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Mini Review

The Importance of Diagnostic Errors in the Field of Patient Safety

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Abstract

Diagnostic errors are more difficult to measure and to fix. Diagnostic errors accounted for 17% of preventable errors in the Harvard medical practice study.

Another estimate suggests that diagnostic errors affect 12 million adult outpatients every year in the US.

In 2015 the NAM "National Academy of Medicine" released another landmark report entitled "Improving Diagnosis in Healthcare", the report concludes that the vast majority of patient will experience a diagnostic error at some point and suggest that greater collaboration among stakeholders is required to mitigate the problem.

Misdiagnosis is estimated to occur in 10 - 15% of medical encounters lack of knowledge is a relatively uncommon cause of medical error. In contrast, a cognitive bias is a common reason for diagnostic error. And it means a misuse of knowledge, resulting in distorted of faulty reasoning.

Keywords: *Diagnostic Error; Stakeholders; Cognitive Bias; Reasoning*

Introduction

This is a classic diagnostic error example.

AJ, a 70-year-old African-American women with mild diabetes, high blood pressure, and elevated cholesterol, presented to Emergency Department after a 30 minutes of squeezing chest discomfort.

An ECG was quickly obtained, the ER physician, studied the tracing and saw some nonspecific changes in the ST and T segments, on exam she found mild tachycardia, clear lungs and mild tenderness over the lower part of the patient's sternum. She considered the latter discovery quite reassuring (a musculoskeletal process). But, she ordered Troponin, it came mildly elevated again not in the range specific for MI but not normal either. Nevertheless, she made a diagnosis of costochondritis, prescribed an anti-inflammatory agent and bed rest, and discharge Ms. AJ home (the patient died later that night).

A victim of undiagnosed and untreated MI.

Here the faulty reasoning may be due to:

- Poor doctor's training

- Inadequate experience
- Personal and professional bias
- Fuzzy thinking brought on by overwork and fatigue
- Physician own tolerance for risk.

Discussion

Many researchers found that good doctors with good diagnostic reasoning are naturally engaged in a process called "Interactive Hypothesis Testing".

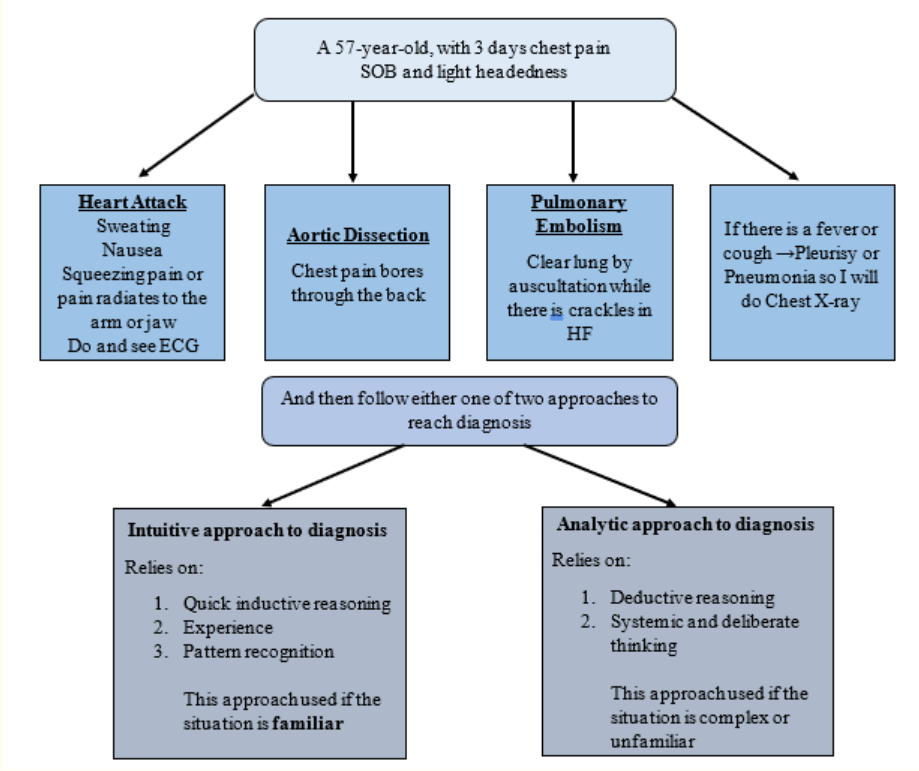

Figure 1

This means that after having the initial portion of case, they immediately began thinking about scenarios to explain the facts modifying their opinions as more information become available.

Also, to enhance diagnosis and decrease diagnostic errors, we can use Bayes' Theorem or Bayesian Reasoning.

The theorem says that any medical test must interpreted from two perspectives:

1. **First:** How accurate is the test?

2. **Second:** How likely is it that this patient has the disease the test is looking for.

Example

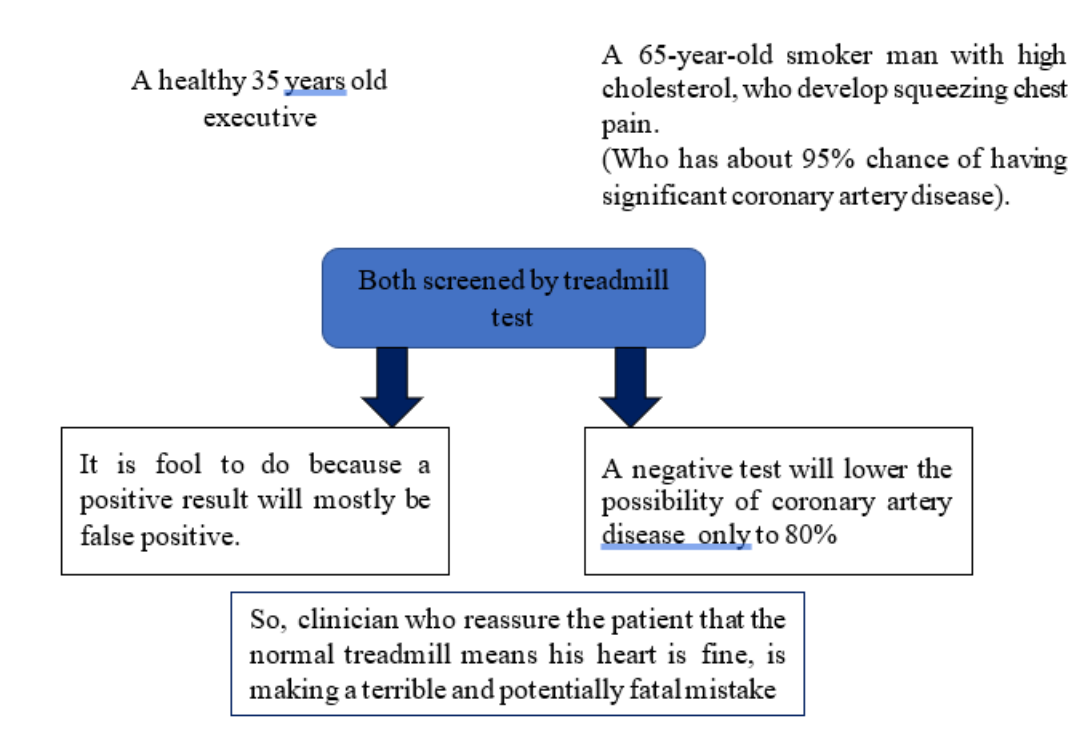

Figure 2

Also, an important thing to decrease the diagnostic errors is to understand the way the person thinks or what we call cognitive bias.

Again, cognitive bias means a misuse of knowledge resulting in distorted or faulty reasoning.

This means that preventing diagnostic errors is likely to depend on understanding how physicians approach diagnostic decisions and providing them with tools (either cognitive or adjunctive such as information technology) to help them make correct decisions more often.

What are the kinds of cognitive bias?

1. **Anchoring:** Is the tendency to lock onto a diagnosis very early on the patient's evaluation.

2. **Availability bias**: Occur when a clinician considers a diagnosis because it easily comes to mind, often because of recently encountering it in another patient.

3. **Premature closure bias**: Is the tendency to accept an initial diagnosis even if it doesn't explain all the patient findings. Means no differential diagnosis.

[This is a human nature; we tend to see what we expect to see rather than what's actually in front of your eyes].

4. **Over confidence bias**: Is the inclination to believe we know more than we really do.

The bias for over confidence can be our experience, our readings or things we have been taught, perhaps incorrectly.

5. **Diagnostic momentum bias:** Perpetuating a diagnosis in the medical record that hasn't been verified. Example "the parent of a child state that he has an immune deficiency, but they aren't sure which one, and all hospital notes during his hospitalization, list immune deficiency in his problem list, without accompanied by a qualifier such as, "unverified"- "per-parent report"- "possible".

6. **Context errors:** Reflect instances where we misinterpret the situation leading to an erroneous conclusion.

   We tend to interpret that each patient came to ER with abdominal pain has a problem involving GI tract, when it may something else entirely.

   For example: Endocrine DKA, Vascular "Aortic Dissection", Neurologic, "Diabetic Neuropathy".

   [This is a human nature; we tend to see what we expect to see rather than what's actually in front of your eyes].

7. **Affective bias:** Refers to the various ways that our emotions, feelings, and biases affect judgement.

   Example: New complaints from patients known to be "frequent flyers" in the emergency department aren't taken seriously.

   Also, the feelings that affect or decisions when we treating our relatives.

Some advices to manage these biases:

- **Metacognition or mindfulness:** Is the process of thinking about our own cognitive processes and reflecting on what biases might be influencing our thinking, it is a powerful tool to avoid diagnostic errors especially affective in availability bias.
- **Experience:** Experienced clinicians are more likely to avoid premature closure than inexperienced ones.
- **HALT:** Hungry, angry, late, tired.

Avoid making decisions in these situation, it is a good way to manage an effective bias.

Improving diagnostic reasoning

1. **HIT- Health information technology:** Will help clinicians make a better and more evidence-based decisions but will not for the foreseeable future replace the clinician mind as the main diagnostic workhorse. CDSS (Computerized Clinical Decision Support System).

   HIT have a great role in decreasing a diagnostic error by:

   - Providing access to information.
   - Recording and sharing assessments.
   - Maintaining dynamic patient history.

- Maintaining problem lists.
- Tracking medication.
- Tracking tests.
- Ensuring coordination and continuity.
- Enabling follow-up.
- Providing feedback.
- Providing prompts: Provide checklist to minimize reliance on memory and directed questioning to aid in diagnosis thoroughness and problem solving.
- Providing placeholder for resumption of work: Delineate clearly in the record where clinician should resume work after interruption, preventing lapses in data collection and thought process.
- Calculating Bayesian probabilities.
- Providing access to information sources.
- Offering second opinion or consultation.
- Increasing efficiency.

2. **System thinking:** Which means a better system for training physicians to avoid common diagnostic speed bumps, and by giving physicians feedback about diagnosis they go right and wrong and encouraging participation in conferences in which diagnostic errors are dissected and reviewed.

Twelve tips for teaching avoidance of diagnostic errors:

- Explicitly describe heuristics, and how they affect clinical reasoning.
- Promote the use of "diagnostic time outs".
- Promote the practice of "worst-case scenario medicine".
- Promote the use of systematic approach to common problems.
- Ask why.
- Teach and emphasize the value of the clinical exam.
- Teach Bayesian theory as a way to direct the clinical evaluation and avoid premature closure.
- Acknowledge how the patient makes the clinician feel.
- Acknowledge learners to find clinical data that don't fit with a provisional diagnosis, "ask" "what can't we explain?".

- Embrace zebras.
- Encourage learners to slow down.
- Admit one's own mistakes.

3. **The use of diagnostic checklist:** General and specific ones.

- **General diagnostic checklist:** Promote clinicians to collect complete data, and engage in metacognition.

Example:

- Obtain your own complete medical history.
- Perform a focused and purposeful physical exam.
- Generate initial hypothesis and differentiate these with additional history, physical exam and diagnostic tests.
- Pause to reflect "take a diagnosis time out".
    - Was I comprehensive?
    - What cognitive bias could affect my decision?
    - Do I need to make the diagnosis now, or can I wait?
    - What is the worst-case scenario?
- Embark on a plan, but acknowledge uncertainty and ensure a pathway for follow up.

- **Specific diagnostic checklist:** That force consideration "don't miss diagnosis when faced with certain symptoms or signs, such as chest pain or tachycardia.
- **A patient-oriented checklist:** To help patients become better stewards of their own health information and aid in the diagnostic process.

Example:

- Tell your story well: be clear, complete, and accurate when you tell your clinician about your illness.
- Be a good historian.
- Be a good record keeper.
- Be an informed consumer.
- Take change of managing your health.
- Know your test results.

- Follow-up.
- Make sure it's the right diagnosis.

NB (checklist might help prevent Type I errors, which comes from fast reflective, intuitive and largely subconscious thinking, by forcing physician to slow down and overcome their innate diagnostic overconfidence).

Issues in diagnostic errors

Many diagnostic errors are due to classic system problems, such as poor communication and inadequate information transfer.

Singh., *et al*. usefully break these problems into five domains:

1. **Provider-patient encounters:** Many problems with history, physical exam, or ordering diagnostic tests, leads to a significant symptom aren't noted or acted upon at the time of the encounter.
2. **Diagnostic tests:** Incorrect laboratory results due to mislabeled specimen.
3. **Follow up and tracking**: No follow up of abnormal X-ray despite suspicious finding.
4. **Referrals:** Consultant requests additional information from referring providers, but the referring provider doesn't respond to the inquiry.
5. **Patient-related issues:** Patient hat doesn't show up scheduled diagnostic test, or a patient low adherence to following physician recommendations.

Over diagnosis

This problem may be accelerating because of the growing availability of highly sensitive diagnostic tests to identify small lesions. (Tumors mostly, blood clots and others). Whose clinical importance is unknown.

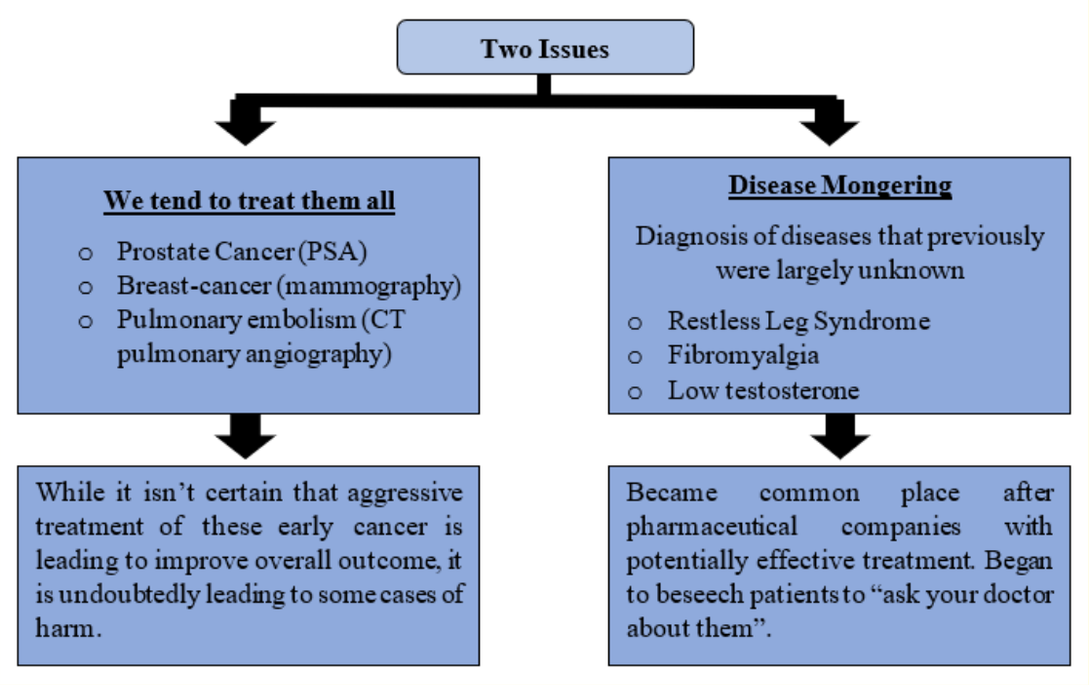

Figure 3

The policy context for diagnostic errors

Since diagnostic reasoning is so central to many physician own notion of professionalism, there is a lot of activity (keeping up with the literature, attending courses and tracking down follow up on patients). That at its core focuses on improving diagnostic effectiveness.

The fact that these activities are often undertaken voluntarily (although sometimes prompted by board certification or continuing education requirements) is impressive.

The growing literature on preventable harm associated with diagnostic errors coupled with the 2015 NAM report may create a burning platform, that will spark policy changes that stimulate improvement in diagnosis.

The NAM concluded its report with eight goals for improving diagnosis and reducing diagnostic error. Achieving these goals will require the collaboration of multiple stakeholders including (providers, patients, healthcare organization, professional societies and policy makers).

Goals for improving diagnosis and reducing diagnostic error

- Facilitate more effective teamwork in the diagnostic process among healthcare professionals, patients, and their families.
- Enhance health professional's education and training in the diagnostic process.
- Ensure that health information technologies support patients and health care professionals in the diagnostic process.
- Develop and deploy approaches to identify, learn from, and reduce diagnostic errors and near misses in clinical process.
- Established a work system and culture that supports the diagnostic process and improvement in diagnostic performance.
- Develop a reporting environment and medical liability system that facilitates improved diagnosis by learning from diagnostic error and near misses.
- Design a payment and care delivery environment that supports the diagnostic process.
- Provide dedicated funding for research on the diagnostic process and diagnostic errors.

Conclusion: The Key Points

- Despite advances in laboratory testing, clinical imaging and information technology, diagnostic errors remain common place.

  Despite their frequency, because they are more difficult to measure and fix than other adverse events, they have been relatively neglected in the patient safety movement.

- A landmark 2015 report by the National Academy of Medicine NAM was commissioned, in part to elevate the status of diagnosis errors in the field of patient safety.
- Clinicians diagnostic and therapeutic actions are influenced by both patient-related (e.g. age, gender, race) and clinician-related (e.g. fatigue, past experience, risk tolerance) factors.
- Good diagnosticians correctly apply:

- Iterative Hypothesis testing, and
- Bayesian Reasoning, and
- Avoid Cognitive pitfalls and biases.

- Improving diagnostic reasoning will involve both computerized decision support and training clinicians to be more effective diagnostics thinker's electronic tools that allow for accurate, timely flow of key information will also help.
- Over diagnosis prompted by both increasingly sensitive screening tests and corporate marketing is an important safety problem as well [1,2].

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