Cognitive bias: How Do We Rethink How We Think?

What Does It Mean For Medicine? What Does it Mean For You?

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1.
Preventing Misdiagnosis

Cognitive Errors in Misdiagnosis
Part I

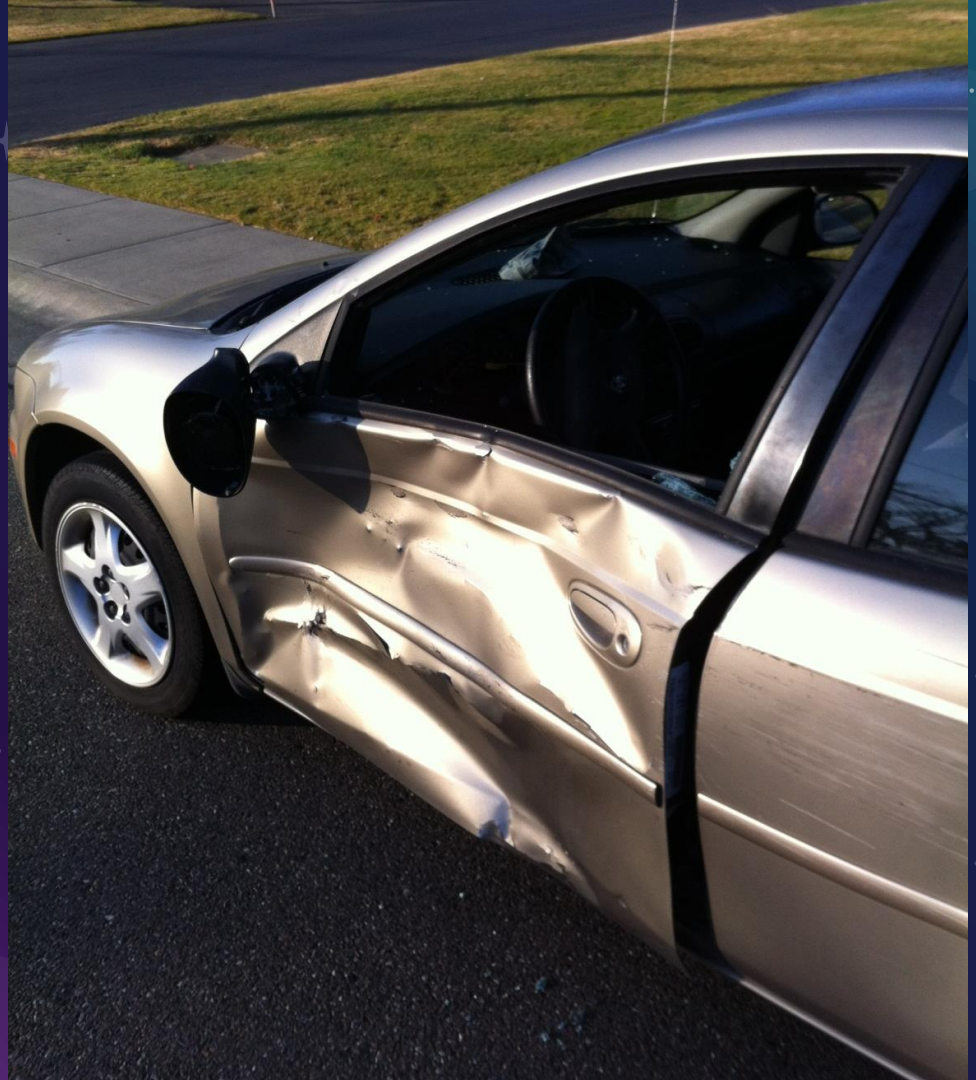
“The human brain is a complex organ with the wonderful power of enabling man to find reasons for continuing to believe whatever it is that he wants to believe

-Voltaire

Decisions - seeing the answer

- Multiple possible answers
- Challenging conditions
- Serious consequences

Patients want to know – *what is causing my problem?*



What can go wrong?

Medical errors cause harm

40,000 – 100,000 deaths per year

Poor decisions

Types of Mistakes

- Procedural
- Clerical
- Cognitive

Impact

- Multiple possible answers
- Challenging conditions
- Serious consequences

What does it mean for medicine?

COGNITIVE ERROR IS PERVASIVE IN MEDICINE

Up to 75% of errors in IM are thought to be cognitive in origin

Cognitive errors have been identified in ALL steps of the diagnostic process

VA study on diagnostic errors: 13% d/t misinterpretation of diagnostics results, 78.9% d/t cognitive error during patient encounter

Among malpractice claims, diagnostic errors are the most **COMMON**, **COSTLY**, and **DANGEROUS** of medical mistakes. The public health burden of diagnostic errors could be TWICE what was previously estimated.

IMPACT

- Common cognitive biases
- Evaluate influence of cognitive biases on diagnostic accuracy or management errors
- Determine impact on patient outcomes
- Identify mitigation strategies

2.
Cognitive Biases

What They Are And How They Work

Cognitive Bias

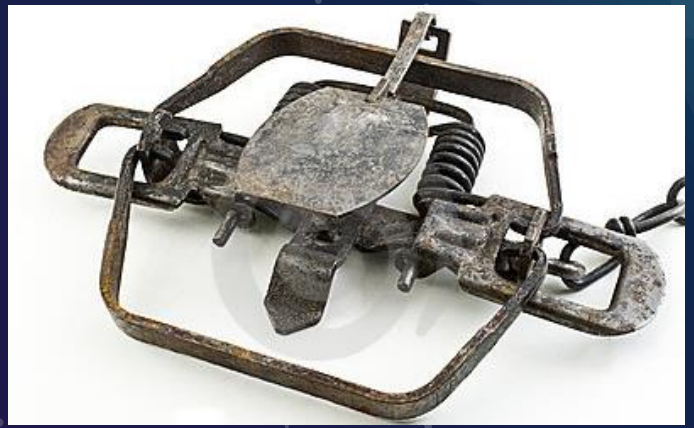
- Causes of bias are varied: learned or innate biases, social and cultural biases, lack of appreciation for statistics and mathematical rationality, even environmental stimuli competing for our attention
- Ubiquitous phenomenon, **does not** correlate with intelligence nor any other measure of cognitive ability
- Significant diagnostic error can result from cognitive bias
- All clinical decision-makers are at risk of error due to bias
- Lack of insight into one's own bias is common, demonstrated by doctors who described themselves as '*excellent*' decision-makers and '*free from biases*'

Example Case

- Board Certified Family Physician
- Middle-aged white male patient
- Typical cardiac chest pain
- Positive cardiac risk factors
- Misdiagnosed with GERD
- Died of fatal MI 4 weeks later

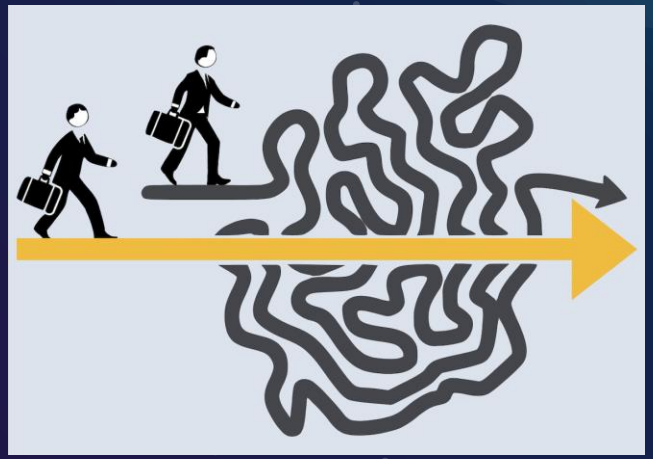
Our Goal

- Recognize Mental Traps
  - Identify Common Cognitive Errors
- Prevent Misdiagnosis
  - Implement Forcing Strategies to Mitigate the Cognitive Bias That Causes Diagnostic Errors



Psychology of Error

- Heuristics - Mental Shortcuts
- Often useful, sometimes dangerous



Dual Process Theory

Type 1:

- Fast, intuitive, pattern recognition-driven method of problem-solving
- Places low cognitive burden on the user
- Allows one to make fast and accurate decisions rapidly

Type 2:

- Slower, more methodical, thoughtful process
- Places a higher cognitive strain on the user
- Allows one to appraise data more critically and look beyond patterns, potentially more suitable for complex problem solving

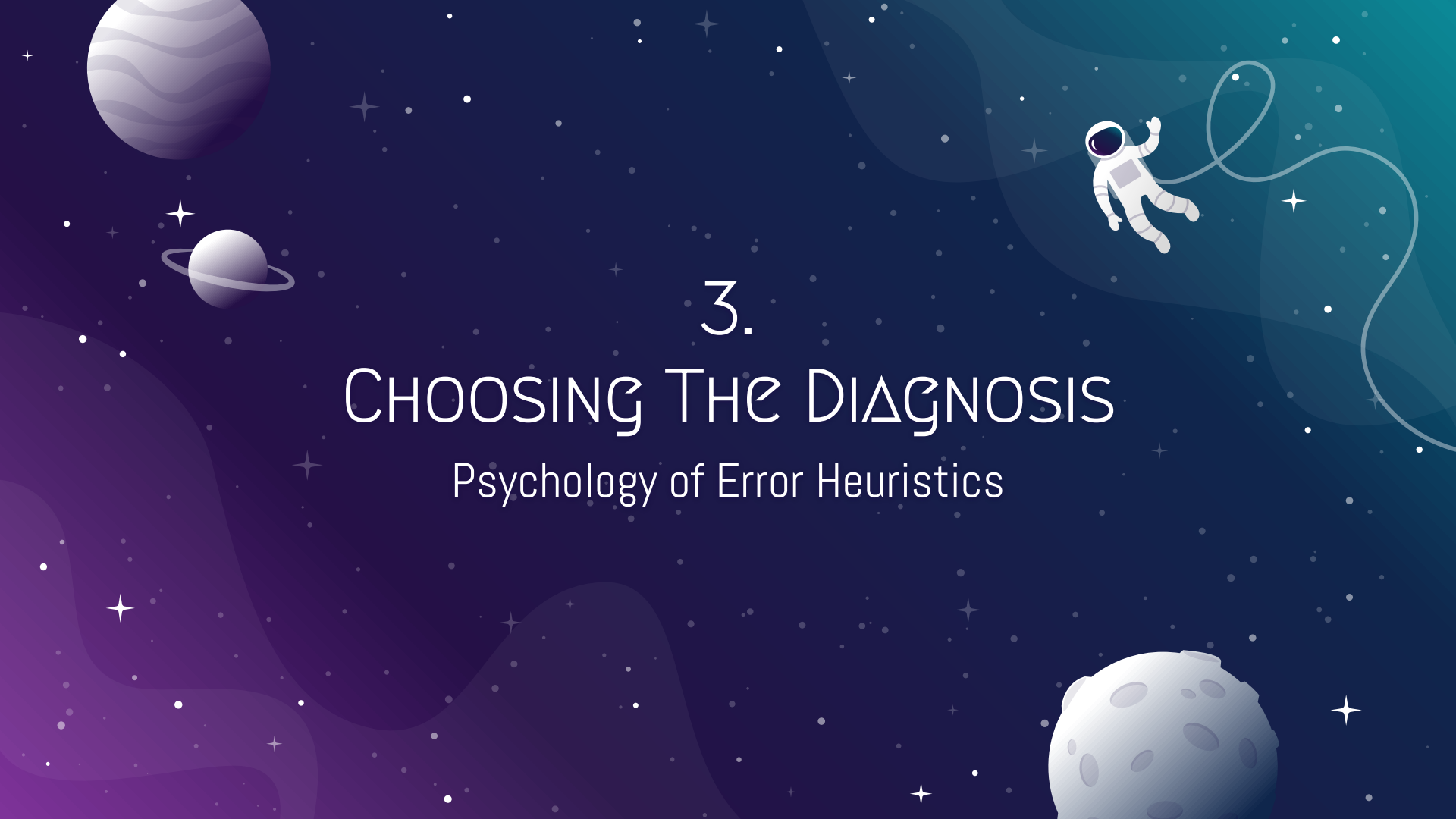
Cognitive Bias – "Mental Shortcuts"

Choosing the Diagnosis

Availability, Framing, Blind Obedience, Overconfidence, Representativeness

Validating the Diagnosis

Anchoring, Premature Closure, Base Rate Neglect, Confirmation



3.
Choosing The Diagnosis

Psychology of Error Heuristics

Availability

Psychology of Error

Cognitive Error	Description	
		coast

FRAMING

Psychology of Error

Cognitive Error	Description	
		The “ER effect”

Blind Obedience

Psychology of Error

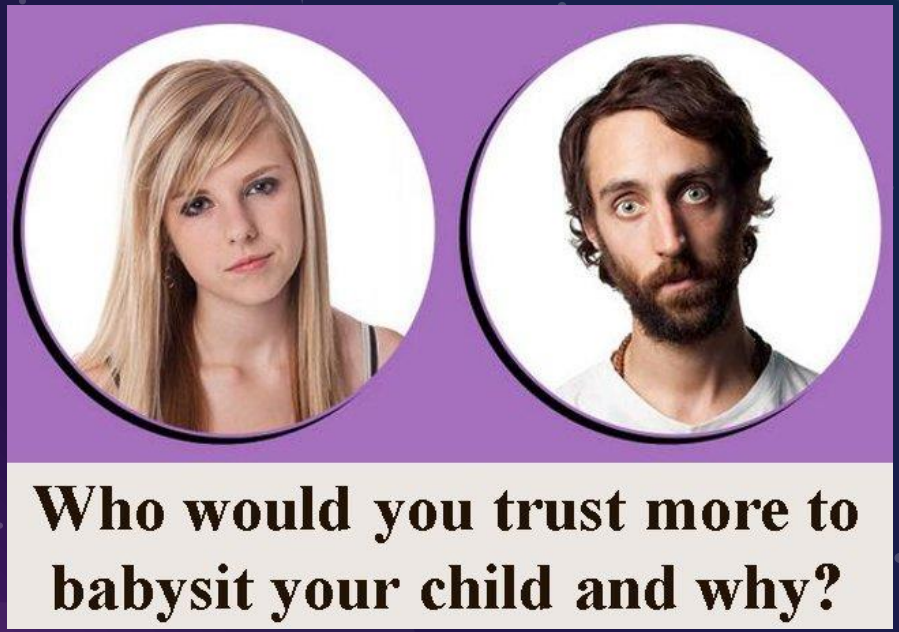
Cognitive Error	Description	
		"Definitive Test"

Overconfidence

Psychology of Error

Cognitive Error	Description	Examples
Overconfidence	Inflated opinion of their diagnostic ability leading to subsequent error	Auscultation error

Representativeness



Psychology of Error

Cognitive Error	Description	Examples
Representativeness	Judging membership in a class by similarity to stereotypes or typical member of a class	MI patient Jim…

Representativeness

Example 2: Jim is tall and very muscular. He's also very competitive. He drives and expensive car and wears flashy clothing. *Which is more probable?*

a) Jim is a professional athlete

This response is predicted by Representativeness Heuristic

b) Jim is a lawyer or financial analyst

This is the better bet.

4.
Valdating The Diagnosis

Psychology of Error Heuristics

Anchoring

Psychology of Error

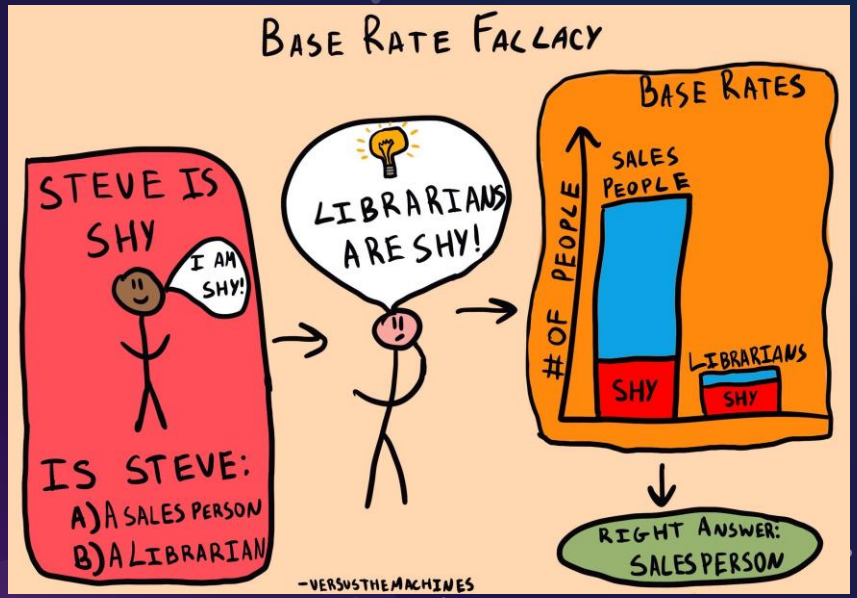
Cognitive Error	Description	
		Sticking with GERD Dx, despite lack of response to Tx

Premature Closure

Psychology of Error

Cognitive Error	Description	
		CXR = PNA, missed PE

Base Rate Neglect



Psychology of Error

Cognitive Error	Description	Examples
Base Rate Neglect	Underlying incident rates of conditions are ignored as if they do not apply to the patient in question	Fit, healthy young man with CP

Confirmation

Psychology of Error

Cognitive Error	Description	Examples
Confirmation	Info is interpreted to fit a preconceived diagnosis, rather than the converse	Patient with elevated WBC

Review

Availability

- Ease of recall

Framing

- Details surrounding the clinical data

Blind Obedience

- Authority or technology

Overconfidence

- Inflated self-opinion → error

Representativeness

- Misinterpret event likelihood based on similarities

Anchoring

- Stuck on initial impression

Premature Closure

- Prematurely halting diagnostic workup

Base Rate Neglect

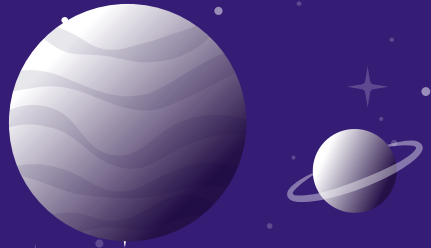
- Incident rates ignored

Confirmation

- Fitting info to preconceptions

5.
DeBiasing Strategies

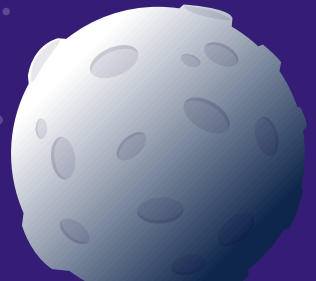
Cognitive Errors in Misdiagnosis
Part II



How Does This Help?

If We Understand a Problem, We Can Solve It!

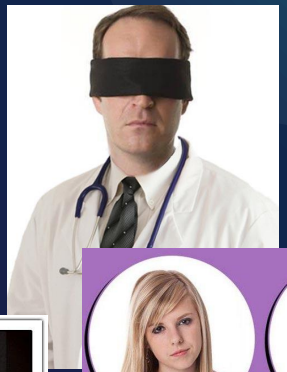
Prevention Strategies...

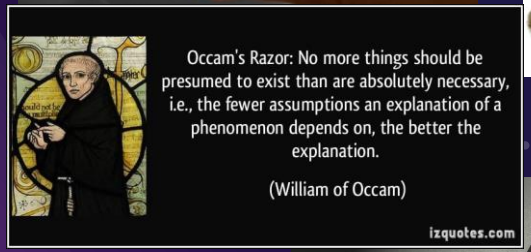


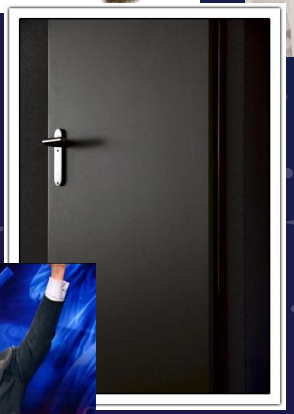
Our goal

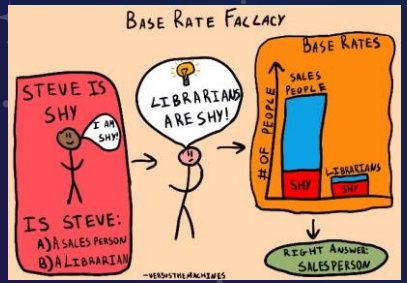
Prevent misdiagnoses with cognitive debiasing strategies

Psychology of Error

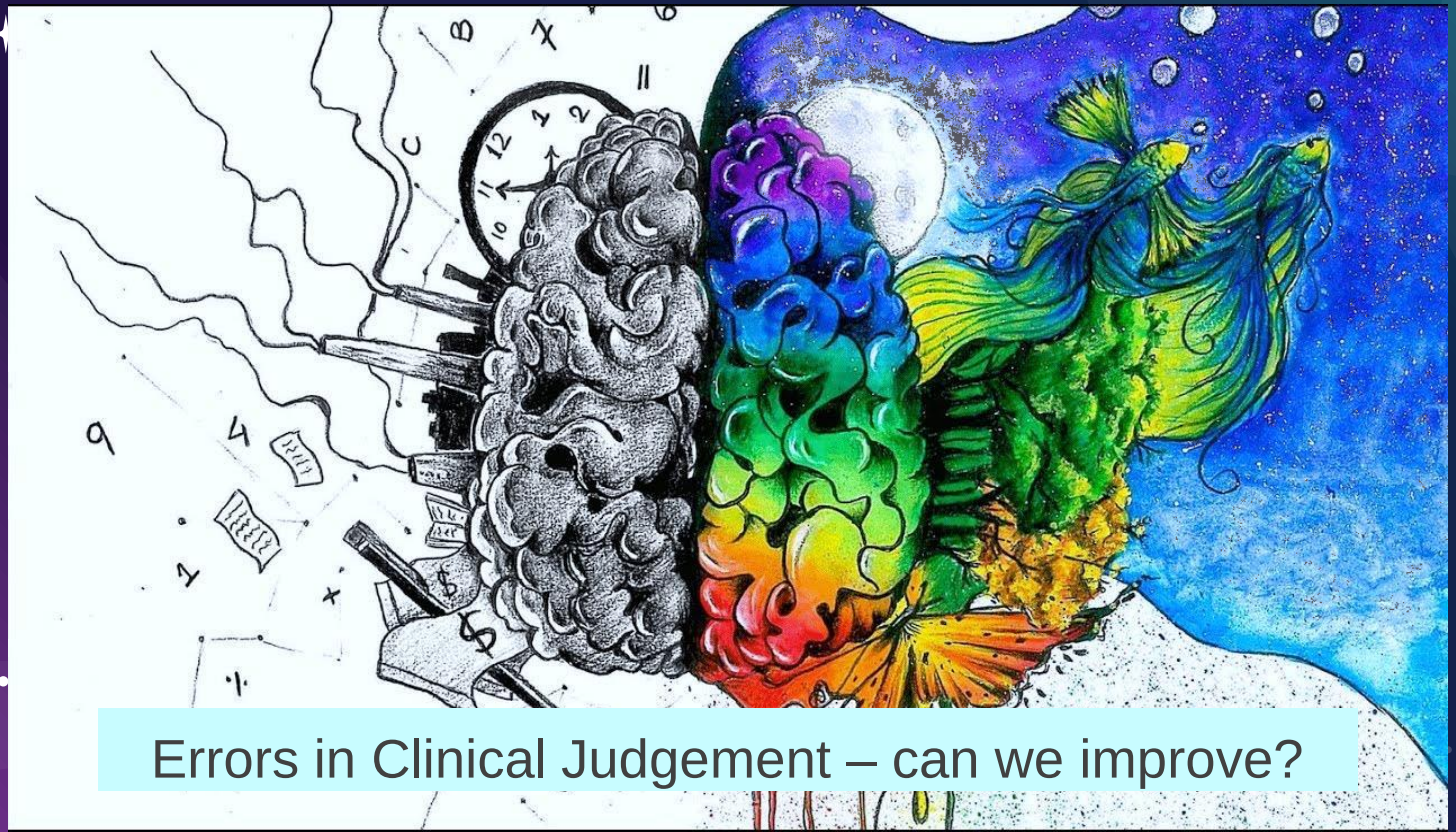








Meta-Cognition: Thinking About Thinking



Errors in Clinical Judgement – can we improve?

Metacognition Strategies

- Summon your knowledge
- Think aloud
- Ask yourself questions
- Use writing
- Organize your thoughts
- Take a timeout
- Test yourself

Thinking About Thinking

Cognitive Forcing Strategies:

- Specific debiasing techniques that introduce self-monitoring of decision-making
- Designed to prevent clinicians from pursuing a path that will typically lead to error

Thinking About Thinking

Checklists:

- Debiasing strategy that challenges our structure of thought
- Computerized or verbal “time-out”

Statistical Principles:

- Statistical bias
- Base rates for differentials

Thinking About Thinking

Relevant Data

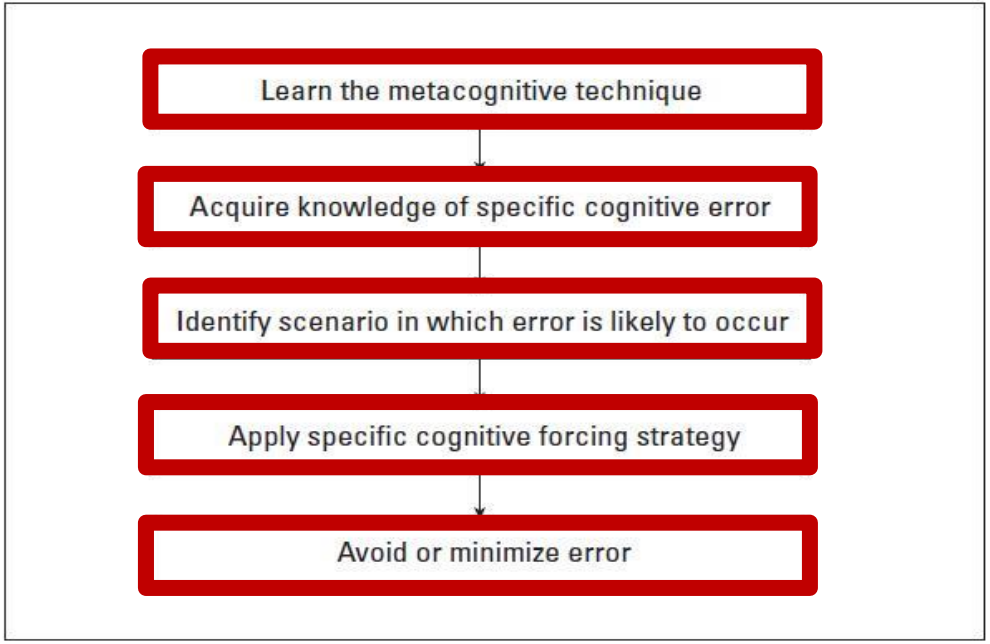
- Separate the “wheat from the chaff”

Actively Seek Alternative Diagnoses

- Make yourself the “Devil’s Advocate” in your own clinical reasoning

Figure.

Steps in using a cognitive forcing strategy.



Thinking about Thinking

The clinician should learn to:

Recognize
situations where increased risk for error exists

Examine
why an error would have been committed

Formulate
decision rules to correct this error

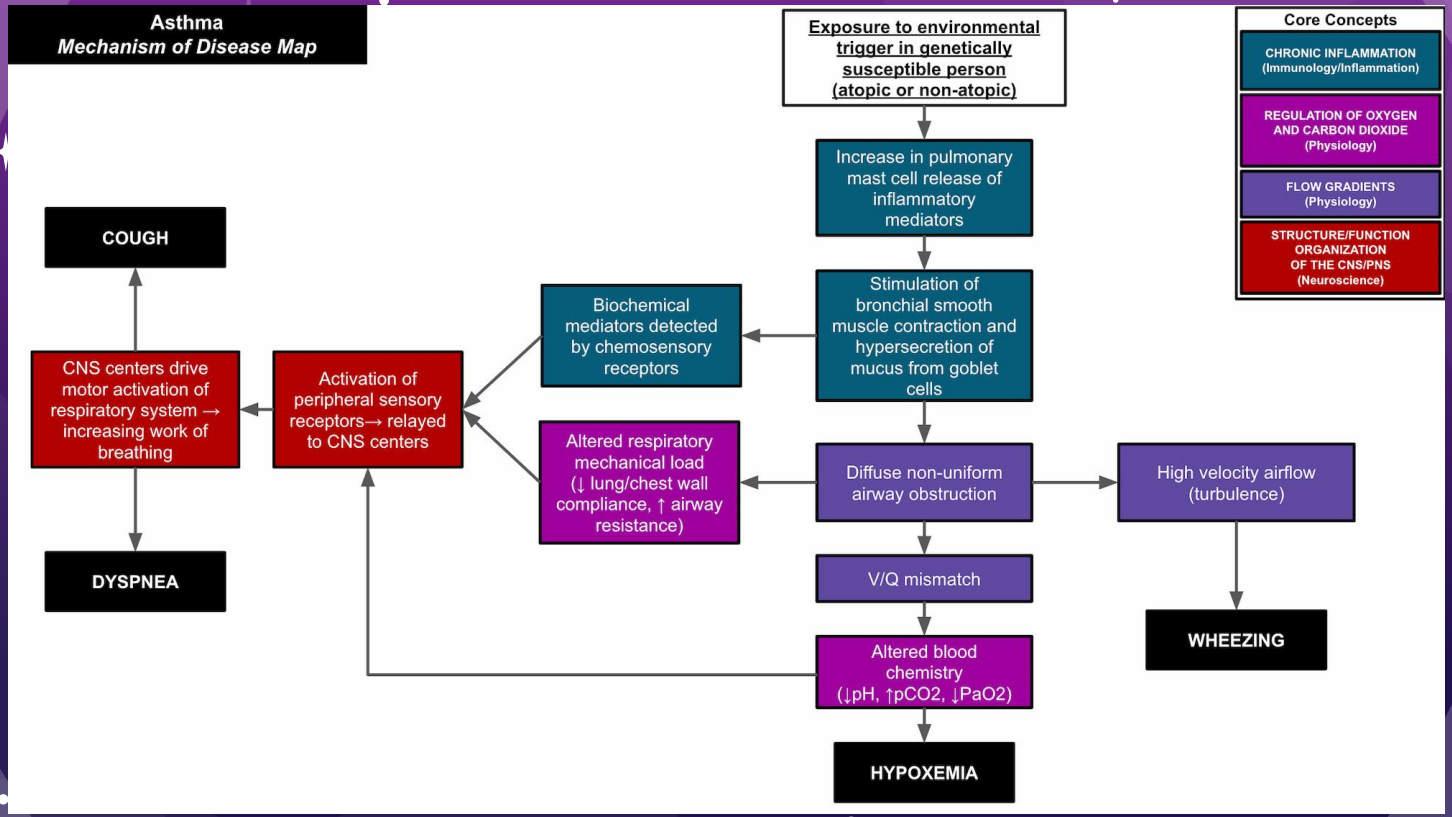
Medical Decision Making

Integrated Illness Scripts (IIS)

- Support for inductive reasoning from observed features back through relevant mechanisms and basic science concepts to the originating insult

Mechanism of Disease (MOD) Maps

- Provides holistic, deductive visual representation of clinical path: original insult, → causal mechanisms and their corresponding concepts → resulting clinical features seen at presentation


Asthma
Mechanism of Disease Map
Exposure to environmental trigger in genetically susceptible person (atopic or non-atopic)
Increase in pulmonary mast cell release of inflammatory mediators
Stimulation of bronchial smooth muscle contraction and hypersecretion of mucus from goblet cells
Biochemical mediators detected by chemosensory receptors
Altered respiratory mechanical load (↓ lung/chest wall compliance, ↑ airway resistance)
Diffuse non-uniform airway obstruction
High velocity airflow (turbulence)
WHEEZING
V/Q mismatch
Altered blood chemistry (↓pH, ↑pCO2, ↓PaO2)
HYPOXEMIA
Activation of peripheral sensory receptors→ relayed to CNS centers
CNS centers drive motor activation of respiratory system → increasing work of breathing
COUGH
DYSPNEA
Core Concepts
CHRONIC INFLAMMATION (Immunology/Inflammation)
REGULATION OF OXYGEN AND CARBON DIOXIDE (Physiology)
FLOW GRADIENTS (Physiology)
STRUCTURE/FUNCTION ORGANIZATION OF THE CNS/PNS (Neuroscience)

Re-evaluative Questions

- Is there anything about this case that argues against my diagnosis?
- Have I seen the same problem recently? If so, how is this case different?
- Is there anything about the way this case was presented to me that may have influenced my initial impression?
- Am I placing an inappropriate amount of value on certain aspects of this case?
- Does anything about this case justify a more thorough or aggressive evaluation?
- Do I have a plan that allows for re-evaluation which will capture potentially missed causes of the patient's problem?

Re-evaluative Questions

- How strongly have I validated my diagnosis?
- Is there anything about the way this case was presented to me that increases my risk for medical error?
- Does new data support my original impression?
- Does new data argue more for a different cause?
- What am I basing my medical decision on?
- Have I considered this case based on my own observations?
- Is there anything about this case that is not consistent with the diagnosis and treatment already in place?
- What are the two or three next most likely causes of this problem? Do I have a plan to catch these if my initial impression is incorrect?

Fixing The Problem

- Recognizing risk
- Slowing down
- Asking questions
- Re-evaluating

Case #1 Review

HPI:

- ★ Healthy 43-year-old female presents to ED
- ★ Acute SOB, dyspnea x 3 hours w/associated N/V
- ★ ST and nasal congestion sxs 4 days ago, resolving

PMH/SH:

- ★ + Tobacco user, recurrent bronchitis

PE:

- ★ VS: tachycardia, tachypnea, borderline hypoxemia, temp 101.0 F
- ★ CXR, CBC, CMP WNL

A/P:

- ★ Rx'd 10-day course antibx for PNA

Case #1 Review

- What was the misdiagnosis?
- Describe the cognitive contributors to error
- What sort of re-evaluative questions might help?
- What actions could be taken?


See WHEN we can't see
Lives depend on it


Questions?
Email: dlarimor@touro.edu
Thank You!

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