

Fixing biases:  
Principles of cognitive de-biasing

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*Clinical Reasoning in Medical Education*

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# Case

- ❑ A 65 year old female presents to the ED with a complaint of shoulder sprain. She said she was gardening this morning and injured her shoulder pushing her lawn mower.
- ❑ At triage she has normal vital signs and in no distress. The triage nurse notes her complaint and triages her to the fast track area.
- ❑ She is seen by an emergency physician who notes her complaint and examines her shoulder. He orders an X-ray.
- ❑ The shoulder X ray shows narrowing of the joint and signs of osteoarthritis
- ❑ He discharges her with a sling and Rx for Arthrotec
- ❑ She is brought to the ED 4 hours later following an episode of syncope, sweating, and weakness. She is diagnosed with an inferior MI.

# Biases

- ❑ A 65 year old female presents to the ED with a complaint of ‘shoulder sprain’. She said she was gardening this morning and sprained her shoulder pushing her lawn mower (**Framing**).
- ❑ At triage she has normal vital signs and in no distress. The triage nurse notes her complaint and triages her to the fast track area (**Triage cueing**).
- ❑ She is seen by an emergency physician who notes her complaint and examines her shoulder. He orders an X-ray (**Ascertainment bias**).
- ❑ The shoulder X ray shows narrowing of the joint and signs of osteoarthritis. He explains to the patient the cause of her pain (**Confirmation bias**).
- ❑ He discharges her with a sling and Rx for Arthrotec
- ❑ She is brought to the ED 4 hours later following an episode of syncope, sweating, and weakness. She is diagnosed with an inferior MI (**Diagnostic failure**).

‘...well documented violations of rationality have...spawned a list of biases that can be used to define ‘rational thinking’...we can assess degrees of rational thinking in terms of the number and severity of cognitive biases that an individual displays’

Stanovich, Toplak  
and West, 2010

# Rationality Failure

Processing problems

Content problems

Cognitive miserliness

Mindware gaps

Mindware contamination

WYSIATI

Minimising cognitive effort  
Accepting things at face value  
Insufficient breadth and depth  
Avoiding complexity

Knowledge deficits

Impaired scientific thinking  
Impaired probability thinking  
Ignoring alternate hypotheses  
Sub-optimal critical thinking

Cognitive biases

Cultural conditioning  
Group culture  
Illogical reasoning  
Egocentric thinking

*Hasty Judgments*

*Distorted  
Probability estimates*

*Biased Judgments*

One of the major mindware contaminants is bias  
We need to understand characteristics of biases

# The Biases

Social/Cultural

Affective

Cognitive

(Contaminated Mindware)

# Social Biases in Medicine

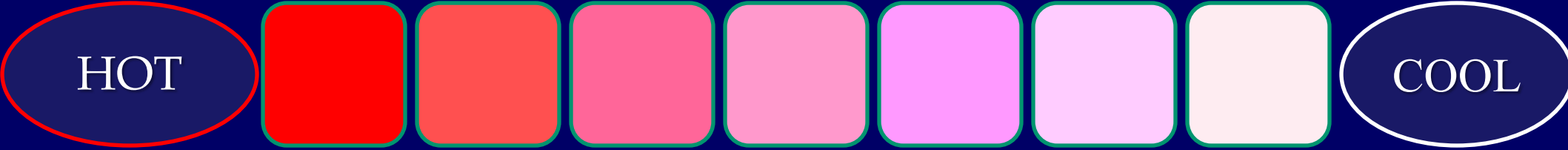
- Race
- Gender
- Obesity
- Age
- Socio-Economic status
- Psychiatric illness
- Drug/alcohol dependency



# Affective Bias

- When the affective state of the decision maker adversely affects decision making
- Usually due to ‘hot emotion’ (vivid-tepid continuum)
- There are about 20 known affective biases
  - Universal
  - Predictable
  - Correctable (affective de-biasing)

# The Emotional Spectrum



# Cognitive Bias

- A failure in rational/logical thought
- Over 200 biases have been described
  - Universal
  - Predictable
  - Correctable (cognitive de-biasing)

# Top 13 biases

Anchoring

Diagnosis Momentum

Confirmation Bias

Unpacking Failure

Search Satisficing

Framing

Ascertainment Bias

Psych-Out Error

Fundamental Attribution Error

Triage Cueing

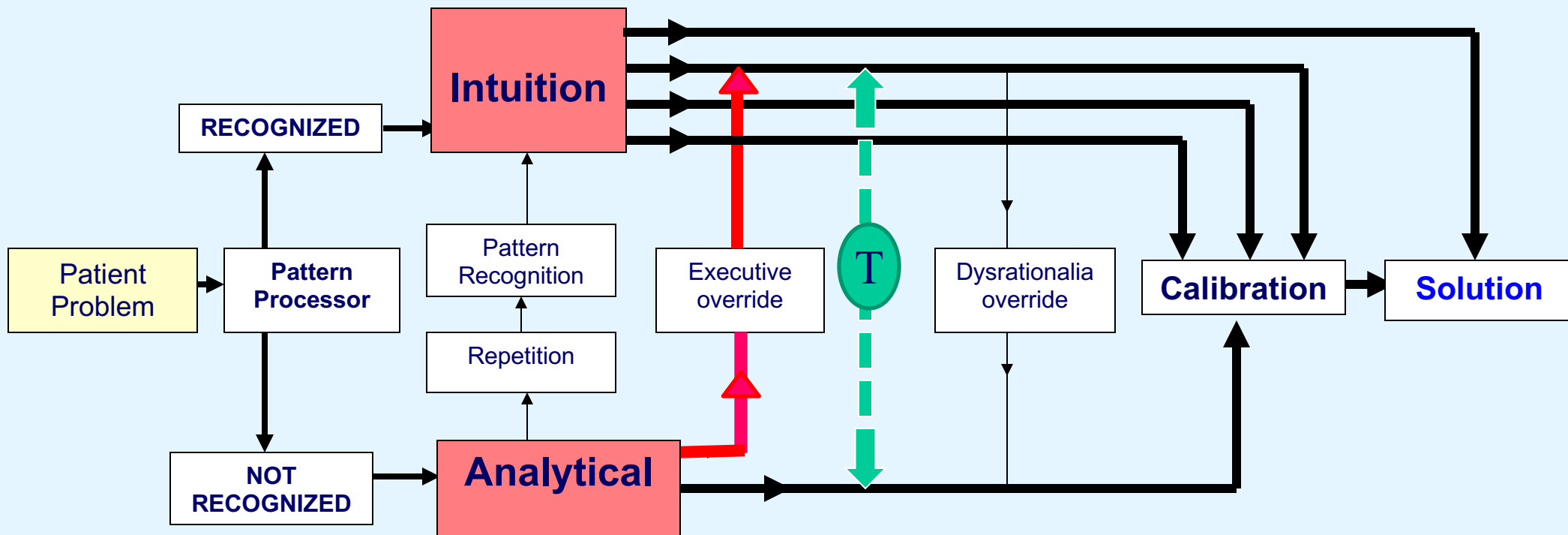
Premature Closure

Omission Error

Commission Error

# CBM

## Cognitive Bias Mitigation



# Executive override

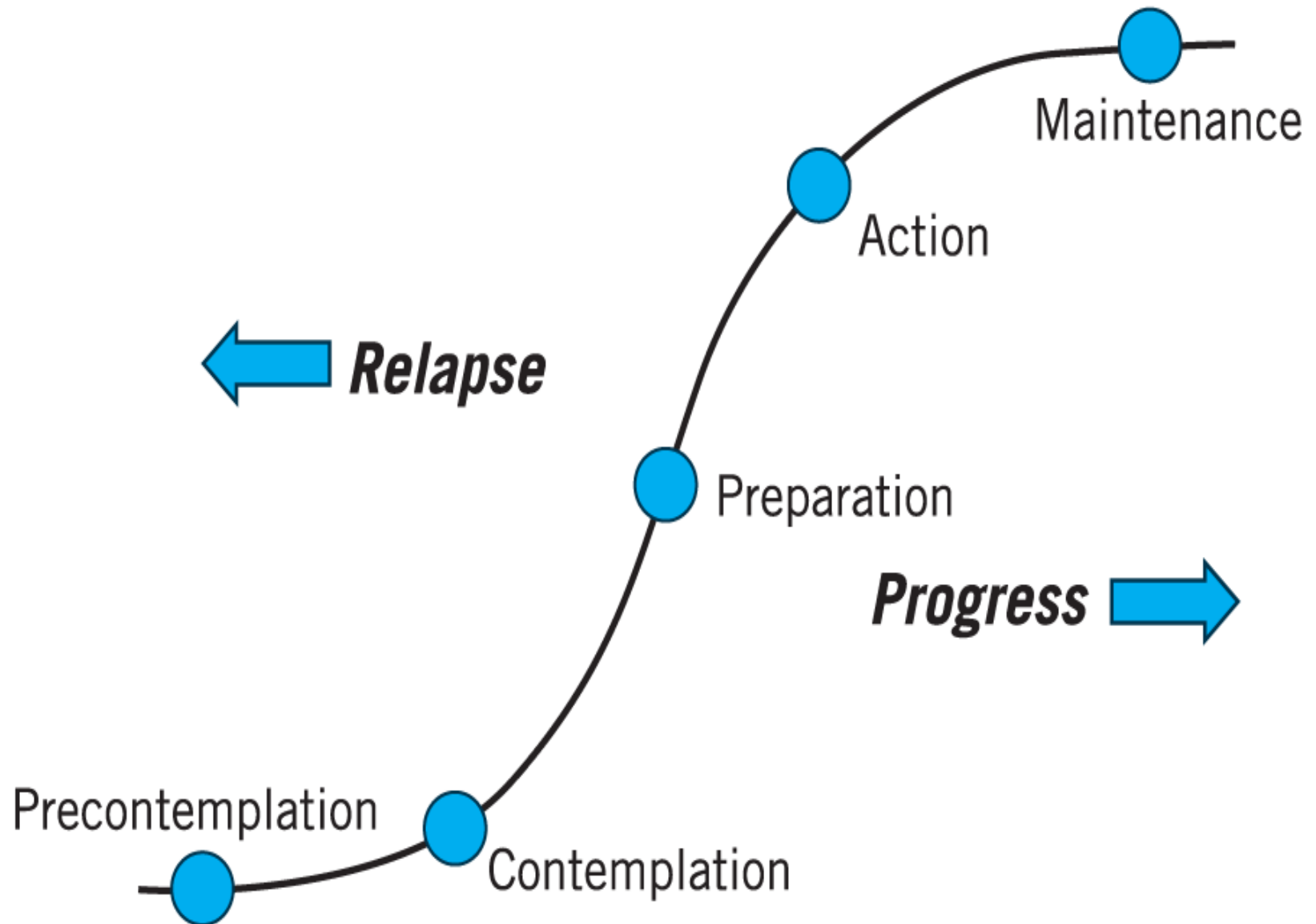
- Thinking about how we think
  - Metacognition
  - Reflection
  - Mindfulness
- 
- System 2 monitoring of System 1
  - System 2 modulation of System 1
  - Cognitive decoupling from System 1
  - Cognitive debiasing

# Five major issues

- Getting people to recognize that bias is a significant problem
- Accepting that we must make changes to our thinking
- Choosing an appropriate debiasing strategy
- Teaching cognitive debiasing strategies
- Sustaining vigilance



Many people are simply unaware of the  
problem...



And some people will never change...

We need to maintain a feral vigilance  
to detect biases

# It ain't easy

- Even though bias detected
- Very unlikely one strategy works for all
- Need for multiple approaches
- Very unlikely one shot will work
- Need for multiple inoculations
- Need for extra vigilance in critical conditions
- Need for lifelong maintenance

Know the general conditions  
under which biased decision  
making is more likely

# Default to System 1 processing

- Wicked environment
- Cognitive overload
- Fatigue
- Sleep deprivation/sleep debt
- Negative mood

Issues that impede cognitive de-biasing



Variable	Descriptor
Clinical relevance	Cognition has not been seen as the business of medicine. Cognitive processes are not usually studied by clinicians except in disease states such as brain injury, dementia, autism and others.
Lack of awareness	Many clinicians are naïve about cognitive processes and unaware that cognitive and affective biases may significantly impair clinical judgment. Usually, not covered in medical undergraduate or postgraduate training.
Invulnerability to cognitive and affective error	Some clinicians may be aware of cognitive and affective biases but do not believe that they are vulnerable to them (cognitive egocentrism, optimism bias, blind spot bias) or that they might affect their own practice.
Myside bias	If clinicians (and researchers) believe cognitive and affective bias are unimportant in clinical reasoning, they will have a prevailing tendency to evaluate data, evidence, and hypotheses in a manner supportive of their opinions.
Status quo bias	Cognitive de-biasing requires Type 2 processing and significant cognitive effort. It is considerably easier to continue with the status quo, than make the effort to learn a new approach and change current practice.
Overconfidence	Clinicians' overconfidence in their own judgments may be the most powerful factors that contribute to diagnostic failure. Hubris and lack of intellectual humility characterize the uncritical thinker.
Vivid-pallid dimension	Discussions of cognitive processes are dry, abstract and uninteresting to the medical mind. They typically lack the vividness and concrete nature of clinical disease presentations that are more appealing to clinicians – therefore, use lots of case examples.

# Implicit strategies for bias mitigation in medicine

<u>Strategy</u>	<u>Purpose</u>	<u>Potential biases addressed</u>
History and physical exam	Deliberate and systematic gathering of data	Augenblick or spot diagnoses Unpacking failures Ascertainment bias
Differential diagnosis	Forces consideration of diagnostic possibilities other than the obvious or the most likely	Anchoring and adjustment Search satisficing Premature diagnostic closure Representativeness Confirmation bias
Clinical prediction rules	Force a scientific, statistical assessment of patient's signs and symptoms, and other data to develop numerical probabilities of the presence/absence of a disease or an outcome	Base rate fallacy Errors of reasoning Many other biases
Evidence based medicine	Establishes imperative for objective scientific data to support analytic decision making	Many
Checklists	Ensure that important issues have been considered and completed, especially under conditions of complexity, stress and fatigue, but also when routine processes are being followed	Anchoring and adjustment Availability Memory failures Others

Mnemonics	Protect against memory failures and ensure that the full range of possibilities is considered on the DDX . Force thinking outside the obvious possibilities.	Availability Anchoring and adjustment Others
Pitfalls	Alert inexperienced clinicians to predictable failures commonly encountered in a particular discipline	Many
Rule out worst case scenario (ROWS)	Ensures that the most serious condition in a particular clinical setting is not missed	Anchoring and adjustment Premature diagnostic closure Others
Until proven otherwise (UPO)	Ensures that a particular diagnosis cannot be made unless other specific diagnoses have been excluded	
Caveats	Often discipline- specific warnings to ensure important rules are followed to avoid missing significant conditions	Many
Red flags	Specific signs and symptoms to look out for, often in the context of commonly presenting conditions, to avoid missing serious conditions	Many

# Dx risk assessment

- Is this patient handed off to me from a previous shift? Diagnosis momentum, framing, ascertain
- Was the diagnosis suggested to me by the patient, nurse or another MD ? Premature closure, framing bias, ascertainment bias
- Did I just accept the first diagnosis that came to mind ? Anchoring, availability, search satisficing, premature closure
- Did I consider other organ systems besides the obvious? Anchoring, search satisficing, premature closure
- Is this a patient I don't like for some reason ? Affective bias
- Was I interrupted/distracted excessively while evaluating this patient? All biases
- Did I sleep badly last night? All biases
- Am I feeling fatigued right now? All biases
- Am I cognitively overloaded or over-extended? All biases
- Am I currently in a bad mood? All biases
- Am I stereotyping this patient? Representative bias, affective bias, anchoring, FAE
- Have I effectively ruled out must-not-miss Dx Anchoring, overconfidence, confirmation diagnoses

# 11 common biases in the ED

Common Biases in the Emergency Department and Debiasing Strategies to Overcome Them: <sup>6,7</sup>		
Bias	Description / Example	Debiasing strategy
Aggregate bias	A belief that aggregate data (i.e. practice guidelines) does not apply to individual patients, which can lead to unnecessary testing.	Routinely apply guidelines / clinical decision rules. Superiority over clinical judgment has been demonstrated. E.g. PERC rule, NEXUS criteria
Anchoring bias	Anchoring onto particular features early in a presentation is normal, but bias occurs when we persist with the initial anchor and fail to adjust when new data suggests another diagnosis.	Avoid sticking with early impressions, judgments and preconceptions. Seek more information. Revisit diagnosis with new data. <b>Mnemonics (i.e. VINDICATES*) can help broaden the differential.</b>
Availability bias	A tendency to judge things as more likely if they readily come to mind. Recent exposure to a disease increases the likelihood of it being diagnosed, whereas not seeing a disease for a long time decreases the likelihood.	Judge cases on their own merits rather than recent experiences. Be aware of the recency effect. Question the objective basis for clinical decisions.
Confirmation bias	An inclination to seek evidence to support a diagnosis rather than refute it. Ex. Allowing N/V and photophobia to confirm Migraine HA, rather than seeking clues that would refute the diagnosis of SAH (gradual onset).	Consider the opposite. Try to disconfirm initial hypothesis. Ensure alternatives are considered. Argue the case for <i>and</i> against.
Triage Cueing	A predilection to allow triage to signal subsequent diagnoses and management, meaning patients placed in non-acute areas are not sick.	See the patient yourself and form your own impressions BEFORE reading the triage summary, nurses' notes, or hearing a learner's case presentation.
Diagnosis momentum	A propensity for labels or diagnoses to "stick" once they have been applied. This process may start with anyone (the patient, EMS, nurses, medical students, residents, other attendings) and continues as data is related from person-to-person. The diagnosis gathers momentum often without gathering evidence.	Two heads (or many) are better than one. You will invariably each pick up important data that the other person did not. Collectively this information forms a more complete picture of the case.  "Group think" should be used for difficult cases. Ask a colleague for an independent assessment or a second opinion. Do not 'frame' the patient to a colleague, give objective data.
Premature closure	A readiness to accept a diagnosis before it has been fully verified.	Force consideration of alternative possibilities. Generate and work through a reasonable differential diagnosis. Also be sure to ask, "What else might this be?" Always rule out worst-case scenarios (ROWS).
Representativeness Restraint	A habit of looking for prototypical manifestations of disease such that atypical variants may be missed.	Be aware of individual variation and atypical presentations. What looks like a duck, walks like a duck, quacks like a duck, may not be a duck.
Search Satisficing	A readiness to call off a search once something is found.	The most commonly missed fracture is the second one. Always consider comorbidities. E.g. A patient presents with <b>diabetic ketoacidosis</b> . What was the trigger?
Psych-out error	An impulse to assume a psychiatric etiology, and overlook serious medical conditions (i.e. hypothyroidism misdiagnosed as depression; chest pain attributed to anxiety).	<b>Employ "until proven otherwise" to ensure that you do not make a psychiatric diagnosis until other diagnoses have been systematically excluded. Return to a broad differential diagnosis before settling.</b>
Visceral bias	A disposition to be influenced by affective sources of error. Countertransference may be in the form of negative feelings towards particular patient populations (i.e. obese, chronic pain, chronic intoxicants), or positive emotions (i.e. this patient reminds me of my mom.)	<b>Remember to act calm no matter how you feel and be aware of emotion on decision-making. Take extra time to look at all the data and employ evidence based medicine. Objective scientific data should aid analytic decisions instead of feelings.</b>

Daniel et al,  
AEM, 2017

# Altered mental status

**Vascular** – TIA, stroke, subarachnoid hemorrhage

**Infectious** – sepsis, meningitis, encephalitis

**Neoplastic** – primary brain tumor or metastasis

**Degenerative** – dementias, Alzheimer's disease, Huntington's disease

**Iatrogenic/intoxication** – narcotics, benzodiazepines, alcohol intoxication or withdrawal

**Congenital** – epilepsy (post-ictal state)

**Autoimmune** – CNS lupus, neurosarcoidosis

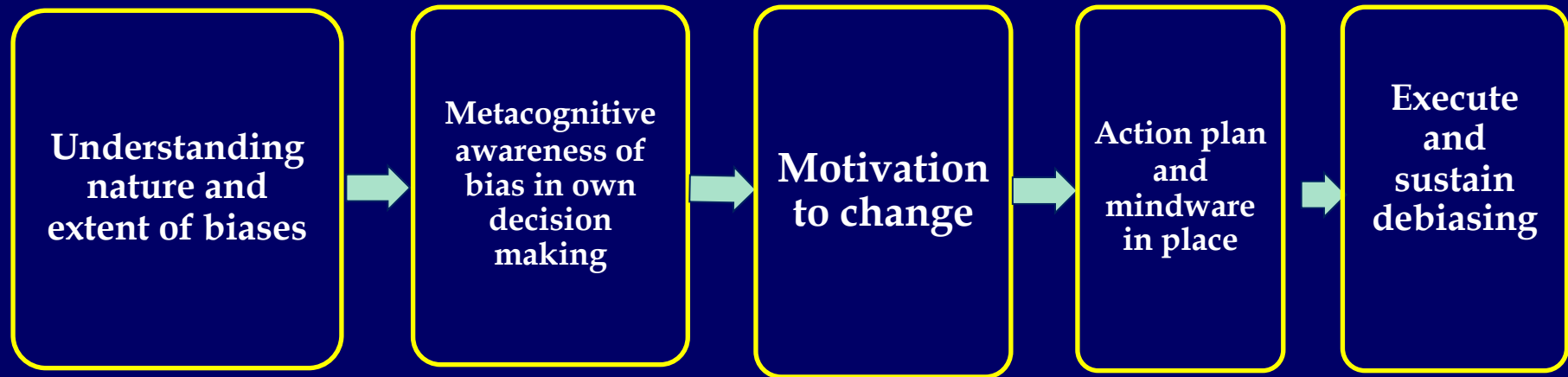
**Traumatic** – traumatic brain injury, traumatic epidural or subdural hematoma

**Endocrine/metabolic** – hypoglycemia, hypo- or hyperthyroidism, hypo- or hypernatremia, hypercalcemia, hepatic or uremic encephalopathy

What general strategies do we have for debiasing?



# Cognitive bias mitigation (CBM)



# Cognitive Debiasing Strategies

- ✓ Teach the basic rationale: DPT and where errors are
- ✓ Review the main cognitive and affective biases
- ✓ Teach specific strategies for particular biases
- ✓ Forcing functions
- ✓ Encourage decision maker to get more information
- ✓ Encourage metacognition and reflection
- ✓ Slow down
- ✓ Think the opposite
- ✓ Maintain a healthy skepticism about intuitions
- ✓ Promote group decision making when appropriate
- ✓ Educate intuition
- ✓ Promote less hubris, less overconfidence

# Cognitive Debiasing Strategies

- ✓ Rule of 3 – explicitly generate three Dx possibilities
- ✓ Time out – summarise out loud where you are periodically
- ✓ Think ROWS and UPO
- ✓ Before finalising, ask: Could this be anything else?
- ✓ Check ambient conditions that might pre-dispose to bias
- ✓ Prospective hindsight
- ✓ Specifically consider risk assessment of diagnosis

# The developing literature

# 15

## *Cognitive Bias Mitigation: Becoming Better Diagnosticians*

Pat Croskerry



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## Over 40 strategies

- Existing strategies in Medicine (12)
- General non-medical (19)
- General forcing functions (12)

## *The Ethical Imperative to Think about Thinking*

### *Diagnostics, Metacognition, and Medical Professionalism*

MEREDITH STARK and JOSEPH J. FINS

**Abstract:** While the medical ethics literature has well explored the harm to patients, families, and the integrity of the profession in failing to disclose medical errors once they occur, less often addressed are the moral and professional obligations to take all available steps to prevent errors and harm in the first instance. As an expanding body of scholarship further elucidates the causes of medical error, including the considerable extent to which medical errors, particularly in diagnostics, may be attributable to cognitive sources, insufficient progress in systematically evaluating and implementing suggested strategies for improving critical thinking skills and medical judgment is of mounting concern. Continued failure to address pervasive thinking errors in medical decisionmaking imperils patient safety and professionalism, as well as beneficence and nonmaleficence, fairness and justice. We maintain that self-reflective and metacognitive refinement of critical thinking should not be construed as optional but rather should be considered an integral part of medical education, a codified tenet of professionalism, and by extension, a moral and professional duty.

**Keywords:** medical decision making; medical ethics; professionalism; medical education; medical error; diagnostic error; patient safety; cognition; judgment; metacognition

No longer an option...



The  
Ultimate  
Cognitive Forcing Strategy

**Always**  
**ask the question:**

**What else**  
**might this be?**



Missed it. Green and Rieck

Bed Blocker. Green, Croskerry, Rieck

# Biases and Error Producing Conditions

- ED very busy
- Framing
- Anchoring
- Unpacking failure
- Premature closure
- Fundamental attribution error
- Psych Out Error



[http://medicine.dal.ca/departments/  
core-units/DME/critical-thinking.html](http://medicine.dal.ca/departments/core-units/DME/critical-thinking.html)

# Critical Thinking Website

- ❑ Educational resources
  - One-pagers
  - Downloadable books
  - Other (lists of biases, graphics, self-evaluate CT)
- ❑ Videos
- ❑ On-Line resources
  - CReMe
  - CT website
  - Skeptical medicine – John Byrne
  - SIDM

# TACT

## Teaching and Assessing Critical Thinking

- On-line course at Dalhousie University Medical School
- Approx 20 hours
- 6 Faculty
- Variety of materials (videos, lectures, refs, discussion boards)
- 20 hours CME Credit
- Option to go on to more advanced TACT 2
- Check Dal FacDev website for more information