Critical Thinking Skills
ACP Hawaii
2/23/2019

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University of Hawaii
Topics

• Critical thinking is at the core of Medicine
• Socratic teaching is not the same as “pimping” in AM rounds
• Unconscious Cognitive Bias affects critical thinking
• Why guidelines don’t help
• Why mnemonics don’t help
• Five step technique to overcome biases and help critical thinking
• Future of AI and Medicine
Critical Thinking & the Socratic Method

"I cannot teach anybody anything, I can only make them think."
~Socrates

How You Can Promote Critical Thinking

- Socratic Method of Teaching
  - Oldest method of teaching
  - Promotes critical thinking and active learning
  - Involves “guided questioning”
    - “Asking rather than telling”

@JasonHarter
Morning Rounds & the Socratic Method

- Lost art to think on your feet, explain, teach
- Inefficient method to teach
- Esoteric facts & trivia
- Public Embarrassment & Shaming
- Limited knowledge
- Tangential thinking
- Intellectual bullying
- Maintain power hierarchy
- Real learning?
# Socratic method vs “Pimping”

## Table 1. DISTINCTION BETWEEN MEDICAL PIMPING AND THE SOCRATIC METHOD OF TEACHING

<table>
<thead>
<tr>
<th>Technique</th>
<th>Medical Pimping</th>
<th>Socratic Method of Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goals</strong></td>
<td>Evaluate students</td>
<td>Connect new knowledge to existing knowledge</td>
</tr>
<tr>
<td></td>
<td>Establish hierarchal order</td>
<td>Teach</td>
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<tr>
<td></td>
<td>Teach</td>
<td></td>
</tr>
<tr>
<td><strong>Setting</strong></td>
<td>One on one focus of questions</td>
<td>Group learning</td>
</tr>
<tr>
<td><strong>Types of questions</strong></td>
<td>Factual, pertaining to history, eponyms, lists, esoteric</td>
<td>Probing and leading: making connections</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>What is tertiary hyperparathyroidism?</td>
<td>What is the mechanism for hypercalcemia in some lung cancers?</td>
</tr>
</tbody>
</table>

Social Science Findings

• People can make poor choices with incomplete information.
• People can make bad decisions even with full information because of unconscious biases.
• Cognitive biases interfere with critical thinking!

• Peer pressure affects individual thinking
• Problems with Group think
• Thinking takes too much effort, I’ll just go into surgery.
• Here’s a 5 step tool to help solve problems.
“Cogito, ergo sum”

• “I think, therefore I am.”
• Rene Descartes
  b. 1596
Thinking Fast & Slow

Daniel Kahneman, Nobel Prize winner in Economics 2002

System 1 & System 2 thinking
(Fast & Slow)

• Unconscious biases influence our decision making
• Anchoring bias
• Confirmation bias
• Sunken cost bias
• Loss Aversion
• Illusion of Validity
• Optimism bias
Cognitive Bias: 4 Categories in Medicine

• Biases from too much information
  • Too many tests

• Not enough meaning
  • Facts without context are merely trivia

• Need to act quickly
  • Performance pressure

• Limits of memory
  • “We live in an age where everything is recorded and little is remembered.”
Different Types of Bias Alter Critical Thinking

**Confirmation Bias**
- Finding facts that support your beliefs
- Ignoring contradictory facts

**Anchoring Bias**
- Relying too heavily, or "anchor," on one piece of information for decisions
- “I saw a similar case last month”

**Availability Bias**
- Thinking of examples that come readily to mind are more representative than is actually the case.

**Sunken Cost Bias**
- The additional cost is less of a factor than the initial cost.
- If you’ve already publicly committed to a diagnosis, then you’re less likely to change to another even if the initial dx was wrong.

**Optimism Bias**
- People tend to overestimate positive than negative outcomes
- Doctors tend to think they are more correct than wrong.
Guidelines Do NOT Replace Critical Thinking

- Experts have made these guidelines
- A lot of thought has gone into developing guidelines.
- Corollary: “I don’t have to think, I will follow the guidelines!”
- Guidelines are a good start.
- Guidelines can be evidence based
- **BUT guidelines don’t make you brilliant. They just help you act less stupid.**
Mnemonics

• R. Douglas Collins 1981
Mnemonics & DDX

- “VINDICATE”
  - Vascular
  - Infectious
  - Neoplastic
  - Degenerative/Drugs
  - Iatrogenic/Inflammatory
  - Congenital
  - Autoimmune
  - Trauma
  - Endocrine

- Tangential thoughts
  - Availability bias
  - Anchoring bias
- Doesn’t prioritize
- No relation to prior probabilities
- Another memory trick
- Not critical thinking
- Confirmation bias
William Osler

Medicine is a science of uncertainty and an art of probability

—William Osler

More science quotes at Today in Science History todayinsci.com
Prior probability

• Bayes Theorem
• Common things occur commonly.
• Key to finding fish: Be in the right place at the right time
Outcomes Analysis

• What’s the worst case scenario?
• What’s the best case scenario?
• What else can happen?
Confirmation Bias

- Doctors have initial diagnoses within 2 minutes
- Confirmatory data emphasized
- Contradictory data ignored
- “We see and hear what fits our expectations.”
Cognitive Dissonance

It's not denial.
I'm just very selective about the reality.
I accept.
Cognitive Dissonance

Look at the chart and say the Colour not the word

YELLOW  BLUE  ORANGE
BLACK  RED  GREEN
PURPLE  YELLOW  RED
ORANGE  GREEN  BLACK
BLUE  RED  PURPLE
GREEN  BLUE  ORANGE

Left – Right Conflict
Your right brain tries to say the colour but your left brain insists on reading the word.
A Solution:
How to Solve any problem in 5 easy steps

• This works for Medical problems
  or
• Figuring out which car to buy
  or
• Choosing a restaurant
  or
• Choosing a mate
Using Positive & Negative Facts to make a Dx

- JAMA article 2010
- IM residents in Netherlands
- Double Entry accounting by the Dutch in 1500s
- Ben Franklin listed positive & negative facts in making decisions
- Helps avoid bias and improves reasoning
Critical Thinking
Making good decisions with incomplete info!

1. Most Likely Diagnosis
2. Second Most Likely Dx
3. Best Case Scenario
4. Worst Case Scenario
5. “Zebra” diagnosis

What else could it be???

- Prior probabilities
- Easy to fix, easy to treat
- What do you NOT want to miss?
- Broad differential dx
- Systematic, Logical deduction using positive and negative facts to make a diagnosis.
How to solve any medical problem in 5 easy steps using positive & negative facts

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<thead>
<tr>
<th>DDx</th>
<th>Evidence for the Dx</th>
<th>Evidence against the Dx</th>
<th>Test</th>
<th>Therapy</th>
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<td>(+)</td>
<td>(-)</td>
<td></td>
<td></td>
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<tr>
<td>Second most likely Dx</td>
<td>(+)</td>
<td>(-)</td>
<td></td>
<td></td>
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<tr>
<td>Best Case Scenario</td>
<td>(+)</td>
<td>(-)</td>
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<tr>
<td>Worst Case Scenario</td>
<td>(+)</td>
<td>(-)</td>
<td></td>
<td></td>
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<tr>
<td>Zebra Dx</td>
<td>(+)</td>
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# Thrombocytopenia

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<tr>
<td><em>ITP</em></td>
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<td>Second most likely Dx</td>
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<tr>
<td><em>DIC</em></td>
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<tr>
<td>Best Case Scenario</td>
<td></td>
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<td><em>Splenic Sequestration</em></td>
<td></td>
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<tr>
<td>Worst Case Scenario</td>
<td></td>
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<td><em>TTP</em></td>
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<td>Zebra Dx</td>
<td></td>
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<td>Low plts</td>
<td>Schistocytes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second most likely Dx <strong>DIC</strong></td>
<td>Low plts Schistocytes</td>
<td>Normal PT, PTT, fibrinogen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best Case Scenario <strong>Splenic Sequestration</strong></td>
<td>Low plts</td>
<td>Normal spleen size. No portal HTN No cirrhosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worst Case Scenario <strong>TTP</strong></td>
<td>Low plts Schistocytes</td>
<td>No neuro sx, fever, purpura, hemolytic anemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zebra Dx <strong>HIV</strong></td>
<td>Low plts</td>
<td>No risk factors</td>
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<td>Most Likely Dx <strong>ITP</strong></td>
<td>Low plts</td>
<td>Schistocytes</td>
<td>Antiplatelet antibodies</td>
<td>Steroids, IVIG, Sx</td>
</tr>
<tr>
<td>Second most likely Dx <strong>DIC</strong></td>
<td>Low plts Schistocytes</td>
<td>Normal PT, PTT, fibrinogen</td>
<td>Blood smear PT, PTT, fibrinogen</td>
<td>Treat the cause of DIC</td>
</tr>
<tr>
<td>Best Case Scenario <strong>Spleenic Sequestration</strong></td>
<td>Low plts</td>
<td>Normal spleen size. No portal HTN No cirrhosis</td>
<td>Spleen scan</td>
<td>Observe</td>
</tr>
<tr>
<td>Worst Case Scenario <strong>TTP</strong></td>
<td>Low plts Schistocytes</td>
<td>No neuro sx, fever, purpura, hemolytic anemia</td>
<td>Blood smear</td>
<td>Plasma exchange</td>
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<td>Zebra Dx <strong>HIV</strong></td>
<td>Low plts</td>
<td>No risk factors</td>
<td>HIV</td>
<td>HAART</td>
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Occam’s Razor

• William of Ockham
• Franciscan Friar b.1265

• Principle of Parsimony
• *Entia non sunt multiplicanda praeter necessitatem.*
• *(More things should not be used than are necessary)*
• KISS
  • Keep It Simple Stupid
Artificial Intelligence & Medicine

HOW TECH CAN TURN DOCTORS INTO CLERICAL WORKERS

THE THREAT THAT ELECTRONIC HEALTH RECORDS AND MACHINE LEARNING POSE TO PHYSICIANS’ CLINICAL JUDGMENT – AND THEIR WELL-BEING.

BY ABRAHAM VERGHESE
ILLUSTRATION BY ERIK CARTER

MAY 16, 2018
Summary

• Critical thinking is at the core of Medicine
• Socratic teaching is not the same as “pimping” in AM rounds
• Unconscious Cognitive Bias affects critical thinking
• Why guidelines don’t help
• Why mnemonics don’t help
• Five step technique to overcome biases and help critical thinking
• Future of AI and Medicine
Summary

I always thought the idea of education was to learn to think for yourself.

— Robin Williams, *Dead Poet Society* (as John Keating)
Mayo Clinic Wisdom

“My own experience has been that the public will forgive you an error in treatment more readily than one in diagnosis...” - Dr. Will Mayo
The Defense Against the Dark Arts:
How to defend yourself against pimping

- Be prepared
- Talk about a lecture given earlier in the year by a specialist.
- Quote a higher authority
- Cite an obscure reference in a prestigious journal
- Keep dancing by requesting more information
- Answer a question with a question that you can answer.
- T-cell NHL
Time to Reflect
• I am a:
  o Medical student
  o 1st year Resident
  o 2nd year Resident
  o 3rd year Resident
  o Internal Medicine (Internist)
  o Other specialty

• My Med School was
  o In the US
  o International

• I am
  o Categorical resident
  o Transitional or Preliminary resident
  o Board eligible Internist
  o Board certified Internist
  o Other

• I have been out of training:
  o Practicing Medicine 1-5 yrs
  o Practicing Medicine 6-10 yrs
  o Practicing Medicine 11-20 yrs
  o Practicing Medicine >20 yrs

• Have you been taught this 5 step method before?
  o Yes
  o No

• Have you used this before?
  o Yes
  o No

• I found this to be
  o Very helpful
  o Somewhat helpful
  o Neutral
  o Not helpful
  o Very useless