs*
- *Premise 2: Finding B is absent*
- *Conclusion: Disease A is not this diagnosis.*

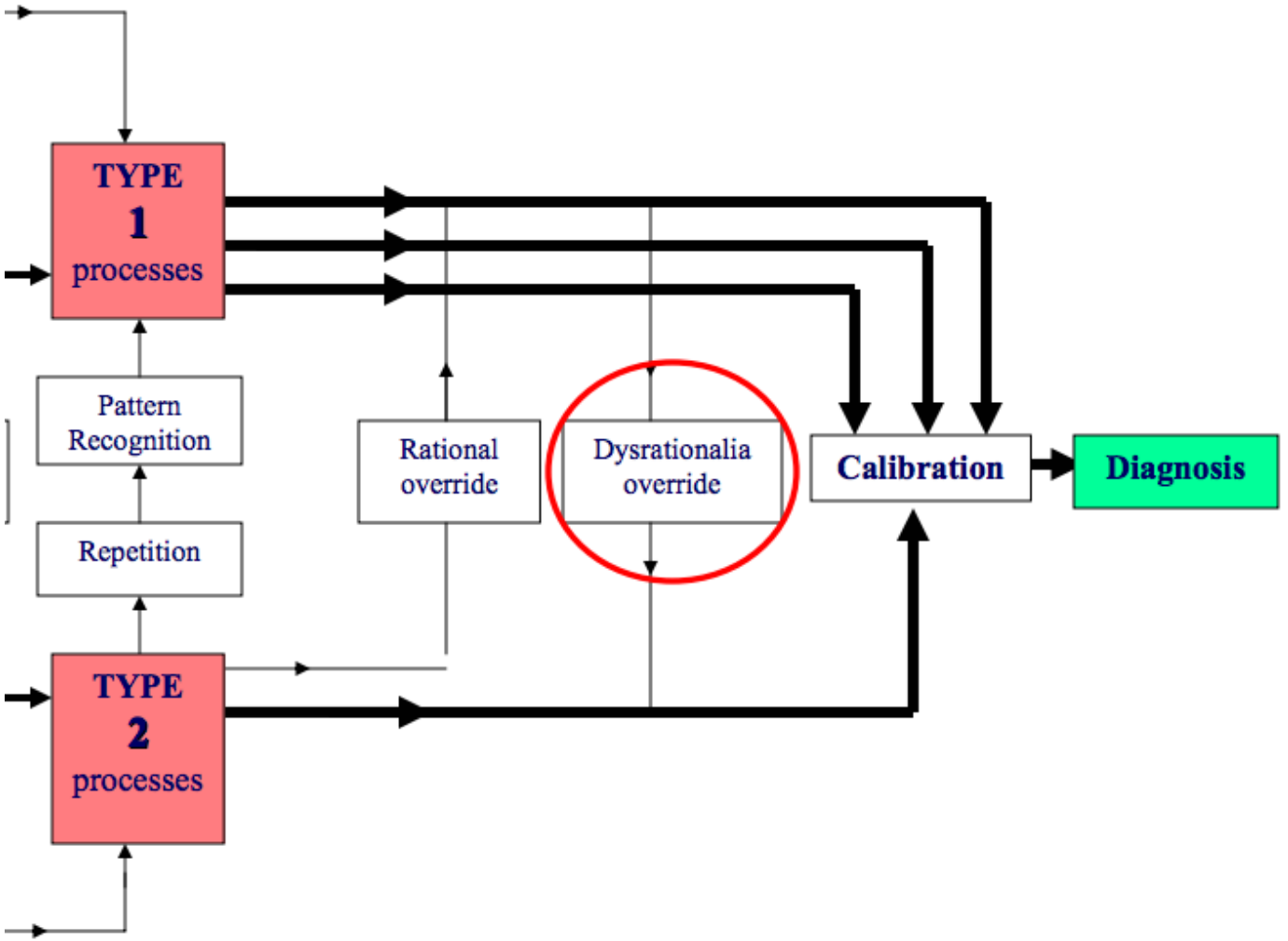
Often can only rule out some hypotheses, and cannot ensure every diagnosis considered.

If original hypotheses and subsequent deductions are flawed can reach inaccurate conclusions

Dual Process Theory



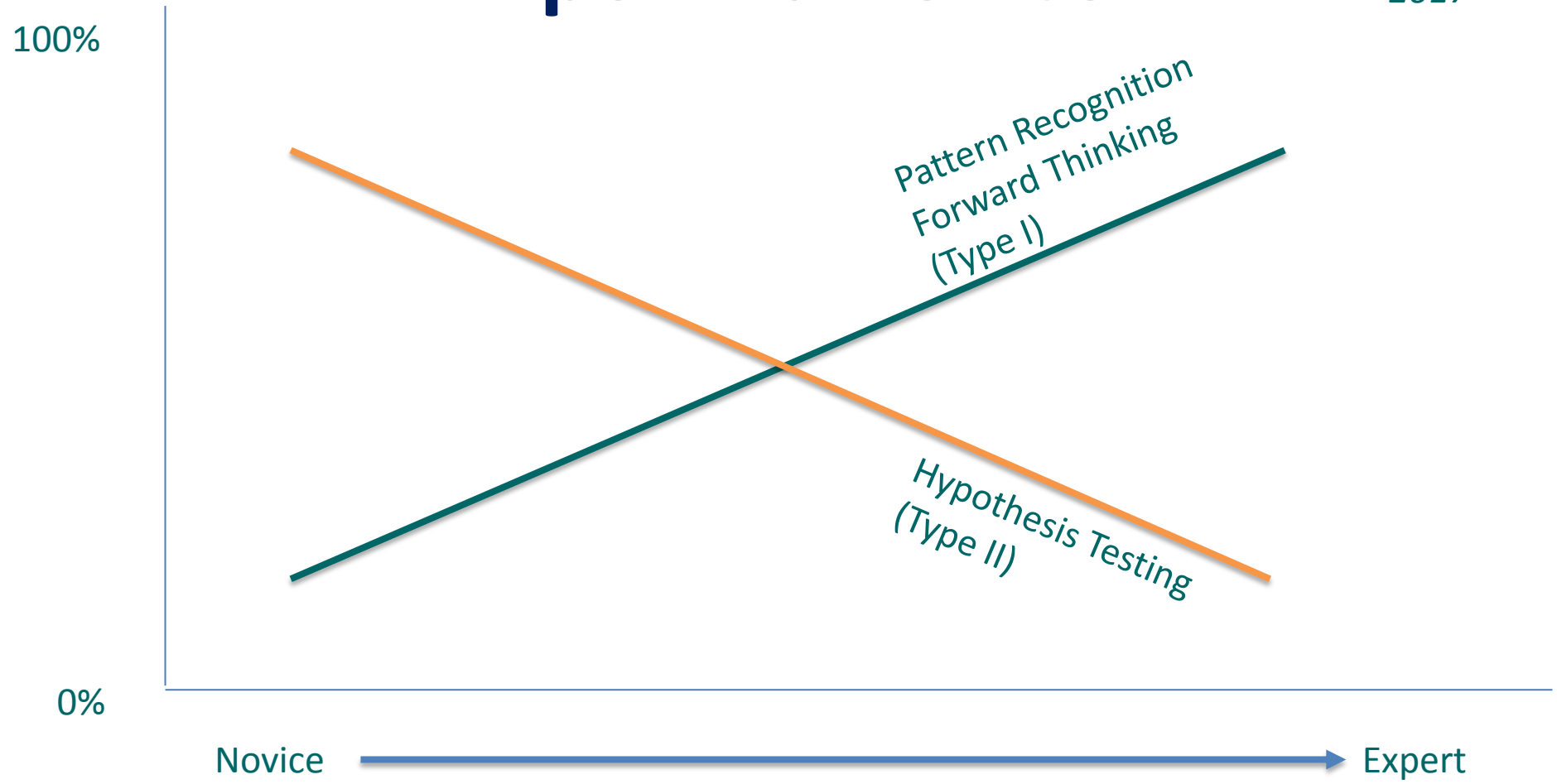
Croskerry, 2009



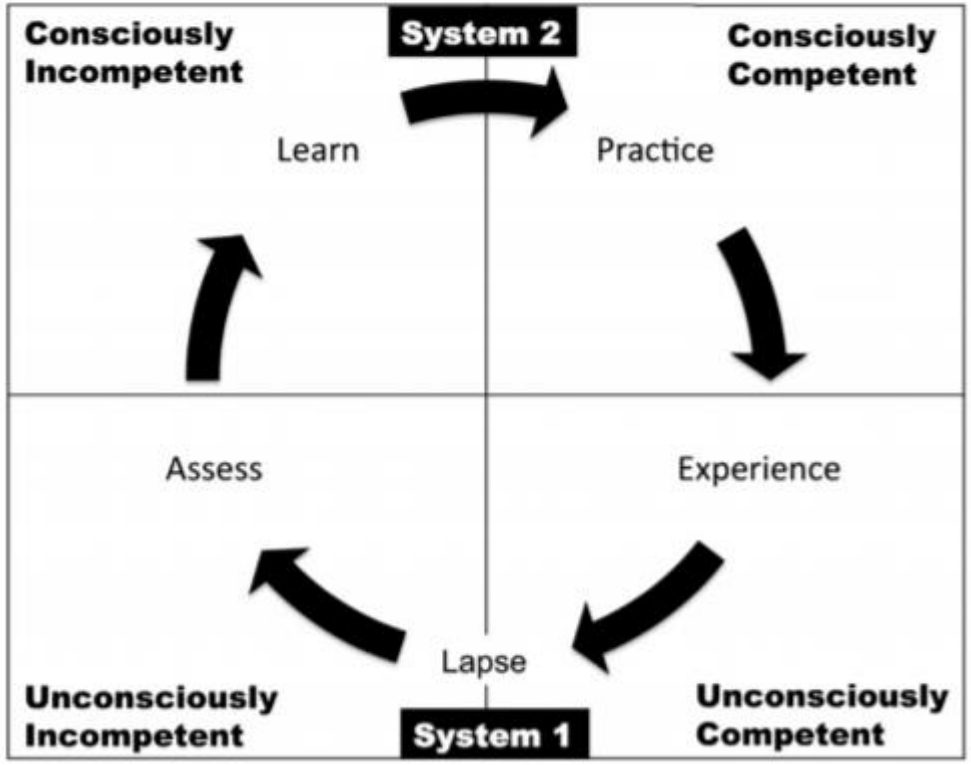
Croskerry, 2009

Expert vs Novice

Cooper, Da Silva & Powell, 2017



Dual-Process Theory and Conscious-Competence Model



Appears in (Cutrer et al, 2013), Adapted from NPC, 2011

The mark of a well calibrated thinker is the ability to recognise what mode of thinking you are in and to anticipate and recognise situations in which cognitive biases and errors are more likely to occur…

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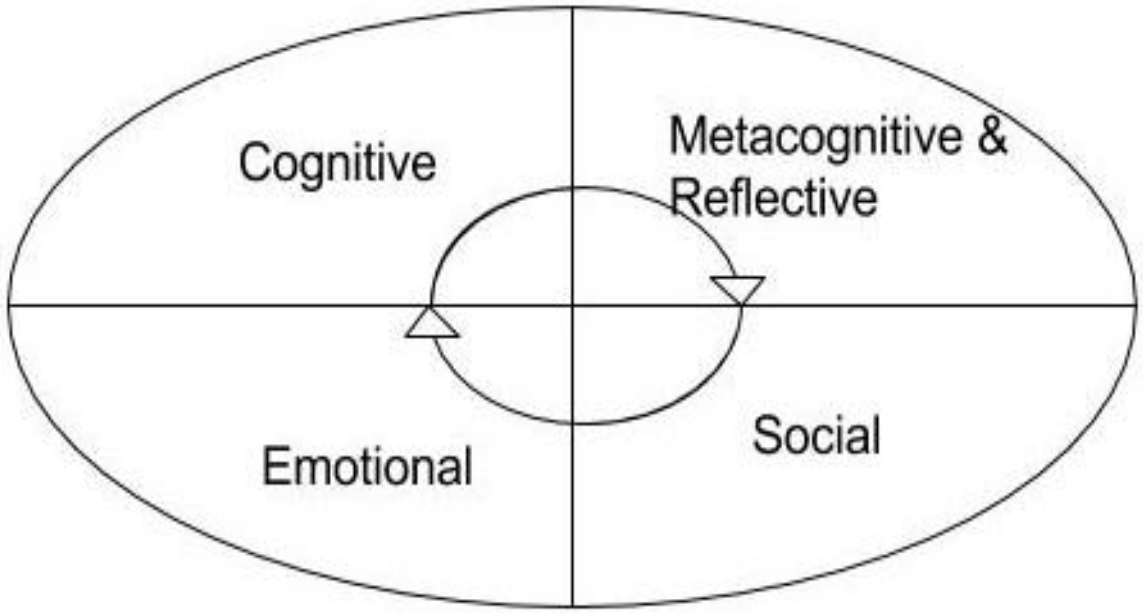
Influences on Clinical Reasoning



Smith, Higgs & Ellis, 2007

Select one of the situations involving clinical reasoning from earlier.

Discuss what factors might influence the clinical reasoning process in practice.

Teaching Clinical Reasoning

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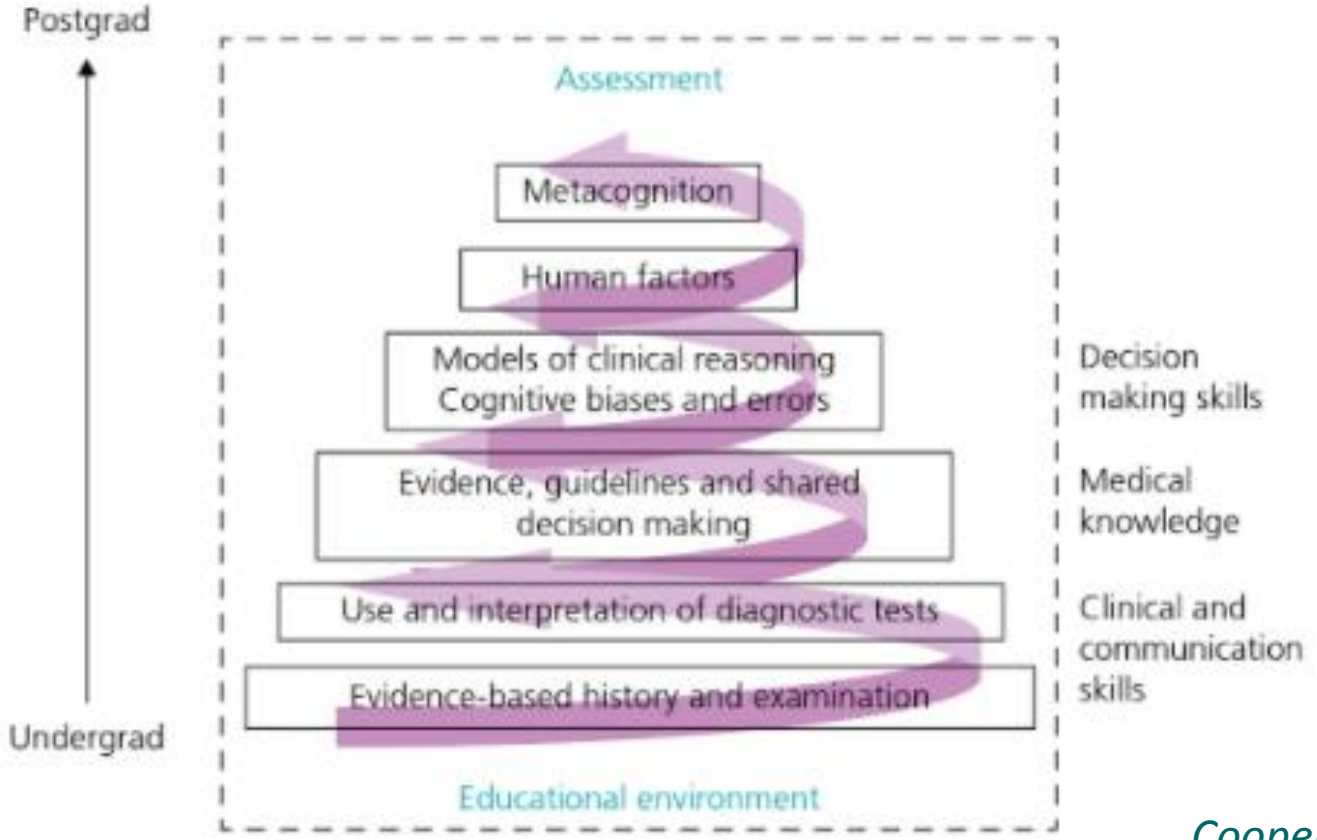
Teaching Clinical Reasoning



Cooper, Da Silva & Powell, 2017

SNAPPS

- **S**ummarise
- **N**arrow your findings to 2-3 differentials
- **A**nalyse your findings based on what makes your diagnoses more or less likely
- **P**robe for any uncertainties
- **P**lan management
- **S**elect case related incident for self study

Wolpaw, Wolpaw & Papp, 2003

One-Minute Preceptor

- Get Learner to commit to what they think is going on
- Probe for supporting evidence
- Teach one or two general principles
- Reinforce what was done well
- Correct one or two errors in reasoning

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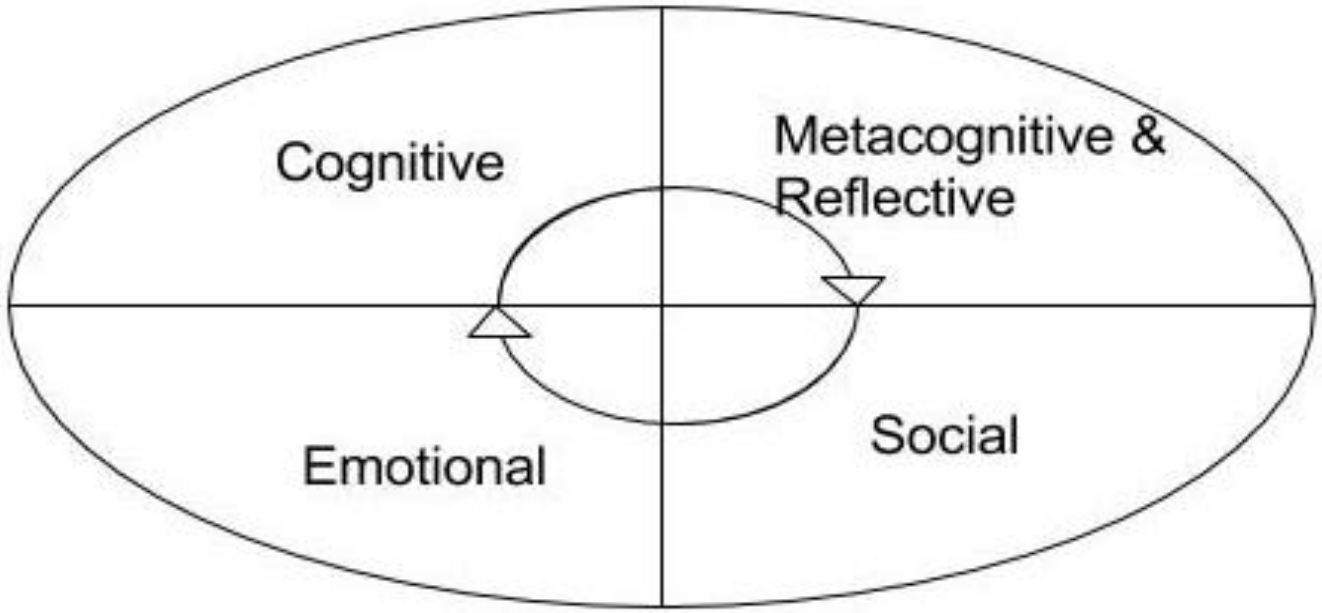
“Live Action Simulation”

What factors impacted on the student's ability to reason in the first example?



Pitfalls in Clinical Reasoning

- Inadequate Knowledge (*Don't know the scripts*)
- Faulty Data Gathering (*No working hypothesis*)
- Data Processing (*Difficulty analysing findings*)
- Metacognition (*Difficulty regulating own thinking*)

Adapted from Cutrer, 2013

Improving Knowledge

- Scaffolding –

  Actively comparing and contrasting similar scripts to widen knowledge base whilst teaching

- Teaching from Presentation to Diagnosis – 'Managing Shortness of Breath' vs 'An Overview of Respiratory Medicine'

Data-Gathering

- Direct Observation of Data Gathering Skills

- Hypothesis-Driven History and Examination

Improving Data Processing

- RIME Framework – Reporter, Interpreter, Manager, Educator
- Using Semantic Qualifiers
- SNAPPS
- One-Minute Preceptor

Semantic Qualifiers

- A 74yrs male with sudden onset, right arm and leg weakness and speech disturbance. He has a PMHx of PVD and IHD. He normally smokes 20 cigarettes a day.

Semantic Qualifiers

- A 74yrs male with sudden onset, right arm and leg weakness and speech disturbance. He has a PMHx of PVD and IHD. He normally smokes 20 cigarettes a day.

Epidemiology: Elderly, Vasculopath, Smoker

Temporal Patterns: Acute

Clinical Features: Hemiplegia and Dysarthria

Reflection-Metacognition

- Diagnostic Timeout
- Awareness of Identification of Cognitive Bias
- Reflective Practice – ‘Stop and Think’ Framework
- Simulation

Diagnostic Timeout

Take a moment to reframe the current problem based on available data, whilst avoiding the lens of the current working diagnosis.

Trowbridge, 2008

Cognitive Bias

- Anchoring Bias
  - *"He works as a delivery driver, its much more likely to be MSK chest pain"*
- Ascertainment Bias
  - *"That young man is clearly just drunk, get him up and out as quickly as possible, please, would you?*
- Availability Bias
  - *"The last patient I saw like this turned out to have endocarditis, I think we should ask cardiology to see"*
- Search Satisficing
  - *"I'm not sure its that unusual if you're a 60yr old with Osteoarthritis to have a bit of back pain?"*

Croskerry, 2013

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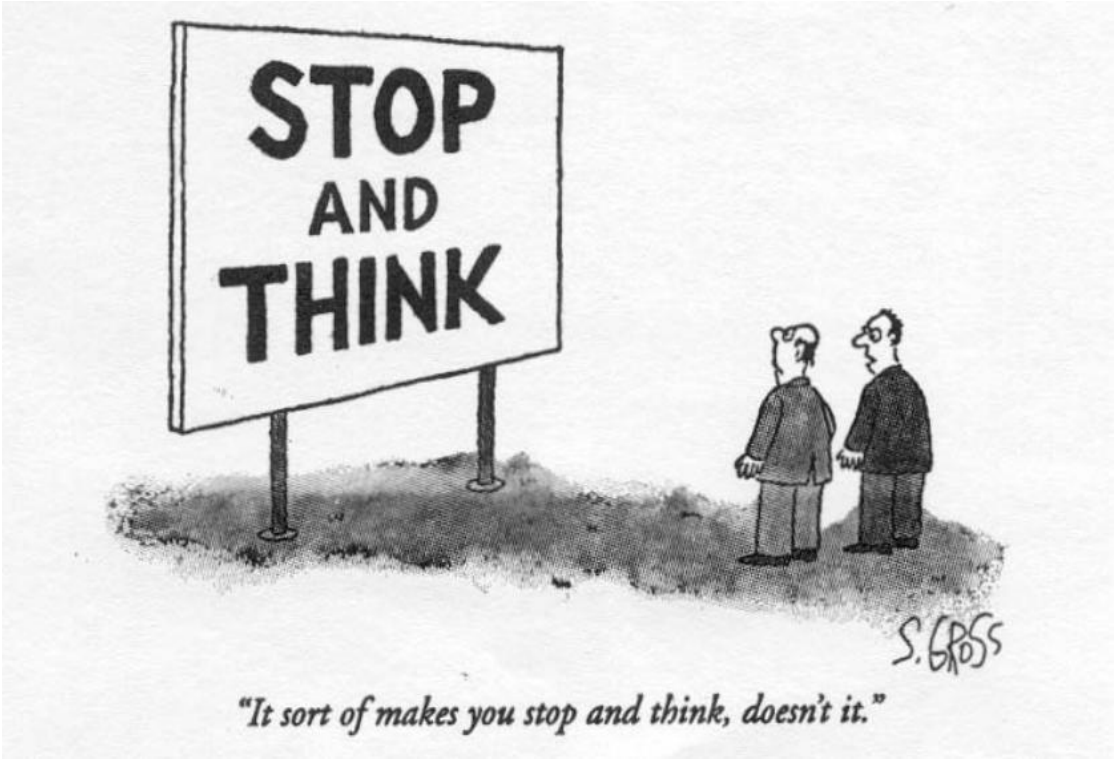
‘Stop and Think’ Framework

- Name the problem
- Reframe the Problem
- Generate Hypotheses
- Deduct Hypotheses
- Test
- Monitor/Detect Likely Consequences
- Reflection-on-Action



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Using the situation you analysed earlier, how could you use these methods to teach clinical reasoning skills to students or trainees?

Summary

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Thanks to…

- Dr Ross Cairns, Dr Kim Shields and Dr Andrew Tester for their assistance and acting skills during the live simulation

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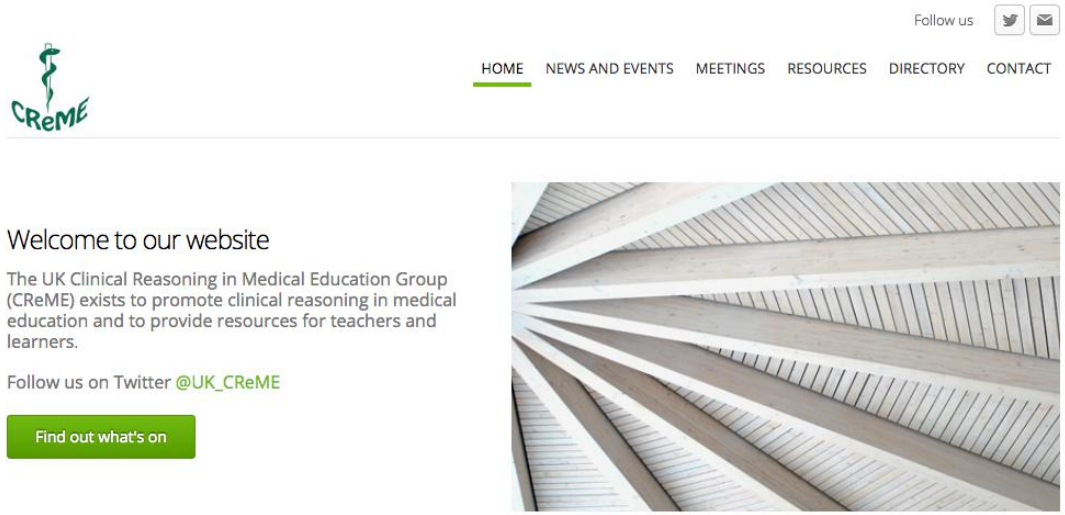
Further Resources



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