What You See is Not All There Is: Cognitive Bias in Medical Decision-Making

Carly Magnusson, MD and Lauren Powell, MD, MBA
ACP Washington Chapter Scientific Meeting 11/2/19
Disclosures

We have NO financial disclosures or conflicts of interest with the material in this presentation
Goals

• Use bias terminology in discussions of cases and actively counteract them on a day to day basis
  • Be familiar with the most common biases and label them—giving them a name makes them easier to combat

• Recognize common situations were you might be at high risk for bias

• Create a culture of feedback and reflection
  • Regularly gather (and give) feedback on decisions so that we can build expertise
  • Know when we got things right or wrong, and reflect on our decision-making to improve
Diagnostic error is common, but underappreciated

<table>
<thead>
<tr>
<th>Treatment Errors</th>
<th>Rx</th>
<th>2 Million Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&gt;250,000 Harmed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs $20 Billion/Year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnostic Errors</th>
<th>Dx</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most Common</td>
</tr>
<tr>
<td></td>
<td>Over 12 Million Affected</td>
</tr>
<tr>
<td></td>
<td>Most Catastrophic</td>
</tr>
<tr>
<td></td>
<td>Est. 4 Million Harmed</td>
</tr>
<tr>
<td></td>
<td>Most Costly</td>
</tr>
<tr>
<td></td>
<td>Est. &gt;$100 Billion/Year</td>
</tr>
</tbody>
</table>

Coalition to Improve Diagnosis in Action, DEM Conference 2018
What role do cognitive biases play?

• Cognitive biases are a universal feature of human cognition—like *system errors for the brain*
• Cognitive biases may *interact* with system errors to produce bad outcomes
• Understanding the contribution of cognitive bias and the interaction of bias with system errors may help us *design upstream interventions* to prevent such errors from occurring in the future
Thinking, Fast and Slow: System errors for the brain
Your Two Brains: Thinking Fast and Slow

System 1
- Fast
- Unconscious
- Automatic
- Everyday Decisions
- Error prone

System 2
- Slow
- Conscious
- Effortful
- Complex Decisions
- Reliable

Con: Type 1 Processing Leads to Use of Heuristics/Biases
Con: Type 2 Processing Requires Attention/Deliberation

http://upfrontanalytics.com/market-research-system-1-vs-system-2-decision-making/
Anchoring

A Group got these questions
1. Are Redwood Trees greater than or less than **150** feet tall (circle one)?
   - Greater
   - Less than
2. How tall is an average Redwood Tree?

A group average: **150**

B Group got these questions
1. Are Redwood Trees greater than or less than **650** feet tall (circle one)?
   - Greater
   - Less than
2. How tall is an average Redwood Tree?

B group average: **494**

Answer: **200-350** feet tall!
The tendency to perceptually lock onto salient features in the patient’s initial presentation too early in the diagnostic process, and failing to adjust this initial impression in the light of later information.

Compounded by: confirmation bias  
Related: diagnosis momentum
CHIEF COMPLAINT: Acute respiratory illness

ASSESSMENT/PLAN:

- Acute Bacterial Sinusitis: diagnosed (B) based on:
  - Rhinosinusitis for ≥10 days with no improvement
  - Severe symptoms OR fever ≥39C (102F)
  - Worsening fever, headache, or nasal discharge after initial improvement
Treatment:
  - Intranasal steroids (B),  □ Antibiotics (B), □ Watchful waiting x7 days (B):
    - Amoxicillin/Clavulanate 875mg/125mg BID x7 days
    - Doxycycline 100mg BID x7 days (avoid in pregnancy)

- Acute Pharyngitis:
  - Streptococcal (positive rapid strep):
    - Penicillin VK 500mg BID x10 days (A)
    - Benzathine Penicillin G 1.2 million units IM single dose (A)
    - Non-anaphylactic Penicillin allergy: Cephalexin 500mg BID x10 days (A)
    - Anaphylactic Penicillin allergy:
      - Clindamycin 300mg TID x10 days (B), OR
      - Azithromycin 500mg on day 1, 250mg daily on days 2 to 5 (B)
  - Non-streptococcal (Centor score 0-1, OR negative rapid strep):
    - No further testing indicated
    - Gonorrhea NAA of throat: _
    - HIV viral load (RNA quant) + HIV screen: _
    - Monospot (heterophile antibody): _

- Pneumonia: Diagnosed by [ □ ] chest X-ray, or [ □ ] clinically
  - Hospitalization recommended:
    - Decompensated comorbidity, failed outpatient therapy, complex social needs
    - Sepsis (Any 2: temp >38.0 or <36.0, HR > 90, RR > 20, WBC >12 or <4, >10% bands)
  - No cardiopulmonary disease or comorbid conditions (B)
    - Azithromycin (B) □ 500mg on day 1, 250mg daily on days 2 to 5
    - Doxycycline (C) 100mg BID x7 days (avoid with pregnancy)
  - Higher-risk (B) [chronic heart / lung / liver / renal disease, diabetes, malignancy, asplenia, alcohol abuse, immunosuppression, use of antibiotics within 3 months]
    - Levofoxacin (A) 750mg daily for 5 days (renal dose if indicated)
    - β-lactam PLUS macrolide (A) or doxycycline (B) as above x 7 days
      - β-lactam options: □ Amoxicillin 1g TID, □ Amoxicillin/clavulanate 2g BID, □ Cefuroxime 500mg BID, □ Cefpodoxime 200mg BID

- Upper Respiratory Infection / Acute Bronchitis
  - Antibiotics not indicated, counseled on potential side effects, risk for invasive drug-resistant bacteria, counseled patient that URI typically resolves in 7 to14 days and cough may persist for weeks or months after resolution of other symptoms. (B)

- Symptomatic recommendations (for all): hydration, rest, saline nose sprays, sinus irrigation humidified air, throat lozenges, saltwater gargles (C)
  - [ □ ] Acetaminophen and/or 1st-generation antihistamine with pseudoephedrine (A)
SUMMARY ASSESSMENT: 82 year old woman with spinal stenosis, chronic pain and history of neglect by her son admitted after being found down unobserved x 48 hours with rhabdomyolysis.

PROBLEMS:
# Rhabdomyolysis/AKI: Patient found down and presents with severe AKI, volume depletion and CPK of 38,000
- S/P 2L IVF bolus
- Insert foley for accurate I&O
- Change sodium bicarb infusion to NS @ 300/hour. Titrate to UOP of 200-300cc/hour
- Nephrology consult in AM (called by ED tonight as well)
- Uric acid level high. Start allopurinol as uric acid >8
- q4H CMR, CPK, phosphorus and uric acid levels until stable/downtrending

# UGIB: Patient with occult + emesis and stool though no further output here. Has history of chonic ischemic colitis which may have been exacerbated by her dehydration.
- T&S ordered
- q4H hg ordered
- IV pantoprazole BID. Consider ggt if she starts bleeding again
- Consider GI consult

# SIRS 2/2 UTI: Technically meets diagnosis for sepsis with leukocytosis, tac 2/2 volume depletion rather than infection.
- Start ceftriaxone for both UTI and possible cellulitis coverage
- FU urine culture

# Elevated liver enzymes: Likely 2/2 rhabdo and muscle breakdown. Could be likely acute hepatitis or acute alcoholic hepatitis.
- Add on tylenol level and EtOH level
- q4H CMR

# Leg swelling/wounds: LLE with significant edema, erythema, warmth and pX breadown or rug burn.
- LLE doppler ordered
- Treat possible cellulitis with ceftriaxone
- Wound care consult

Problem #5 actually the most important problem!
Other “anchors?”

- Management plans
  - “continue current management”
  - “continue to monitor”
- Billing codes
- Reason for consultation
- Problem lists
- Previous admissions
- Old diagnosis – new problem
- Chronic disease “flare”
- Previous providers’ notes
- First study published
- How the patient looked at the last visit (i.e. dangers of treating via portal message)
- Mental valleys
Confirmation bias

The tendency **to look for confirming evidence** to support a diagnosis **rather than disconfirming evidence** to refute it

AKA WYSIATI

Related: premature closure, search satisficing
What you see is all there is (WYSIATI)

“Time Transfixed”
Rene Magritte

Amy Herman:
“How Visually Intelligent are you?”
Easy to see (confirm) what is currently there or was there before

Hard to see what is missing
Upper GI Bleed Order Set

### Components

**DIET**
- NPO (now)
- Hold Tube Feeding

**CLINICAL ORDER(S)**
- For non-surgical patients with urinary catheters please follow Nurse Initiated Protocol for removal
- RN Medical Foley Removal Protocol

**MEDICATIONS**
- Suspected variceal bleeding
- Pantoprazole Bolus and Infusion
- Octreotide: Suggested bolus is 50mcg, followed by 50 mcg/hr infusion.
- Dextrose 5% in Water (mcg/hr) 500 mL + octreotide-additive 1,000 mcg
- Ceftriaxone: MD to convert to ciprofloxacin 400mg PO BID to complete 7-day course once IV is no longer needed.
- cefTRIAxone
- Suspected NON-variceal bleeding
- Pantoprazole Bolus and Infusion

**Meds - Miscellaneous**
- pantoprazole
- pantoprazole
- Desmopressin 0.4mcg/kg over 10 minutes. For uremic bleeding associated with acute or chronic renal failure.
- desmopressin
  - For significant or severe bleeding regardless of INR consider 10 mg IV vitamin K given slowly to avoid anaphylaxis.
  - For INR 2-3 give 2.5 mg po vitamin K
  - For INR 3-4 give 5.0 mg po vitamin K
  - Note: Vitamin K will take effect 12-24 hours after administration regardless of route, higher dose will not increase effect.
  - Reversal of warfarin induced coagulopathy. Do not use for patients with active cancer, hypercoagulable states, or patients with DVT/PE or ischemic stroke in last three months unless severe bleeding.
- phytonadione
- phytonadione
- phytonadione

**LABORATORY**
- Complete Blood Count w/ Differential, Manual if Indicated
- Lab Next AM Labs (AM Labs)
- Hemoglobin
  - Please notify provider for INR >1.6
- Prothrombin Time

**RADIOLOGY AND OTHER DIAGNOSTIC TESTS**
- Patients with new suspected GI bleed and abdominal pain consider CT abdomen/pelvis to rule out ischemic colitis, inflammatory disease or perforation.
How to combat anchoring and confirmation bias?

- Beware of higher risk situations:
  - Handoffs (night to day, ED to floor, transferring hospital to floor, CCU to floor and vice versa, inpatient to outpatient)
    - Did I create and work through my own differential or did I accept the diagnosis given to me?
    - Has the patient’s status evolved since the last person saw them?
    - How is “copy/paste” affecting my ability to adjust my impressions in the light of new information?
    - Should I ask clarifying questions or re-do the history if things don’t make sense?
  - Unclear diagnosis (or seemingly obvious diagnosis), multiple admissions for the same thing
    - Did I accept the first thing that came to mind?
    - Did I consider other organ systems?
    - What are the other things on my differential? Do I actually have the information I need to rule those things out?
Combat anchoring and confirmation bias

- Ask disconfirming questions
  - Why could my answer be wrong?
  - If the lab value/feature I’m hanging my hat on didn’t exist, would I still think this was the diagnosis?
  - What available information am I ignoring or dismissing because it doesn’t fit my diagnosis?
  - What information would I need to see to change my diagnosis?
- WSIATI connection: What information is missing?
- Ask your residents these questions!
Availability bias

Which is more likely?

Lung cancer death
51.7/100,000 men
34.7/100,000 women

Opioid overdose death
14.9/100,000

What do doctors think is more likely?

20%  80%
Availability bias

We tend to judge things as being more likely or more frequent if they readily come to mind.

Things that come to mind more easily:

Recent    Emotional    Vivid
Availability bias

Recent experience with a disease may inflate the likelihood of its being diagnosed.

If a disease has not been seen for a long time (is less available), it may be under-diagnosed.

WYSIATI connection: if you haven’t heard of a diagnosis (or you can’t remember it), it may as well not exist...
Combat availability bias

• Make sure you have a lot of diagnoses “available” to you
  • Keep up your medical knowledge and engage in CME
  • Read about/solve interesting cases (e.g. NEJM, Human Diagnosis Project)

• Actively build a differential diagnosis to consider less “available” diagnoses

• Understand how recent cases may be influencing your decision-making
  • Am I ordering a CTPA more readily than I should because I recently saw a surprising PE?
  • On the other hand, am I over-adjusting and assuming the next case can’t be influenza because I already saw five cases in a row?
Visceral bias

• Negative (or positive) feelings towards a patient may result in diagnoses being missed

• Common types:
  • Non-adherent patients
  • Homeless patients
  • Patients with chronic pain
  • Obese patients
  • Psychiatric patients
  • Drug use
  • VIPs
Overconfidence bias

• Confidence level that people could recognize bike parts: 80%

• Actual percentage that could draw bike parts: 20%
Overconfidence bias

Universal tendency to believe we know more than we do
Physician confidence outpaces accuracy

Combat overconfidence bias

• Acknowledge that you know less than you think you do and be open to considering that you could be wrong

• Gain insight about your judgement - follow up on what happens to your patients

• Importantly, recognize this bias in your learners! Ask them disconfirming questions and give them feedback on their clinical judgement
What's your diagnosis? A 29 yo M w/ acute onset of myalgias, abdominal pain, and dark urine

Hi Lauren,

Sharpen your clinical reasoning with today's cases from adult medicine, primary care, and pediatrics.

The Human Diagnosis Project

JAN 4, 2019

GLOBAL MORNING REPORT

Slide left to update differential <
This is by listener request! Art and Nic analyse what went wrong in the case of a man who presented with sudden onset back pain.

Dr. Fatimah Alkhunaizi, a medicine intern at Johns Hopkins Hospital, presents a clinical unknown to Rabih.

---

**Schema #1**

**Schema #2**

**Show notes**

**References**

**Guest**
Patient is a 20 year old female with target shaped rash, eschar and nausea.
PROSPECT THEORY
Prospect Theory

Expected Value

Psychological value

Physical value
Loss aversion

Potential costs, efforts, and sacrifices are weighted more heavily than potential benefits, rewards, and opportunities – even if the absolute magnitude of the change is the same.
Loss aversion – framing effect

Imagine that the United States is preparing for the outbreak of an unusual disease that is expected to kill 600,000 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

‘A’ Group got these choices:
- If Program A is adopted, 200,000 people will be saved (and 400,000 people will die)
- If Program B is adopted, there is a one-third probability that 600,000 people will be saved and a two-thirds probability that no people will be saved.

% who favor A
87%

Choose certainty over risk when framed as a sure gain vs a possible loss

‘B’ Group got these choices:
- If Program A is adopted, 400,000 people will die (and 200,000 people will be saved)
- Program B: If Program B is adopted, there is a one-third probability that no one will die and a two-thirds probability that 600,000 people will die.

% who favor A:
6%

Choose risk over certainty when framed as a sure loss vs a possible gain
Framing effect

The way an issue or problem is presented affects how people make a decision

Another example of WYSIATI!
Framing effect

In patients with multiple risk factors for heart disease, Lipitor reduces risk of heart attack by 36%*

*That means in a large clinical study, 3% of patients taking a sugar pill or placebo had a heart attack compared to 2% of patients taking Lipitor.
**Side Effects**

**Standard dose statins**

- **Common side effects**
  - nausea, diarrhea, constipation (most patients can tolerate);
  - Muscle aching/stiffness
  - 5 in 100 patients
  - (some need to stop statins because of this);
  - Liver blood test goes up
  - (no pain, no permanent liver damage):
  - 2 in 100 patients
  - (some need to stop statins because of this);

- **Muscle and kidney damage**
  - 1 in 20,000 patients
  - (requires patients to stop statins).
Defaults

- Defaults serve as powerful reference setting, which takes advantage of loss aversion (endowment effect), laziness, and implied recommendation.
- Ex. opt-in vs. opt-out in organ donation, code status in end of life care.

*Effective consent rates, by country.* Explicit consent (opt-in, gold) and presumed consent (opt-out, blue).
Defaults

Prospect Theory

Physical value

Psychological value

Organ donation status
Code status
Medication dosing
Defaults

USE THE LOWEST EFFECTIVE DOSE
When opioids are started, clinicians should prescribe the lowest effective dosage. Clinicians should use caution when prescribing opioids at any dosage, should carefully reassess evidence of individual benefits and risks when considering increasing dosage to ≥50 morphine milligram equivalents (MME)/day, and should avoid increasing dosage to ≥90 MME/day or carefully justify a decision to titrate dosage to ≥90 MME/day.

<table>
<thead>
<tr>
<th>Dose Range</th>
<th>Opioid Formulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>45-90 MME/day</td>
<td>5-10 mg, tab, PO, Q4 HR, PRN, For Pain, Routine</td>
</tr>
<tr>
<td>90-135 MME/day</td>
<td>5-10 mg, oral soln, PO, Q4 HR, PRN, For Pain, Rx</td>
</tr>
<tr>
<td>16-32 MME/day</td>
<td>10-15 mg, tab, PO, Q4 HR, PRN, For Pain, Routine</td>
</tr>
<tr>
<td>160-320 MME/day</td>
<td>10-15 mg, oral soln, PO, Q4 HR, PRN, For Pain, Rx</td>
</tr>
</tbody>
</table>
How can we take action?
Watch for high risk situations

- Handoffs (outside transfers, ED to inpatient, PCP to subspecialty, night to day) – have I adequately looked at the available information myself, or am I accepting what I’ve been told?

- Multiple presentations of the same problem – is this just diagnosis momentum? Could something else be going on?

- Information doesn’t fit – is this lab value irrelevant, or is it pointing me another direction I haven’t thought of?

In general, ask **disconfirming questions**
Acknowledge uncertainty

With our patients...

I think this is just a run-of-the-mill muscle strain, but it might still be too early to rule out something more serious. It’s important that you come back if...

It’s ok if you’re not certain about the diagnosis at this point – what other information do you think you might need, and how could we get that information?

...and with our learners
Embrace a culture of feedback
Acknowledgement

Special thanks to Eric Warm, MD, FACP, from the University of Cincinnati for allowing us to adapt some of the quiz questions and concepts from his workshop on cognitive bias at the 2017 APDIM Chief Resident Conference
Thank you!