Assessing Diagnostic Skills: Psychometric and Systemic Issues
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Outline

1. The Problem with Diagnosis
2. The Basis of Diagnosis
3. The Opportunities for Diagnosis
The Critical Importance of Diagnosis

**Patient**
- Diagnosis (Accurate and Timely)
- Health Outcomes

**Healthcare System**
- Timely Intervention
- Costs of Treatment
- Length of Stay
- Complications

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Medical Diagnosis

Newman-Toker (2009) "The next frontier in patient safety"

Clinical assessment generally regarded as the second most frequent stage for errors in diagnosis (Graber, 2002)

- No-Fault Error
- Cognitive Error
- System Error

Accounts for 10%-15% (approx) of medical error

Leading cause of malpractice litigation (29% of cases)

(Graber, 2013; Elstein, 1995; Schiff et al., 2000)

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The Problem with Diagnosis

(as a learner)

Explicit → Implicit
The Problem with Diagnosis
(as a competent practitioner)

Condition X

Condition Y

“It looked just like…”

The Problem with Diagnosis
(as an ‘expert’)

Condition X

“Oh, that’s…..”

Factors in Diagnostic Capacity

Does the system give you the right information?
Is the information provided in the right form?
Is the information provided at the right time?
Is the information provided in the right sequence (for you)

How often have you seen this condition?
How often have you seen this condition in different forms?
How much recent experience have you had?

Are you fatigued?
Is there a time-constraint?
Are there distractions?
Are you anxious?
Are you pre-occupied?
Are you in a positive mood?
The Problem with Diagnosis

The Basis of Diagnosis

The Opportunities for Diagnosis

Diagnostic Capacity at the Core

Perception | Decision | Response

Diagnostic Capacity

Perception | Decision | Response

The capacity to label and draw implications from a select pattern of stimuli.
Situation Assessment

Multiple Cue Probability Theory

What features in the environment are important for diagnosis?

Cue Validity: To what extent does a feature predict and event/object?

Cue Validity = Diagnostic Accuracy

Cue Salience: To what extent does a feature draw attention?

Cue Validity x Cue Salience = Diagnostic Accuracy

'Bottom Up' Diagnosis
Ideally……

Capture the performance of experts and model this behaviour in training and system design.

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The Reality

In complex, uncertain environments, there is often no ideal set of diagnostic features, and experts will achieve similar levels of accuracy, despite different ‘diagnostic paths’ incorporating different diagnostic features.

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The Problem with Cues

Errors of Commission (Miscue) (James, 2013)

Wrong Feature – Event/Object (Signature Cue)

- Failure to respond
- Unnecessary response
- Incorrect response
### Approaches to Diagnosis

**Top Down**

- Expectancy

**Bottom Up**

- Features (Symptomatology)

(Sacket et al., 1996)

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### Cue Utilisation

Experts differ from non-experts in their acquisition of cue-based information from an array

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### What we Know About Cues?

1. Experts are reliant on cues (Abernethy, 1990; Mann et al., 2007)
2. People use different cues (Shanteau, 1989, 1992)
3. Patterns of cues can be misinterpreted (Crosskerry, 2009)
4. Cues can limited (restrict) information acquisition (Gigerenzer & Betsch, 2008)
5. Different cue use can lead to similar levels of accuracy (Gigerenzer, 1995)
6. Individual differences in cue acquisition (Wiggins et al., 2014)
7. Cues are context-specific (Lany et al., 2007)
8. Cues can be triggered in memory (Morrison et al., 2013)
9. Cues can be very precise (Lowery et al., 2013)
10. The successful use of cues increases their use (Newell et al., 2004)
11. Cues can be prioritised (Parish & James, 2004)
Self Assessed Diagnostic Skills
(or... the problem of base rates)

How would you rate your diagnostic skills?

Below Average  Average  Above Average

1. How do you know that you made a correct diagnosis?
2. How does your overall performance compare to others?
3. Can you remember correct from incorrect diagnoses?

The Role of Feedback

Task Performance

- Association
- Revise
- Refine
- Reject
- Maintenance
- Adaptation

Novice  Competent  Expert

Diagnostic Skills and Feedback

Process

Outcome
The Problem with Diagnosis
The Basis of Diagnosis
The Opportunities for Diagnosis

Assessing Diagnostic Performance

Trigger Tools
- Unscheduled hospitalisation within 2 weeks
- Discrepant pharmacy and laboratory reports

Reporting Tools
- Patients
- Clinicians

Characteristics of Skilled Diagnosis

Identify and Extract Features
Associate Features and Events in Memory (Cues)
Apply Feature-Event Associations from Memory
Prioritize Feature-Event Associations in Context

(Wiggins, 2014)
The Psychometrics of Diagnosis

If the scores are out of 100, then a clinician who scores 70% is in the top 30% of clinicians.

Psychometric Dependencies

- Does the ‘assessment tool’ actually measure clinical diagnostic skills?
- Does the ‘assessment tool’ need to account for different specialties?
- Is the ‘assessment tool’ sensitive to differences in skill acquisition?
- Is the response to the ‘assessment tool’ consistent for a given clinician?

Opportunities

- Benchmark individual performance
- Identify areas of development
- Target interventions to individuals and specific skills
- Test the impact of new diagnostic tools
- Identify skill degradation
- Evaluate prospective new appointments
- Incentive towards improvements at the system level
System Dependencies

- Needs a whole of ‘system’ approach
- Outcomes need to be generative, rather than punitive (just culture)
- Opportunities for improvement (development)
- Confidence in the data security

An Example (that might surprise you)

Proactive Assessment

Six Sigma (TQM)
Thank you

END