

Introduction to Diagnostic Error in Medicine

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- PI Improving Cancer Diagnosis AHRQ Diagnostic Center for Excellent (BWH & U Wash)

Disclosures Acknowledgements

No Commercial Conflicts

Grant Funding

-**AHRQ** (US Agency for Healthcare Res. Quality)

Diagnostic Safety Center of Excellence

Learning from Cancer Dx delays

Time for Better Diagnosis

Measuring Outcomes Stress Time (MOST)

-**IHI / Hartford Foundation**

Earlier Diagnosis Adverse Drug Reactions in Older Adults

Learning Objectives

1. Describe the frequency and importance of diagnostic errors
2. Define diagnostic errors, and using a Venn diagram model differentiate diagnostic process errors, mis/wrong diagnosis, and adverse outcomes.
3. List at least 3 approaches to minimizing and preventing diagnostic errors.
4. Explain concept of “diagnostic pitfalls” and give a clinical example illustrating use in alerting to errors

Big picture concepts: Importance

Epidemiology, Frameworks, (teach to fish, eat for a lifetime)

Practical Approaches and Pointers

Ways you can improve diagnosis in your own practice

Prepare for Boards' Questions

Frankly don't know what now asking; but will give a few tips

Briefly Touch on AI

AI diagnosis, AI documentation Other IT

Outline

- Background on Diagnostic Errors
 - Data from local, national studies
 - Controversies
- Key Concepts and Tools
- Approaching Diagnosis as a System
 - 8 Recommendations from NAM Report
 - 5 Practical Practice Suggestions
 - AI tools/issues for Clinicians and Patients
 - 3 Key Questions to Ask

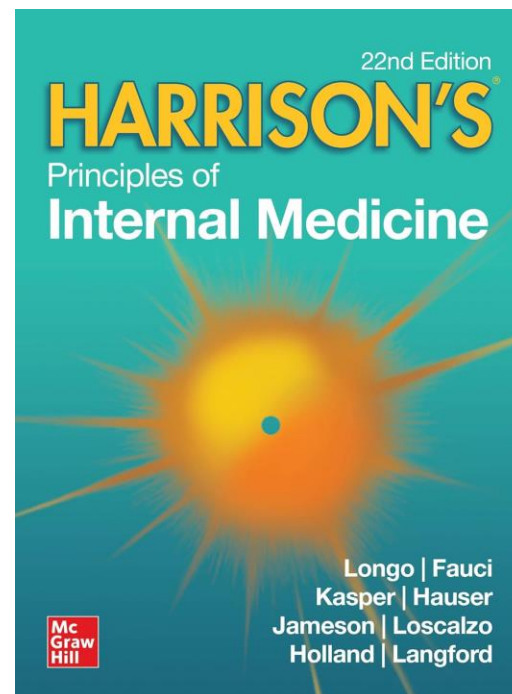
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Diagnosis: Reducing Errors and Improving Quality

Gordon Schiff

Diagnosing patients' illnesses is the essence of medicine. Patients present to doctors seeking an answer to the question, "What is wrong with me?" Ideally, no clinician would want to treat a patient without knowing the diagnosis or, worse yet, erroneously treat a misdiagnosed illness. From the earliest moments of medical school, the defining quest toward becoming a knowledgeable and proficient physician is learning how to put a diagnostic label on patients' symptoms and physical findings, and clinicians pride themselves on being "good diagnosticians." Yet the centuries-old paradigm of mastering a long list of diseases, understanding their pathophysiology, and knowing the cardinal ways they manifest themselves in signs and symptoms, while still of fundamental importance, is being challenged by new insights illuminated by the glaring spotlight of diagnostic errors. Basic internal medicine diseases, such as asthma, pulmonary embolism, congestive heart failure, seizures, strokes, ruptured aneurysms, depression, and cancer, are misdiagnosed at shockingly high rates, often with 20–50% of patients either being mislabeled as having these conditions (false-positive diagnoses) or having their diagnosis missed or delayed (false negatives). How and why do physicians so often get it wrong, and what can we do to both diagnose and treat the problem of delayed diagnosis or misdiagnosis?

Diagnosis is both an ancient art and a modern science. The current science of diagnosis, however, goes far beyond what typically comes to clinicians' and patients' minds when they conjure up images of state-of-the-art molecular, genetic, or imaging technologies. Improvements in diagnosis are just as likely to come from other areas, many with origins outside of medicine, as they are from advanced diagnostic testing modalities. These



One way to visualize diagnostic errors is through a Venn diagram (Fig. 10-1), which illustrates the fact that many things can go wrong in the diagnostic process (e.g., failure to ask an important history question, physical examination sign overlooked, laboratory specimen erroneously switched between two patients, x-ray not followed up, but this usually does not result in a wrong diagnosis or patient harm). Similarly, a patient can be misdiagnosed but unharmed, without an identifiable error in the care received. Our greatest concern is where these three circles intersect, with conservative estimates suggesting that 40,000–80,000 patients die each year in U.S. hospitals alone from diagnostic errors. The NAM report outlined eight recommendations that are the foundation for this chapter (Table 10-1).

NEW WAYS TO THINK ABOUT DIAGNOSIS AND DIAGNOSTIC ERRORS

Medical textbooks have historically given attention to "clinical reasoning" and associated cognitive heuristics and biases. Errors in

Three Quotes:

Systems Perspective

The Boston Globe



Genius diagnosticians make great stories,
but they don't make great health care.

The idea is to make accuracy reliable,
not heroic

Don Berwick
Boston Globe 7/14/2002

Lucian Leape

Father of Patient Safety



Safer practice can only come about from acknowledging the potential for error and building in error reduction strategies at each stage of clinical practice

Dr. Nancy Leveson



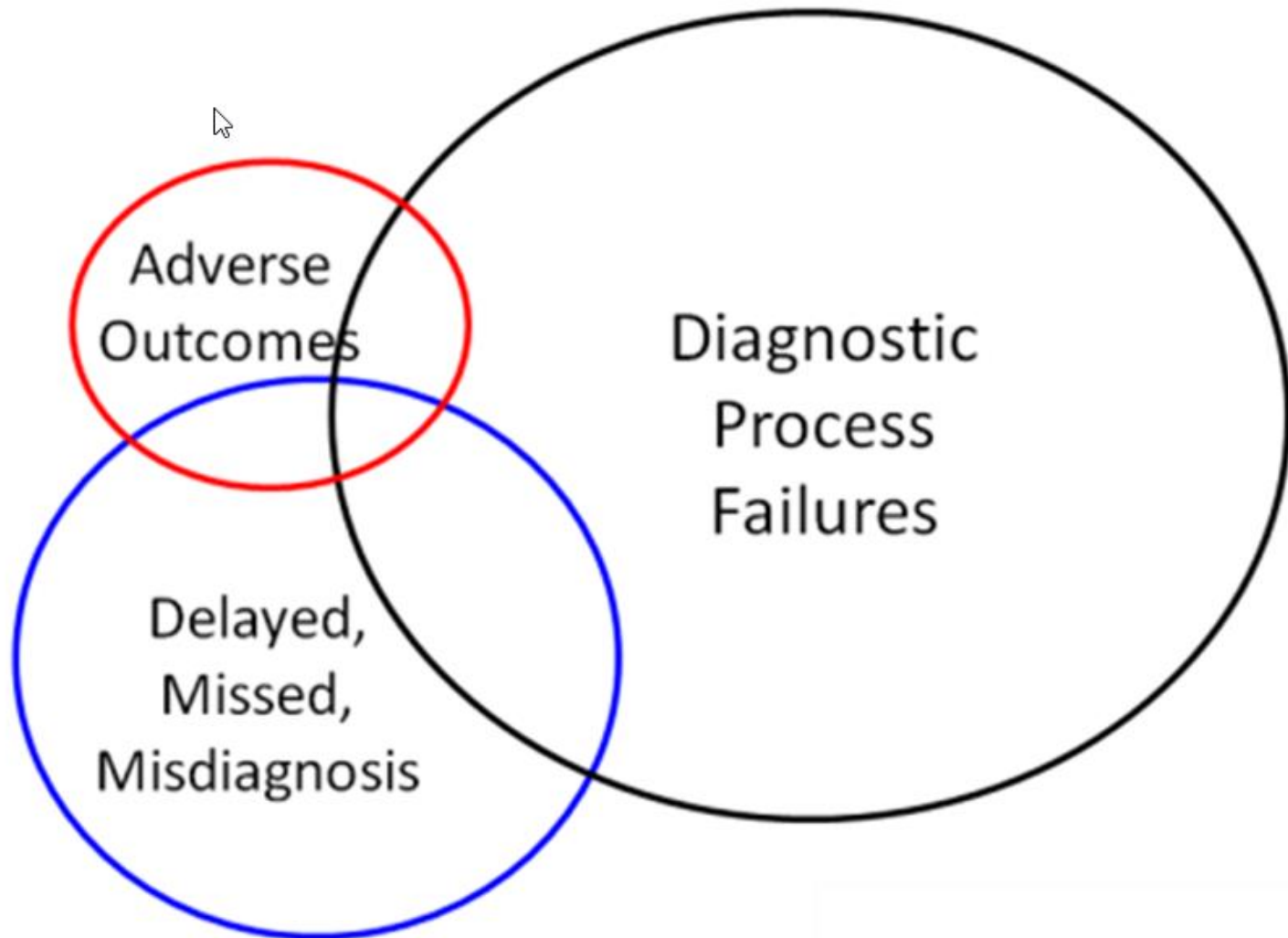
Operator error is a *symptom* not a *cause* of an error

Human error is a symptom of a system
that needs to be redesigned.

Safety is a system property

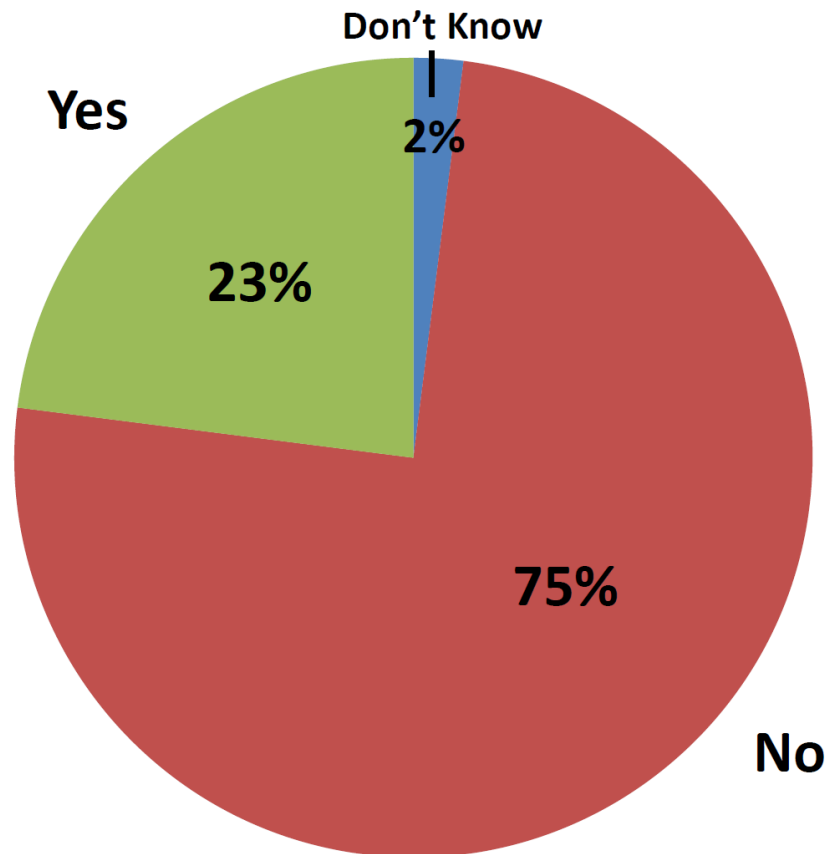
Dr. Nancy Leveson, Professor of Aeronautics and Astronautics Engineering Systems at MIT
<https://www.youtube.com/watch?v=8bzWvII9OD4&list=PLmo9XI8PKe5vz1CBNcJlzk1lvQK7Fjf7s>

What is a Diagnosis Error?



MA Residents Involved in a Medical Error Situation

% saying personally involved in a situation where a preventable medical error was made in their own care or in the care of someone close to them



Most Common Types of Medical Error Experienced by MA Residents

% saying...

(Among the 23% who said they or a person close to them experienced a medical error)

Your/their medical problem was misdiagnosed



You/they were given the wrong test, surgery, or treatment



You were given wrong or unclear instructions about your follow-up care



You/they were given an incorrect medication, meaning the wrong dose or wrong drug

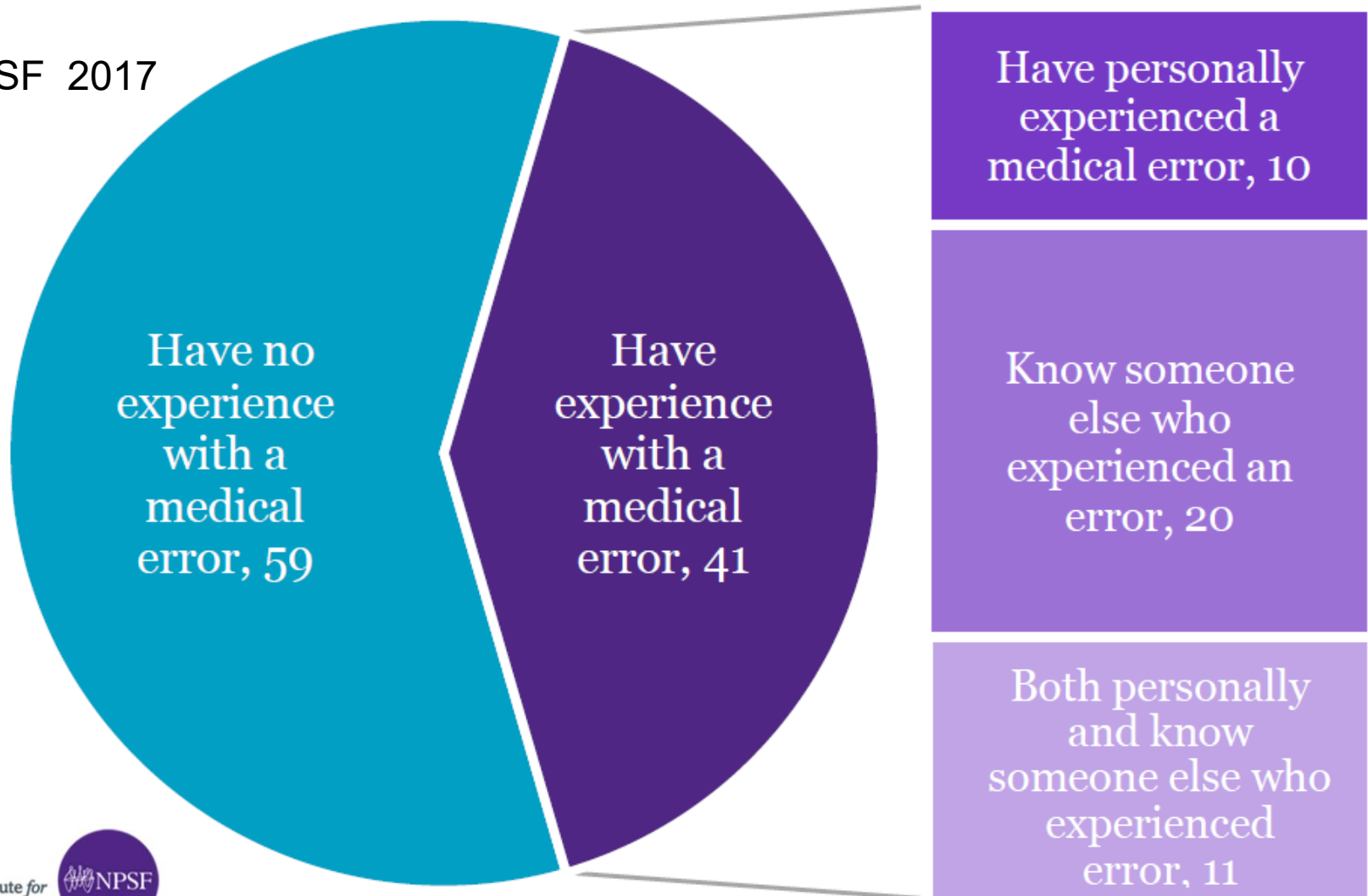


You/they got an infection as a result of your/their test, surgery, or treatment

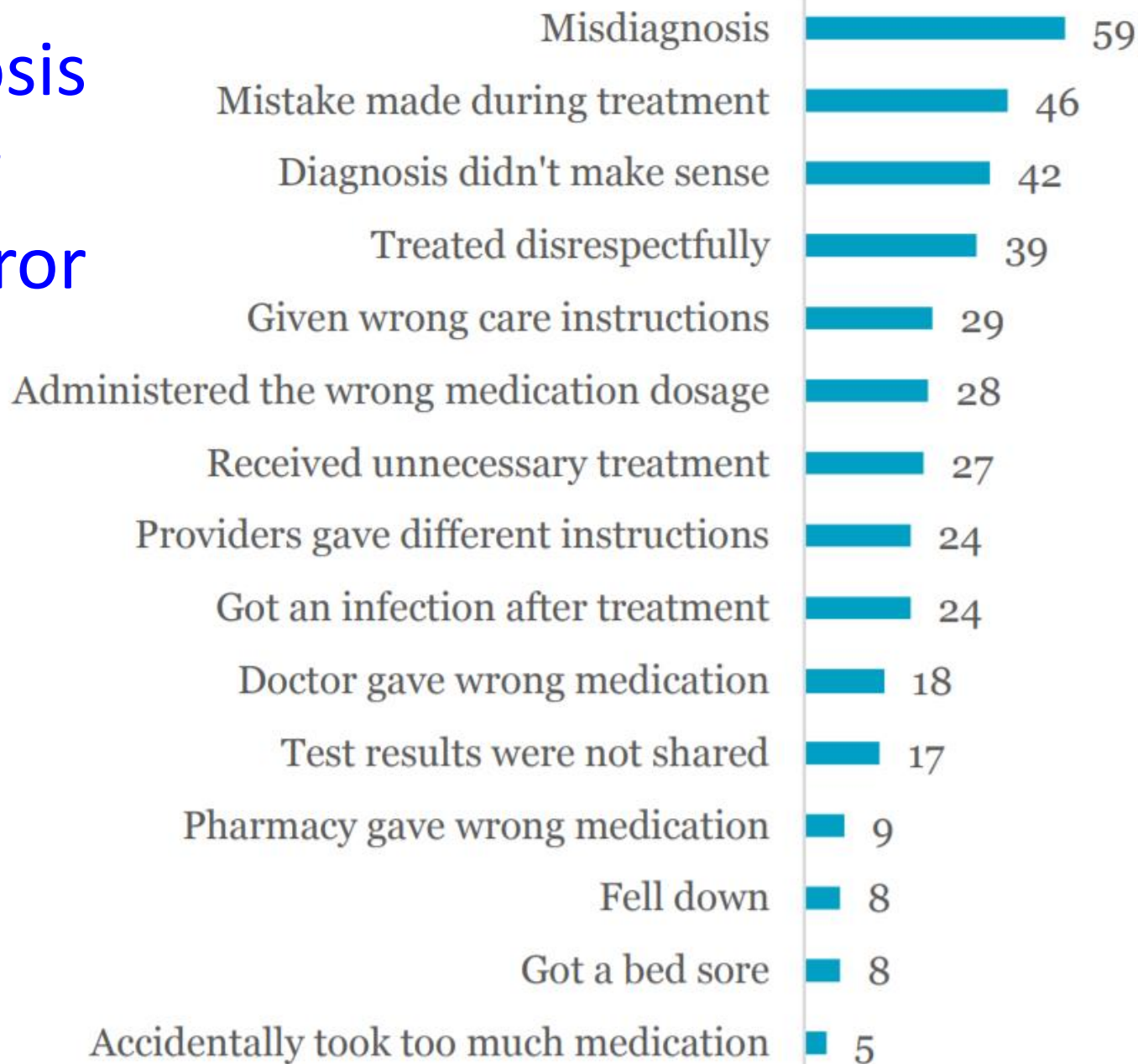


41% Personally Experienced or Knew Someone with Medial Error

IHI/NPSF 2017
Survey

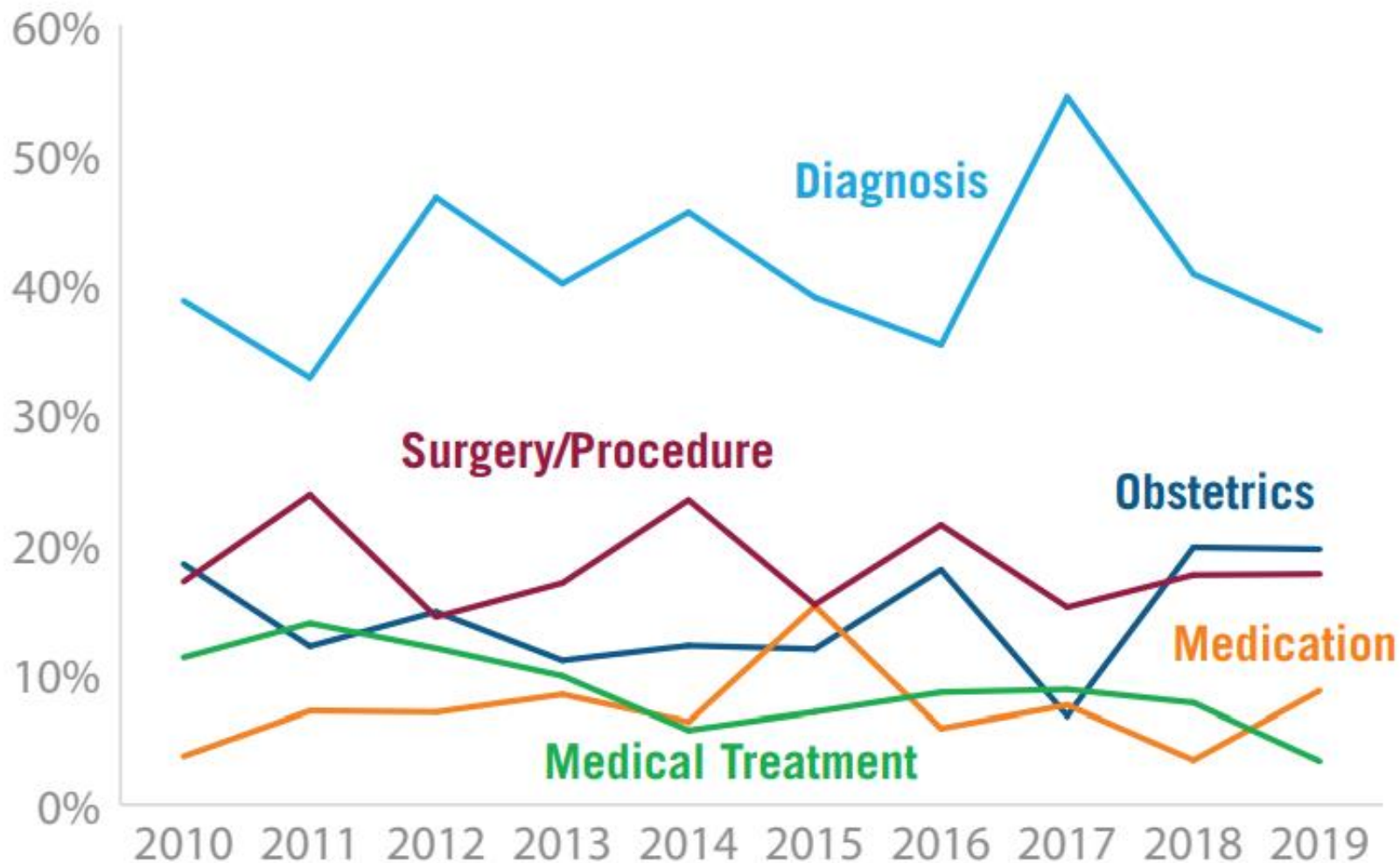


Misdiagnosis Leading Type of Error



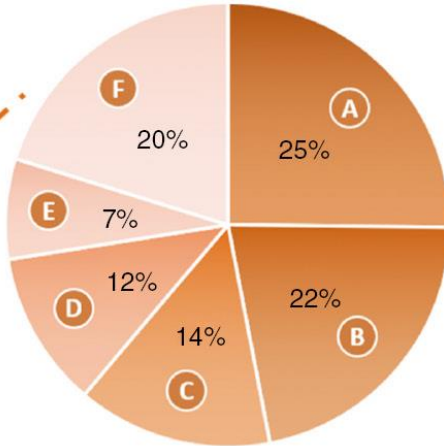
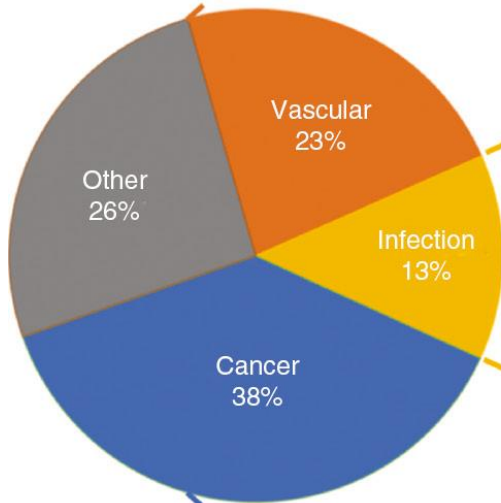
Closed With Indemnity Paid

Top 5 Allegation Types

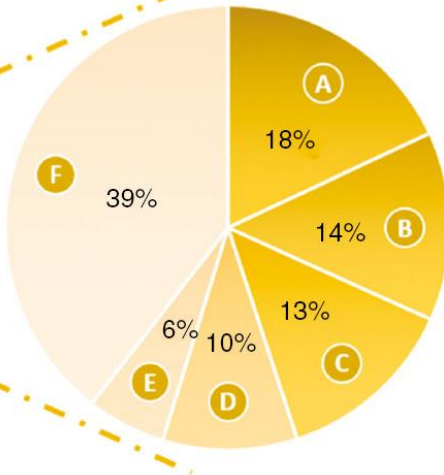


“Big Three” breakdown of high-severity harms among diagnostic error claim cases CRICO 2006–2015 (n = 7379)

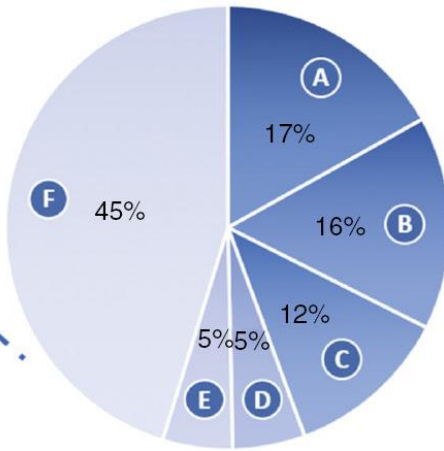
BIG 3



- A Stroke
- B Myocardial infarction
- C Venous thromboembolism
- D Aortic aneurysm and dissection
- E Arterial thromboembolism
- F Other

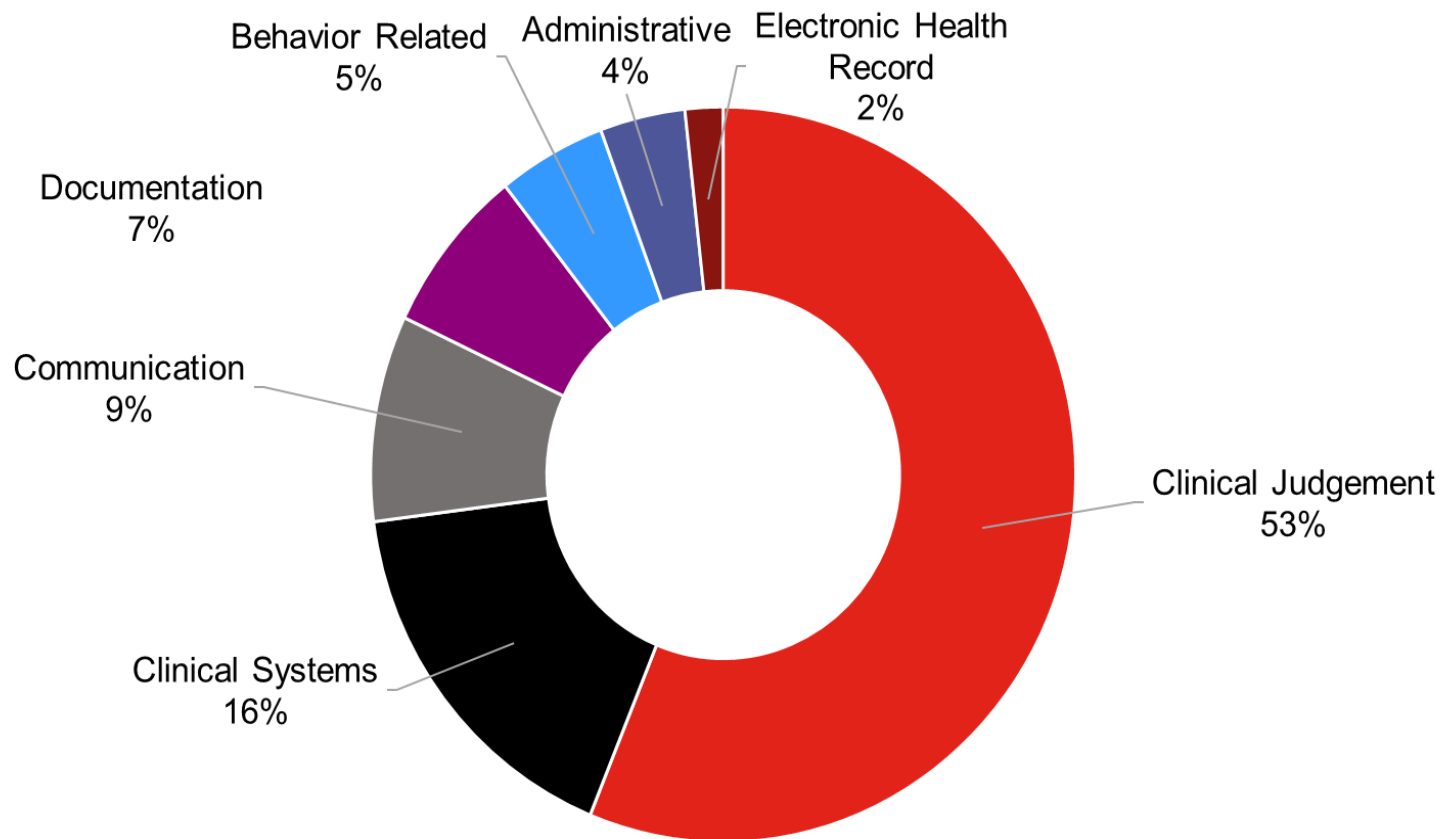


- A Sepsis
- B Meningitis and encephalitis
- C Spinal abscess
- D Pneumonia
- E Endocarditis
- F Other



- A Lung cancer
- B Breast cancer
- C Colorectal cancer
- D Prostate cancer
- E Melanoma
- F Other

High-severity harms include permanent, serious disability or death, including fetal death (NAIC scale 6–9)



Selection: Closed PL claims from 2013-2017, N=3466 with a Diagnosis-Related allegation and an identified Risk Management issue

Footnote: A claim can have more than 1 Risk Management issue.

Clinical Judgment – *Percentage of Claims*

21%

Narrow
Diagnostic
Focus

19%

Inadequate /
Inappropriate
Testing

17%

Misinterpretation
of Diagnostic
Studies

10%

Failure to
Adequately
Assess
Patient's
Condition

8%

Failure to
Obtain
Specialty
Consult or
Referral

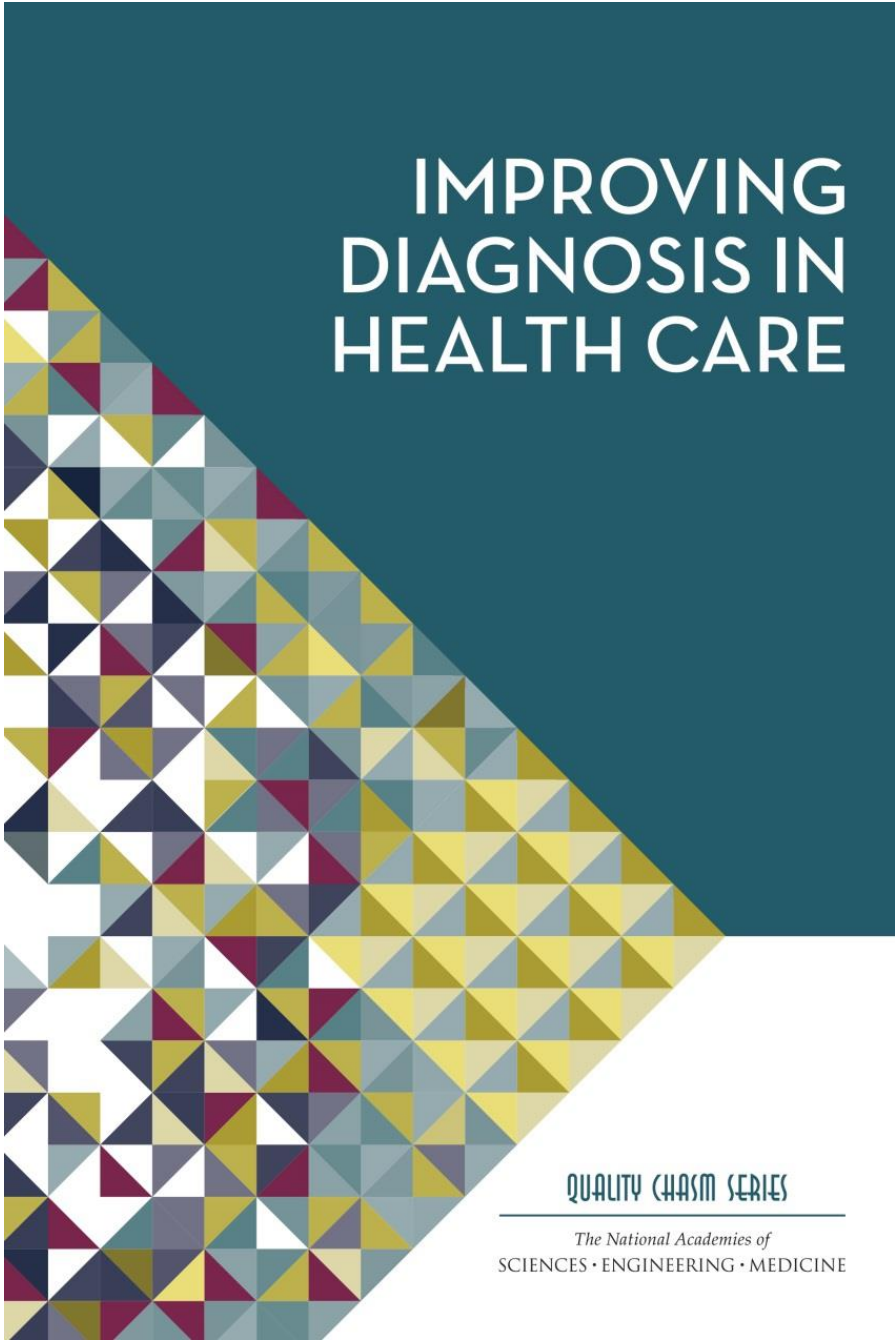
Selection: Closed PL claims from 2013-2017, N=1840 with a Diagnosis-Related allegation and a Clinical Judgment Risk Management issue

Top 10 Cognitive Biases

Premature Closure	Accepting a diagnosis before it has been fully verified
Anchoring	Tendency to fixate on specific symptom or piece of information early in the diagnostic process with subsequent failure to appropriately adjust
Confirmation Bias	Looking for confirming evidence to support one's diagnostic hypothesis, rather than disconfirming evidence to refute it
Search satisficing	Calling off search once a piece of data is found, and not considering/searching for additional findings or diagnoses
Availability Bias	Giving too much weight to diagnoses that come more readily to mind (e.g. recent dramatic case).

Top 10 Cognitive Biases

Base-Rate Neglect	Failing to adequately take into account prevalence of the disease (e.g. erroneously interpreting positive test as indicating disease in a low prevalence population using test w/ 5% false + rate)
Knowledge Deficit	On part of provider, with accompanying lack of awareness
Framing bias:	Judgement overly influenced by the way problem was presented (how it was framed in words, settings, situations).
Social/Demographic Stereotype bias:	Biases from personal or cultural beliefs about women, minorities or other patient groups for whom prejudices may distort diagnostic assessment
Hindsight Bias	Inclination to retrospectively view a missed diagnosis as obvious; blame MD for dx others “would never have missed.”



IMPROVING DIAGNOSIS IN HEALTH CARE

IOM Report
September
2015

QUALITY CHASM SERIES

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

SEPTEMBER 22, 2015 | 2 MIN READ

Most Americans Will Be Misdiagnosed at Least Once

Alarming gaps in knowledge about diagnostic errors and medical delays require intense scrutiny, says an expert medical advisory group

BY DINA FINE MARON

Health ▾

Most people in the U.S. will experience at least one misdiagnosis or delayed diagnosis in their lifetimes, according to a new report from the Institute of Medicine (IOM). Such mistakes—called diagnostic errors by physicians—could be as simple as failing to forward the results of a medical test showing that a patient recovered from a recent illness. Other errors can have

Improvement Ideas

8 NAM IOM Goals to Improve Diagnosis and Reduce Diagnostic Error

- GOAL 1** Facilitate **more effective teamwork** in the diagnostic process among health care professionals, patients, and their families
 - GOAL 2** Enhance health care professional **education** and **training** in the diagnostic process
 - GOAL 3** Ensure that **health information technologies** support patients and health care professionals in the diagnostic process
 - GOAL 4** Develop and deploy approaches to **identify**, **learn from**, and **reduce** diagnostic errors and near misses in clinical practice
-

8 IOM Goals to Improve Diagnosis and Reduce Diagnostic Error

- GOAL 5** Establish a **work system** and **culture** that supports the diagnostic process and improvements in diagnostic performance
- GOAL 6** Develop a **reporting environment** and **medical liability system** that facilitates improved diagnosis through **learning from diagnostic errors and near misses**
- GOAL 7** Design a **payment** and **care delivery environment** that supports the diagnostic process
- GOAL 8** Provide **dedicated funding for research** on the diagnostic process and diagnostic errors
-

5 Practical Suggestions

- Create, cultivate, a **culture of diagnosis safety**
- Collect, **learn from, share, anticipate** dx errors
 - PRIDE Network ~ M&M Case Sharing
 - Become an expert on *diagnostic pitfalls*
- Ensure **closed loop** follow-up/feedback **systems**
 - Close the loop on tests, symptoms, and...misses
- Leverage **health IT**, clinical documentation, AI
 - To overcome negatives, build on positive potential
 - But approach critically, carefully, cautiously
- **Engage patients** to help **co-produce** better dx

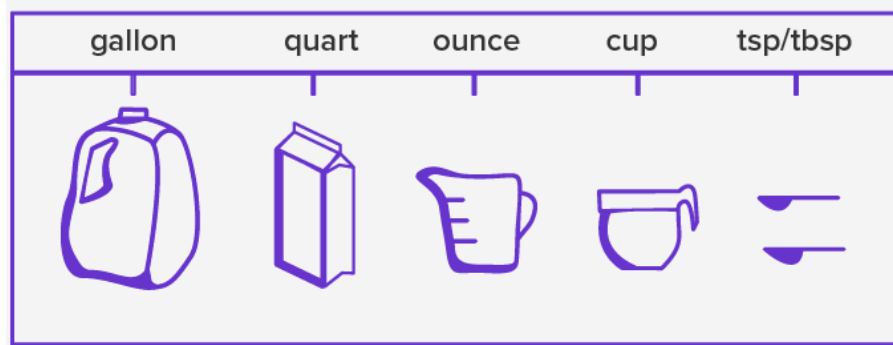
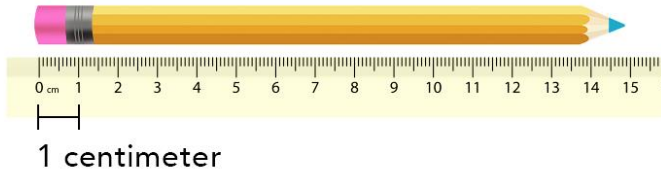
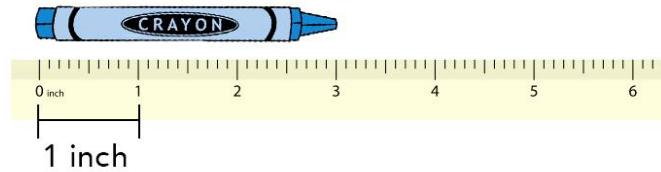
1. Culture of Diagnostic Safety & Improvement

1. Driving out fear so no one afraid to ask questions, question a diagnosis, share when things go wrong
 - Dealing w/ adverse events replacing blame & fear, w/ learning & improvement
 - Freely share cases with colleagues building interest, avoiding defensiveness
2. Organization-wide commitment to improving diagnosis, learning from diagnosis delays, diagnostic process errors
 - Leadership/organizational recognition that misdiagnosis is the #1 top cause of patient-reported errors
 - Aggressive reporting, appreciative investigation, of adverse events
 - Relentless curiosity/worry/conferencing: what is wrong with patient; what might be missing, what can go wrong in system?
 - Obsession w/ details of dx process: what can go wrong, limitations of tests

Culture of Diagnostic Safety & Improvement

3. Recognition uncertainty inherent in diagnoses, tests, illness presentation and evolution; anticipation of common pitfalls
 - Situational awareness local, disease specific, literature reported vulnerabilities/pitfalls.
 - Communication of uncertainties to patient, , families, in notes
 - Reliable, proactive, follow-up safety nets & feedback systems to detect and protect
 - Conservative approaches to testing, imaging
 - Enabled by shared decision-making and reliable follow-up
4. Respect human limitations, need for cognitive, process support
 - Decreased reliance on human memory, minimizing negative effects of stress, fatigue, fear, recognizing limited ability to truly multitask.
 - Redesign EMRs & communication systems to support cognition, collaborative diagnosis, and follow-up
5. Enhanced role for patient in co-producing diagnosis
 - Working collaboratively to formulate history, diagnosis, monitor course, raise and research questions

INSTRUMENTS TO MEASURE





New AHRQ Tool

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Diagnostic Safety Supplemental Items for Medical Office SOPS

The SOPS® Diagnostic Safety Supplemental Items for the [Medical Office Survey](#) are designed to be used in conjunction with the core Medical Office SOPS to help medical offices assess the extent to which their organizations support the diagnostic process, accurate diagnoses, and communication around diagnoses. The supplemental items may be added to the end of the Medical Office Survey, just before the Background Questions, to assess content in areas not included in the core questionnaire.

The Diagnostic Safety Supplemental Items were developed and pilot tested for providers and staff and ask for their opinions about their medical office's processes around diagnosis.

- Diagnostic Safety Supplemental Items for the Medical Office Survey – English ([Word](#), 120 KB; [PDF](#), 204.5 KB).
- Diagnostic Safety Supplemental Items for the Medical Office Survey – Spanish ([Word](#), 77 KB; [PDF](#), 270 KB).

Topics Covered by the Diagnostic Safety Item Set

The Diagnostic Safety Supplemental Items address the following topic areas:

- Time Availability.
- Testing and Referrals.
- Provider and Staff Communication Around Diagnosis.

Pilot Study Results

Pilot study results are available for the Medical Office Diagnostic Safety Supplemental Items, which were administered to more than 800 providers and staff in 66

The following items ask about **your medical office's processes around diagnosis**. The processes start when a patient seeks care for a health problem, and include:

- Gathering, integrating, and interpreting information about the patient (e.g., clinical history, physical exam, test and imaging results, referrals),
- Making an initial diagnosis,
- Discussing the diagnosis with the patient, and
- Following up with the patient and revising the diagnosis over time, as needed.

New AHRQ Tool

Your Medical Office's Processes Around Diagnosis

SECTION F: Time Availability

How much do you agree or disagree with the following statements?	Strongly Disagree ▼	Disagree ▼	Neither Agree nor Disagree ▼	Agree ▼	Strongly Agree ▼	Does Not Apply or Don't Know ▼
1. The amount of time for appointments is long enough to fully evaluate the patient's presenting problem(s).....	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
2. Providers in this office have enough time to review the relevant information related to the patient's presenting problem(s)	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
3. Providers in this office finish their patient notes by the end of their regular workday	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉



New AHRQ Tool

SECTION G: Testing

How much do you agree or disagree with the following statements?	Strongly Disagree ▼	Disagree ▼	Neither Agree nor Disagree ▼	Agree ▼	Strongly Agree ▼	Does Not Apply or Don't Know ▼
1. This office is effective at tracking a patient's test results from labs, imaging, and other diagnostic procedures	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
2. When this office <u>doesn't</u> receive a patient's test results, staff follow up	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
3. All test results are communicated to patients, even if the test results are normal.....	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉



New AHRQ Tool

Pilot Test Diagnostic Safety Items – 08-11-2020

SECTION H: High Priority Referrals



How much do you agree or disagree with the following statements?	Strongly Disagree ▼	Disagree ▼	Neither Agree nor Disagree ▼	Agree ▼	Strongly Agree ▼	Does Not Apply or Don't Know ▼
1. This office is effective at tracking high priority referrals to outside providers	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
2. When this office makes a high priority referral to an outside provider, we provide relevant patient information with the referral (e.g., medical history, provider notes, test results)	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
3. When this office makes a high priority referral, we try to confirm whether the patient went to the appointment	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉



SECTION I: Provider and Staff Communication Around Diagnosis



How much do you agree or disagree with the following statements?	Strongly Disagree ▼	Disagree ▼	Neither Agree nor Disagree ▼	Agree ▼	Strongly Agree ▼	Does Not Apply or Don't Know ▼
I 1. Providers in this office encourage staff to share their concerns about a patient's health condition.	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
2. Providers document differential diagnoses when they have <u>not</u> ruled out other diagnoses	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
3. When a provider thinks another provider in this office/system may have missed a diagnosis, they inform that provider	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
4. When a missed, wrong, or delayed diagnosis happens in this office, we are informed about it.	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉
5. Providers in this office talk directly with specialists/radiologists/pathologists when something needs clarification	☐ ₁	☐ ₂	☐ ₃	☐ ₄	☐ ₅	☐ ₉



2. Learn from Anticipate and Share Errors

Diagnostic Pitfalls

Diagnostic Risk

Situational Awareness

- Specialized type of situational awareness
- High reliability organizations/theory
 - High worry anticipation of what can go wrong
 - Preoccupied w/ risks recognizing/preventing
- Appreciation diagnosis uncertainty, limitations
 - Limitations of tests, systems' vulnerabilities
 - Knowing when “over head” need for help
- Making failures visible
- Don't miss diagnoses, red flag symptoms
- Diagnostic pitfalls – potentially useful construct

What is a **Diagnostic Pitfall**?



Clinical situations where patterns of, or vulnerabilities to errors leading to missed, delayed or wrong diagnosis

DECEMBER 28, 1912

The Journal of the American Medical Association

Published Under the Auspices of the Board of Trustees

VOL. LIX, No. 26

CHICAGO, ILLINOIS

DECEMBER 28, 1912

DIAGNOSTIC PITFALLS IDENTIFIED DURING A STUDY OF THREE THOUSAND AUTOPSIES *

RICHARD C. CABOT, M.D.
BOSTON

I wish in this paper to make three points: 1. A goodly number of "classic" time-honored mistakes in diagnosis are familiar to all experienced physicians because we make them again and again. Some of these we can avoid; others are almost inevitable, but all should be borne in mind and marked on medical maps by a danger-signal of some kind: "In this vicinity look out for hidden rocks," or "Dangerous turn here, run slow." I shall enumerate some of these danger points presently.

2. Some common diseases are relatively inaccessible to diagnosis, no matter how carefully we are on the watch for them. From the study of 3,000 autopsies, I have begun to work out a percentage or ratio of accessibility for the commoner diseases (shown in the accompanying chart).

3. Besides the classic and well-known pitfalls there are some less familiar to the profession and needing all the more, therefore, to be marked "dangerous."

FREQUENT AND WELL-RECOGNIZED PITFALLS

poisoning, morphin habit, alcoholic neuritis, trichiniasis and gonorrheal infection. "Rheumatism" is one of the most dangerous of all diagnoses to the conscientious physician.

"Cystitis" is usually a symptom, not a disease. It points to disease below the bladder (stricture, obstructing prostate, etc.), or above it (renal tuberculosis and other renal infections) as its cause.

"Hemorrhoids" often mask cancer of the rectum.

"Neurasthenia." The real disease almost always shows itself in youth on the basis of congenital tendencies, though like tuberculosis it may be roused into active progress by any prolonged strain, mental or physical. When it appears after middle age it is almost always a symptom of organic disease such as dementia paralytica, chronic nephritis, arteriosclerosis, myxedema, hyperthyroidism or phthisis.

The incipient stages of the disease mentioned in the last sentence are rarely recognized. The same is true of gastric ulcer, pernicious anemia, leukemia, cirrhosis of the liver, congenital renal cysts, renal tuberculosis and many other diseases.

All this is trite and obvious, but I mention it to avoid the reproach of ignoring it.

As one looks at the accompanying chart of diagnoses one naturally asks: Whose success or failure does this represent? Where Smith and Jones have failed, could you and I have done better? I doubt it. The study of

The Journal of the American Medical Association

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CHICAGO, ILLINOIS

DECEMBER 28, 1913

IDENTIFIED DURING
THOUSAND

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T, M.D.

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Original Investigation | Health Policy

Characteristics of Disease-Specific and Generic Diagnostic Pitfalls

A Qualitative Study

Gordon D. Schiff, MD; Mayya Volodarskaya, MD; Elise Ruan, MD, MPH; Andrea Lim, MD; Adam Wright, PhD; Hardeep Singh, MD, MPH; Harry Reyes Nieva, MAS, MA

Abstract

IMPORTANCE Progress in understanding and preventing diagnostic errors has been modest. New approaches are needed to help clinicians anticipate and prevent such errors. Delineating recurring diagnostic pitfalls holds potential for conceptual and practical ways for improvement.

OBJECTIVES To develop the construct and collect examples of “diagnostic pitfalls,” defined as clinical situations and scenarios vulnerable to errors that may lead to missed, delayed, or wrong diagnoses.

DESIGN, SETTING, AND PARTICIPANTS This qualitative study used data from January 1, 2004, to December 31, 2016, from retrospective analysis of diagnosis-related patient safety incident reports, closed malpractice claims, and ambulatory morbidity and mortality conferences, as well as specialty focus groups. Data analyses were conducted between January 1, 2017, and December 31, 2019.

MAIN OUTCOMES AND MEASURES From each data source, potential diagnostic error cases were identified, and the following information was extracted: erroneous and correct diagnoses, presenting signs and symptoms, and areas of breakdowns in the diagnostic process (using Diagnosis Error Evaluation and Research and Reliable Diagnosis Challenges taxonomies). From this compilation, examples were collected of disease-specific pitfalls; this list was used to conduct a qualitative analysis of emerging themes to derive a generic taxonomy of diagnostic pitfalls.

RESULTS A total of 836 relevant cases were identified among 4325 patient safety incident reports, 403 closed malpractice claims, 24 ambulatory morbidity and mortality conferences, and 355 focus group responses. From these, 661 disease-specific diagnostic pitfalls were identified. A qualitative

Key Points

Question Are there similarities among clinical situations associated with diagnostic errors?

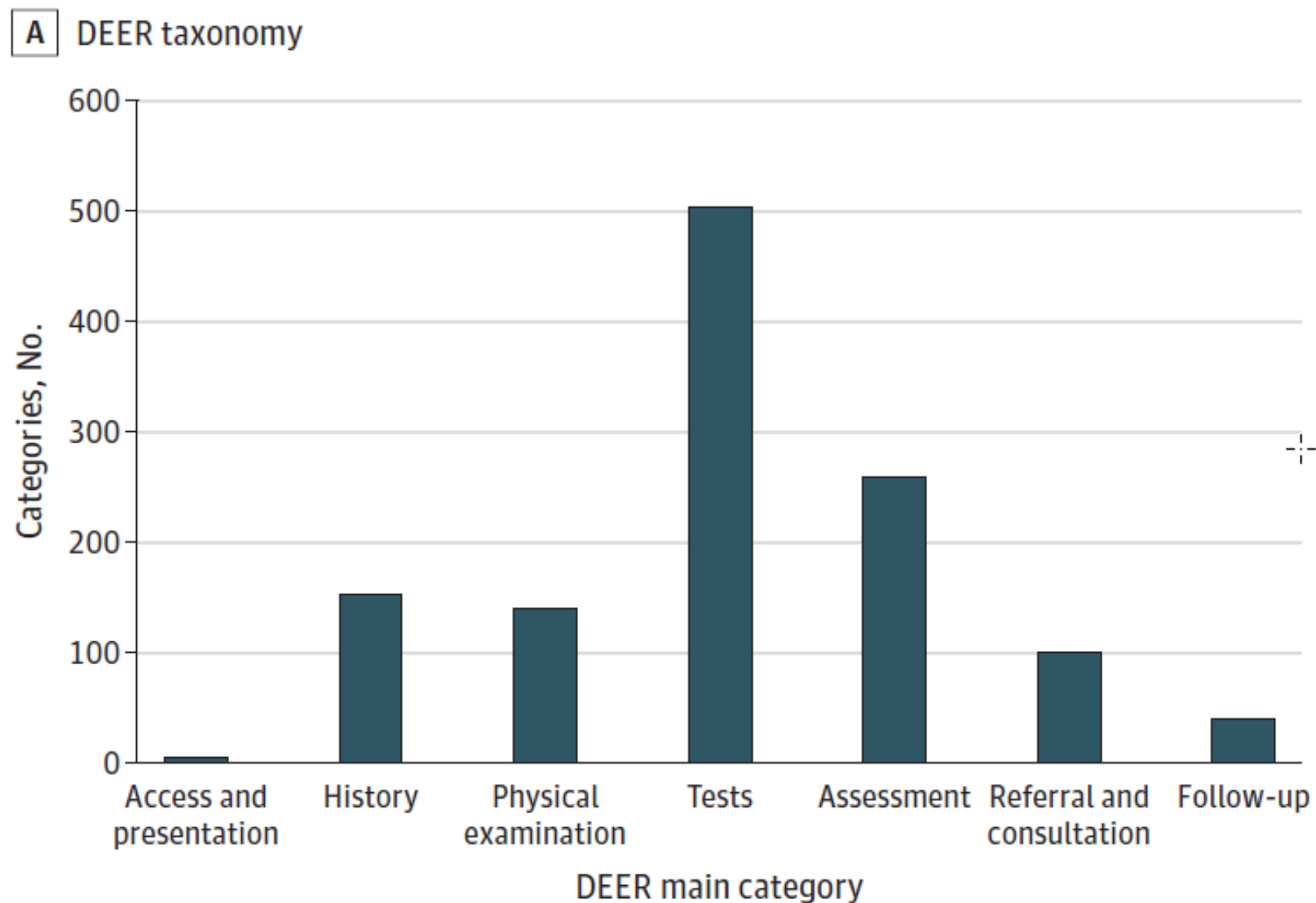
Findings This qualitative study identified 836 relevant cases among 4325 patient safety incident reports, 403 closed malpractice claims, 24 morbidity and mortality reports, and 355 focus group responses. From these, 661 disease-specific and 21 generic diagnostic “pitfalls” were identified.

Meaning Diagnostic pitfalls represent potentially useful construct that bridge cognitive and systems diagnosis error approaches because they can delineate and demonstrate recurrent patterns of diagnostic error.

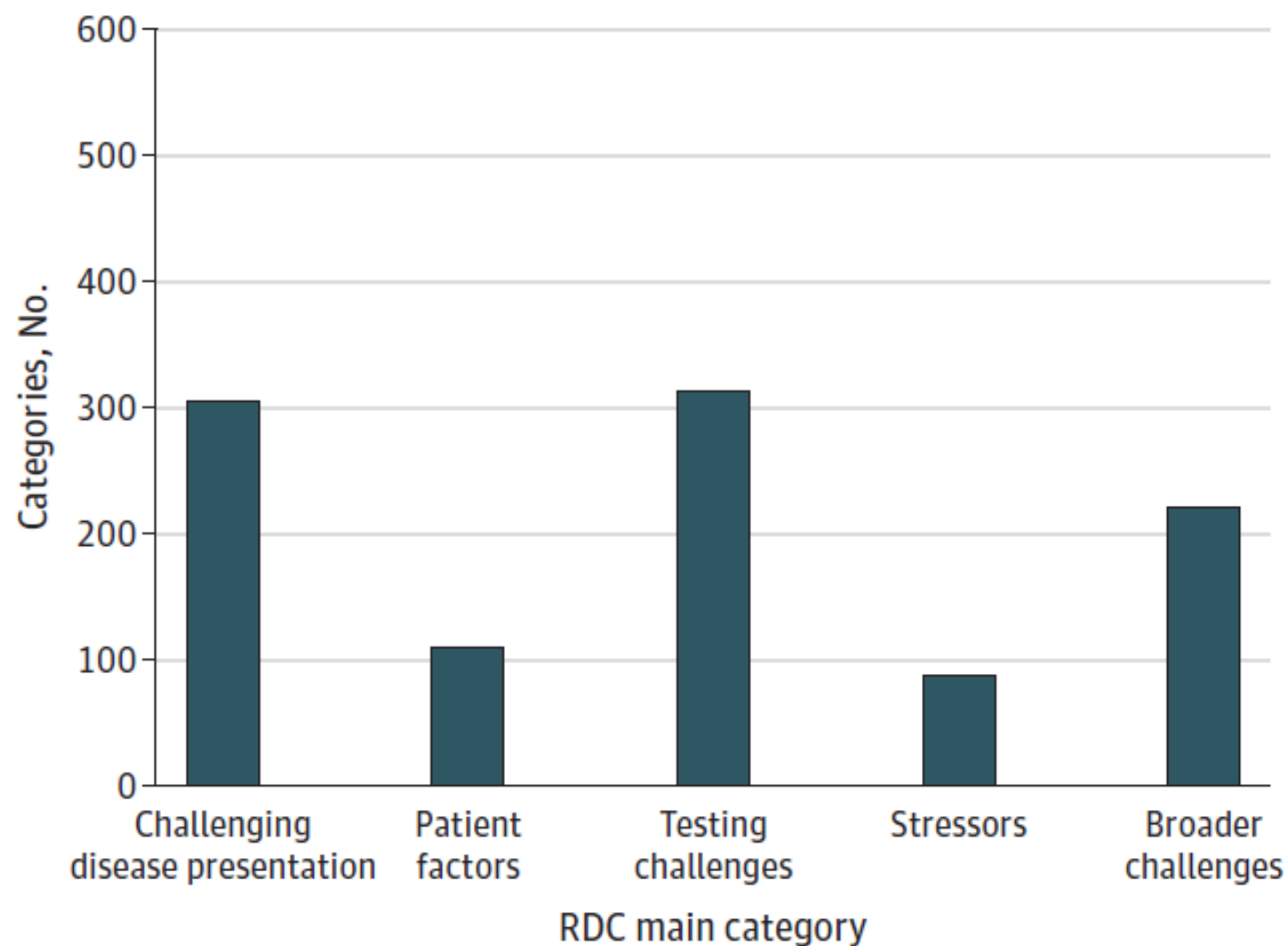
+ Supplemental content

Author affiliations and article information are listed at the end of this article.

Figure 2. Classification by Diagnosis Error Evaluation and Research (DEER) and Reliable D



B RDC taxonomy



PITFALL	EXAMPLES
Disease A mistaken for disease B Diseases often mistaken/misdiagnosed with each other	- Aortic dissection misdiagnosed as acute myocardial infarction 34% - Bipolar disorder misdiagnosed as depression 65%
Misinterpretation of test result(s) False-positive or false-negative results with failure to recognize test limitations	- Breast lump dismissed after negative mammogram 15% - Negative COVID-19 test early or late in course 28% day 1 of sx
Failure to recognize atypical presentation, signs, and symptoms	- Apathetic hyperthyroidism - Sepsis in elderly patient who is afebrile or hypothermic
Failure to assess appropriately the urgency of diagnosis Urgency of the clinical situation was not appreciated and/or delays critical diagnoses	- Compartment syndrome - Pericardial tamponade - Tension pneumothorax
Perils of intermittent symptoms or misleading evolution	“Lucid interval” in traumatic epidural hematoma

Drug or environmental factor not considered/overlooked Underlying etiology causing/ contributing to symptoms, or disease progression not sought, uncovered	especially if urgent or treatable • Ventricular arrhythmia related to QT-prolonging drug • Achilles tendon rupture related to quinolone drugs
Failure to appreciate risk factors for particular disease	• Family history of breast, colorectal cancer not solicited and/or weighed in diagnostic evaluation or screening
Failure to appreciate limitations of physical exam Now with ↑ telemedicine, missing physical exam entirely	• Overweighing absence of tenderness, swelling in deep vein thrombosis • Missing pill-rolling tremor during telemedicine visit
Confusion arising from response/ masking by empiric treatment	• Empiric treatment with steroids, proton pump inhibitors, antibiotics, pain medication erroneously masking serious diagnosis
Chronic disease or comorbidity presumed to account for new symptoms Especially in medically complex patients	• Septic joint signs misattributed to chronic rheumatoid arthritis • Mental status change due to infection or medication misattributed to underlying dementia

Diagnostic Pitfalls	Overall (N=241)	Colon cancer (N=46)	Lung cancer (N=43)	Prostate cancer (N=34)	Breast cancer (N=33)	Myocardial infarction (N=29)	Sepsis (N=16)	Stroke (N=16)	Pulmonary Embolism (N=11)	Thyroid cancer (N=7)	Melanoma (N=6)
Failure to follow-up	28%	10	14	16	14	6	-	-	-	4	4
Limitations of a test or exam finding not appreciated	26%	5	12	8	14	12	-	4	2	3	2
Disease A repeatedly mistaken for Disease B	24%	9	11	5	-	12	6	8	3	-	4
Risk factors not adequately appreciated	16%	10	-	15	4	7	-	-	3	-	-
Atypical presentation	15%	-	-	4	15	8	3	7	-	-	-
Counter-diagnosis cues overlooked (e.g., red flags)	10%	21	-	-	-	-	4	-	-	-	-
Communication failures between primary care physician and specialist	7%	7	4	-	4	3	-	-	-	-	-
Issues surrounding referral	3%	-	-	3	-	4	-	-	-	-	-
Urgency not fully appreciated	2%	-	-	-	-	-	4	2	-	-	-
Chronic disease presumed to account for new symptoms	2%	-	-	-	-	-	3	1	-	-	-
Miscommunication related to lab ordering	1%	-	-	-	-	-	3	-	-	-	-
Evolving symptoms not monitored	1%	-	2	-	-	-	-	-	-	-	-

Examples of 50 Disease-Specific Pitfalls

A1. COVID Diagnosis Pitfalls

- 
1. False negative COVID test results (PCR, home antigen) - depending on timing, technique.
 2. COVID with no symptoms- pooled data shows 40% of patients are asymptomatic
 3. Atypical presentations: patients presenting with ocular, cutaneous, delirium, thrombosis, hepatic
 4. Deceptive Initial stability; later onset severe illness, unstable with cytokine storm
 -  5. Confusion, complexity with AMI, PE - both as a competing diagnosis as well as a complication

A2. Non-COVID Diagnoses COVID Related Pitfalls

→ 6. Delays in presentation, due to patient reluctance to come in for fear of exposure to COVID.

→ 7. Missing physical exam (for fear of coming in; tele-visits) findings.

8. False positive antibody, PCR tests-which can be consequential (i.e. lead to assume safe to be exposed)

9. Influenza, RSV misdiagnosed as COVID

→ 10. False + mammogram after vaccination
(false positive lymphadenopathy in 1st week after mRNA vaccine 1st dose 10.2% vs. 4.8 placebo patients; 2nd dose 14.2% vs. 3.9 placebo recipients).

B1. Cancer - Breast

- 
- 11. False negative mammogram breast lump on exam mammogram ordered negative, falsely reassure patient
 - 12. Ordering or doing *screening*, rather than *diagnostic* mammogram in a patient with a palpable breast lump (related to #11 above)
 - 13. Failure to suspect and diagnose in younger patients (9% of breast cancer in US in patients <45, despite this being cut-off age for initiating screening)
 -  14. Failure to obtain, or update, family history. Neg 1st visit to MD, but next year 1st degree relative diagnosed
 - 15. Erroneous alternate diagnoses in patients with presenting with as yet undiagnosed breast cancer. Incorrectly attributing symptoms to mastitis, fibrocystic disease.
 -  16. Failure to appreciate false negative MMG screen mammography risk dense breasts, as well as recognize the ~2x risk dense breasts confer on patients.

B2. Cancer --Colorectal



17. Attributing rectal bleeding to hemorrhoids

18. Failure to repeat colonoscopy done < 2 years prior, but continuing symptoms further time elapsing (i.e. now is 3 years)

19. Failure to obtain or update family history – initially negative but in next year 1st degree relative diagnosed but failure to capture/update family history risk.

20. Anemia (from LGI bleeding due to colon cancer) attributed to heavy menses



21. Distracting UGI lesion (e.g., gastritis) leading to search satisficing for source of + stool guaiac test/anemia.

B2. Cancer --Colorectal



22. Universal delayed return of Pathology report – overlooked because disconnected from colonoscopy report with failure to incorporate recommendations/timeframe .

23. False negative colonoscopy due to poor/inadequate prep (often with failure to carry out recommendations for more timely repeating of the test)

24. Pts declining colonoscopy- but with failure to revisit shared decision-making in subsequent visits or offer alternative screening

25. Deferring colonoscopy (at times indefinitely) in patients with competing medical issues. Can be at times appropriate (terminal lung cancer)

C. Cardiology

26. Failure to appreciate that echocardiogram findings are dynamic and reader dependent

→ 26. Leg swelling, then ultrasound finding *chronic* DVT, misinterpreted as *acute* DVT (with erroneous starting of urgent anticoagulation)

27. Underlying dysautonomia failure to consider and test being dismissed as chronic fatigue, anxiety, lightheadedness, and/or palpitations, esp in younger pts

28. Cellulitis misdiagnosed in patients with stasis dermatitis who have red and swollen legs (often bilaterally, and chronically).

29. Labeling patients w/ PE as having heart failure, acute, coronary syndrome, syncope.

30. Misdiagnosing acute aortic dissection as acute MI (with grave potential consequences from erroneously anticoagulating in type A aortic dissection)

→ 31. PSVT- misdiagnosing patients, especially female patients, as having anxiety, or panic attacks

D. Infectious Diseases



32. Contaminated urine misinterpreted as UTI (multiple organisms), or related problem of overlooking true UTI organism because “contaminated” specimen dismissed

33. Too much consideration to Lyme disease, without considering other tick-borne illness like babesia.

34. New back pain, with anemia, failure to consider and dx spinal epidural abscess



35. Misinterpreting test characteristics based on disease stage (Covid, Lyme, syphilis, HIV) w/ (e.g., HIV) negative window for up to 90 days after exposure

36. False +HIV test, esp in lower resourced countries, (rates 5% or higher) due to over-interpretation of weakly + or cross reactivity due to HLA class II antigens

D. Infectious Diseases

37. Interferon-Gamma Release Assays (IGRAs), TB test TB: false negatives due to errors collecting and transporting (must be processed 8-30 hours after collection while WBCs still viable); limited data on ability to predict clinical TB.

→ 38. Absence or masking (by antipyretics) of fever erroneously interpreted as ruling-out infection . Failure to appreciate tachycardia as red flag for infection.

39. False negative blood cultures, (e.g., in endocarditis or sepsis) especially in pts partially treated with antibiotics.

40. Failure to note elevated eosinophil count (absolute or % on differential) in pts from country endemic for *Strongyloides* (particularly dangerous for pts given steroids, other immune suppressive Rx)

→ 41. Missing necrotizing fasciitis in pts w/ rapidly progressive skin infections, esp w/ risks (diabetes, steroids) Often initially indistinguishable from benign soft tissue infections; failure to recognize key clues e.g. bullae and crepitus.

E. Urology



42. Falsely reassuring normal PSA level in pts on finasteride or prostatectomy-- level is reduced by 50% w/ finasteride (thus should double result). Likewise, *any* detectable PSA after a prostatectomy is abnormal.

43. Falsely elevated PSA levels in pts with very enlarged prostate (BPH PSA density issues).

44. Hydroureter/obstructive uropathy presenting silently. Progressive renal damage before obstruction is clinically evident, suspected, or $\uparrow$ Cr noted.



45. Failure to note significant change-delta in PSA levels when the rising PSA is still within the normal (i.e., < 4) range.

F. Miscellaneous



46. Endometriosis dismissed as “normal” menstrual pain (despite severe disabling periods) or dyspareunia or IBD. Failure to refer for definitive diagnostic test (laparoscopy) even when suspected.

47. Bipolar misdiagnosed as depression (major depression disorder); or at rarer times other psychiatric diagnoses.

48. Failure to consider carbon monoxide toxicity due to non-specific vague sx (e.g. headache, dizziness, nausea, weakness, malaise, fatigue). Confused w/ flu since both seen winter months.

49. Foot pain due to a spinal lesion or spinal stenosis (not recognizing that pain originating way above the location of the pain).

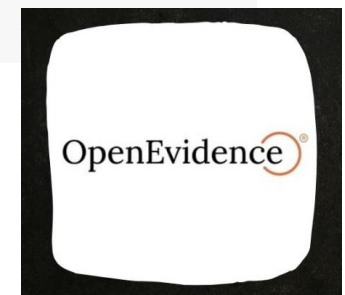
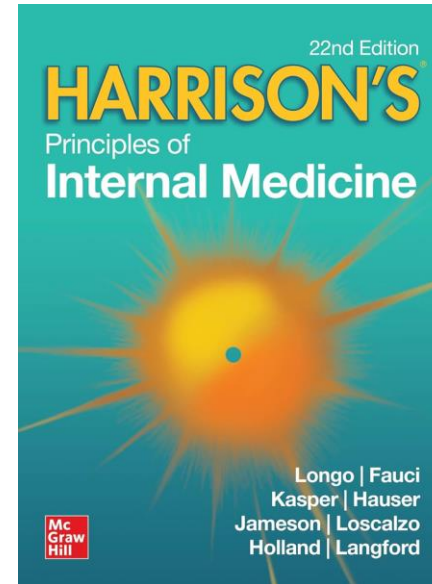
50. Failure to consider drug etiology (many many drugs and clinical symptoms).



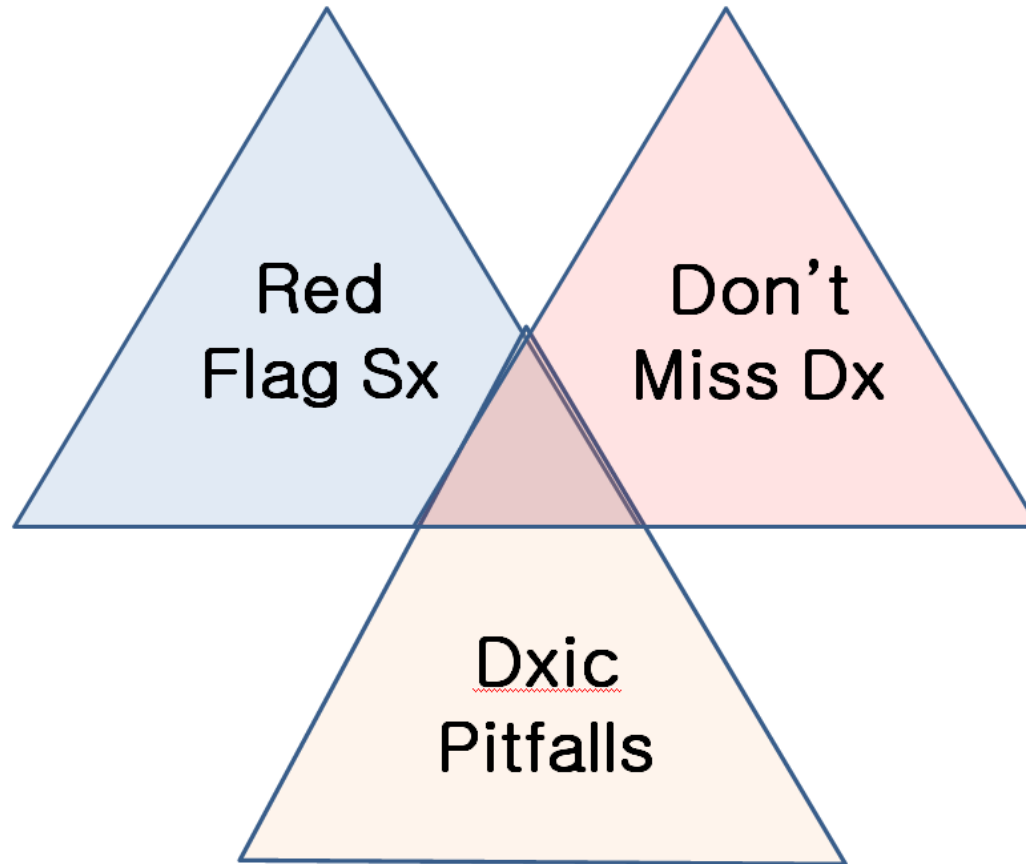
51. False negative ESR in temporal arteritis (sensitivity only 82-87%). Or even false negative temporal artery biopsy (reported rate false negative ~7%)

What if We Had a New Section for Each Disease in Harrison's or Up-to-Date?

- Definition
- Epidemiology
- Pathophysiology
- Diagnosis
 - Clinical Features
 - Differential Diagnosis
 - Testing
 - **Diagnostic Pitfalls**
- Management/Treatment
- Prognosis
- Prevention



Diagnostic Situational Awareness Model



Don't Miss Diagnoses 4 R's

4 R's mandating acute dx/rx

- Rare
 - Rapidly Progressive
 - Remediable
 - Really bad
-
- > *Spinal cord compression*
 - > *Upper airway obstruction*
 - > *Pericardial tamponade*

Don't Miss Diagnoses 4 C's

4 C's serious consequence misses

- Continuing exposures
- Contagious
- Chronically progressive
- Confusing

> *COVID*

> *Carbon monoxide poisoning*

> *TB*

> *Occupational Asthma*

Examples of “Don’t Miss Diagnoses

Infections/Inflammation	Cardiac/Ischemic/Bleeding	Metabolic/Hematologic/Environmental
Spinal epidural abscess	Aortic dissection Leaking/ruptured AAA	Diabetes ketoacidosis Hyperosmolar hyperglycemia
Necrotizing fasciitis	Pericardial tamponade	Myxedema/thyrotoxicosis
Meningitis	Wolff-Parkinson-White	Addison's disease
Endocarditis	Pulmonary embolism	B12 deficiency anemia
Peritonsillar abscess	Tension pneumothorax	von Willebrand disease
TB-active pulmonary, other	Acute mesenteric ischemia Sigmoid volvulus	Hemochromatosis
COVID-19 infection	Esophageal perforation	Celiac sprue
Guillain-Barre Syndrome	Cerebellar hemorrhage	Carbon monoxide poisoning
Temporal arteritis	Spinal cord compression	Food poisoning
Rhabdomyolysis	Testicular, ovarian torsion	Malignant hyperthermia
Angioedema	Ectopic pregnancy	Alcohol, benzo, barbiturate withdrawal

3. Closed Loop Systems

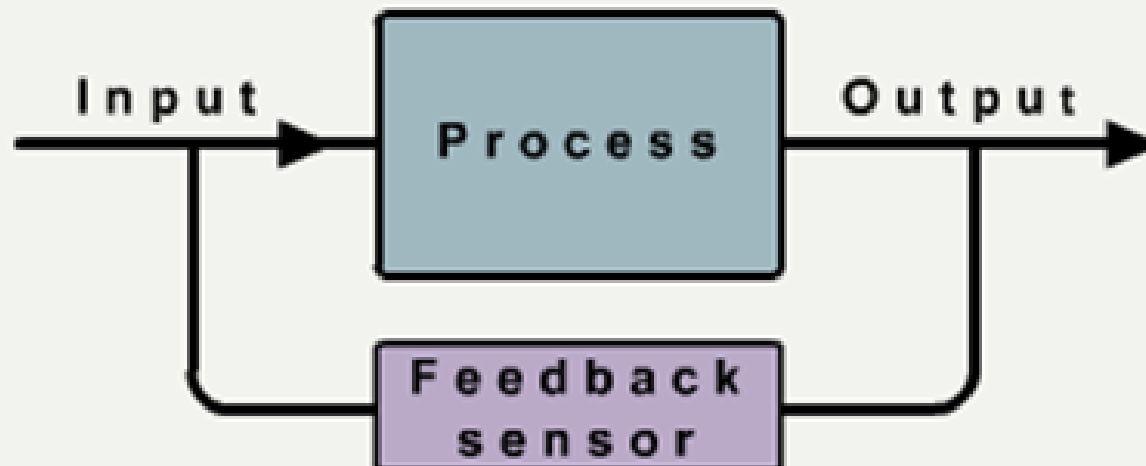


Diagnosis is Currently
an Open Loop System

Water goes on the
same time each day,
regardless of whether
it is raining or lawn is
flooded

Schiff A J Med 2008

Open and closed loop systems



Open Loop System	Closed Loop System
Absence of Monitoring	Monitoring
Non-feedback system	Feedback system
Simple	More complex
Action unencumbered	Controlled by monitoring feedback
Non-reliable	More Reliable
Traffic light, washing machine, water faucet, toaster, lawn sprinkler, one-way broadcast	Heating/AC controlled by thermostat, refrigerator, oven, 2-way conversation, thirst, satiety, blood glucose.
DIAGNOSIS	
DX PROCESS	

Open Loop System	Closed Loop System
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Non-feedback system	Feedback system
Simple	More complex
Action unencumbered	Controlled by monitoring feedback
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Traffic light, washing machine, water faucet, toaster, lawn sprinkler, one-way broadcast	Heating/AC controlled by thermostat, refrigerator, oven, 2-way conversation thirst, satiety, blood glucose.

DIAGNOSIS 

DX PROCESS 

Closed Loop Systems

↑ Transparency

↑ Reliability

↑ Learning

Ability Self-Regulate

Closed Loop Systems

↑ Transparency

↑ Reliability

↑ Learning

Ability Self-Regulate

↑ Data required

↑ Upfront Investment

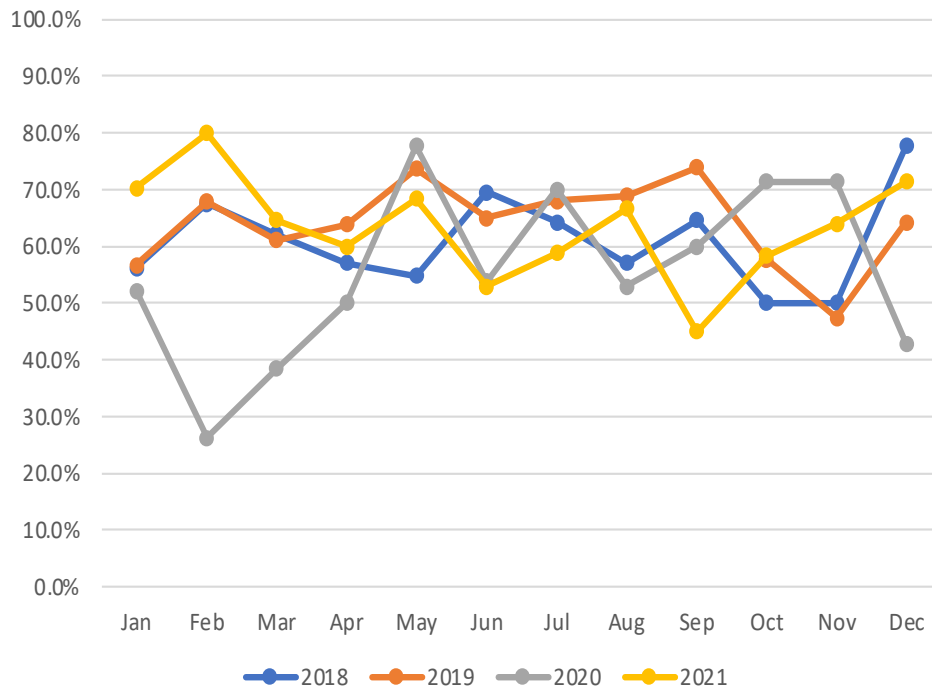
↑ IT Design

↑ Coordination

↑ Continuity

Quantitative example – Logistic regression of loop closure rates (combined dermatology referrals, stress tests, colonoscopies)

HCA Percentage of Completed Procedures by Month and Year (2018-2021) , within 45 days



Variable	Overall (Odds Ratio, 95% CI)
Gender	
Male	1.11 (1.03 to 1.19)
Education	
High school or less	0.91 (0.83 to 0.99)
Payor (%)	
Medicaid	0.82 (0.73 to 0.91)
Medicare	1.18 (1.06 to 1.31)
Patient engagement	
Use of patient portal	1.32 (1.22 to 1.44)
Mental illness	
Presence of depression	0.82 (0.75 to 0.90)
Physician type	
Resident	0.88 (0.79 to 0.98)
Primary care site	
Healthcare Associates	0.84 (0.74 to 0.97)
Visit Modality	
Telephone	0.44 (0.38 to 0.53)
Video	0.73 (0.59 to 0.92)
Referral type	
Dermatology referral	1.33 (1.16 to 1.52)
Cardiac stress test	1.15 (1.01 to 1.31)

Key takeaways: Closed loop rates suboptimal for all: more related to process than anything else

*Age, race, ethnicity, medical complexity and referral timing relative to COVID were not statistically significant

4. Health IT Clinical Documentation

4. Health IT & Clinical Documentation



The NEW ENGLAND
JOURNAL of MEDICINE

Can Electronic Clinical Documentation Help Prevent Diagnostic Errors?

Gordon D. Schiff, M.D., and David W. Bates, M.D.

The United States is about to invest nearly \$50 billion in health information technology (HIT) in an attempt to push the country to a tipping point with respect to the adoption of computerized records, which are expected to improve the quality and reduce the costs of care.¹ A fundamental question is how best to design electronic health records (EHRs) to enhance clinicians' workflow and the quality of care. Although clinical documentation plays a central role in EHRs and

many questions about it persist. For example, can it be leveraged to improve quality without adversely affecting clinicians' efficiency? Will the quality of electronic notes be better than that of paper notes, or will it be degraded by the widespread use of templates and copied-and-pasted information?

A fundamental part of delivering good medical care is getting the diagnosis right. Unfortunately, diagnostic errors are common, outnumbering medication and surgical errors as causes

ing physicians from the patient, discouraging independent data gathering and assessment, and perpetuating errors.⁴ But we envision a redesigned documentation function that anticipates new approaches to improving diagnosis, not one that relies on the putative "master diagnosticians" of past eras. The diagnostic process must be made reliable, not heroic, and electronic documentation will be key to this effort. Systems developers and clinicians will need to reconceptualize documentation



OPEN ACCESS

Use of health information technology to reduce diagnostic errors

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► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bmjqs-2013-001884>).

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ABSTRACT

Background Health information technology (HIT) systems have the potential to reduce delayed, missed or incorrect diagnoses. We describe and classify the current state of diagnostic HIT and identify future research directions.

Methods A multi-pronged literature search was conducted using PubMed, Web of Science, backwards and forwards reference searches and contributions from domain experts. We included HIT systems evaluated in clinical and experimental settings as well as previous reviews, and excluded radiology computer-aided diagnosis, monitor alerts and alarms, and studies

INTRODUCTION

Unaided clinicians often make diagnostic errors. Vulnerable to fallible human memory, variable disease presentation, cognitive processes plagued by communication lapses, and a series of well-documented 'heuristics', biases and disease-specific falls, ensuring reliable and timely diagnosis represents a major challenge.^{1–3} Health information technology (HIT) tools and systems have the potential to enable physicians to overcome—or at least minimise—these human limitations.

Despite substantial progress during the 1970s and 1980s in modelling and simulating clinical decision-making,

10 WAYS HEALTH INFORMATION TECHNOLOGY CAN HELP PREVENT AND MINIMIZE DIAGNOSTIC ERRORS



I

FUNCTION	EXAMPLES
Facilitate collection/gathering of information	-Quickly access <u>past history</u> from prior care at same and outside institutions. -Electronic collection of history of present illness, review of systems, social determinant risks, in advance of visits
Enhanced information entry, organization, and display	-Visually enhanced flowsheets showing trends, relationships to treatment -Reorganized notes to facilitate summarization, simplification, and prevent items from getting lost
Generating Differential Diagnosis	-Automated creation of lists of diagnoses to consider based on patient's symptoms, demographics, risks
Weighing diagnoses likelihoods	-Tools to assist in calculation of post-test (Bayesian) probabilities
Aids for formulating diagnostic plan, intelligent test ordering	-Entering a diagnostic consideration (e.g., celiac disease, pheochromocytoma) and computer suggests most appropriate diagnostic test(s) and how to order

10 WAYS HEALTH INFORMATION TECHNOLOGY CAN HELP PREVENT AND MINIMIZE DIAGNOSTIC ERRORS

Access to diagnostic reference information	-Info-buttons instantly linking symptom or diagnosis relevant to Harrisons, Up-to-Date chapters, references
Ensuring more reliable follow-up	-Hardwiring “closed loops” to ensure abnormal labs, missed referrals, worrisome symptoms are tracked and followed-up
Support screening for early detection	-Collaborative tools that patients, clinicians, offices, can use to know when due, order and track screening based on individualized demographics, risk factors, prior tests
Collaborative diagnosis; access to specialist	-Real time posing/answering of questions -Electronic consults; virtual co-management
Facilitating feedback on diagnoses	-Feeding back new diagnoses (from downstream providers, patients) that emerge suggesting potential misdiagnosis/errors to clinicians, ERs who saw previously

Clinical Documentation



CYA



[Van Gogh: Self-Portrait in Front of the Easel](#)

Canvass for Your Assessment



Canvass for Your Assessment

What are elements of A Good Diagnostic Assessment

1. Assessment of “the diagnosis”
 - Differential Diagnosis
 - Likelihood (differentiating features, uncertainties)
 - Probable, unlikely, data needed
 - Red flags, don’t miss, pitfalls
2. Underlying etiology (organism, exposures, risk factors)
3. Severity
4. Evolution
 - Better/Improving, Worse, Stable
5. Impact on patient
 - Coping well, very stressed.

Assessing the Assessment—Developing and Deploying a Novel Tool for Evaluating Clinical Notes' Diagnostic Assessment Quality



2/2023

Mirica Maria, PhD¹, Khazen Maram, PhD², Hussein Sarib, MD³, Ramos Jason, BA⁴, Tewodros Eguale, MD^{1,5}, Linzer Mark, MD⁶, and Schiff D. Gordon, MD^{1,7}

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BACKGROUND: Ambulatory diagnostic errors are increasingly being recognized as an important quality and safety issue, and while measures of diagnostic quality have been sought, tools to evaluate diagnostic assessments in the medical record are lacking.

OBJECTIVE: To develop and test a tool to measure diagnostic assessment note quality in primary care urgent encounters and identify common elements and areas for improvement in diagnostic assessment.

DESIGN: Retrospective chart review of urgent care encounters at an urban academic setting.

PARTICIPANTS: Primary care physicians.

MAIN MEASURES: The Assessing the Assessment (ATA) instrument was evaluated for inter-rater reliability, internal consistency, and findings from its application to EHR notes.

KEY RESULTS: ATA had reasonable performance characteristics (kappa 0.63, overall Cronbach's alpha 0.76). Variability in diagnostic assessment was seen in sev-

to measure quality that can be useful and used for catalyzing improvement.³ To make meaningful progress, organizations and clinicians need practical, effective, and sustainable tools that can engage clinicians and patients to help close care and communication gaps in a myriad of interrelated areas.⁴ Akin to an ophthalmoscopic examination, clinical note documentation can provide a window into the quality of the diagnostic process. Notes are not only a recorded representation of the clinician's diagnostic activities and thinking, but also serve as important communication tools for ensuing visits, other clinicians, and, increasingly, patients accessing their medical records via Open Notes.⁵ Particularly where there is diagnostic uncertainty, clear and thorough documentation is important for transparently capturing clinicians' assessments and guiding next steps.⁶

Clinical notes remain a challenge with widely voiced issues, especially note quality and time burden for writ-

I. DIAGNOSTIC ASSESSMENT
a. Addresses chief complaint
b. Differential diagnosis related to chief complaint
c. Addresses psychosocial information/Impact
d. Discusses possible etiologies
e. Addresses degree of certainty/uncertainty
II. DIAGNOSTIC PLAN/FOLLOW-UP
a. Mentions diagnostic tests (lab, imaging)
b. Contingencies discussed in note
c. Time frames discussed in note
d. Includes rationale
III. SITUATIONAL AWARENESS/SAFETY NETS
a. Red Flags: considered/noted/commented on
b. Don't miss diagnoses considered/noted
c. Pitfalls: considered/noted/commented on
IV. DOCUMENTATION QUALITY
a. Succinctness
b. Readability (formatting, organization, clarity)
1. Readability for other clinicians
2. Patient readability (including ↑abbreviations)
c. Avoids legal liability, pejorative red flags
d. Overuse/inappropriate copy/paste, templating
V. GLOBAL SUBJECTIVE ASSESSMENT
a. Quality of diagnosis/differential diagnosis
b. Adequate testing needed for clinical situation
c. Avoids over-testing

Assessing the Assessment (ATA) for Acute Symptoms/Problems

Quality of Diagnosis Documentation in Clinical Notes

- 1- Absent
- 2- Minimal/ Some mention
- 3- Adequate / OK
- 4- Good
- 5- Excellent / Outstanding

Review 100 Urgent Care Notes

a. Addresses chief complaint

c. Contextual/psychosocial information/impact

d. Discusses possible etiologies

e. Addresses degree of certainty/uncertainty

II. DIAGNOSTIC PLAN/FOLLOW-UP

a. Mentions diagnostic tests (lab, imaging)

b. Contingencies discussed in note

c. Time frames discussed in note

d. Includes rationale

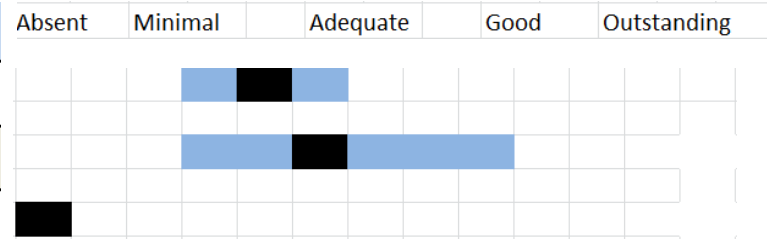
Age Group	1-2 times a week	3-4 times a week	5-6 times a week
18-24	10	1	9
25-34	10	2	8
35-44	2	2	6
45-54	4	2	4

III. SITUATIONAL AWARENESS/SAFETY NETS

a. Red Flags: considered/noted/commented on

b. Don't miss diagnoses considered/noted

c. Pitfalls: considered/noted/commented on



IV. DOCUMENTATION QUALITY

a. Succinctness

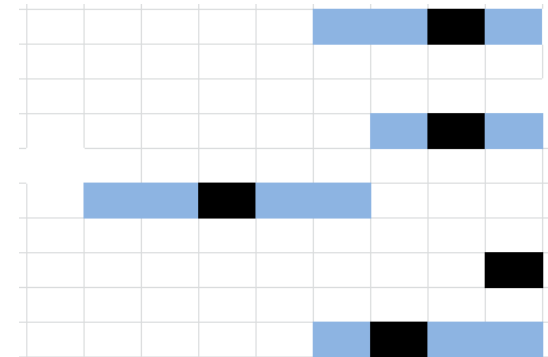
b. Readability (formatting, organization, clarity)

1. Readability for other clinicians

2. Patient readability (including ↑abbreviations)

c. Avoids legal liability, pejorative red flags

d. Overuse/inappropriate copy/paste, templating



V. GLOBAL SUBJECTIVE ASSESSMENT

a. Quality of diagnosis/differential diagnosis

b. Adequate testing needed for clinical situation

c. Avoids over-testing



Thinking critically about AI documentation quality in primary care

BMJ QSHC 2026

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Received 25 August 2025

Accepted 21 January 2026

The introduction of artificial intelligence (AI)-driven clinical documentation has taken healthcare by storm. According to many leaders and clinicians, there has never been a technology that has been so impressive and rapidly adopted by clinicians.¹ Arising on the soil of widespread clinician burnout and frustrations, including with the time consumed by charting clinical encounters, AI vendors have developed modules that facilitate clinical documentation.² These tools work by recording the encounter (with patient consent) as a digital audio file, which is then transcribed using speech-recognition technology, and then processed by AI to produce a formatted note for the clinician to review and sign. This perspective piece is written by a primary care clinician and patient safety researcher using AI docu-

our work with AI-documented notes, as well as touch on broader issues raised by this new technology.

In 2021 two key developments threw the doors wide open for rethinking outpatient clinical notes in the USA and beyond. The first was a revision of coding requirements by the US Centres for Medicare and Medicaid which previously required documentation of a specific number of history and physical examination components. The new regulations simplified note-writing, making notes less about check-box documentation, thereby providing flexibility for more meaningful narrative and recording of medical decision-making. This liberated notes from prior constraints and provided an opportunity to rethink and improve

Assessment & Plan

1. Abdominal pain.

- Reports experiencing lower abdominal pain for about 2 months, worsens with spicy or heavy foods, relieved by bowel movements.
- No blood in stool, bowel movements are regular.
- Advised to continue incorporating high-fiber foods like oatmeal and spinach into diet to prevent constipation.
- If symptoms persist, further tests may be considered.

NO REAL ASSESSMENT OF THE PROBLEM

Assessment & Plan

1. Abdominal pain.

- Reports experiencing lower abdominal pain for about 2 months, worsens with spicy or heavy foods, relieved by bowel movements.
- No blood in stool, bowel movements are regular.
- Confusing. Most likely just simple constipation sx, with rash on thighs unrelated. But patient convinced flaring together and related. Difficult to explain their co-occurrence, tho dermatomyositis could be in part responsible for both. Longer differential diagnosis includes lymphatic obstruction w/ inguinal node swelling as basis for swelling he has described. Will reassure, as exam today OK except for rash, but closely monitor and refer to Derm for rash.
- Advised to continue incorporating high-fiber foods like oatmeal and spinach into diet to prevent constipation.
- If symptoms persist, further tests may be considered.

Assessment & Plan |||

1. Knee pain.

- He reports stiffness and pain in both knees, with the right knee being more problematic.
- He uses Voltaren sparingly for relief.
- A prescription for diclofenac topical 1% (Voltaren) has been provided, with instructions to apply 2 g four times daily as needed.

Assessment & Plan |||

1. Knee pain.

- He reports stiffness and pain in both knees, with the right knee being more problematic.

- He uses Voltaren sparingly for relief.

- Most likely DJD, acute flare atop more chronic. No swelling to suggest gout, septic. Pt opposed to idea of joint replacement surgery; regardless unclear if candidate.

- A prescription for diclofenac topical 1% (Voltaren) has been provided, with instructions to apply 2 g four times daily as needed.



The NEW ENGLAND
JOURNAL of MEDICINE

AI-Driven Clinical Documentation — Driving Out the Chitchat?

Gordon D. Schiff, M.D.^{1,2}

For the past year, I have been using artificial intelligence (AI)-based documentation software to write the patient notes for my primary care practice. At its best, the software, which combines voice recognition with advanced AI technology to turn the transcript of a patient encounter into a completed note in less than 60 seconds, is awesome. Its ability to systematize a conversation into a “history of present illness,” “physical exam,” “results,” and “assessment and plan,” often with

minimal or no errors, is both time-saving and transformative for my note-writing workflow. As a fast typist, I used to record my patients’ comments in real time during each encounter, and I would be left with a jumble of quotes and notes that I’d have to spend the evening editing. Cleaning up these notes and crafting a succinct and (ideally) thorough, thoughtful, respectful, nuanced assessment of the patients and their problems took many nighttime hours, often spilling over to the weekend.

Although this new software sometimes makes mistakes, occasionally even serious ones (getting drug names wrong or omitting mention of important diagnoses), one of the things I noticed immediately was that it stripped out much of the “social” conversation. A patient’s daughter is struggling with substance use; a patient and his wife are about to leave for a trip to Puerto Rico; another has a stressful new job; a patient loved or hated the annual music mix I give patients each holiday season.

Drove out the Chit-Chat- Actual Cases

- Patient's daughter overdosed on drugs – distraught
- Going on trip to Haiti -to visit devastated family/home
- Had to quit job so stressful; starting new job
- Getting called in for overnight shifts at shelter – exacerbating pre-existing sleep disorder
- Breaking up with boyfriend over stress from recent presidential election
- Still grieving loss of son 5 years ago
- Loved or hated music I shared

AI and Diagnosis

- Diagnostic support not AI makes the Diagnosis
 - 2025 meta-analysis 83 studies—pooled accuracy 52%
 - Roughly comparable to non-expert MD, worse than experts
 - RCT 50 MDs GPT-4 did not improve dx reasoning
 - Suggest issue is how MD's use, trust, challenge it
 - Strongest with “bounded tasks”
 - Image recognition, ECG interpretation, Derm/Ophthalmology, Path, DD generation

JAMA 2023

VIEWPOINT

AI IN MEDICINE

Artificial Intelligence in Clinical Diagnosis
Opportunities, Challenges, and Hype**Prathit A. Kulkarni, MD**

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ChatGPT, a generative artificial intelligence (AI) chatbot, has recently been hailed as a promising tool to improve health care quality. One study compared output from the AI chatbot for medical questions with answers from physicians¹; other studies have evaluated the AI chatbot's responses to sample clinical vignettes.^{2,3} A foundational aspect of high-quality health care—making a correct and timely diagnosis—remains a challenge in modern medicine despite decades of technological advances.^{4,5} Therefore, any emerging technology with potential to reduce diagnostic errors warrants serious examination.

Recent literature provides some suggestions as to what role AI and the AI chatbot may have in assisting with diagnosis.⁶⁻⁸ However, clinical diagnosis is both an art and a science, and is more challenging for AI to optimize than visual diagnostic interpretation, such as radiographic and pathologic diagnosis. Here, we provide a realistic overview of generative AI's role in clinical diagnosis to clarify hype, strengths, challenges, and future opportunities.

Diagnostic dilemmas are common in clinical medicine. Arriving at a patient's final diagnosis is a process that evolves over time and can include periods of uncertainty. One potential use of AI is to identify rare

tient's presentation. For example, dyspnea on exertion, anemia, and hyponatremia are classic general medicine problems, but clinicians often rely on their memory when performing their diagnostic evaluation, a fallible approach. Additionally, laboratory or radiographic findings might not be interpreted correctly by clinicians. AI chat platforms can be consulted, potentially in real time, to ensure that obvious diagnostic possibilities have not been overlooked. Ideally, the platform would be embedded into the electronic health record (EHR) to make this consultation highly efficient.

AI also has the advantage of being able to scan a patient's medical record faster than a person can. Clinicians often spend long periods trying to decipher a patient's story and longitudinal journey by clicking through scores of notes, laboratory trends, radiology and pathology reports, and additional diagnostic data. With associated visualization platforms, AI could display these data in a more intuitive way and potentially assist with nuanced interpretation of such cumulative historical data.

Despite these potential benefits of AI, fundamental limitations and challenges require careful consideration as AI is further integrated into medical care. Of

Major Potential Benefits

- Broadening DD
- Reducing availability bias
- Suggesting “don’t miss” dx
- Checking drug/lab clues
- Identifying missed follow-up
- Diagnostic 2nd reader or opinion
- Safety net – “have you considered.....”
 - This is different from letting it declare the diagnosis

Downsides; Adverse Consequences

- Premature closure w/ technological authority
 - Fluent, confident, well formatted....but wrong
 - Especially early in diagnostic process
 - “Automation bias” – stops us from asking what else could this be. What doesn’t fit.
 - False sense of reassurance
 - Moves away from bedside: history and physical
- Bias and equity risks
- Can lead to overdiagnosis and overtesting
 - Broad DD tho useful can trigger search for every rare dx.
- Lack transparency and external validation
- Pseudo-solution to access, continuity, PCP crisis, burnout

What about Patients Using AI for Dx

- Help understand medical terms, lab results, discharge instructions, and med names
 - Translate medical jargon into plain language
- Prepare questions for a doctor visit
 - Organize symptoms chronologically
 - Suggest when symptoms may require urgent care
- Help patients advocate for themselves
 - Help to question diagnoses

Where Does AI Become Unsafe

- Lacks vital signs, P Exam, access to past record
- Harms include
 - Delayed care (pt is falsely reassure)
 - Over triage (worries stable patients to go to ER)
 - Under-triage (misses red flags because pts don't know what details matter)
 - Hallucinated advice
 - Serious dangers w/ mental health dx/patients
- Erosion of clinician relationship
 - False personalization – answers may sound tailored but context, longitudinal continuity

5. Working w/ Patients to CO-PRODUCE Diagnosis

Role for Patient

In Minimizing and Preventing Diagnosis Error and Delay

- Seek timely access/care
- Reliable follow-up, continuity
- Keen observer, reporter sx
- Proactive on test results
- Sharing hunches
- Curiously reading on own
- Adhering w/ treatment empiric trial regimens
- Active as co-investigator
- Co-grappling with Uncertainty
- Being patient: time & tests
- Recruiting family for support
- Respecting limits on staff time, society resources
- Agreeing to disagree
- Help in building, maintaining trust and communication
- Getting involved with patient organizations

Key question is:

What will it take at the provider and institutional end to support these roles and help them flourish?

Key Takeaway Messages

1. Diagnosis errors are frequent, important, and receiving increasingly attention
2. Venn Diagram conceptual model: Need to tease apart: *process errors* from *misdiagnosis*
3. Diagnostic Process can be broken down into discrete but interacting steps, each vulnerable to errors and potentially amenable/ripe for improvement.

Key Takeaway Messages

4. Five most promising areas for high leverage improvement

- Diagnostic culture transformation
- Learning from, anticipating, sharing errors, and pitfalls
- Closed loop systems: role/need and how to design integrating feedback loops for tests, referrals
- Leveraging the EMR: taming the beast
- Working with patients to co-produce diagnosis

5. AI documentation and diagnosis

- Use to support not “make” the diagnosis
- Assessment is critical

3 Questions – Patient Care

- 1. What else might this be?
 - Forcing a differential diagnosis to be made
- 2. What doesn't fit?
 - Making sure unexplained abnormal findings are not dismissed
- 3. What critical diagnosis are important not to miss ?
 - Injecting consideration of don't miss, red flags, known pitfalls

3 Questions – System of Care

- 1. Do we have reliable “closed loop” systems for tracking and following up sx, abnl labs or imaging, and important referrals ?
- 2. What is the culture of safety climate in our organization and office/clinic?
- 3. How does EMR (and now AI) help vs. get in the way of efficient, timely, accurate, and fail safe diagnosis; and how can it be improved?

Selected Background Readings/References

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- UCSF Coordinating Center for Diagnostic Excellence <https://codex.ucsf.edu/>
- Community to Improve Diagnosis <https://www.improve-dx.org/>

Quiz Question 1

Which of the following is **not true** regarding diagnostic errors

- A. Diagnostic errors are the #1 type of error reported by patients and allegation in malpractice claims
- B. There are many types of failures in the diagnostic process that mostly do not result in patient harm or even misdiagnosis.
- C. More important than “making” the exact right diagnosis initially is creating safety nets to ensure reliable follow-up, particularly in the patient is not responding or improving as expected.
- D. Making sure patients do not interfere with clinicians thinking and making the correct diagnosis is a good strategy for preventing misdiagnosis.

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Quiz Question 2

Which of the following are **not** ways that EMRs can be leveraged to improve diagnosis and decrease errors

- A. Provide a space to craft and share a narrative assessment, including differential diagnosis, degree of certainty, and contingency plan
- B. Hard-wire delivery, acknowledgement and tracking of key lab results and referrals
- C. Produce comprehensive, lengthy notes, to document extensive review of system questions that are copy and pasted from preceding visits and others' notes for billing and defensive medicine purpose
- D. Facilitate easy access to reference material so that clinicians can more easily look up information
- E. Aid in calculating post-test likelihood of various diseases using sensitivity, specificity and pre-test likelihood of that disease

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Encourage you to send questions, feedback or
request more information

Supplemental Slides



PRACTICE POINTER

Five strategies for clinicians to advance diagnostic excellence

Hardeep Singh,¹ Denise M Connor,^{2,3} Gurpreet Dhaliwal^{2,3}

What you need to know

- The World Health Organization and the National Academy of Medicine (US) have identified measuring and reducing diagnostic error as a patient safety priority
- Diagnosis is a process that is influenced by systems, cognitive, teamwork, and social factors that may either enhance or reduce diagnostic accuracy
- Clinicians can integrate diagnostic performance feedback into their day-to-day work
- Clinicians can take steps to mitigate biases (regarding race, ethnicity, gender, and other identities) that run counter to their values and impair diagnostic performance
- Clinicians can integrate the expertise of other health professionals, patients, and families to reimagine the routines and culture around diagnosis

Diagnostic accuracy is an important component of clinical excellence. However, diagnostic errors—failures to establish an accurate and timely explanation of a patient's health problem or to communicate that explanation to the patient—harm patients worldwide.^{1,2} In a recent UK study, diagnostic errors occurred in 4.3% of primary care consultations.³ A meta-analysis estimated that nearly 250 000 harmful diagnostic errors occur annually among hospitalised adults in the United States.⁴ The National Academies of Science, Engineering, and

literature, expert opinion, and theoretical frameworks pertaining to diagnostic decision making and learning, we propose five strategies for clinicians to consider to achieve diagnostic excellence and reduce diagnostic error in their practice.

Why diagnostic errors occur

Diagnosis is a complex categorisation task driven by mental models (illness scripts and diagnostic schemas) that reside in long term memory. Through education and experience, clinicians form illness scripts that encapsulate their knowledge of specific conditions (such as osteoarthritis) and develop diagnostic schemas that structure their approach to a specific health problem (such as knee pain). This cognitive process intersects with systems, teamwork, and social factors that can enhance or reduce diagnostic accuracy.¹⁴ Diagnosis is often a dynamic longitudinal process in which patients' clinical features evolve, multiple interactions with the healthcare system occur, and additional information surfaces.¹⁵

Multiple factors can contribute to a delayed or inaccurate diagnosis. Clinicians may be unaware of a disease, or a disease may manifest in an atypical way. However, most diagnostic errors involve common conditions that clinicians are aware of.^{4,16-18} In these situations, diagnostic errors may result from inadequate data gathering, inadequate information processing, or inadequate application of

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Cite this as: *BMJ* 2022;376:e068044
<http://dx.doi.org/10.1136/bmj-2021-068044>

Advancing Diagnostic Excellence

Five strategies for clinicians

Diagnostic excellence involves making a correct and timely diagnosis using the fewest resources while maximising patient experience and managing uncertainty. Based on current scientific literature, expert opinion, and theoretical frameworks pertaining to diagnostic decision making and learning, we propose five strategies for clinicians to consider to achieve diagnostic excellence and reduce diagnostic error in their practice.



Strategy



Seek feedback on diagnostic decisions



"Byte" sized practice



Consider biases



Make diagnosis a team sport



Foster critical thinking

Why

Fosters better understanding of your own diagnostic accuracy

Ensures better calibration of future decisions

Test-enhanced learning promotes knowledge acquisition and skill development

Encourages awareness of fallibility in clinical decision making

Promotes humility

Increases recognition of the impact of harmful societal forces (such as racism) on diagnosis

Diagnosis is not just the purview of doctors alone

Optimises data acquisition and interpretation throughout the diagnostic process

How

Create an electronic list of patients where diagnosis-related questions remain

Solicit feedback from colleagues and patients on your performance

Integrate brief diagnostic challenges from apps, social media, and medical journals into your daily routine

Find common ground, foster individuation, and build empathy

Use practice level data to identify harmful patterns in diagnostic evaluation

Consider if alternative diagnostic possibilities would be entertained if a patient had a different background or identity

Flatten hierarchy and elevate voices of all health professionals on the diagnostic team

Seek opportunities for group decision making with colleagues and invite patient concerns and opinions about diagnoses

Use technology to augment decision making

Take a sceptical stance towards your initial provisional diagnosis by looking for data to both support and contradict it

Commit to monitoring and collecting more data and setting prompts for further investigation if the patient doesn't improve

IDEAS AND OPINIONS | 2 OCTOBER 2018

Ten Principles for More Conservative, Care-Full Diagnosis FREE

Gordon D. Schiff, MD; Stephen A. Martin, MD, EdM; David H. Eidelman, MD; Lynn A. Volk, MHS; Elise Ruan, BS; Christine Cassel, MD; William Galanter, MD; Mark Johnson, MD, MS; Annemarie Jutel, PhD; Kurt Kroenke, MD; Bruce L. Lambert, PhD; Joel Lexchin, MSc, MD; Sara Myers, BA; Alexa Miller, MA; Stuart Mushlin, MD; Lisa Sanders, MD; Aziz Sheikh, MD

[Article, Author, and Disclosure Information](#)

FULL ARTICLE

**Promoting Enhanced
Caring and Listening
Developing a New Sci-**

Many spotlights currently illuminate the challenges associated with medical diagnosis. The National Academy of Medicine estimates that all patients will experience 1 serious diagnostic error during their lifetime, and diagnostic errors are now the leading cause of medical malpractice claims (1, 2). To avoid missing

Diagnostic Error in Medicine

Analysis of 583 Physician-Reported Errors

Gordon D. Schiff, MD; Omar Hasan, MD; Seijeoung Kim, RN, PhD; Richard Abrams, MD; Karen Cosby, MD; Bruce L. Lambert, PhD; Arthur S. Elstein, PhD; Scott Hasler, MD; Martin L. Kabongo, MD; Nela Krosnjak; Richard Odwazny, MBA; Mary F. Wisniewski, RN; Robert A. McNutt, MD

Background: Missed or delayed diagnoses are a common but understudied area in patient safety research. To better understand the types, causes, and prevention of such errors, we surveyed clinicians to solicit perceived cases of missed and delayed diagnoses.

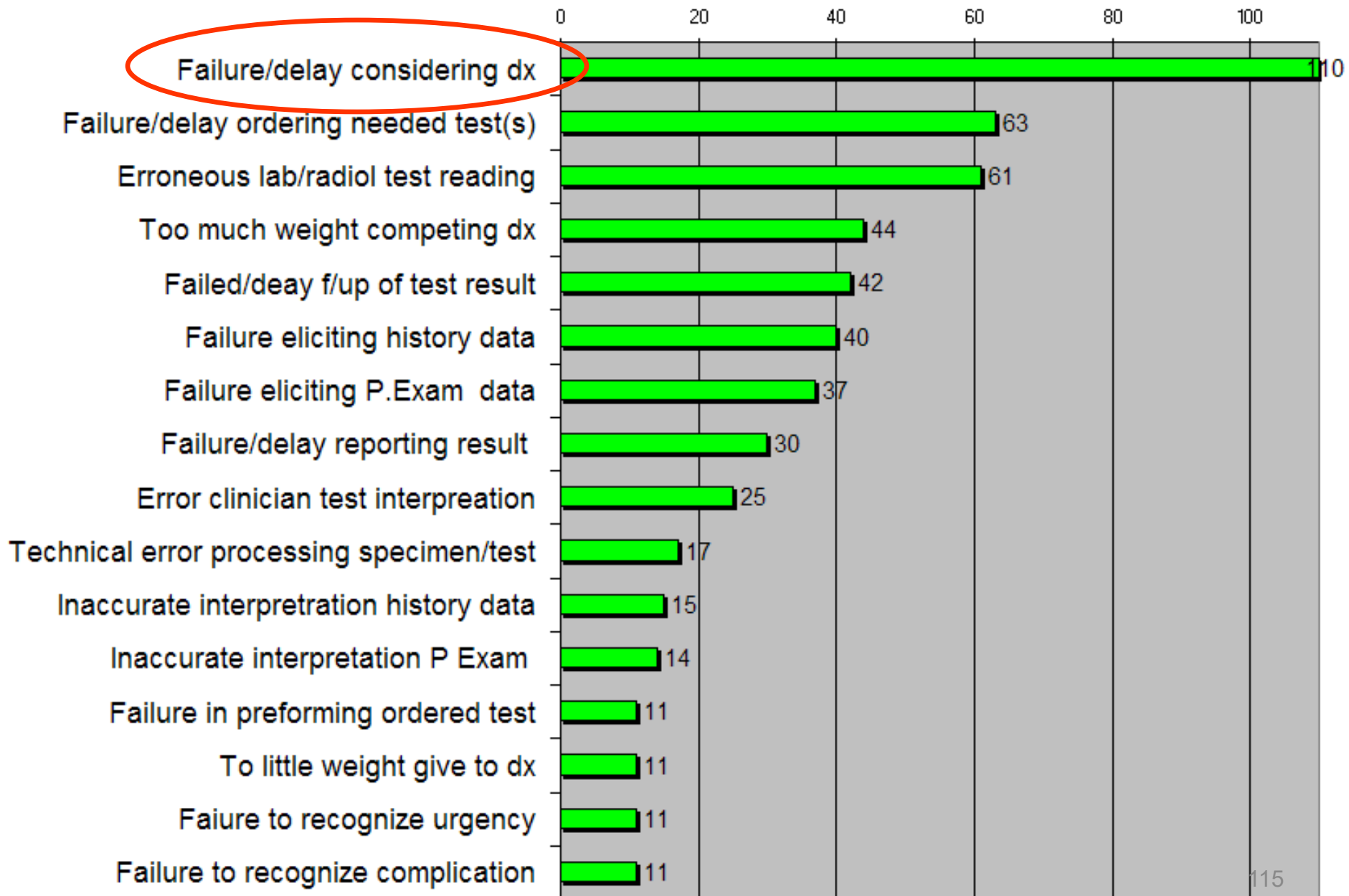
Methods: A 6-item written survey was administered at 20 grand rounds presentations across the United States and by mail at 2 collaborating institutions. Respondents were asked to report 3 cases of diagnostic errors and to describe their perceived causes, seriousness, and frequency.

Results: A total of 669 cases were reported by 310 clinicians from 22 institutions. After cases without diagnostic errors or lacking sufficient details were excluded, 583 remained. Of these, 162 errors (28%) were rated as major, 241 (41%) as moderate, and 180 (31%) as minor or insignificant. The most common missed or delayed diagnoses were pulmonary embolism (26 cases [4.5% of total]), drug

reactions or overdose (26 cases [4.5%]), lung cancer (23 cases [3.9%]), colorectal cancer (19 cases [3.3%]), acute coronary syndrome (18 cases [3.1%]), breast cancer (18 cases [3.1%]), and stroke (15 cases [2.6%]). Errors occurred most frequently in the testing phase (failure to order, report, and follow-up laboratory results) (44%), followed by clinician assessment errors (failure to consider and overweighing competing diagnosis) (32%), history taking (10%), physical examination (10%), and referral or consultation errors and delays (3%).

Conclusions: Physicians readily recalled multiple cases of diagnostic errors and were willing to share their experiences. Using a new taxonomy tool and aggregating cases by diagnosis and error type revealed patterns of diagnostic failures that suggested areas for improvement. Systematic solicitation and analysis of such errors can identify potential preventive strategies.

What went wrong: DEER Taxonomy Localization





ELSEVIER

Minimizing Diagnostic Error: The Importance of Follow-up and Feedback

An open-loop system (also called a “nonfeedback controlled” system) is one that makes decisions based solely on preprogrammed criteria and the preexisting model of the system. This approach does not use feedback to calibrate its output or determine if the desired goal is achieved. Because open-loop systems do not observe the output of the processes they are controlling, they cannot engage in learning. They are unable to correct any errors they make or compensate for any disturbances to the process. A commonly cited example of the open-loop system is a lawn sprinkler that goes on automatically at a certain hour each day, regardless of whether it is raining or the grass is already flooded.¹

To an unacceptably large extent, clinical diagnosis is an open-loop system. Typically, clinicians learn about their diagnostic successes or failures in various ad hoc ways (eg, a knock on the door from a server with a malpractice subpoena; a medical resident learning, upon bumping into a surgical resident in the hospital hallway that a patient he/she

improve diagnosis. Whereas their emphasis centers around the question of physician overconfidence regarding their own cognitive abilities and diagnostic decisions, I suspect many physicians feel more beleaguered and distracted than overconfident and complacent. There simply is not enough time in their rushed outpatient encounters, and too much “noise” in the nonspecified undifferentiated complaints that patients bring to them, for physicians, particularly primary care physicians, to feel overly secure. Both physicians and patients know this. Thus, we hear frequent complaints from both parties about brief appointments lacking sufficient time for full and proper evaluation. We also hear physicians’ confessions about excessive numbers of tests being done, “overordered” as a way to compensate for these constraints that often are conflated with and complicated by “defensive medicine”—usually tests and consults ordered solely to block malpractice attorneys.

The issue is not so much that physicians lack an awareness of the thin ice on which they often are skating, but that

Feedback –Key Role in Safety

- Structural commitment patient role to play
- Embodies/conveys message: uncertainty, caring, reassurance, access if needed
- Allows deployment of test of time, more conservative diagnosis
- Enables differential diagnosis
- Emphasizes that disease is dynamic
- Reinforces culture of learning & improvement
- Illustrates how much disease is self limited
- Makes invisible missed diagnoses visible

Examples of Feedback Learning

Feeding back to upstream hospital

- Spinal epidural abscess

IVR follow-up post urgent care visit

- UAB project

Dedicated Dx Error M&M

Autopsy Feedback

- 7/32 MDs aware disseminated CMV

ED residents post admission tracking

Feedback to previous service

Tracking persistent mysteries

Chart correction by patients

Radiology/pathology

- systematic second reviews

2nd opinion cases

- Best Doctors dx changed

Linking lab and pharmacy data

- to find signal of errors (missed ↑ TSH)

Urgent care

- call back f/up systems

Malpractice

- knock on the door

Exploration of an Automated Approach for Receiving Patient Feedback After Outpatient Acute Care Visits

Eta S. Berner, EdD¹, Midge N. Ray, RN, MSN¹, Anantachai Panjamapirom, PhD², Richard S. Maisiak, PhD³, James H. Willig, MD¹, Thomas M. English, PhD⁴, Marc Krawitz, MBA⁵, Christa R. Nevin, MSPH¹, Shannon Houser, PhD¹, Mark P. Cohen, MD⁶, and Gordon D. Schiff, MD⁷

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55/338 (16%) → not improved
of whom only 21 (38%)
had contacted any clinician

DESIGN: A three-phase cross-sectional study [live follow-up call three weeks after acute care visits (baseline), one week post-visit live call, and one week post-visit interactive voice response system (IVRS) call]

DOI: 10.1007/s11606-014-2783-3

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