WebM&M

Morbidity and Mortality Rounds on the Web

Spotlight

Premature Closure: Was it Just Syncope?

AHRQ Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

PSNet
PATIENT SAFETY NETWORK

Source and Credits

- This presentation is based on the November 2020 AHRQ WebM&M Spotlight Case
  - See the full article at https://psnet.ahrq.gov/webmm
  - CME credit is available
- Commentary by: David Maurier, MD and David K. Barnes, MD
- AHRQ WebM&M Editors in Chief: Patrick Romano, MD, MPH and Debra Bakerjian, PhD, APRN, RN
  - Spotlight Editors: Ulfat Shaikh, MD and Patrick Romano, MD, MPH
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Objectives

At the conclusion of this educational activity, participants should be able to:

- Understand how cognitive biases such as framing errors and premature closure may contribute to medical error
- Interpret ECG patterns that may indicate serious non-cardiac illness
- Categorize systemic anticoagulation as a high-risk clinical situation
- Choose and apply systematic interventions such as checklists and forcing functions to mitigate cognitive biases and prevent adverse events

PREMATURE CLOSURE: WAS IT JUST SYNCOPE?

A case describing how cognitive biases and anti-coagulation use in high-risk scenarios contributed to the missed diagnosis of fatal intracranial hemorrhage

Case Details

- 60-year-old male presented to the Emergency Department (ED) with his partner after an episode of dizziness and syncope when exercising
  - Vital signs were notable for systolic blood pressure in the 100s and heart rate of 56 beats/minute
  - Electrocardiogram (ECG) demonstrated ST segment and T wave changes but not ST-elevation myocardial infarction
  - A brain CT scan was ordered and performed but it is unclear whether the ordering physician ever reviewed the images

Case Details

- Concerned for a cardiac etiology of syncope, the ED physician ordered:
  - High-dose aspirin
  - Unfractionated heparin drip
  - Echocardiogram to assess cardiac function
- The patient reputed that he felt well and wished to pursue an outpatient workup instead of an admission
  - ED physician consulted a cardiologist who recommended therapeutic low molecular weight heparin and next-day cardiology follow up

Case Details

- While awaiting the echocardiogram, the patient became somnolent and heart rate slowed
  - ED physician placed a pacemaker, intubated the patient, and ordered a full-body CT scan
  - CT images demonstrated a large subdural hematoma with mass effect on the brain and surrounding cerebral edema
- Patient was transported to the operating room and the neurosurgeon performed an emergent craniotomy and placed an external ventricular drain
- Serial brain imaging demonstrated expansion of the intracranial hemorrhage and ultimately brainstem herniation
- Patient was placed on comfort care and later died

Case Details

- During the post-mortem review:
  - Medical records indicated that the patient had multiple ED visits with similar episodes of syncope in the preceding months, all resulting in falls and subsequent head trauma
  - First CT scan of the patient's brain showed a small subdural hematoma that was not recognized by the clinical team
  - Initial ECG changes were retrospectively interpreted as consistent with intracranial hemorrhage

PREMATURE CLOSURE: WAS IT JUST SYNCOPE?

THE COMMENTARY

By David Maurier, MD and David K. Barnes, MD

Background

Background

- Three preventable medical errors contributed to this patient's death
  1. Absence of complete history from the patient, his family, or medical record, which would have alerted the clinical team to the history of recurrent syncope with repeated falls and head injuries
  2. Physician did not recognize the ECG abnormalities as consistent with intracranial hemorrhage
  3. Physician failure to appreciate the high-risk nature of anticoagulation, especially in the setting of head trauma

Framing and Premature Closure (1)

- Framing/framing effect occurs when decisions are influenced by the way information is presented
  - Example: patients may be more likely to elect for a treatment when it is framed in terms of their likelihood of survival rather than mortality
  - Example: a patient presented with a cancer treatment survival rate of 95% compared to a mortality rate of 5% is more likely to choose the treatment although both options are identical

Framing and Premature Closure (2)

- Framing may also influence diagnostic reasoning
  - Example: nurses in one simulation study were more likely to attribute symptoms of a heart attack to a benign etiology (e.g., emotionally upset) if informed that the patient was recently unemployed (Brannon and Carson, 2003)
- In this case, the patient's syncope while exercising, combined with bradycardia and EKG changes, may have caused the clinician to frame the case primarily as a 'cardiac' problem

Framing and Premature Closure (3)

- Premature closure is the acceptance of a diagnosis before it has been objectively established and alternative diagnoses have been fully investigated
  - To efficiently establish a diagnosis and treatment plan, ED physicians often ‘close’ on the diagnosis that is (1) first conceived, (2) most common, (3) most dangerous, or (4) the easiest to admin, despite lack of supporting evidence or evidence to the contrary
- In this case, the clinician did not review the results of neuroimaging before initiating anticoagulation, suggesting that the clinician initially considered trauma but prematurely narrowed their focus to cardiac pathology and excluded other possible diagnoses

ECG Changes in Intracranial Hemorrhage (1)

- ECGs are common diagnostic studies used to evaluate chest pain with the possibility of myocardial ischemia
- ED physicians need to recognize different diagnoses associated with various ECG patterns
  - In this case, the clinician failed to consider that the ECG changes could be secondary to intracranial hemorrhage rather than primary cardiac pathology
  - Intracranial hemorrhage frequently presents with non-specific ECG changes that can mimic patterns seen in acute coronary syndromes
  - ST-segment abnormalities in a patient with a recent history of head trauma and no chest pain should prompt consideration of intracranial hemorrhage

High-Risk Medications: Anticoagulation (1)

- According to the Institute for Safe Medication Practices, unfractionated and low molecular weight heparin are considered “high alert” medications and dangerous when administered in error
- Contraindications to heparin include:
  - Active major bleeding
  - History of heparin-induced thrombocytopenia
  - Hypersensitivity to the drug’s constituents, benzyl alcohol, or pork products

High-Risk Medications: Anticoagulation (2)

- In the absence of contraindications, anticoagulants are associated with significant adverse events
  - Research has found that patients treated with oral anticoagulants are at increased risk of hemorrhage and patients with hemorrhage secondary to anticoagulation are at risk of permanent disability or death
- In this case, the patient's age and complaint of syncope prompted concern for intracranial hemorrhage and a brain CT was ordered
  - The images were not reviewed prior to the administration of anticoagulation, and a clear contraindication (intracranial hemorrhage) to heparin was not identified
  - Additionally, a complete patient history may have warranted re-examination of the plan to discharge on therapeutic low molecular weight heparin

High-Risk Medications: Anticoagulation (3)

- Unclear whether anticoagulation was indicated from the start
  - Syncope is not an indication for systemic anticoagulation. Syncope with ECG changes may have caused suspicion of:
    - Pulmonary embolism, but the medical history did not support that diagnosis
    - Acute coronary syndrome, but there were no clinical criteria present to support a diagnosis of unstable angina or myocardial infarction and therefore anticoagulation was not indicated
- Without a clear indication for anticoagulation, these high-risk medications should not have been administered

Approach to Improving Safety and Systems Change Needed

Approach to Improving Safety

- Hospitals should adopt systematic changes to ensure patients are screened for contraindications to high-risk medications and that there are clear indications for their use, including the use of cognitive aids such as (1) checklists and (2) forcing functions
  - Even if the clinician failed to elicit the history of recent head trauma, together these cognitive aids may have prevented a sequence of events that lead to this patient's death by calling attention to the high-risk nature of anticoagulation and forcing consideration of contraindications to high-risk medications.

Checklists

- Checklists are cognitive aids with demonstrated efficacy as tools to prevent medical error
- One simple monitoring checklist for anticoagulation use is the mnemonic ABCDEF
  - **A**dherence
  - **B**leeding
  - **C**reatinine clearance
  - **D**rug interactions
  - **E**xamination
  - **F**ollow-up
- Checklists may be particularly helpful in ED settings, given the fast pace, diagnostic uncertainty, and presence of distractions

Forcing Functions (1)

- Forcing functions are automatic, built-in features of systems designed to minimize or avert errors
  - Example: inhalation gas canister connectors are constructed with unique fittings that physically prevent the connection of a gas cylinder to the wrong hose
  - Example: EHR system requires providers ordering an MRI to complete a contraindication screening checklist before the order can be completed
  - Example: EHR alert that, when triggered, sends a page to the treating physician when elements consistent with sepsis are entered into the patient's chart

Forcing Functions (2)

- For anticoagulant and antiplatelet agents, one healthcare system implemented an alert whenever a patient taking either high-risk medication is scheduled for an elective endoscopic gastrointestinal procedure
  - The alert recommends referral to an anticoagulation clinic
  - After implementation, there were significantly fewer planned cancellations of endoscopic procedures as a result of antithrombotic medication mismanagement

Forcing Functions (3)

- In this case, anticoagulation may have been avoided entirely if there were forcing functions built into the existing systems to:
  - Alert the physician to recent imaging from patients visits related to head trauma
  - Alert the physician to pending results of neuroimaging or other critical tests

TAKE HOME POINTS

Take-Home Points (1)

- Inaccurate framing and premature closure are two common cognitive biases that can contribute to diagnostic error.
- ECG changes are not always ischemic and do not always indicate primary cardiac pathology. “Cerebral” T-waves may mimic ischemia.

Take-Home Points (2)

- Anticoagulants and antiplatelet agents are high-risk medications and should always prompt a thorough consideration of indications and contraindications prior to administration.

- Checklists and forcing functions are two tools that healthcare providers can use to mitigate cognitive traps and avoid medical error.

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