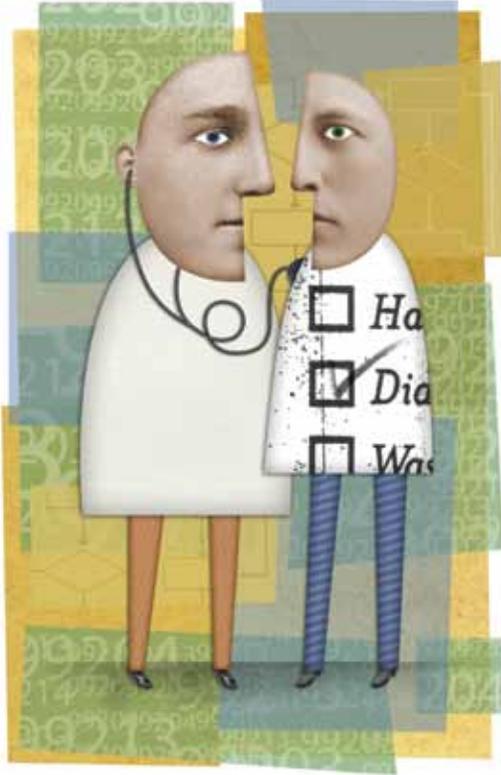


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Diagnostic errors

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Presentation

A 67-year-old man was admitted to the hospital at 2:40 p.m. under the care of an internal medicine physician. The patient had a history of abdominal pain, nausea, and vomiting for several days. The internal medicine physician wrote admission orders with a diagnosis of acute pyelonephritis. He ordered a gastroenterology consult and a CT scan of the abdomen to rule out kidney stones. He also ordered a full liquid diet for the patient. The physician had not seen or evaluated the patient when these admission orders were written.

Physician action

At 5:08 p.m., the internal medicine physician assessed the patient. He revised the admission orders, changing the diagnosis to “acute gastroenteritis.” The internal medicine physician also changed the order for the CT scan to include contrast and changed the status to “stat.”

A gastroenterologist saw the patient at 7:20 p.m. He ordered an EGD to be performed the next morning. His progress notes indicated that he was aware the CT scan was pending. The gastroenterologist contacted the internal medicine physician to discuss his plan to perform the EGD.

At 7:44 p.m., the CT scan report became available in the hospital’s electronic medical record system. The results indicated a partial small bowel obstruction. A copy of the CT report was also printed on the surgical floor so the report could be placed in the patient’s chart.

At 11:10 p.m., a nurse on the surgical floor logged in to the hospital computer system and printed a copy of the CT report. However, neither this paper copy nor the one that printed when the CT report was generated, made it to the patient’s paper chart. The internal medicine physician logged on to the hospital’s EMR system at 11:15 p.m. and ordered a surgical consult. The plaintiffs later alleged that the internal medicine physician knew about the results of the CT scan, which explained why he ordered a surgical consult.

Nursing notes throughout the evening indicate the patient’s abdomen was distended with no bowel sounds. The patient vomited once and complained of indigestion.

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At 5:30 a.m., the patient signed a consent form for the EGD. A nurse examined him 30 minutes before the EGD and documented that his abdomen was distended with no bowel sounds. The gastroenterologist accessed the radiology records in the computer system at 8:22 a.m. for approximately 22 minutes. He claims he did not see the CT report. The patient was already in the endoscopy suite and anesthesia commenced at 8:30 a.m. The procedure began and the patient began vomiting violently after the endoscope tube was inserted. The gastroenterologist suctioned 700-800 cc of stomach contents with an NG tube. The patient was taken to the PACU. He was later intubated and transferred to the ICU on ventilator support due to aspiration of stomach contents.

The patient had a long hospital course. He experienced multiple complications including aspiration pneumonia, ventilator requirements, and deconditioning. The partial bowel obstruction resolved without surgical intervention.

Allegations

Lawsuits were filed against the gastroenterologist, the internal medicine physician, the radiologist, the anesthesiologist, and the hospital. The plaintiffs alleged that the EGD was contraindicated because the CT scan showed a dilated bowel and possible bowel obstruction.

Legal implications

The CT scan of the abdomen showed a small bowel obstruction. This report was available on the hospital's computer system the night before the scheduled EGD. The access log shows that the gastroenterologist logged in to the system on two occasions after the CT report was in the system, but he apparently failed to see the CT report.

A nurse's note — written approximately 30 minutes before the procedure — documented that the patient's abdomen was distended with no bowel sounds. This note was available on the hospital's system and the patient's chart. The gastroenterologist testified that, when he examined the patient just before the procedure, his abdomen was not distended. This was not documented in the medical record.

Additionally, the gastroenterologist had to acknowledge that he was aware that a CT scan of the abdomen had been ordered, but he went forward with the EGD without knowing the results. He also testified that, had he known the CT report showed a partial bowel obstruction, he would have cancelled the procedure.

The internal medicine physician re-wrote the admission orders to change the diagnosis from pyelonephritis to gastroenteritis. He also changed the CT order to "stat." The gastroenterologist did not follow up on these results, and he claimed that he never saw the results of the CT scan. The plaintiffs argued that he must have known about the CT findings since he ordered a surgical consult.

Disposition

The cases against the radiologist and the hospital were dropped. The cases against the gastroenterologist and the internal medicine

physician were settled prior to trial. The case against the anesthesiologist went to trial and the jury found in favor of the anesthesiologist.

Diagnostic errors

Efforts to improve patient safety often address issues such as medication errors, nosocomial infection, wrong-site surgery, postsurgical complications, and hand-offs. Diagnostic error — which is the leading cause of malpractice claims against primary care physicians — has received comparatively less attention.¹

This article will review the current research on the prevalence of diagnostic errors, identify common causes of diagnostic errors, and discuss ways to prevent these types of errors.

Prevalence

Determining the prevalence of diagnostic errors is challenging, particularly outside the fields of pathology and radiology. With the progressive decline in autopsy rates, physicians do not generally receive feedback on their diagnoses. As a result, "diagnostic errors often are unrecognized or underreported, and the science of measuring these errors (and their effects) is underdeveloped."²

A few studies have attempted to measure the frequency of misdiagnosis, but these studies are limited by patient selection, inadequate standards for diagnosis, and issues of hindsight bias. The Harvard Medical Practice Study found that diagnostic error accounted for 14% of preventable errors in hospitalized patients.³

Researchers analyzing the results of 53 autopsy studies over a 40-year period found that approximately 9% of patients experienced a major diagnostic error that went undetected until after the patient's death.⁴

"In aggregate, studies consistently demonstrate a rate of diagnostic error that ranges from <5% in the perceptual specialties (pathology, radiology, dermatology) and up to 10% to 15% in most other fields."⁵

Physician decision making

Other studies have examined the causes of diagnostic error at the individual physician level. This research has been influenced by findings from cognitive psychology, which studies how individuals process information and make plans.⁶

In cognitive psychology, most tasks are classified as involving schematic behavior or attentional behavior. Schematic behavior tasks are performed reflexively or on auto-pilot. Attentional behavior tasks require active planning and problem solving.

Errors associated with schematic behavior are known as "slips" and occur due to distractions, fatigue, or lapses in concentration. Errors related to attentional behavior are "mistakes" and are often caused by a lack of experience or training.

In health care, the majority of errors are caused by slips. Interventions such as checklists have been shown to greatly reduce the

likelihood of errors due to slips.⁷ Conversely, errors that involve attentional behavior — such as diagnostic errors — “require solutions focused on training, supervision, and decision support rather than standardizing behavior.”⁸

When it comes to making diagnostic decisions, physicians frequently use heuristics or shortcuts to make a preliminary diagnosis, especially when treating a patient with common symptoms. “While heuristics are ubiquitous and useful, researchers have used categories developed in cognitive psychology to classify several types of errors that clinicians commonly make due to incorrect application of heuristics.” Table 1 lists some examples.⁶

and staff members; lack of reliable systems for following up on test results; and patient noncompliance. Underlying health system issues — such as health insurance refusal to pay for diagnostic testing — also contribute to errors in diagnosis.

A study of diagnostic errors in the ambulatory setting published in the *Annals of Internal Medicine* found that few diagnostic errors were linked to single contributing factors. The study identified the following as main breakdowns in the diagnostic process:

- failure to order appropriate diagnostic tests;
- inappropriate or inadequate follow up;
- failure to obtain an adequate medical history;

| Cognitive Bias | Definitions | Example |
|---|---|--|
| Availability heuristic | Diagnosis of current patient biased by experience with past cases. | A patient with crushing chest pain was incorrectly treated for a myocardial infarction, despite indications that an aortic dissection was present. |
| Anchoring heuristic (premature closure) | Relying on initial diagnostic impression, despite subsequent information to the contrary. | Repeated positive blood cultures and <i>Corynebacterium</i> were dismissed as contaminants; the patient was eventually diagnosed with <i>Corynebacterium</i> endocarditis. |
| Framing effects | Diagnostic decision-making unduly biased by subtle cues and collateral information. | A heroin-addicted patient with abdominal pain was treated for opiate withdrawal, but proved to have a bowel perforation. |
| Blind obedience | Placing undue reliance on test results or “expert” opinion. | A false-negative rapid test for <i>Streptococcus</i> pharyngitis resulted in a delay in diagnosis. |

Table 1. Types of errors

Other causes of cognitive diagnostic errors include:

- Confirmation and related bias — “the tendency to seek out data that confirm one’s original idea rather than to seek out disconfirming data.”
- Context errors — characterizing a “problem in terms of the organ system involved, or the type of abnormality that might be responsible. In these situations, clinicians are biased by the history, a previously established diagnosis, or other factors, and the case is formulated in the wrong context.”⁽⁵⁾

In the closed claim study featured with this article, the physician diagnosed the patient with acute pyelonephritis, but later changed this diagnosis after examining the patient. The new diagnosis was “acute gastroenteritis,” but it was eventually discovered that the patient had a partial bowel obstruction. The internal medicine physician diagnosed the patient based on the available information, but then did not follow up on test results that would have altered the diagnostic and treatment plan. The gastroenterologist did not seek out additional information to confirm the need for the EGD.

Other causes

Diagnostic errors are not simply a consequence of cognitive biases on the part of caregivers. They result from multiple causes, such as poor teamwork and communication between physicians; poor communication between patients and physicians or patients

- failure to perform an adequate physical exam; and
- incorrect interpretation of diagnostic test results.⁸

In the closed claim study, the appropriate tests were ordered, but neither the internal medicine physician nor the gastroenterologist followed up on the results.

Preventing diagnostic errors

Efforts to reduce the occurrence of diagnostic errors focus on both physician cognitive process and health system factors. System-related suggestions to reduce diagnostic error include:

- “Ensure that diagnostic tests are done on a timely basis and that results are communicated to providers and patients.”
- “Optimize coordination of care and communication. Develop formal and universal ways to communicate information verbally and electronically across all sites of care.”
- “Continuously improve the culture of safety. Include diagnostic errors as a routine part of quality assurance surveillance and review; identify any adverse events that appear repeatedly . . .”

Suggestions to reduce diagnostic errors related to cognitive process include:

- “Take advantage of suggestions from the human-factors literature on how to improve the detection of abnormal results.”

- “Provide physicians with access at the point of care to the Internet, electronic medical reference texts and journals, and electronic decision-support tools.”
- “Have appropriate clinical expertise available when it’s needed. Facilitate referrals to appropriate subspecialists. Encourage second readings of key diagnostic studies . . . and encourage second opinions in general.”
- “Encourage discussion of diagnostic errors. Encourage and reward autopsies and ‘morbidity and mortality’ conferences. Establish pathways for physicians who saw the patient earlier to learn that the diagnosis has changed.”⁹

Risk management considerations

Physicians can consider the following guidelines to help reduce liability related to errors in diagnosis.

- Stay current with clinical practice standards that are applicable to your practice. Consider using computer-based decision support tools or other electronic resources at the point of care. If you use these resources, do not ignore the guidelines, alerts, and reminders these systems employ.
- Making an accurate diagnosis requires asking the right questions, conducting a thorough physical exam, and gathering clinical data.
- When possible, follow up with patients to ensure diagnostic accuracy. Repeat calls or visits from patients with ongoing complaints provide physicians opportunities to reassess the patient and identify an issue that may have been previously overlooked.
- Have a well-defined and consistently followed process to verify that test results have been received and acted upon. Processes should be developed for both diagnostic studies and specialist referrals.
- Even if the patient is advised to contact the practice in a set time frame, it is recommended that the physician have a follow-up system in place.
- When test results or consultant reports are received in the office, do not file the reports in a medical record until the ordering physician has reviewed, dated, and initialed

them. When caring for hospitalized patients, maintain open communication with all members of the health care team, including consulting physicians and hospital staff. Thorough patient evaluation and assessment — including reviewing nursing notes and directly communicating with consulting physicians — promotes optimal patient care.

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