CRITICAL THINKING: CAN IT BE TAUGHT?

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March 11th, 2015
OBJECTIVES

By the conclusion of the presentation, attendees will be able to:

1. Distinguish between type 1 thinking and type 2 thinking.
2. Define cognitive biases and how they commonly occur.
3. Describe strategies to help learners develop critical thinking.
4. List signs in learners who are having difficulty developing critical thinking.
CRITICAL THINKING - DEFINITION

“the ability to engage in purposeful, self-regulatory judgment”
- Abrami et al

“the ability to solve problems by assessing evidence using valid inferences, abstractions, and generalizations”
- Scott et al

“thinks open-mindedly about alternative systems or perspectives and assesses assumptions, implications, and consequences when addressing complex problems”
- Mitchell et al
CRITICAL THINKING - DEFINITION

Synonymous with:
- Clinical Decision-making
- Clinical Reasoning
- Diagnostic Reasoning
- Diagnostic Thinking
CRITICAL THINKING - IMPORTANCE

- Development of diagnostic skills is one of the most important goals of medical education.
- Diagnostic error rate ~ 10-20%
  - Approximately 75% of diagnostic failures can be attributed to a failure in diagnostic reasoning
- Applicable to both experienced physicians and trainees.
HOW DO WE MAKE DECISIONS?

Two processes or systems:

- **Type 1 thinking**: intuitive, non-analytic
  - quick, requires little effort
  - pattern recognition
  - very vulnerable to cognitive bias, and therefore error
- **Type 2 thinking**: analytic, critical
  - slow, deliberate
  - pauses to consider the evidence and alternative hypotheses
  - more accurate, less vulnerable to bias
TYPE 1 THINKING

- Where we operate the majority of the time – in medicine as well as in life.
  - Efficient
  - Good in emergencies
  - Often automatic – our *natural* thought process
    - Patterns recognized almost subconsciously
  - Very vulnerable to cognitive bias
    - Particularly if fatigued, stressed, or distracted
    - Common situation for trainees
COGNITIVE BIASES

There are MANY, though common ones include:
- **Availability** – recall of recent similar diagnosis
- **Anchoring** – continuing with same dx despite evidence to the contrary
- **Diagnosis Momentum** – accepting the dx that was passed on to you
- **Confirmation** – seeking out only information that will confirm your dx
- **Premature closure** – closing the diagnostic process too early due to vivid presenting features
Viral gastroenteritis is prevalent in the community. A 22 year old woman presents with nausea, vomiting, low grade fever and abdominal pain for 24 hours. She denies diarrhea. Abdominal exam shows diffuse tenderness, slightly worse in lower quadrants, no rebound, and normal bowel sounds. The patient is told she has gastroenteritis and sent home. Pain continues to worsen and she returns the next day, when appendicitis is diagnosed.

Biases: Availability, anchoring, confirmation, premature closure...
COGNITIVE BIASES

- Much more common in settings of sleep deprivation, fatigue, and cognitive overload

- Often subconscious mistakes and so are seldom corrected

*The first step to developing critical thinking skills is to learn to be aware of cognitive bias.
TYPE 2 THINKING

- Our executive override – our *nurtured* thinking
- Pause for reflection and evaluation of the evidence and consideration of alternative explanations (diagnoses)
TYPE 2 THINKING

- Comes easier when we don't "recognize the pattern" – new or rare conditions
- We may falsely identify a pattern and so don't use it when we should (fatigue, stress, cognitive overload)
- Triggers for Type 2 thinking:
  - Piece doesn’t fit
  - When normal is not normal
  - When your original treatment doesn’t produce the results you expected
DUAL-PROCESS MODEL OF THINKING

Continuum between type 1 and type 2 thinking

-As critical thinking skills develop, one can more easily move between the two and recognize when type 2 thinking is needed.
CRITICAL THINKING

Five Phases of Diagnostic Reasoning:
1. Symptom-based
2. Symptom Cluster/Encapsulation
3. Formation of Illness Scripts
4. Hypothetico-deductive Reasoning
   - Beginning of Critical Thinking/Diagnostic Reasoning
5. Advanced Critical Thinking
CRITICAL THINKING

Phases of Diagnostic Reasoning:
- First: Symptom-based
  - Symptoms addressed individually
- Second: Symptom-cluster/encapsulation
  - Symptoms clustered together in common syndromes
  - Early pattern recognition

Learners here often present inadequate or generic differentials, or a separate diagnosis for each symptom.
CRITICAL THINKING

Phases of Diagnostic Reasoning:
- Third: Formation of illness scripts
  - comes with experience
  - links syndromes with predisposing conditions, pathophysiology, and consequences
  - advanced pattern recognition
CRITICAL THINKING

Phases of Diagnostic Reasoning:
- Fourth: Hypothetico-deductive reasoning
  - Clinical cues → hypotheses → directed questioning → Diagnosis
- Early critical thinking
CRITICAL THINKING

Phases of Diagnostic Reasoning:
-Fifth: Transition from novice to expert in diagnostic reasoning
- Efficiently and reflectively select and use type 2 thinking
CRITICAL THINKING

- The goal is not to operate in type 2 thinking all the time, but to know how and when to think critically.

  - Excellent diagnosticians still use type 1 often.
    - what makes them advanced is that they know how and when to use type 2

Knowledge and experience are important, but you don’t have to have been in practice for 30 years to be a good diagnostician.
*CRITICAL THINKING*

Teaching critical thinking is teaching learners how to process and use information and knowledge.

- Facts are increasingly accessible.
- Education is increasingly more about how to process them.
TEACHING CRITICAL THINKING

- It is not just a medical skill.
  - Can be taught in all levels of education, particularly in undergraduate education
  - Life skill
    - better parents, citizens, functioning adults in general?

- Students leave medical school with expansive knowledge
  - teaching critical thinking is teaching them how to use that knowledge better.
TEACHING CRITICAL THINKING

All levels of medical education:
  - include education about cognitive biases
    - what they are
    - why they are a problem
    - when they are most likely to occur
    - how to overcome them

If they aren’t aware that they exist, they cannot recognize or address them.
TEACHING CRITICAL THINKING

Years 3, 4, and Residency:

The Challenge
Give high quality patient care while simultaneously assessing and teaching our learners.
How do we teach critical thinking while providing care?
TEACHING CRITICAL THINKING

Model it !!!

- Continue to develop it yourself
  - Be aware of cognitive bias
- Be explicit
  - Recognize and vocalize any potential for bias
  - Vocalize when you are stepping back and entering type 2 thinking
Model it !!!

- Approach difficult cases as problems to be solved and as a way to expand your knowledge
- Engage in **intentional problem solving**, and vocalize it
  - reason aloud
- **Model an attitude and belief that learning is never over**
TEACHING CRITICAL THINKING

Guide it !!!

- Following presentations:
  - Have the learner reason through the case and their assessment aloud
  - Engage them in discussion and debate about the case
TEACHING CRITICAL THINKING

Guide it !!!

- Help them ask the “right” questions to reach the best diagnosis.
  - Ask them what else they would want to know to further narrow their differential
    AND/OR
  - Ask them what about the case does NOT support their diagnosis
TEACHING CRITICAL THINKING

Encourage it !!!

- Create personal accountability
  - Review decisions/diagnoses
    - Those who knew they would have to justify their actions later put more thought into their actions/diagnosis
- Maintain a supportive environment
  - Mistakes will be made. Avoid humiliation and belittling.
How do we know they are having trouble developing or using critical thinking skills?
CRITICAL THINKING DIFFICULTIES

Often there are clues in their presentations:

- Can't give one-sentence summary in abstract terms
- Poor data gathering
- Lack use of semantic qualifiers
The Case as Seen by a Novice Resident and an Expert Resident.

| Patient's story: | My knee hurt me so much last night, I woke up from sleep. It was fine when I went to bed. Now it's swollen. It's the worst pain I've ever had. I've had problems like this before in the same knee, once 9 months ago and once 2 years ago. It doesn't bother me between times. |
| Novice resident's presentation: | My next patient is a 54-year-old white man with knee pain. It started last night. He does not report any trauma. On examination, his vital signs are normal. His knee is swollen, red, and tender to touch. It hurts him a lot when I test his range of motion. He's had this problem twice before. |
| Expert resident's presentation: | My next patient is a 54-year-old white man with a sudden onset of pain in his right knee that awakened him from sleep. He does not report any trauma and was essentially asymptomatic when he went to bed. His history is remarkable for two episodes of similar, severe pain 9 months and 2 years ago. He is pain-free between episodes. He is afebrile today. His knee is swollen, tender to touch, and erythematous. |
| Teacher's inquiry: | What do you think is causing this patient's knee pain? |
| Novice resident's response: | It could be an infection. It could be a new onset of rheumatoid arthritis. It could be Lyme disease. Since he doesn't recall falling, I doubt it's an injury. I don't know whether osteoarthritis ever presents like this, but he does have a history of knee pain. |
| Expert resident's response: | The patient has acute gout. He has had multiple discrete episodes with abrupt onset of extremely severe pain involving a single joint with evidence of inflammation on examination. Before all his episodes, he is asymptomatic. I would have expected gout to affect the first metatarsophalangeal joint, but it can present in the knee. Nothing suggests any ongoing, chronic problem in the knee. I didn't see any portal of entry to suggest acute infectious arthritis and he looks quite well for that. His other joints are normal on examination. I doubt that he has a flare-up of osteoarthritis with pseudogout or a systemic, inflammatory arthritis such as rheumatoid arthritis. |

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CRITICAL THINKING DIFFICULTIES

Sometimes you need to further assess their reasoning:

“What makes you think that?”
“What was puzzling?”
“Does anything not quite fit?”
“What else could it be? Why or why not?”
CRITICAL THINKING DIFFICULTIES

Signs a learner isn’t thinking critically:
- Difficulty gathering pertinent data
- Difficulty “putting it all together”
- Difficulty forming a differential (making hypotheses)
- Failing to recognize the common
- Disorganized
CRITICAL THINKING DIFFICULTIES

Symptom: Poor data acquisition/reporting
Diagnosis: Learner does not yet identify what is important
- Don’t acquire it or don’t think to present it

Treatment: Model at the bedside/in the exam room
- Alert the learner to what you want them to watch for
- Have them reflect on what they saw and/or redo the presentation from what you obtained
CRITICAL THINKING DIFFICULTIES

Symptom: Disorganized presentation/poor summary statement

Diagnosis: Little experience with the problem or lacks good understanding of the problem

Treatment: Go through chart/history and point out important points and why they are important
- Give your own summary statement for example
CRITICAL THINKING DIFFICULTIES

Symptom: Poor differential diagnosis
Diagnosis: Learner hasn’t yet created an illness script for this problem
-lacks experience with this problem

Treatment: Discuss salient features of the case and ask learner to prioritize, narrow, or refine differential
-Probe for at least one other alternative diagnosis and how to differentiate between the two
CRITICAL THINKING DIFFICULTIES

Symptom: Far-fetched diagnosis

Diagnosis: Poor understanding of the case or lacks sense of probability

Treatment: Question the typical presentation for their diagnosis
- Ask them to compare/contrast to current presentation
- What else would we need to know?
CRITICAL THINKING DIFFICULTIES

Symptom:  *Unexpectedly* poor presentation or differentiation

Diagnosis: Learner lacks experience with the problem or didn’t anchor prior experience

Treatment: Ask them about their prior experience with problem
- Assign reading and follow-up for discussion
- Be sure to determine if this was isolated or recurring
CRITICAL THINKING DIFFICULTIES

Remember that though residents ARE physicians with true patient care duties, they are still in an EDUCATIONAL program and have more to learn!
CRITICAL THINKING DIFFICULTIES

In Closing…
- When a problem is identified or after a difficult case, always encourage reflection – including the provider’s feelings and state of mind at the time – and discuss the next day.

- Discuss what biases could have been affecting their thinking
Can critical thinking be taught?

Yes and no

It can certainly be DEVELOPED through modelling, guidance and encouragement!!
References


This slightly unpolished presentation courtesy of the KC Royals!