Objectives

By the end of this interactive workshop you will be better able to:

– Recognize and analyze cognitive biases and medical decision making errors

– Explicitly use strategies to prevent or mitigate them

Bruce Fisher University of Alberta 2014
Nature and Causes

Error rates

- ‘Perceptual’ specialties (e.g. radiology, pathology) < 5%
- Other settings (including ED) = 5–15%

- 6 diagnostic errors per case (average)
- Multiple root causes
- Equally systemic and cognitive

Based on review of autopsy studies, studies using standardized patients, or of specific conditions like myocardial infarction in various settings and specialties.
Not addressing System related error

Causes of system related error

• Environmental induced cognitive overload
• Fatigue and sleep deprivation
• Information from diagnostic tests not relayed to provider
• Lack of Coordination of care

Interventions to address system related error

• Communications skills training and courses
  – Institute for Healthcare improvement http://www.ihi.org/IHI/Programs/IHIOpenSchool

• Supportive data systems (Netcare etc)

• Team training systems (e.g. SBAR for improved handover)
Heuristics in medicine

• Simple decision-making strategies, ‘rules of thumb’

• Use of less than “complete” information

• More common in fundamentally uncertain domains such as medicine
Core Knowledge

Rendered Knowledge

Problem Formulation and Differential

Illness script

Instance script

Checks for heuristic errors

Intuitive Reasoning
  Rapid
  Unconscious
  Contextualized

Trigger

Analytic Reasoning
  Slow Deliberate
  Logical
  Conceptual

Dual Processing theory
Core Knowledge

Rendered Knowledge
Semantic qualifiers (paired opposing descriptors)
Semantic networks
Key features (defining and discriminating)

Problem Formulation and Differential
Efficiency strategies: Filter with pivotal key features
Abstract patient derived data into semantic terms and relationships
Contrast and compare Elaborate and encapsulate (Compile)

Illness script
Instance script

Analytic Reasoning
Repetitive processing

Checks for heuristic errors
Bayesian vs Fast and Frugal

• **Bayesian**
  – Need for base rates of disease and diagnostic test characteristics
  – Cognitive overload on working memory (vs chunks of scripts)
  – Over-fit of models
  – Slow

• **Fast and Frugal (use less information)**
  – Key features and strategies selected for quantitative power
  – Re-invest time saved in “Checking”
  – As robust as decision trees supported by statistics, logistic regression, and machine learning
Two sides to coin

• Heuristics and biases are efficient mental strategies to deal with uncertainty

• They often work
• Occasionally they fail

• Must use strategies to address these failures
<table>
<thead>
<tr>
<th>Heuristic</th>
<th>Expert Utility</th>
<th>Embedded Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>Common things are common Rapidly explore the probable</td>
<td>Don’t know........ so don’t see Expect stereotypes Premature closure</td>
</tr>
<tr>
<td>Representation</td>
<td>Guided by prototypic features</td>
<td>Miss variants Polymorphism blind spot</td>
</tr>
<tr>
<td>Anchoring</td>
<td>Sticking with initial impressions Rapidly compare &amp; select among alternatives</td>
<td>Get stuck Dismiss new “discordant” data Premature closure Overconfidence</td>
</tr>
<tr>
<td>Confirmation</td>
<td>Seek data that confirm rather than refute hypothesis</td>
<td></td>
</tr>
<tr>
<td>Framing</td>
<td>Cueing from initial impressions Efficient “Gestalt” “Intuition”</td>
<td>How things present affect what you see &amp; think</td>
</tr>
</tbody>
</table>
Cognitive interventions

1. Medical education strategies to improve clinical reasoning and address decision making errors

2. Improvement of knowledge and experience
   (e.g. simulation-based training, CPG on single disease)

3. Provision of cognitive support
2. Improvement of knowledge & experience

- Presently **disease-specific training** is only intervention that is both supported by evidence and readily implementable.
  - For example UK mammography interpretation training programs

- Promising: Simulation
  - To teach clinicians about diagnostic error and error-prevention strategies
  - As method to rapidly build expertise
3. Available diagnostic support

• Web-based differential diagnosis generators for decision support
  – Isabel  http://www.isabelhealthcare.com
  – DXplain  http://dxplain.org/dxp/dxp.pl
  – PEPID  http://www.pepid.com
  – Show promise

• Medical librarians (?)

• Consultation and second opinions (?)
Checks for heuristic errors

Core Knowledge

Rendered Knowledge

Problem Formulation and Differential

Illness script

Instance script

Availability

Anchoring

Confirmation

Representation

Framing

Analytic Reasoning

Repetitive processing
Cognitive forcing strategies need triggers

Diagnostic time out/de-biasing trigger

Not like airlines
• Thoughts versus actions
• Hard to “see” and determine needed degree of completion

Embed Cognitive forcing into scripts to act as forcing function

“Final diagnosis cannot be made until checklist has been reviewed”
Routine use of check lists as cognitive forcing strategies to build scripts
Core Knowledge

Problem Formulation and Differential

Illness script

Instance script

Embedded checks for heuristic errors

Generic:
Overarching checklists applied

Specific:
Tips or checks for particular diseases, added to “instance scripts”

Intuitive Reasoning

Trigger Embedded checklist

Analytic Reasoning Checklist
General Checklists

1. Affect or environment
2. History taking
3. New learners
Checklists: Affective and Situational

Recognize altered mood states or other conditions
Develop strategies to reduce their negative consequences

<table>
<thead>
<tr>
<th>Situation</th>
<th>Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do I like this patient (or not)?</td>
<td>Affective Framing</td>
</tr>
<tr>
<td>Am I fatigued, sleep deprived, cognitively overloaded?</td>
<td>All</td>
</tr>
<tr>
<td>Have I been interrupted or distracted?</td>
<td></td>
</tr>
<tr>
<td>Am I stereotyping this patient?</td>
<td>Affective, Framing Representation, Anchoring, Availability</td>
</tr>
</tbody>
</table>
# Checklist for Predictable biases

<table>
<thead>
<tr>
<th>Situation: History taking</th>
<th>Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambiguous language</td>
<td>People are prone to answer ambiguous expressions without taking time to ask for clarification&lt;br&gt;Jargon can intimidate patients&lt;br&gt; Say nothing rather than disclose uncertainty</td>
</tr>
<tr>
<td>Question clustering as shortcut</td>
<td>Answers global “no” to a list</td>
</tr>
<tr>
<td>Wording of question shapes response*</td>
<td>“You haven’t had…”</td>
</tr>
<tr>
<td>Telescoping</td>
<td>Assign a date that is more recent than is true and including more events within that time</td>
</tr>
</tbody>
</table>
# Problems for clinical judgement: 1. Eliciting an insightful history of present illness

Donald A. Redelmeier,*† Michael J. Schull,†† Janet E. Hux,*†† Jack V. Tu,*†† Lorraine E. Ferris††

Abstract

<table>
<thead>
<tr>
<th>Task</th>
<th>Error</th>
<th>Example</th>
<th>Solution</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehension</td>
<td>Ambiguous language</td>
<td>Doctor: &quot;When did the fatigue start?&quot; Patient: &quot;Only recently.&quot;</td>
<td>Avoid jargon or vague language</td>
<td>Doctor: &quot;When you say 'recently,' what do you mean?&quot; Patient: &quot;Not long, maybe 1 or 2 years.&quot;</td>
</tr>
<tr>
<td></td>
<td>Tacit misunderstandings</td>
<td>Doctor: &quot;Have you had any pains?&quot; Patient: &quot;No.&quot;</td>
<td>Give permission for the patient to say more</td>
<td>Doctor: &quot;Describe your pains to me, even things you wouldn't usually tell a doctor.&quot; Patient: &quot;OK.&quot;</td>
</tr>
<tr>
<td>Recall</td>
<td>Failures of memory</td>
<td>Doctor: &quot;Have you noticed anything else that has changed?&quot; Patient: &quot;No.&quot;</td>
<td>Use diaries and careful records</td>
<td>Doctor: &quot;Start a daily diary and show it to me at our next visit.&quot; Patient: &quot;OK.&quot;</td>
</tr>
<tr>
<td></td>
<td>Automatic shortcuts</td>
<td>Doctor: &quot;Do you have a cough, diarrhea, sore throat, constipation?&quot; Patient: &quot;No.&quot;</td>
<td>Organize and focus questions</td>
<td>Doctor: &quot;Do you have a cough or sore throat?&quot; Patient: &quot;No.&quot; Doctor: &quot;How about diarrhea?&quot;</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Inconsistent expectations</td>
<td>Doctor: &quot;How do you feel?&quot; Patient: &quot;Fine, it's my son who is worried about me.&quot;</td>
<td>Set realistic expectations</td>
<td>Doctor: &quot;What's your view of the situation and what's your son's view of it?&quot; Patient: &quot;Well, ....&quot;</td>
</tr>
<tr>
<td></td>
<td>Faulty personal beliefs</td>
<td>Doctor: &quot;Any problems?&quot; Patient: &quot;No, just normal aging.&quot;</td>
<td>Be wary of false beliefs</td>
<td>Doctor: &quot;Any problems?&quot; Patient: &quot;No, just normal aging.&quot; Doctor: &quot;But how might things be better?&quot;</td>
</tr>
<tr>
<td>Expression</td>
<td>Extraneous distractions</td>
<td>Doctor: &quot;Is there anything else?&quot; Patient: &quot;No.&quot;</td>
<td>Take into account temporary moods</td>
<td>Doctor: &quot;Is there something distracting you right now?&quot; Patient: &quot;Well, ....&quot;</td>
</tr>
<tr>
<td></td>
<td>Ignoble failures</td>
<td>Doctor: &quot;Hello, let me introduce myself.&quot; Patient: &quot;Oh, you're the doctor?&quot;</td>
<td>Double-check for subtle prejudice</td>
<td>Doctor: &quot;I may not be what you expected.&quot; Patient: &quot;Yes, it's a bit of a surprise.&quot;</td>
</tr>
</tbody>
</table>

Table 1: Avoiding errors when eliciting an insightful history of present illness
Checklist for Newbies

Data as anxiolytic
– Ordering too many investigations
– Collecting too much information
– Overemphasizing positive findings
– Report findings that aren’t there
– Incorrectly interpret context of information or cues given by patient

“Thoroughness is the reflex response to uncertainty”

Georges Bordage
## Checklist for other High risk situations

<table>
<thead>
<tr>
<th>Situation</th>
<th>Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is this a “handover”?</td>
<td>Diagnosis momentum</td>
</tr>
<tr>
<td></td>
<td>Framing</td>
</tr>
<tr>
<td>Has the diagnosis been suggested to me by the patient, nurse or another</td>
<td>Premature closure</td>
</tr>
<tr>
<td>physician?</td>
<td>Framing</td>
</tr>
<tr>
<td>Did I accept the first diagnosis that came to mind?</td>
<td>Anchoring</td>
</tr>
<tr>
<td>Did I consider other organ systems besides the obvious one?</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Search satisfaction</td>
</tr>
<tr>
<td></td>
<td>Premature closure</td>
</tr>
<tr>
<td>Have I ruled out a “must not miss” diagnosis?</td>
<td>Anchoring</td>
</tr>
<tr>
<td></td>
<td>Confirmation</td>
</tr>
</tbody>
</table>
Generic:

- Diagnostic time out
- Exposure control: look for yourself first
- Rule out worst case scenario
- What if...
- “Prospective hindsight”
Explicit practice & role modelling as trigger

- Thinking out loud
- Promote ‘diagnostic timeouts’
- Intermittent summaries
- Encourage uncertainty  Admit mistakes

- Call your “diagnostic” shots
  - Make a plan, but explain reasoning
  - Make uncertainty clear
  - Involves others (including patient) in process to focus attention and critical appraisal
  - Provides “calibration”—perceived vs actual diagnostic accuracy
Checks for heuristic errors

Simple Knowledge

Core Knowledge

Problem Formulation and Differential

Instance script

Illness script

R = Reporter
I = Interpreter
M = Manager
E = Educator

One minute preceptor and RIME

Probe for evidence

Get a commitment

Repetitive processing

Consolidate behaviors and Correct mistakes

Teach general rules that apply to other situations

Embed de-biasing in script
References

- Norman GR, Eva KW. Diagnostic error and clinical reasoning. Medical Education 2010;44:94-100
- Graber M. Educational strategies to reduce diagnostic error: can you teach this stuff? Adv in Health Sci Educ.2009;14:63-69
- Redelmeir DA, Ferris LE, Tu JV, Hux JE, Schull MJ,. Problems for clinical judgment: introducing cognitive psychology as one more basic science. CMAJ 2001;164:358-360