Clinical Reasoning and Diagnostic Errors

UTSA Grand Rounds
May 13, 2011
Geeta Singhal, MD, MEd

Goals and Objectives

To introduce the field of diagnostic errors and to open dialogue about their occurrence
1. Become familiar with literature about diagnostic errors
2. Review some cognitive causes of why diagnostic errors may be made
3. Define teaching/reflection strategies that can be utilized with medical learners

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 Story
Questions

- These are from a multi-site survey
- The survey was sent to Baylor Pediatric Faculty, TCPA pediatricians, UT Houston faculty and Cincinnati Children’s Hospital and associated community pediatricians (general and subspecialist pediatricians)

Diagnostic Error

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”

What is the most common type of medical error?

A. Diagnosis-Related
B. Medication-related
C. Monitoring-related (i.e. growth charts, follow-up on chronically ill children)
D. Prevention-related (handwashing)
E. Surgery-related

What did pediatricians say?

- (B) Medication-related
- (D) Prevention-related
- (C) Monitoring-related
- (A) Diagnosis-related
- (E) Surgery-related

What Does the Literature Say?

- Limited data, especially in pediatrics
- Adult medicine: diagnostic error seems to be the most common cause of lawsuits
- 59% of claims in the ambulatory setting were attributed to diagnostic error
  (Gandhi, TK., Annals of Internal Medicine, 2006)
- Lawsuits alleging negligent misdiagnoses are the most prevalent type of claim in the United States
  (Phillips, RL., Qual Saf Health Care, 2004)
- This may not be the best way to measure diagnostic error incidence

Once upon a time...

- Shawn Ralston is an intern
- Geeta Singhal is a pediatric hospitalist
What is the diagnosis?

A. Parapneumonic effusion  
B. Empyema  
C. Myocarditis  
D. Hemothorax  
E. 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 CV ICU.

What went wrong?

Stay Tuned…

Categories of Diagnostic Errors

- Cognitive errors
  - Inadequate knowledge  
  - Data gathering  
  - Data interpretation
- System errors
  - Technical failures/equipment failures  
  - Organizational issues
- No-fault errors
  - Atypical, silent  
  - New disease  
  - Lack of cooperation
- Visual Error

A model for cognitive error
Cognitive Error

- Basis in cognitive psychology
- About fifty known biases exist
- They are universal and predictable
- A “failure” in rational/logical thought
- Often due to cognitive/affective biases
- Known as “Cognitive Dispositions to Respond”

Cognitive Errors

- Availability Bias…when a diagnosis is commonly seen and the provider keeps that diagnosis in mind
- Framing effect…Patient was “packaged” in the ER and alternative diagnoses were not pursued
- Confirmation bias…the team looked for evidence to confirm the diagnosis
- Premature closure…the first diagnosis was accepted

Other Examples

- Base-Rate Neglect: Tendency to ignore rate of disease and look for more exotic diseases (pneumonia or CCAM)
- Blind Obedience: An individual may stop thinking about a problem when confronted with authority…(resident to attending, generalist to a consultant)
- Premature closure: Reaching a diagnosis and failing to assimilate additional data that contradicts it (UTI or C. diff colitis)

What is the most common process breakdown leading to diagnostic error?

A. Care not sought in a timely manner by patient/caregiver
B. Failure to gather available medical information through history and physical and/or review of previous charts
C. Problems with ordering, performance or interpretation of diagnostic/laboratory tests
D. Failure to follow up on test results
E. Patient/caregiver non-adherence to provider recommended follow-up plan

What did the pediatricians say?

B. Failure to gather medical information through history and physical and/or review of charts
A. Care not sought in a timely manner by patient/caregiver
D. Failure to follow up on test results
E. Patient/caregiver non-adherence to provider recommended follow-up plan
C. Problems with ordering, performance or interpretation of diagnostic/laboratory tests

What Does the Literature Say?

1. Failure to order an appropriate diagnostic test
2. Failure to create a proper follow-up plan
3. Failure to obtain an adequate history or perform an adequate physical exam
4. Incorrect interpretation of a diagnostic test

(Gandhi, TK., Annals of Internal Medicine 2006)
A morning report

- 3-week-old infant, vomiting for 1 week, projectile, white/formula, postfeeding, intermittent spitting, no diarrhea, no bloody stool, two bowel movements today, no fever, no congestion, decreased activity today
- Formula: Enfamil—Isomil—Nutramigen, 3 oz every 2-3 hours, decreased intake past 2 days, 3 wet diapers today
- G/P, full-term, NSVD, BW 3,200 g, GBS-negative, passed meconium on the first day
- PE: Temp 36 C, PR 180, RR 55, BP 60/40, SpO₂ 95%
- GA: sleeping, dry lip, moist membrane, pale, good skin turgor
- Neuro: grossly intact CN, normal DTR, no clonus, no stiff neck, negative kernig and brudzinski signs

What is the diagnosis?

A. Pyloric stenosis
B. Severe GERD
C. Sepsis
D. Inborn error metabolism
E. Brain tumor

Pattern recognition

3-week, vomiting, projectile, white/formula, postfeeding, intermittent spitting, no diarrhea, no bloody stool, two bowel movements today, no fever, no congestion, decreased activity today

- Formula: Enfamil—Isomil—Nutramigen, 3 oz every 2-3 hours, decreased intake past 2 days, 3 wet diapers today
- G/P, full-term, NSVD, BW 3,200 g, GBS-negative, passed meconium on the first day
- PE: Temp 36 C, PR 180, RR 55, BP 60/40, SpO₂ 95%
- GA: sleeping, dry lip, moist membrane, pale, good skin turgor
- Neuro: grossly intact CN, normal DTR, no clonus, no stiff neck, negative kernig and brudzinski signs

Competing evidence

- 3-week-old infant, vomiting for 1 week, projectile, white/formula, postfeeding, intermittent spitting, no diarrhea, no bloody stool, one bowel movement today, no fever, no congestion, decreased activity today
- Formula: Enfamil—Isomil—Nutramigen, 3 oz every 2-3 hours, decreased intake past 2 days, 3 wet diapers today
- G/P, full-term, NSVD, BW 3,200 g, GBS-negative, passed meconium on the first day
- PE: Temp 36 C, PR 180, RR 55, BP 60/40, SpO₂ 95%
- GA: sleeping, dry lip, moist membrane, pale, good skin turgor
- Neuro: grossly intact CN, normal DTR, no clonus, no stiff neck, negative kernig and brudzinski signs

What “cognitive factor” leads most to diagnostic error?

A. Inadequate data gathering or work-up, such as incomplete history and physical
B. Inadequate data assessment such as failure to pursue a correct diagnosis once an initial diagnosis has been made
C. Inadequate knowledge base
D. Inadequate recognition of critical information previously documented in the chart

What is the diagnosis?

A. Pyloric stenosis
B. Severe GERD
C. Sepsis
D. Inborn error metabolism
E. Brain tumor
What did the pediatricians say?

A. Inadequate data gathering or work-up
B. Inadequate data assessment
C. Inadequate recognition of critical information previously documented in the chart
D. Inadequate knowledge base

What Does the Literature Say?

1. Faulty synthesis/Flawed processing of available information (faulty interpretation of a lab result)
2. Faulty Verification (premature closure)
3. Faulty data gathering (ineffective workup)
4. Inadequate knowledge base

(Grabler ML, Diagnostic Error in Internal Medicine, 2005)

What diagnoses are most vulnerable to diagnostic error?

A. Appendicitis
B. Asthma
C. Medication side effects
D. Psychiatric disorders
E. Viral illness diagnosed as a bacterial illness

What did the pediatricians say?

E. Viral illness diagnosed as a bacterial illness
C. Medication side effects
D. Psychiatric disorders
A. Appendicitis
B. Asthma

What Does the Literature Say?

- Meningitis
- Appendicitis
- Fractures (humerus, radius/ulna)
- Testicular torsion
- Fracture femur
- Fracture (tibia/fibula)
- Neurologically impaired newborn
- Symptoms involving abdomen/pelvis
- Pneumonia

(Seibert SM, Pediatric Emergency Care, Vol 21, Number 3, March 2005)

Diagnoses in Emergency Medicine Malpractice Suits (In order of frequency)

- Meningitis
- Appendicitis
- Fractures (humerus, radius/ulna)
- Testicular torsion
- Fracture femur
- Fracture (tibia/fibula)
- Neurologically impaired newborn
- Symptoms involving abdomen/pelvis
- Pneumonia

Irrational & Unexplainable

“i think you should be more explicit here in step two.”

from What’s so Pharan about Science? by Edward Walsh (1977)
Teaching Doctors How to Think

Metacognition and Reflective Practice
Efficient case presentations
System-based solutions

Metacognition

- It is learning from experience
- It is thinking about one’s own or another’s thoughts, feelings and values
- It is checking your diagnostic thinking for possible biases
- It is “thinking about thinking”

Reflective Practice

- Knowing-in-action (use of experience, pattern recognition)
- Reflection-in-action (thinking on our feet)
- Reflection-on-action (make sense of an event)
- Slowing down when you should

Critical Thinking

- Dual Process of Reasoning
- Recognize distracting stimuli
- Be aware of cognitive pitfalls in reasoning
- Be aware of the critical impact of fatigue and sleep on decision-making
- Understand the need for monitoring one’s own affective state

Pattern Recognition

i cdnuolt blveiee taht I cluod aulaclty uesdnatnrld what I was rdanig. The phaonmneal pweor of the hmuan mnid, aoccdrnig to a rscheearch at Cmabrigde Universty, It dseno’t mtaetr in waht oerdr the ltteres in a word are, the olny iproanmnt tihng is taht the frist and lsat ltteer be in the rghit pclae. The reasn for this is thot evey ltter is fucntal n rder of its espisitn. Tihs is bcuseae the huamn mnid deos not raed ervey ltter by istlef, but the wrod as a wlohe.

Diagnostic Pause!

- Did I put enough effort toward this differential?
- Did I omit anything serious/life threatening?
- Am I about to repeat my past mistakes?
- Did I have any biases?
- Does the diagnosis make sense?
- Let’s think outside the box!
“Cognitive Autopsies”

- Conduct as soon as possible
- Be well-rested
- Find a secluded place, free of interruptions
- Start with the beginning of the day or shift
- Free-associate fully about the event-recall thoughts and feelings
- Pay attention to ambient conditions
- Write everything down
- Discuss with others and record their comments and observations
- Review cognitive biases

Efficient presentation: A reflection of thought process

Data delivery → Data synthesis
Thoroughness → Selectivity
All the data → The pivotal data
“Hx-heavy” → “DDx-heavy”

PBAR: Case Presentation

- **CHIEF COMPLAINT**
  - P: PROBLEM
  - Represent the problem using abbreviations of the key features to represent what you are thinking about the problem

- **HISTORY, PE; LAB**
  - B: BACKGROUND
  - Report ONLY the key elements of the pertinent problem
  - Ask more detailed questions if needed

- **ASSESSMENT**
  - A: ANALYSIS
  - Analyze the differential: Compare contrast key features to determine diagnosis

- **PLAN**
  - R: RECOMMENDATION
  - Express uncertainty
  - Goals for management
  (courtesy, Mary Dobby, MD, MPH, Children’s National Medical Center)

What is the best way to decrease diagnostic errors?

A. Access to Electronic Medical Records (EMR)
B. Diagnostic Decision Support Tools
C. Peer review process to review medical records
D. Establishing feedback pathways to learn about one’s diagnostic errors
E. Increasing access to and availability of consultants and experts

What did the pediatricians say?

1. Access to EMR
2. Availability of diagnostic decision support tools

(Community pediatricians ranked increased access to and availability of consultants second)

(p< 0.0001, unpublished data, Singh, et al)

What does the Literature Say?

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

- Adopt system solutions to cognitive errors
  - Availability of experts/second opinions
  - Electronic medical records
  - Clinical guidelines, clinical-decision support systems

(see reference card)
Let’s Hear From You!

Take Home Messages

- Diagnostic errors exist, are understudied, and much research needs to be done, especially in pediatrics
- Understanding cognitive biases, metacognition and reflection may help in addressing this issue
- Teaching strategies can be used to decrease diagnostic errors in our trainees

References and Credits

- Drs. Lorin, Drutz, Quinonez, and Thammasitboon