Reducing Diagnostic Errors

Cognitive Implications

Educational strategies

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Disclosures

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Goals and Objectives

- Describe the field of diagnostic errors and raise awareness about their occurrence
- Review basic tenets of diagnostic errors with an emphasis on cognitive reasons
- Analyze cases of diagnostic errors using a "cognitive autopsy" format
- Outline cognitive strategies that can be used to minimize diagnostic errors
Workshop Outline

- Talk about diagnostic errors in daily practice
- Introduction and theoretical frameworks
- Cognitive autopsy
  - Review cases in small groups
- Teaching strategies
  - Small group exercise/discussion
A True Patient Story

Why are diagnoses missed?
Why did you miss the diagnosis in the past year?

1. Diagnosis never crossed my mind.
2. Didn’t listen enough to patient’s story.
3. Paid too much attention on one finding.
4. Too much in a hurry.
5. Didn’t reassess the situation.
6. Influenced by a “similar” case.
7. Talked myself out of an “upsetting” Dx.
What do diagnostic errors mean to you?
Diagnosis

The most critical of a physician’s skills

“It is every doctor’s measure of his abilities; it is the most important ingredient in his professional self image”

A diagnosis that was:

- Unintentionally delayed (sufficient information was available earlier)
- Wrong (another diagnosis was made before the correct one)
- Missed (no diagnosis was ever made)

Newer Definition:
“Misdiagnosis-related harm”

(Graber, Diagnostic Error in Internal Medicine, Arch Intern Med/Vol 165, July 11, 2005; Newman-toker, D., JAMA 2009)
Percent of adverse events from Dx errors classified as negligence

1. 5%
2. 15%
3. 28%
4. 47%

Results of the Harvard Medical Practice Study II
64% of claims come from these four high-risk areas.

Percentage of all claims asserted 2002-2006, N=1,164 claims
Geeta is a pediatric intern.
Terri is a pediatric hospitalist.
Satid is a cardiology fellow.

On the Set...
CXR

- Interstitial infiltrates
- Left para-pneumonic effusion/empyema
What is the diagnosis?

1. Empyema
2. Parapneumonic effusion
3. Myocarditis
4. Hemothorax
5. Cardiomyopathy
What happened?

• The child was found to be “restless, tachypneic, and with an increasing oxygen requirement.”
• Due to scheduling delays in the operating room, the treating physicians decided to pursue an ultrasound-guided thoracentesis.
• The interventional radiologist aspirated a clear transudate suggestive of congestive heart failure. Cardiologist was called to bedside for a stat echocardiogram that revealed a dilated heart with an EF of 28%.
• Patient was admitted to PICU.
What went wrong?
The Field of Diagnostic Error

- **Cognitive errors**
  - Inadequate knowledge
  - Data gathering
  - Data interpretation

- **System errors**
  - Technical failures
  - Organizational issues

- **No-fault errors**
  - Atypical, silent
  - New disease
  - Lack of cooperation
Reduce Cognitive Errors

- Improve cognition
  - Learn to avoid cognitive biases
  - Improve diagnostic reasoning skills

- Adopt system solutions to cognitive errors
  - Availability of experts
  - Second opinions
  - Clinical guidelines, Clinical-decision support systems
Optical illusion

as a model for cognitive errors
Cognitive Errors

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

(Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. Acad Med. 2003;78:775-80.; Elstein, Thinking About Diagnostic Thinking, Advances in Health Science Education, Springer 2009)
Sample CDRs

- **Availability bias:** Particular diagnosis is considered more likely because it is easily recalled.

- **Anchoring Bias:** Too much reliance on one piece of information too early in the process.

- **Confirmation bias:** Seek only information to confirm the initial impression and ignore disconfirming evidence.

- **Representativeness bias:** “If it looks like a duck, it walks like a duck, it must be a duck.”

- **Premature diagnostic closure:** Reaching a diagnosis too soon and failing to assimilate additional data that contradicts it.
Great news - your surgery was completely unnecessary!
Dual Process Reasoning

Unconscious

Intuition

System 1

Non-analytical

Rapid

Deliberate

System 2

Analytical

Metacognition

Conscious

Quirk, M 2006; Crokerry 2003
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

1. 20
2. 100
3. 25
4. 5
$1,000,000,000

Question!
Which city has the larger population?

1. Detroit
2. Milwaukee

Goldstein 2002, Psychological Review 109: 75-90
Intuition Defined

- Knowing without intervention of any reasoning process
- A fast and frugal metal process
- Addresses, integrates and makes sense of multiple complex pieces of data subconsciously
- “Pattern recognition”
- Comes with practices
Fast & Frugal Decision

Look up features in order of importance.

Stop the search if a feature offers a Dx.

Diagnose the problem according to the feature.

Concepts from Gigerenzer 2007, Gut Feelings
Less sometimes is more

Fast & Frugal Tree

Full tree

System 1
n+1 exits

System 2
2^n exits

n = clinical factor

Gigerenzer 2007, Gut Feelings
Falling off the decision tree!

“No broken bones. You’re lucky, looks like the tree helped break your fall.”
i cdnuolt blveiee taht I cluod aulaclty uesdnatnrd what I was rdanieg. The phaonmneal pweor of the hmuan mnid,
aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in waht oerdr the ltteres in a word are, the olny iproamtnnt tihng is taht the frsit and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed it whotuit a pboerlm.
Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Azanmig huh?
Yaeh and I awlyas tghuhot slpeling was ipmorantt!
Expert & Intuition

Mental availability

Answer

Intuitive solution

Experience
Personal theories, rules
Easy, common

Clinical Judgment
Novice and Cognitive Bias

Mental availability

Intuitive solution

Actual probability

Abscess
Kawasaki’s
Mononucleosis

Pharyngitis

Mood
Assumptions
Stereotyping
Biases

Wrong judgment

Metacognition
Thinking about Thinking
Reflexive Problem Solving

- Making **plan before** thinking episode
- **Regulating** thought **during** episode
- **Reflecting afterwards** to revise and plan future practices
Metacognition Training

- Step back from the immediate situation
- Check one’s own diagnostic thinking
  - Force a complete differential diagnosis
  - Limitations & failings of memory
  - Possible biases (CDRs)
- “Crystal ball experience”
  - Examine flaws of original thought
  - Search for alternatives

Croskerry, 2003
Time out

Surgical Pause...
Metacognitive strategy

**DIAGNOSTIC PAUSE!**

- Let’s think outside the box!
- Did I put enough effort toward this DDx?
- Did I omit anything serious/life threatening?
- Am I about to repeat my past mistakes?
- Did I have any biases (CDRs)?
- Does the diagnosis make sense?
“Over the years, countless instructors and students have spent countless hours listening to tedious case presentations, trying to revive themselves sufficiently at the end of the presentation to make a few intelligent remarks.”
Effective presentations: Reflection of thought process

Data delivery → Data synthesis
Thoroughness → Selectivity
All the data → The pivotal data
“Hx-heavy” → “DDx-heavy”
A 54-year old white man presents with knee pain that woke him up from sleep; “the worst pain I’ve ever had.” The knee was normal before he went to bed; now it’s also swollen. He had similar problems 9 months and 2 years ago.
P - B - A - R

- CHIEF COMPLAINT
- HISTORY, PE; LAB
- ASSESSMENT
- PLAN

- **P**: ROBLEM
  - Represent the problem using abstractions of the key features to represent how you are thinking about the problem

- **B**: ACKGROUND
  - Report ONLY key info relating to the Dx/Rx of problem
  - Ask if more detail is needed

- **A**: NALYSIS
  - Analyze the differential-
  Compare/contrast key features to determine diagnosis

- **R**: ECOMMENDATION
  - Express uncertainty
  - Goals for management
Problem representation

Synthesize the case in one sentence, at a higher level of abstraction… big picture

Nendaz, Acad Med, 2002
Presenting a Synthesized History
(not summarized history)
“Seeing the Forest for the Trees”
“Here’s an older man with an acute, recurrent attack of severe pain in a single, large joint, a mono-arthritis. This could be gout or septic arthritis.”
Access to relevant Dx

Older man
Acute onset
Recurrent
Mono, large joint

Woman
Gradual onset
Chronic
Poly, small joint

Gout, Septic arthritis
Rheumatoid arthritis
Why did you miss the diagnosis?
Cognitive autopsy

Why did I miss the diagnosis?

(Small group)
ESP (Eight Step Preceptor)

Diagnose the Patient:
• Listen carefully
• Clarify information
• Determine concerns
• Focused PE

Diagnose the Learner:
• Assess Learner Level
• Problem Representation
• Probe thought process: Assess Gaps

Manage the Patient:
• Determine the plan
• Communicate plan
• Enter orders

Manage the Learner:
• Clarify knowledge gaps
• Focused- generalizable principles
• Help ID learning objectives
• Feedback- use tools
Structured Feedback for Presentations on Rounds

**Structure:** The presentation begins with a representation of the patients’ primary problem including name. Only the key features of the history, PE, labs, are presented followed by differential diagnosis and management plan. The components were presented in the PBAR format. (This is not an evaluation of the quality of the components).

| Did not represent the problem. | Represented the problem using abstract qualifiers appropriately. |
| Miss key components. | Incorporated all key components. |
| Not problem focused. | Problem focused. |
| Presented material out of order or intermixed. | Well organized. |

Comments:

**Communication skills:** audible/clear. Uses medical terms/notes appropriately. Sensitive to impact on pt/family

| Spoke inaudibly. | Spoke clearly without repetition. |
| Often digressed or repeated. | |
| Read or used notes inappropriately. | Used notes appropriately. |
| Ignored patient/family. | Included patient/family. |

Comments:

**Subjective:** Accurately synthesizes the history. Problem-focused pertinent +/- Logical progression of events.

| Missed key data. Included irrelevant data. | Included pertinent data. |
| Did not interpret relevance of data problem. | Correctly interpret relevance of data to problems. |
| Confused the progression of events. | Easy to follow progression of pertinent events. |

Comments:

**Objective data:** Accurately synthesizes the PE and lab data? Problem-focused +/-

| Exam and/or results were inaccurate. | Accurate and complete exam/lab data. |
| Missed key data or included irrelevant exam/lab data. | Include only pertinent data. |
| Did not interpret relevance of data to problems. | Correctly interpreted relevance of data to problems. |

Comments:

**Analysis & synthesis:** Problem-focused assessment and plan. Appropriate differential. Data interpretation, investigation, & intervention plan reflect a sound understanding of the disease process.

| Not problem focused. | Problem focused. |
| Limited or inappropriate differential. | Differential diagnosis appropriate. |
| Limited use of abstract qualifiers to compare differential diagnoses. | Use abstract qualifiers well to compare differential diagnoses. |
| Plan partially correct. | Manage plan complete and correct. |

Comments:
Let’s learn from you!

- Share ideas about how to teach learners to avoid cognitive errors based on what we have learned today:
  - Clinical reasoning
  - Cognitive de-biasing
  - Clinical expertise (intuition/metacognition)
- What are the settings, teaching formats?
- How to assess/document it?
Other tips for Reduction of Diagnostic Errors

- Promote a systematic approach to common problems.
- Use of algorithms or checklists
- Keep asking questions. What can I not explain?
- Acknowledge your feelings about a patient or family. Positive or negative feelings may bias your approach.
- Slow down. When individuals are rushed, more mistakes may occur.
- Be aware of the critical impact of fatigue and sleep on decision-making
- Admit your mistakes. This can lead to reflection and change in behavior.
Summary

- Diagnostic errors are critical and consequential.
- Understanding one’s own thinking, diagnostic reasoning and cognitive biases are keys to reducing cognitive errors.
- Medical learners must be taught “How to Think” in addition to attaining medical knowledge.
When We All Work Together
References

- Drs. Lorin, Drutz, Turner