Decision Making
Clinical Judgment
Diagnostic Error

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‘Clinical judgment deserves just as much scrutiny as a drug, device, test procedure or other component of patient care. Indeed clinical judgment might merit more attention because of the potential for huge error and the opportunities for immediate improvement’

Redelmeier et al, 2001

Donald A. Redelmeier, Lorraine E. Ferris, Jack V. Tu, Janet E. Hux, and Michael J. Schull. Problems for clinical judgement: introducing cognitive psychology as one more basic science. CMAJ. 2001 February 6; 164(3): 358–360.

Error Comparison

	Procedural	Cognitive
Visibility	High	Low
Discreteness	High	Low
Witnessed	Usually	Not usually
Awareness	High	Low
Recorded	Yes	Rarely
Temporality	Close	Distant
Medical Nature	High	Low
Familiarity	High	Low

What do we know about decision making?

‘Deep defects in design of cognitive machinery’

Haselton MG, Buss DM. (2003). Biases in social judgment: Design flaws or design features. In J. Forgas, K. Williams, B von Hippel (Eds.) *Responding to the social world: Implicit and explicit processes in social judgment and decisions*. New York, NY: Cambridge

- Ignore base rates when estimating probability
- Biased towards confirming own beliefs
- Take undue credit for lucky accomplishments
- Overestimate number of others who share beliefs
- Prone to ‘hindsight bias’
- See illusory relationships between events
- Exaggerated sense of control
- Misperceive intentions of opposite sex

What do we know about clinical decision making?

Clinical Decision Making

- Generally, poorer than we think
- Limited insight into the process
- Poor and unrealistic feedback
- Lack of training in critical thinking
- Failure to see it as critical part of performance
- Major disconnection between theory and practice

Medical Decision Making: Metacognition

- First step in improving cognition
- Awareness of our thought process in clinical decision-making
- To understand our errors we must understand how we think

Features of Metacognition

- Awareness of learning process
- Recognition of the limitations of memory (7 +/- 2)
- Ability to appreciate perspective
- Capacity for self critique
- Ability to select strategies for decision making problems when things don’t fit

Cognitive Strategies in Clinical Decision Making

- Exhaustive method
- Hypothetico-Deductive (Analytic) method
- Heuristics/Rule based
- Pattern recognition

Novice

Expert

Analytic/Hypothetico-Deductive
Originate a novel solution, diagnosis, or treatment plan for patient presentations where no obvious patterns or rules “fit” case

Using Rules
Use rules, algorithms, clinical pathways, heuristics, that “fit” case

Pattern-Recognition
Recognize (without conscious thought) patterns of symptoms, signs, and diagnostic test results that “fit” case

Maximal Mental Effort

Minimal Mental Effort

Exhaustion

- Painstaking invariant search for all medical facts about the patient by sifting through data for the diagnoses
- Novice strategy
- Exhaustive strategies appear when uncertainty is high or when fatigue and circadian dysynchronicity occur, regression to earlier decision making forms occur

Hypothetico-Deductive (Analytic) Reasoning

- Hypothesis generation: looks for patterns of illness and develops differential diagnosis
- Hypothesis refinement: Gather data to test theory
- Testing the hypothesis: results are interpreted
- Causal reasoning: based on gathered information try to fit into one or more diagnosis
- Diagnostic verification: Reach a conclusion with a working diagnosis

Hypothetico-Deductive Error

- Knowledge gap or inexperience
- Failure to recognize a disease pattern
- Misinterpretation or misapplication of diagnostic testing
- Inaccurate assessment of the strength of the evidence

To every answer you can find a new question. Yiddish proverb

Hypothetico Deductive Errors: Hypothesis Generation

- Psych out: failure to consider medical diagnosis due to apparent psychiatric diagnosis
- Context or situational bias: patient location/triage level determines acuity
- Playing the odds: faulty estimate of disease prevalence
- Anchoring: accepting previously accepted labels or an initial diagnosis without questioning
- Yin-Yang Out: presuming you have nothing to add to a prior workup

Pattern Recognition

- Automatic
- Schematic control mode
- Parallel processing
- Rapid
- Preconscious

Common errors with Pattern Recognition

- Slips: a well practiced preconscious routine is improperly applied
- Lapses: failures in memory result in omissions/inefficiencies
- Missed Cues: tendency to recognize only what is memorized
- Biased memory: relying only on what you know from prior experience and discounting other possibilities

Things that influence decision making that formal decision makers do not acknowledge

- Biases
- Information gaps
- Ambient conditions
- Availability of resources
- Well-being of decision maker (i.e. fatigue)
- Patient and Physician Gender
- Personality
- Hard-wiring

We use two basic decision strategies

- System 1
- System 2

	System 1 (intuitive)	System 2 (analytical)
Cognitive style	Heuristic	Systematic
Cognitive awareness	Low	High
Cost	Low	High
Automaticity	High	Low
Rate	Fast	Slow
Reliability	Low	High
Errors	Usually	Few
Effort	Low	High
Predictive power	Low	High
Emotional component	High	Low
Scientific rigor	Low	High

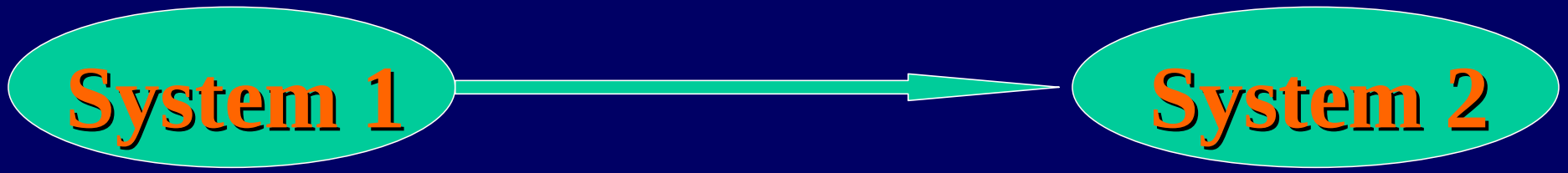
Most cognitive and affective errors occur in System 1

Given that we have to spend much of our time in System 1, can we improve our performance in it?

Heuristics or Rule Based Decision Making

- Heuristics are short cuts and rules of thumb and guide many decisions in emergency medicine
- Algorithmic approaches are one example (ACLS, etc)
- Simple “if then” rules help guide reactive behavior in stressful conditions
- Attentional, conscious, sequential processing

Continua of clinical decision making



High Signal:Noise **Diagnosis Manifestness** Low Signal:Noise

Degree of Manifestness

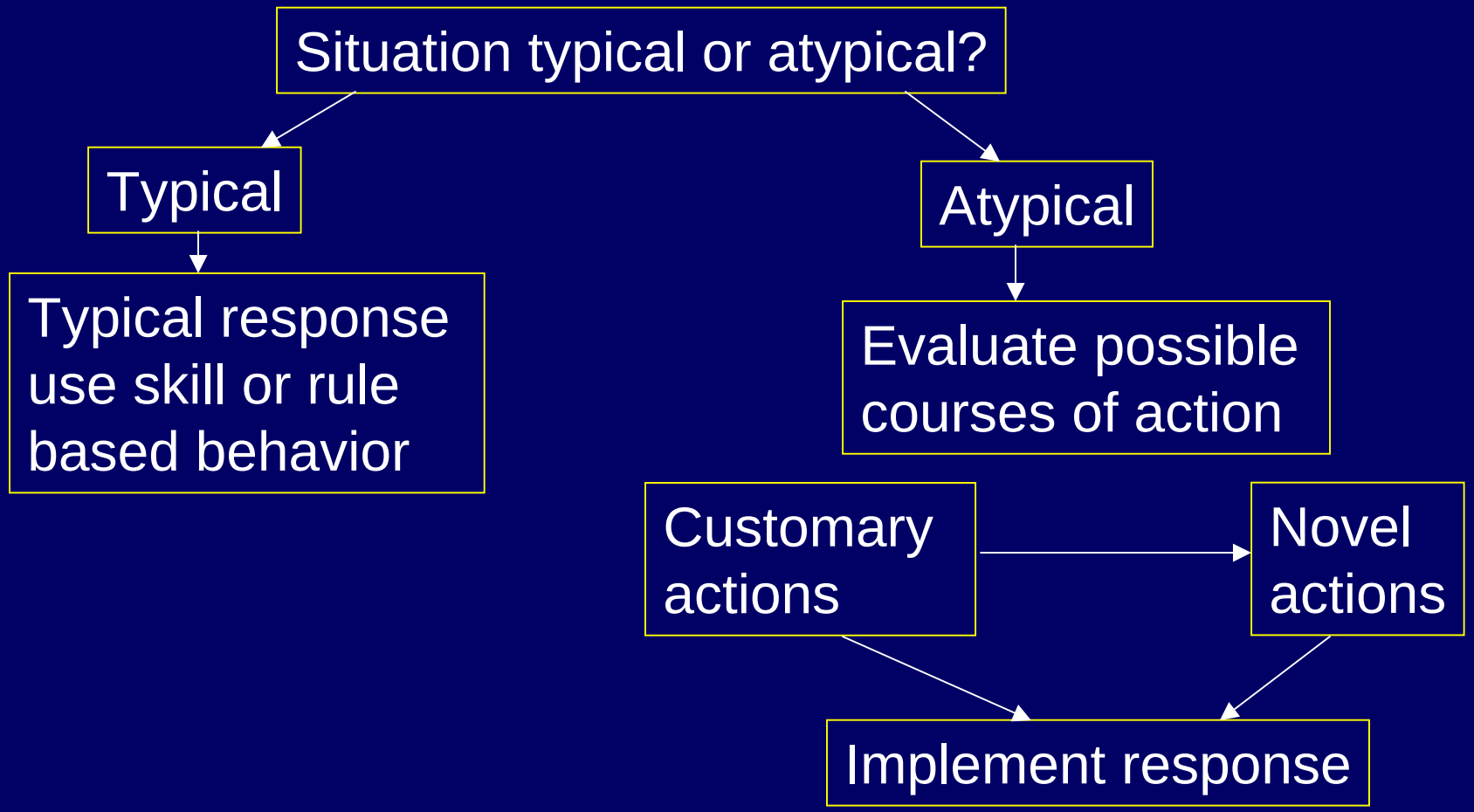
High Signal : Noise

- Shingles
- Anterior shoulder dislocation
- Laceration
- Foreign body
- Colles fracture

Low Signal : Noise

- Chest pain
- Abdominal pain
- Headache
- Weak and dizzy
- Shortness of breath

Naturalistic Model of Decision Making



If physicians were more critical thinkers, would this reduce medical error?

But medical training improves critical thinking - right?

- Participation in educational, higher-level learning setting
- Small class size and highly motivated peers
- Overall increase in knowledge base
- Increased experience at validating sources of information during clinical training
- Increased practice at integrating information
- Cognitive maturation

And yet……

Goals of Critical Thinking

- To be able to recognize distracting stimuli, propaganda, bias, irrelevance
- To identify, analyse, and challenge assumptions in arguments
- To recognize deception, deliberate or otherwise
- To assess credibility of information
- Ability to monitor and control own thought processes
- Ability to imagine and explore alternatives
- To effectively work through problems
- To make effective decisions

How important is diagnostic error?

Benchmark Studies and Diagnostic Error

- **Diagnostic error ranked #2-5**
- **Up to 14% of all adverse events**
- **Principal disciplines:**
  - **Emergency Medicine**
  - **Internal Medicine**
  - **Family Practice**
- **75-95% preventability**
- **Serious disability in up to ~ 50%**

Diagnostic Error

- Consistent discrepancy with autopsy findings 20-40%
- 1/3 of these autopsies would not have occurred if correct diagnosis was known
- Diagnostic failure highest in emergency medicine, family medicine, internal medicine (Benchmark studies)
- 50% of US closed claims against Emergency Medicine physicians for delay or missed diagnosis
- 66% of all claims against family physicians in UK
- 47% of preventable deaths within 24 hrs in admitted Emergency Department (ED) patients due to delayed or missed diagnosis (Taiwan study, 2006)
- 21% of ED adverse events (in CTAS levels 1-3) due to diagnostic error (Ottawa study, 2006)
- Delayed or missed diagnosis principal cause of litigation in hospitals in Nova Scotia (HOPA data, 2006)

3 kinds of Diagnostic Error

- No Fault
- Systemic
- Cognitive/Affective

Origins of diagnostic error in 100 patients

Graber ML. Franklin N. Gordon R. Diagnostic error in internal medicine. Archives of Internal Medicine, 2005; 165(13): 1493-9.

Cognitive Error only	28%
System-related Error only	19%
Both System-related and Cognitive Factors	46%
No-fault Factors only	7%

No Fault

- Unreliable information from patient
- Deliberate misrepresentation of illness (malingering)
- Somatization Disorder
- Factitious Disorders
- Insufficient information available on new disease
- Patient refusal of critical investigations
- Silent presentation of co-morbid disease

Systemic

- Error producing conditions within system
- Laboratory error
- Inefficient follow-up of reports
- Time delays
- Unavailability of services
- Poor patient follow-up

Error Producing Conditions (EPCs)

Error Producing Conditions (EPCs)

Intrinsic

- High diagnostic uncertainty
- High decision density
- High cognitive load
- Narrow time windows
- Multiple transitions
- Interruptions/distractions
- Low signal/noise ratio
- Surge phenomena
- Circadian dysynchronicity
- Novelty

Systemic

- Workplace design/equipment
- High communication load
- Overcrowding
- Holding admitted patients (Emergency Dept.)
- Production pressures
- High noise levels
- Inadequate staffing
- Poor feedback
- Inexperience
- Inadequate supervision

Cognitive Error and Cognitive Biases or Cognitive Dispositions to Respond (CDRs)

Cognitive Error

- A failure in rational / logical thought
- Often due to biases or ‘Cognitive Dispositions to Respond (CDR)’
- About fifty known biases exist
- They are universal
- They are predictable
- They can be corrected (cognitive de-biasing)

One of the major impediments to convincing people of the prevalence and seriousness of cognitive error is the faith they have in their knowledge of the outside world

Visual perception is the most meaningful form of knowledge of the world around us.

It is our most immediate connection to the outside world.

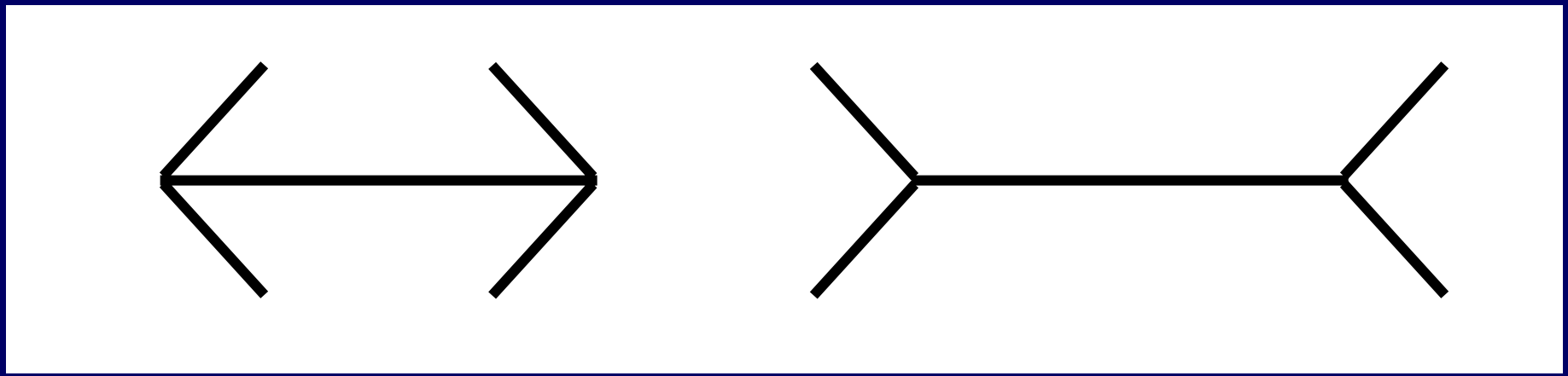
It is the sense that we would least like to lose.

So, how reliable is it?

Visual Error

as a model for

Cognitive Error



Perception

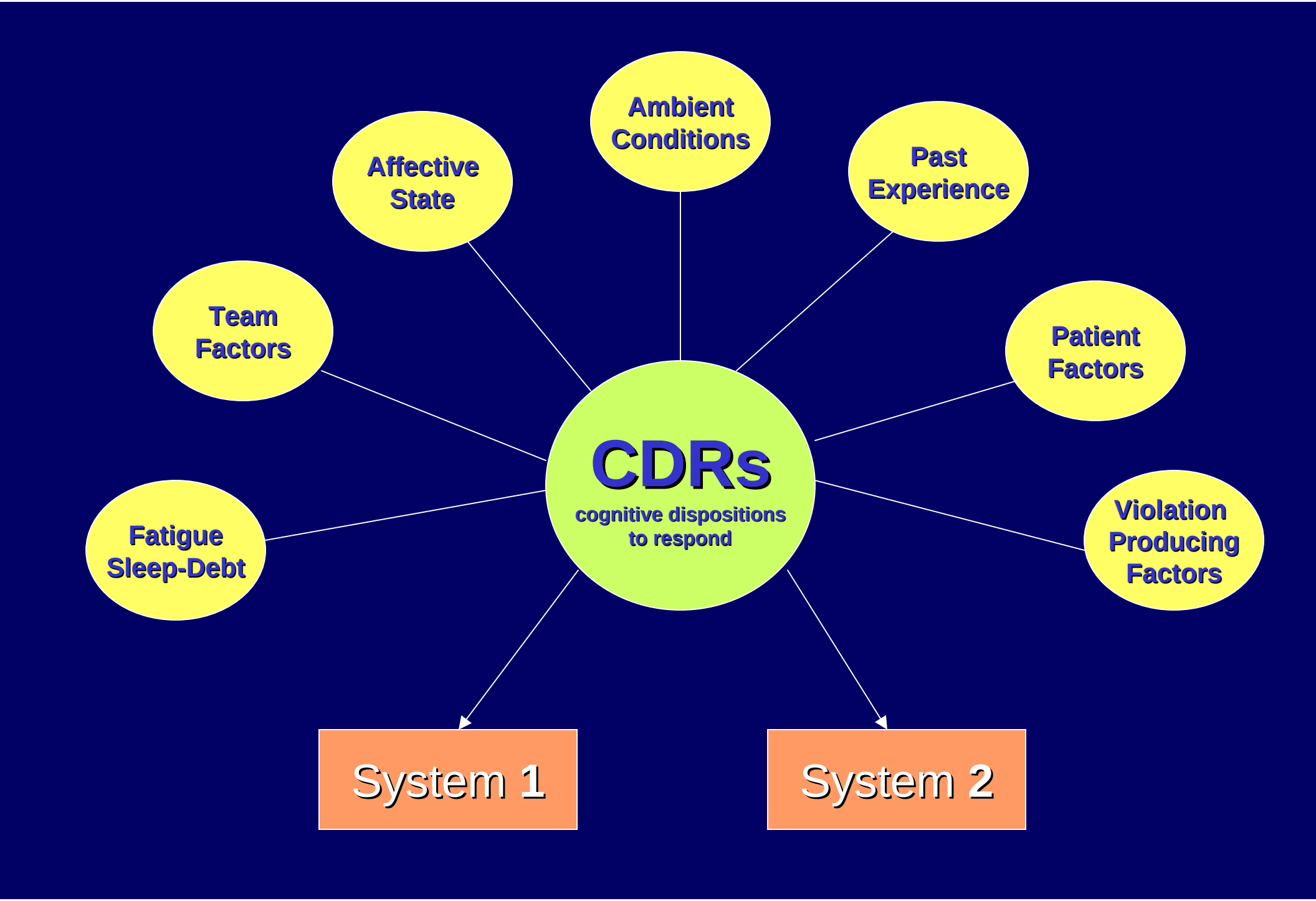
- We do not always see what we are looking at
- We often see what we expect to see
- We build in redundancy
- What we see depends on context
- We look for coherence and order

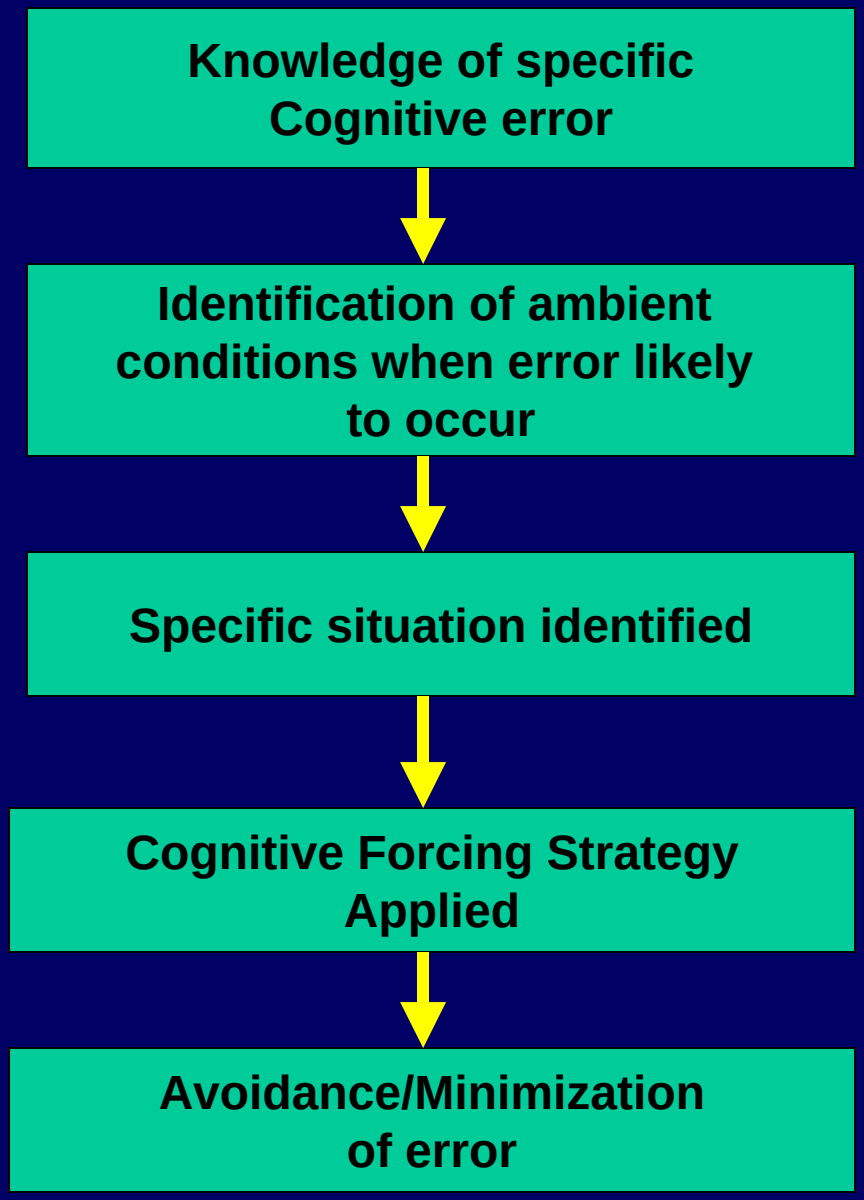
Sample CDRs

- Availability bias: Particular diagnosis considered more likely because it is easily recalled
- Representativeness bias: “If it looks like a duck, it walks like a duck, it must be a duck”
- Anchoring Bias: Too much reliance on one piece of information
- Confirmation bias: Clinicians seek information to confirm their initial impression, weigh evidence favoring our diagnosis more heavily
- Search satisfaction bias: Once we find one abnormality we stop looking for others

Sample CDRs

- Premature diagnostic closure: Reaching a diagnosis and failing to assimilate additional data that contradicts it.
- Zebra retreat: A diagnosis is considered but than not pursued to avoid an unfamiliar diagnostic path
- Omission bias: Physicians tend to favor inaction when risks are great, if the risk of not acting is greater
- Prevalence bias: We weigh a diagnostic possibility higher than expected for the likelihood of disease in a population (Rule out worst case scenario heuristic)
- Hindsight bias: "Knew it all along" effect, we exaggerate what should have been anticipated in foresight and overestimate what was known at time of first encounter


Ambient Conditions
Affective State
Past Experience
Team Factors
Patient Factors
CDRs
cognitive dispositions to respond
Fatigue Sleep-Debt
Violation Producing Factors
System 1
System 2


Knowledge of specific Cognitive error
Identification of ambient conditions when error likely to occur
Specific situation identified
Cognitive Forcing Strategy Applied
Avoidance/Minimization of error

Using forcing functions to reduce error

A forcing function constrains actions such that failure at one stage prevents the next step from happening

Croskerry, Acad Emerg Med 2000

Using simulation to instruct emergency medicine residents in cognitive forcing strategies

- Metacognitive strategies can be taught by simulation
- Experience ranked second only to direct patient care for educational effectiveness
- May be more effective with upper-level residents

- *Bond et al, Acad Med 2004*

Training to improve Clinical Decision Making

- Take some specific training in critical thinking
- Develop insight/awareness
- Be aware of your decision mode
- Always consider alternatives
- Metacognition
- Decreased reliance on memory
- Specific training to avoid Cognitive and Affective Dispositions to Respond
- Simulation
- Cognitive forcing strategies
- Make task easier
- Minimize time pressures
- Accountability
- Feedback