

# Teaching Diagnostic Thinking Using a More Explicit Approach

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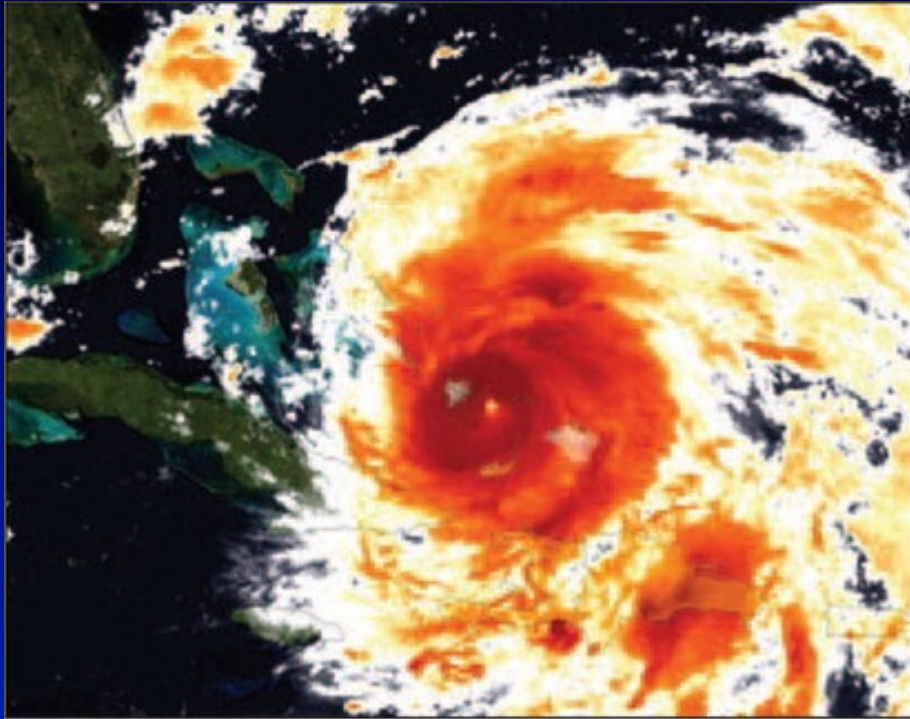
Medical Partnership, Athens

Three Owl Learning Institute

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# Coming Your Way ...



- Define diagnostic error, view causes
- Define 2 modes diagnostic thinking
- Identify explicit approach to teaching diagnosis
- Consider whether it will reduce error

# Diagnostic Error

- Distinguish between the error (process) and the resulting harm (outcome)
- Diagnosis that is missed, wrong, or delayed, as detected by some subsequent definitive test or finding

# How frequent is Dx Err?

- Clinical studies: ~ 5 – 15% encounters
- Autopsy studies: ~ 5% lethal Dx error, with ~ 25% overall Dx errors
- Harvard Medical Practice study: more likely to cause harm by Dx Error than by drugs (14% vs. 9%)
- Also, misdiagnosis considered negligent ~75%

# Causes of Error – Graber et al

Retrospective study over 5 years at  
several academic medical centers

100 cases of diagnostic error

Average of 5.9 errors/case

- No fault 44%
- System-related 65%
- Cognitive 74%

*Graber et al Arch IM 2005*

# Cognitive Errors

## Cognitive errors

Inadequate knowledge

Faulty data gathering

Faulty information processing

Faulty metacognition

- Knowledge 11
- Data gathering 45
- Info processing 159
- Metacognition and Verification 106
- 
- Both knowing and thinking

# How is diagnostic thinking often taught?

## **Diagnostic Thinking:**

- **Implicit**
- **Haphazard**
- **Fragmented, asynchronous**

## **Curricular Context:**

- **Crowded**
- **Incoherent**
- **Segregated**
- **Devalued**

# What is Clinical Diagnosis?

An effort to recognize the class to which a patient's illness belongs so that, based on our prior experience with that class, the subsequent clinical acts we can afford to carry out, and the patient is willing to follow, will maximize that patient's health.

*Sackett DL, Clinical Epidemiology, 2/e, 1991*

# Cases a & b



# 'Perceptual' Mode

- Rapidly recognize patient's illness as an instance of a familiar disorder
- 'Pattern recognition' or 'skill-based'
- Rapid, automatic
- 'Pre-analytic' phase of perception
- Speed > Power
- Requires familiarity from experience
- We all use this mode (we can't stop ourselves)
- Experts in field use this mode for ~80% cases in their field

# Perceptual Dx: Strengths

- Speed: ~ 0.5 sec
- If experienced, is reasonably accurate
- Draws on multiple senses for perception
- Calibrated to our practice setting
- Self updating



# Perceptual Dx: Limitations



- Inexperience
- 'Look-alikes'
- Atypical or new presentations
- Finding has more than one cause\*

# 'Dual Process Model' Dx

## Perceptual (Non-analytic)

- Rapidly recognize patient's illness as an instance of a familiar disorder
- 'Pattern recognition' or 'skill-based'
- Rapid, automatic
- 'Pre-analytic' phase of perception

## Analytic

- Recognize problem
- Recall knowledge
- Use it to make inferences & draw conclusions
- Derive unique diagnostic solution for this patient's illness
- Coherent narrative\*

# 'Analytic' Mode

- Recognize problem
- Recall knowledge
- Use it to make inferences & draw conclusions
- Derive unique diagnostic solution for this patient's illness
- Coherent narrative\*
- Slower, deliberate
- Explicit, structured knowledge
- Requires knowledge and reasoning
- Experts in field use this mode for ~20% cases in their field
- Must be learned

# Analytic Dx: Strengths

- Power > speed
- **Highly accurate**
- Draws on multiple sources of knowledge
- **Can be used with or without experience**
- Derived solutions can be recognized later\*
- **Transfers well to new clinical settings**



# Analytic Dx: Limitations



- Wrong or absent knowledge
- **Wrong reasoning**
- Slower, 'resource intensive'
- **Affected by human cognitive psychology**
- **Requires active updating with new knowledge**

# 1 Gather Clinical Findings

- 68M, right-handed, smokes heavily, notice bilateral finger clubbing
- Causes?
- What additional history should we gather?
- What exam findings should we seek?



## 2a Recognize 'clinical problem'

- Single symptoms
- Single signs
- Single test results
- Groups of symptoms
- Groups of symptoms + signs
- Groups of symptoms + signs + results
- Whole clinical syndromes
- ... but not yet the final diagnosis

## 2b Frame 'problem synthesis'

- Concise (1 sentence) statement of the clinical problem(s) and the context
- **Evolves as information accumulates**
- Temporary framework or 'scaffold' for building a diagnostic solution
- **Syntax: This is a case of <clinical problem> in this person with <context>**
- **Context: whole person, link to problem**

# Problem Synthesis – example

- “This is a case of bilateral finger clubbing in this older right-handed man who smokes heavily”
- Note the syntax “This is a case of ... in this person with ...”



# 3 Select Differential Diagnosis

- General: methods we use to consider possible causes of patient's illness before selecting the final diagnosis
  - Patient-specific 'DDx': the result of using those methods
- What you think of drives what you find
- What you don't think of, you won't find

# Patient-Specific Differential Diagnosis 'DDx'

- Leading Hypothesis
  - Single best explanation for illness
  - What you really think it is
- Active Alternatives
  - 1 – 5 disorders: likely, serious, treatable
  - What you want to be sure it isn't
- Other Hypotheses
  - Not likely, serious or treatable enough ...
- (Excluded hypotheses)

# Pt-specific DDx: Example



- Leading hypothesis:
  - ‘COAD’
- Active alternatives:
  - Lung cancer
  - Bronchiectasis
  - Chronic infection, e.g TB
- Other:
  - Cystic fibrosis
- (Excluded: none yet)

# 4 Select & Interpret Tests

- For leading hypothesis:
  - Select test(s) to confirm this condition
  - Start initial treatment
- For active alternatives
  - Select test(s) to exclude these disorders
  - Start initial treatment?
- Other Hypotheses
  - Do no tests now; reconsider if unexplained
- (Excluded hypotheses)

# 5 Verification: “6 Tests”

- Adequacy
- Coherence
- Primacy
- Parsimony
- Robustness
- Prediction



# Traditions in Analytic Diagnostic Thinking

**Descriptive**

**Criteria-based**

**Anatomic**

**Pathophysiologic**

**Bio-psycho-social**

**+ Probabilistic**

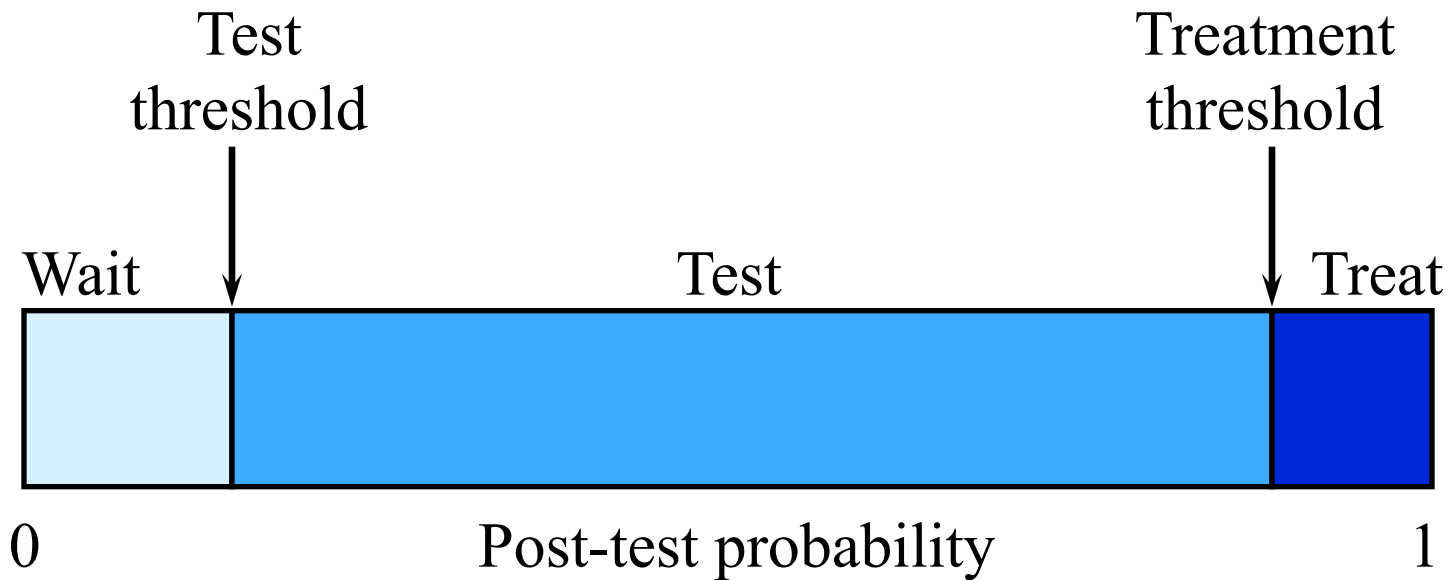


# Why 'traditions'?



- Historical roots
- Protagonists and detractors
- Way of knowing (epistemology)
- Way of building case (rhetoric)
- Each useful often, not always

# Probabilistic reasoning



**Estimate pretest probability, then as each new result comes, use its LR to revise probability, until we cross a threshold for action: wait (and don't test), test further, or treat**

# 'Disease 7'

- Cause/Pathophysiology
- Exposures/Risk factors
- Clinical manifestations
- Diagnostic test strategy
- Treatments
- Complication/Prognosis
- Associated conditions
- Need to know about a disease in order to diagnose it
- As knowledge grows, add depth and update
- Explicit structures

# **‘Clinical Problem 5’**

- Problem definition
- Causes
- Clinical findings
- Tests
- Diagnostic strategies
- Need to know how to work from presenting clinical problems forward to the final diagnosis
- As knowledge grows, add depth and update
- Explicit structure

# **‘Current Predicament’**

## **Analytic Thinking:**

- **Implicit**
- **Haphazard**
- **Fragmented,  
asynchronous**

## **Curricular Context:**

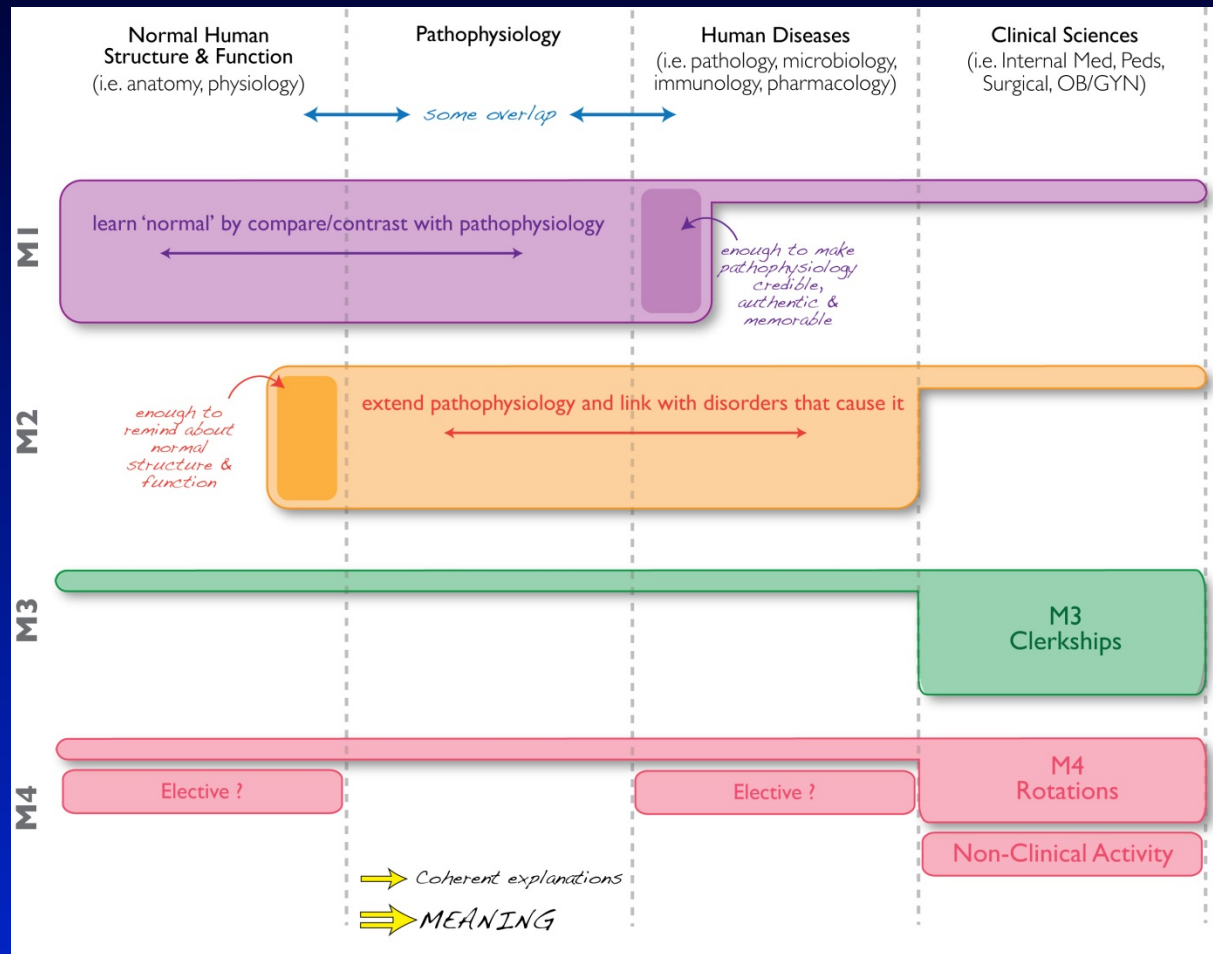
- **Crowded**
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# Affect Analytic Thinking?

- Store relevant K
- Recognize, discern problems
- Recall relevant K
- Infer from findings
- Build case for or against explanation
- Troubleshoot, e.g. metacognition



# Curriculum Overview



# Can we predict ... ?



- Implicit, haphazard approach to teach diagnosis may contribute to errors
- **Explicit approach to teach diagnosis is available**
- Will it reduce diagnostic error?