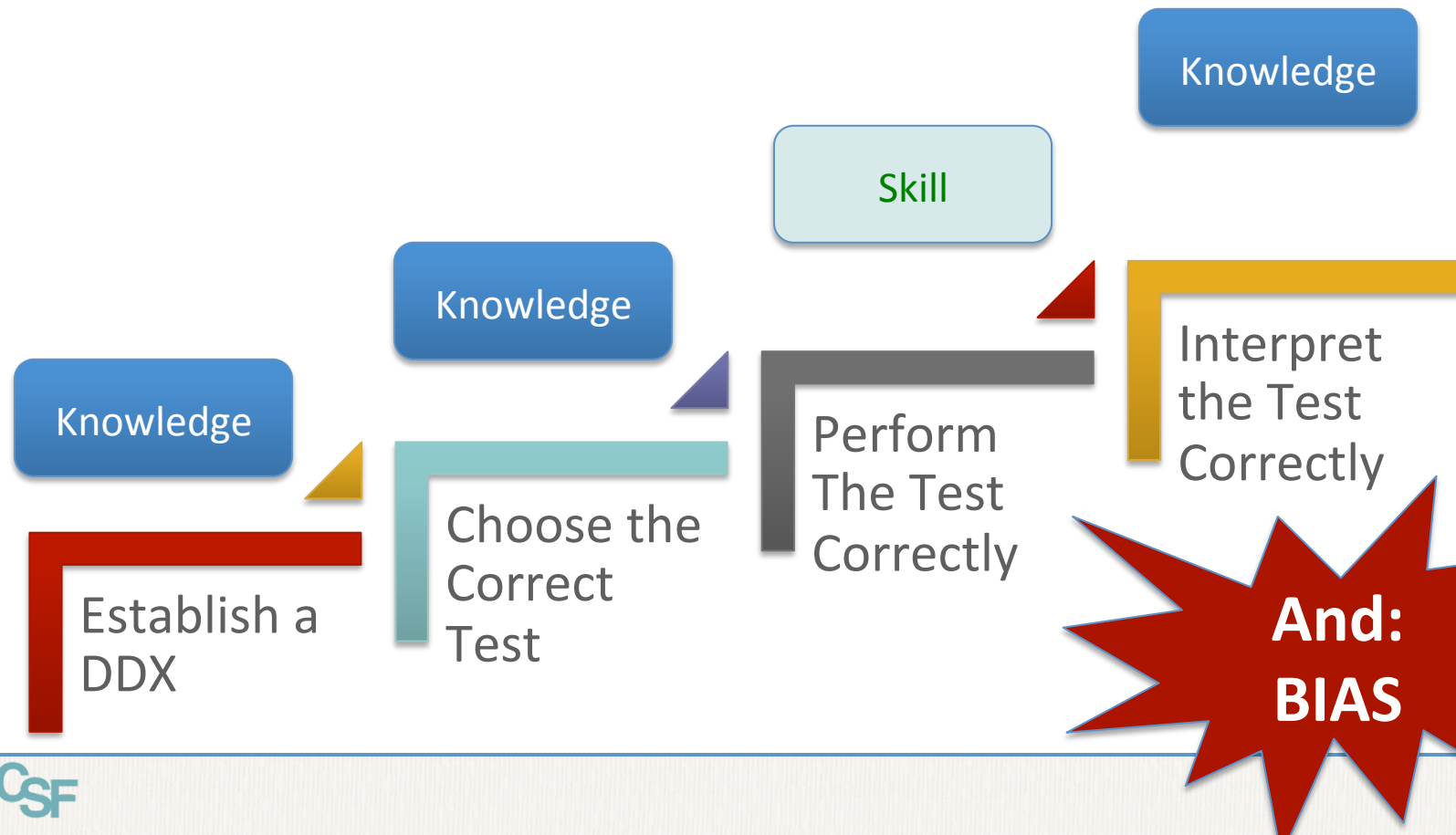


# Diagnostic Error

- The elephant in the room in the patient safety movement
  - Most safety interventions (barcoding, checklists) focus on getting ensuring that the right patient gets the right diagnostic test or prescribed treatment.
  - They assume that the diagnosis that prompted the therapeutic decision was right.

# Test Interpretation Human Errors

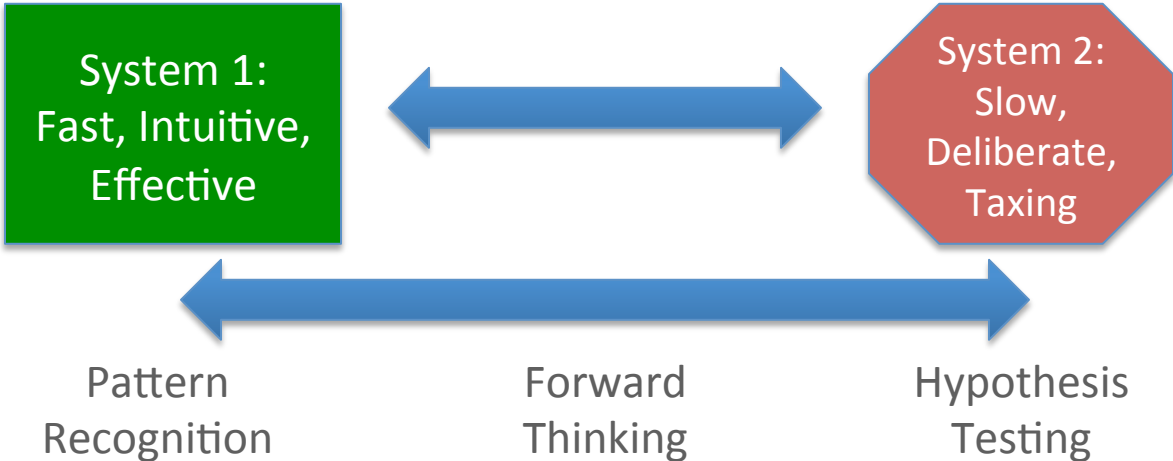


# Many causes of diagnostic error

- Clinical Input error: wrong data was collected from the patient
  - Lack of clinical encounter skills: wrong history questions or incorrectly interpreted physical exam.
  - Eg: If the initial resident doesn't pick up the weak arm and misdiagnoses the patient as having isolated vertigo, this is an input error
- Clinical Analysis error: right data but wrong clinical interpretation
  - Lack of Knowledge: ignorance of disease or disease characteristics
  - Cognitive Biases: mental models that trip us up.

## How Experts View Thinking and Error

We are creatures of habit.  
When habits fail, we resort to more conscious  
forms of thinking.



# System 1: Skill Based Activity

- Intuitive, Automatic, Subconscious
- Used for: Common, recurrent scenarios
  - Like Driving A Car...
- Relies upon: Schema: Pattern Recognition(Diagnosis) and The Directions that follow (Therapeutic)
  - Stored Patterns of Preprogrammed Instruction
- Once consciously activated, the performance flows automatically.
- Requires periodic monitoring checks

# Schema: For Common Issues

- Context and Individual Specific
- Procedural
  - Chief Resident inserting a central line
  - CT surgeon doing a CABG
- Diagnostic:
  - Internist diagnosing essential Hypertension
  - Rheumatologist diagnosing Gout
- Limitless number and complexity

# Rule Based Activity

- Midway between System 1 and System 2
- Used for: **Familiar but not common** situations or failure of schema
- Relies upon: **Stored rules** for generic situations
- Less specific than skill based decisions
- “One size fits most”

# Rule Based Activity Examples

- Algorithmic Thinking: If.....Then Statements
- If the car doesn't start... Then check the gas gauge.
- If ....the blood pressure doesn't respond to three drugs, then its not essential hypertension
- If.... the patient remains febrile despite appropriate antibiotics, then look for an abscess.

## System 2: Knowledge Based Activity

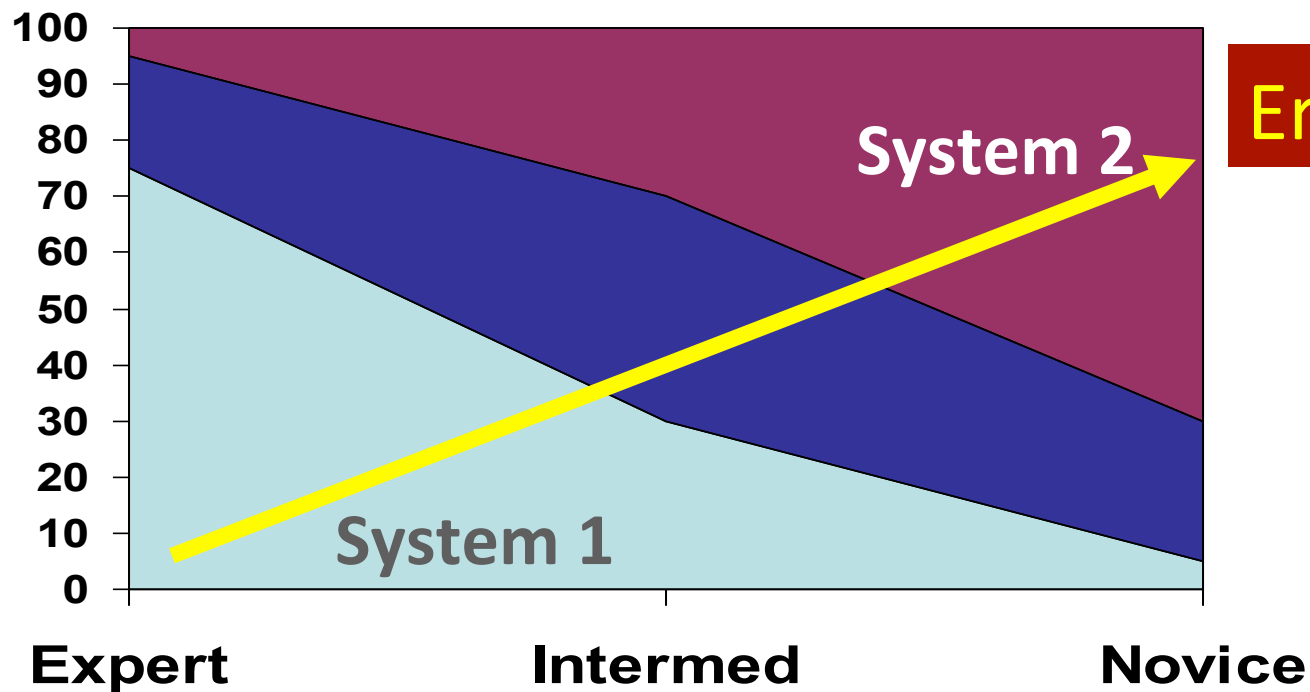
- Conscious, Deliberate, Rational Thought
- Used in: **Novel Situations** or Ultimate **problem solving failures**
- Relies upon: **Conscious, synthetic problem solving**
  - Access, process and apply stored knowledge
  - Constant attention, frequent rules check
- Challenging, Taxing, Unsustainable
  - Involves a form of hypothesis testing...

# Examples of Knowledge Based Activity

- Novice:
  - First Driving Experience
  - First Central Line
  - First H and P
  - Initial Diagnostic Quest
- Vexatious Problems
  - The Patient who won't get well

# Experts vs Novices

■ Skill ■ Rule ■ Knowledge



Error Rate

## Quiz 5.3

○ Experts:

1. Use more system 1 thinking and make fewer errors
2. Use more system 2 thinking and make fewer errors
3. Use more system 2 thinking and make more errors.

## Type of Error depends on Type of Thinking/Activity Used

- System 1, SB Activity: **Slips**
  - Execution Errors
- System 2: RB and KB Activity: **Mistakes**
  - Planning Errors
- Violations: disregard for appropriate, established protocols

## System 1 Errors in Skill Based Activity

- Right Solution is chosen but the outcome is not what was intended.
- Imbalance between monitoring checks and automatic activity
- Heavily impacted by: stress, fatigue, boredom, multitasking, workload

# Examples of System 1 Errors

- Distraction errors
  - Periodic checks are decreased
- Capture errors
  - The need for monitoring increases
  - A-B-C-D-E as norm, with A-B-C-**X-Z** planned

# Clinical Examples

- Diagnostic Input Error: Resident reading a chest xray is interrupted to deal with a contrast reaction and misses the pneumothorax. (distraction error)
- Therapeutic Error: The anesthesiologist is used to administering antibiotics quickly now uses an antibiotic that requires a different infusion rate (capture error)

# Rules Based Activity Errors

- Planning Error
- Types:
  - Good Rule, Misapplied
    - Strong but Wrong Rule.
  - Bad Rule
    - Anecdotaly driven

## Rules Based Activity: Clinical Examples

- Give Esmolol for tachycardia causing hypotension
  - strong but wrong rule if the tachycardia is the result of rather than a cause of the low BP
- Give thrombolysis when angioplasty is unavailable
  - strong but wrong rule if the diagnosis is not an Acute Coronary Syndrome

## System 2: Knowledge Based Activity Errors

- Problems accessing the appropriate stored knowledge and applying new information
  - limitations in knowledge & short term memory
- Strong tendency to fit the problem into something we have seen before
  - Biases in long term memory
- Most difficult to analyze and recognize

# Common Cognitive Biases

- Availability Heuristic
  - This patient has what the last patient had...or.. Common things are common
- Confirmation Bias
  - Giving preferential attention to data that supports an initial hypothesis rather than refutes the initial hypothesis
- Over confidence Bias
  - Relying heavily on the opinion of experts
- Premature Closure
  - The most commonly missed fracture is the second one...

# Additional Biases

- Fundamental Attribution error
  - Tendency to identify the patient as the cause of his/her illness.
- Commission/Omission bias
  - Tendency towards action (like test ordering) or inaction (like nihilism.)

# Biases are everywhere

- They are not always bad: mental models help us get through the day..
- It is difficult to identify your own biases because they remain when you are trying to uncover them....
- How can we identify errors due to cognitive biases and learn from them?

# Appoint a Designated Critic

- Someone whose job it is to demand justification of your diagnosis and treatment plan.

# Cognitive Discipline

- Make yourself work through the systematic approach, even if you KNOW the patient has disease X.

# Reflection and Analysis

- Work backwards on your forward thinking to identify where you deviated from the right course and what data you overemphasized

## Quiz 5.4

- Cognitive Biases

1. Happen rarely and can be avoided if you are smart enough
2. Happen commonly and are difficult to avoid without conscious thought.