Improving Diagnostic Accuracy in Health Care

Melissa DeVries

Follow this and additional works at: https://commons.und.edu/nurs-capstones

Recommended Citation
DeVries, Melissa, "Improving Diagnostic Accuracy in Health Care" (2017). Nursing Capstones. 76.
https://commons.und.edu/nurs-capstones/76

This Independent Study is brought to you for free and open access by the Department of Nursing at UND Scholarly Commons. It has been accepted for inclusion in Nursing Capstones by an authorized administrator of UND Scholarly Commons. For more information, please contact zeinebyousif@library.und.edu.
Improving Diagnostic Accuracy in Health Care

NURS 997 Independent

Melissa DeVries

University of North Dakota
IMPROVING DIAGNOSTIC ACCURACY IN HEALTH CARE

PERMISSION

Title

Department Nursing

Degree Master of Science

In presenting this independent study in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the College of Nursing of this University shall make it freely available for inspection. I further agree that permission for extensive copying or electronic access for scholarly purposes may be granted by the professor who supervised my independent study work or, in her absence, by the chairperson of the department or the dean of the Graduate School. It is understood that any copying or publication or other use of this independent study or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my independent study.

Signature Melissa DeVries

Date 04-05-17
Abstract

In the past decade, the commonality of diagnostic error has been explored. Diagnostic error compromises the integrity of the healthcare system, as it causes adverse patient outcomes, increased cost, and decreased patient satisfaction. Health care providers are trusted with the task of accurately diagnosing and treating patient’s medical conditions, however, the process of arriving at an accurate diagnosis is much more daunting than one may assume. Due to the complexity of the diagnostic process in conjunction with the complex health care system, errors occur. Increasing the accuracy of the diagnostic process will improve patient outcomes, decrease health care costs, and increase patient satisfaction, yet the question remains, how can the clinician assure accurate diagnosis? This paper will emphasize the process and improvement of medical decision making through thorough, sound clinical reasoning and formulation of an exhaustive differential. The concept of cognitive bias and the ability of cognitive bias to potentiate diagnostic error will also be explored.
IMPROVING DIAGNOSTIC ACCURACY IN HEALTH CARE

Introduction

Research has shown that the incidence of diagnostic error is common, estimated to occur 5-15% of the time (Graber, 2009). This statistic translates into an alarming estimation of 40-80,000 deaths in the United States each year (Commonwealth of Massachusetts Board of Registration in Medicine, Quality and Safety Division, 2016). Healthcare providers have a moral and professional responsibility to provide safe medical care to patients. Prior to a medical provider developing a treatment plan for a patient (medication, PT/OT, consults, surgery) an accurate diagnosis of disease must be established. Arriving at an accurate diagnosis requires great diligence and is a complex process: integration of clinical reasoning skills, formulation of a thorough differential diagnosis, and avoidance of cognitive bias are all crucial. This frequency of diagnostic error compromises the integrity and effectiveness of health care. Thus, it is the due diligence of health care providers to seek to understand how these errors occur in their own practice. Failure to comprehend how and why errors occur will augment the risk for inaccurate diagnosis, thereby increasing the likelihood that the patient will receive the wrong treatment, which negatively impacts morbidity and mortality.

The importance of accurate diagnosis is apparent across medical settings, including the clinic. One case study involves an 88-year old female. The patient presented to the clinic with the common, but non-specific complaint of cough. Per Silvestri, Weinberger, Barnes, King, and Hollingsworth (2014), cough is considered one of the most common complaints for which patients seek care, estimating 30 million healthcare visits each year. A multitude of disease processes can produce cough; thus, the development an exhaustive list of differential diagnoses is a critical step in the diagnostic process. In conjunction with the possible etiologies associated with cough, patient-specific risk factors need to be taken into consideration, as risk factors (i.e
smoking) can predispose a patient to a certain disease. While the most common etiologies of chronic cough include upper airway cough syndrome, asthma, and gastroesophageal reflux disease (GERD), considering the patient’s history in conjunction the possible etiologies for cough will assist the clinician in the development of a broad differential list, increasing the probability of accurate diagnosis (Silvestri et al., 2017).

To understand the range of potential causes for a cough, one must first understand the pathophysiology of a cough. A cough occurs via the cough arc reflex. Cough receptors reside within the epithelium and are located throughout the body including in the upper and lower airways, the pericardium, the esophagus, the diaphragm, and the stomach. Cough receptors can be stimulated in various ways, including by acid, heat, cold, chemical irritants, and touch/displacement. When stimulated, the cough receptors send an impulse to the vagus nerve, which then utilizes an afferent pathway to activate the Medulla’s “cough center”. The Medulla then generates an efferent signal that is transmitted back to the vagus, phrenic, and spinal nerves into the diaphragm, larynx, trachea, or bronchi, finally producing the cough (Silvestri et al., para.6). Understanding the pathophysiology of the cough, we see that a cough can originate in various parts of the body, and thus, could indicate disease in any one (or more) of these areas. The variability of the potential etiologies for cough in conjunction with the patient’s history prove validity as to why it is crucial to formulate a broad differential diagnosis. In this case, the patient’s risk factors include elderly, history of tobacco use, hypertension, and taking an ACE inhibitor. See Appendix A for a detailed clinical note pertaining to this patient.

Ownership of error
The complex and varied pathophysiology of the cough in conjunction with the individuality of patient’s risk factors increases the likelihood of clinician diagnostic error. As mentioned above, clinicians are trusted with identifying a correct diagnosis and providing patients with effective medical management of disease processes. Though clinicians work diligently to provide accurate medical care, errors can still transpire. (The Commonwealth of Massachusetts Board of Registration in Medicine, Quality and Safety Division (2016) hypothesizes that “Diagnostic errors are common, frequently preventable, and often underreported” (p.1). The Commonwealth of Massachusetts Board of Registration in Medicine, Quality and Patient Safety Division (2016) provides several causes for such errors: “Diagnostic errors can be the result of the confluence of insufficient data, communication lapses, variable disease presentations, a variety of provider biases and heuristics (mental shortcuts) and other sources of cognitive error” (“Overview, para. 2”). It is not necessarily the individual clinician or a specific health care system that is solely responsible for errors, but rather a combination of flawed processes that contribute to diagnostic error. (Graber, 2009).

As the health care system continues to evolve, Physicians are no longer the only medical provider on the health care team. The addition of Advanced Practice Providers (APP), such as Nurse Practitioners, have been utilized to improve patient’s access to health care. As medicine has progressed, the complicated diagnostic process, once unique to only the role of a Physician, has become a feat of APP’s. Differences in the experience and educational backgrounds of MD’s and APP’s have raised concern about the abilities of the APP to provide comparable care to that of a Physician. It should be mentioned here, that a review of the literature reveals that several studies have shown that there is no significant difference between Physicians (MD) and Nurse Practitioners (NP) pertaining to the prevalence of diagnostic error. An initial review of the
literature revealed a study in New Zealand which compared diagnostic reasoning abilities of MD’s and NP’s in a complex medical case. The two groups were asked to determine the diagnosis, identify the problem, and choose the correct actions for the diagnosis. Statistical analysis did not reveal any difference between the two groups (Pirret, Neville, La Grow, 2013). An additional study was reviewed which compared MD’s and Emergency NP’s rate of missed injuries or inappropriate management, wait time, and length of stay in the Emergency Department. The study concluded that there was no significant difference between the two groups in relation to missed injuries/inappropriate management or wait times, and, interestingly, NP’s had a shorter length of stay as compared to MD’s. (van der Linden, Reijnen, & de Vos, 2010). While error is prevalent in health care, these comparative studies indicate that error is no more prevalent in NP’s as compared to MD’s.

The Diagnostic Process

The first step in formulation of accurate diagnosis is understanding the diagnostic process itself. The diagnostic process is defined as “…a complex, patient centered, collaborative activity that involves information gathering and clinical reasoning with the goal of determining the patient’s health problem (The Institute of Medicine, 2015). The process begins prior to the patient seeking medical care, when a patient begins to experience one or more symptoms for which they may seek immediate or delayed care. Arriving at the health care facility, the patient begins to explain their symptoms, and the health care provider begins the clinical history taking process. Historical information is gathered and interpreted, which helps shape an individualized physical examination of the patient. Information from the history and physical examination then guides the provider to come up with what type of, if any, diagnostic tests the patient should undergo. Appendix B of this paper depicts the cyclical process of diagnosis, displaying how the
process is ongoing and updated as new information is learned from the clinical history, physical exam, diagnostic tests, and input from potential consults/referrals (The Institute of Medicine, 2015). From the moment the provider sees the patient, a list of hypotheses, or possible causes for the patient’s complaint, is being formulated. The hypothetical list of potential diagnoses is also known as the differential diagnosis. Being able to formulate a comprehensive list of differential diagnoses takes sound knowledge and practice in clinical reasoning skills.

**The dual-process theory and clinical reasoning**

Clinical reasoning is shown to occur via two concurrent cognitive processes, also described by researchers as the “dual-process theory” (Pelaccia, Tardif, Triby & Charlin, 2011). Barrows (as cited in The Institute of Medicine, 2015) defined clinical reasoning as “the cognitive process that is necessary to evaluate and manage a patient’s medical problem” (p.19). The first cognitive component of the dual-process theory is known as non-analytical thinking, which has been described as “a subconscious, automatic process that is driven from similarities between present and past encounters with patients” (Scordo, 2014, p. 231). Provoking the clinician’s intuition, non-analytical thinking stimulates initial thoughts on potential causes for the patient’s symptoms, oftentimes prior to seeing a patient. The Electronic Medical Record (EMR) is often reviewed prior to the visit, providing the clinician with the patient’s complaint, vital signs, and past medical history. If the EMR reveals a chief complaint of right lower quadrant pain with a fever, appendicitis will be suspected until proven otherwise. The provider’s intuitive suspicion for appendicitis in a patient with right lower quadrant pain is a classic example of non-analytical thinking. The thought is at the forefront without in-depth analysis of the complaint. The comparison of a previous patient’s clinical presentation to a current presentation is known as pattern recognition. When a patient presents with a characteristic finding that matches a pattern
of a typical disease, the clinician can rapidly formulate a hypothesis about the chief complaint. This type of pattern recognition is known as an “illness script” (Scordo, 2014). An example of an illness script would be a 56 year-old female with a history of uncontrolled hypertension and smoking who presents with an acute onset of left sided hemiplegia and expressive aphasia. It could be hypothesized that due to the patient’s risk factors and presenting symptoms that she is having a Cerebral Vascular Accident. This “illness script” allows for rapid identification a life-threatening condition, which prompts the clinician to quickly formulate a plan (CT scan of the head) to either confirm or reject the hypothesis of CVA. If the patient’s head CT does not indicate any bleeding in the brain and the patient’s symptom onset was within the past 3 hours, a “lytic” medication can be given to break up the clot in the brain that is causing the patient’s symptoms.

The second cognitive component of the dual-process theory is analytical reasoning, also called diagnostic or hypothetico-deductive reasoning. While non-analytical reasoning is an unconscious, fast, and intuitive process, analytical reasoning is a longer process which requires “…critical thinking, objective analysis, and reflection” (Scordo, 2014, p. 231). During the analytical process, the clinician takes a detailed history and physical examination, derives an exhaustive list of differential diagnosis, and proceeds through each possibility while interpreting diagnostic tests and additional data to either confirm or reject each differential (Scordo, 2014). This analytical process can be described as hypothesis testing. The Institute of Medicine (2015) describes the analytical phase of hypothesis testing as slow system 2, whereas non-analytic thinking is termed fast system 1.

As mentioned, analytical reasoning requires the process of hypothesis testing to answer clinical questions. The Institute of Medicine (2015) describes four steps to hypothesis testing:
cue acquisition, which includes the history, physical exam, diagnostic tests and consult or referral; hypothesis generation, where the differential diagnoses are formulated; cue interpretation, the step in which clinicians evaluate and interpret the diagnostic information while considering each potential diagnosis; and hypothesis evaluation, when all information is gathered and weighed against the potential diagnosis to see if a definitive diagnosis can be made. If the diagnosis is unable to be determined, the process is repeated until the diagnosis is verified. Aside from the cognitive components of the dual-process theory, Scordo (2014) describes an additional type of diagnostic reasoning which is termed scheme-inductive reasoning. Reasoning of this nature utilizes an algorithm approach whereas the medical provider follows the decision tree to rule out diagnoses. Emphasizing the importance of stellar clinical reasoning skills, Zunkel, Cesarotti, Rosdahl, and McGrath (2004) state “Efficiency and accuracy of diagnostic reasoning are important because poor reasoning can result in inappropriate treatment, late treatment, and failure to initiate treatment, which can lead to progression of disease and development of complications” (p. 162).

**Common causes for clinician error**

In understanding these two types of clinical reasoning, it is important to understand common mistakes clinicians make in this process so that these mistakes can be prevented or rectified. While non-analytical thinking can work well for experienced providers, it is considered a subjective approach to decision making and is a contributor to the error-prone part of the dual-process theory (Scordo, 2014). Unfortunately, not all patients present with typical or characteristic symptoms of a disease, therefore, non-analytical thinking cannot be the only process used in clinical reasoning (Scordo, 2014). Though considered a slower, more in-depth thought process, analytical thinking is not exempt from error. Cognitive rationales for diagnostic
errors can be characterized into three groups: “…inadequate or faulty knowledge, faulty data gathering, and faulty synthesis” (Scordo, 2014, p. 234). It is the responsibility of the clinician to gather accurate data, to be knowledgeable in diagnosis and treatment of medical concerns, and to be able to synthesize and integrate the said knowledge and data; failure to be competent in these three areas will increase the likelihood of diagnostic error.

**Heuristics and heuristic error**

Additionally, diagnoses are often made via heuristics, or “experienced-based techniques” (Scordo, 2014). Thought to assist in generation of the diagnostic hypotheses (differential), “heuristics are shortcut mental strategies, for example, educated guess, common sense, or rule of thumb that streamline information” (Scordo, 2014, p. 232). Common heuristic techniques the clinician often utilizes to streamline information include representativeness, availability, anchoring/adjustment, and premature closure. Representativeness stimulates the clinician to ask themselves, “How closely patient A match patient B?” The clinician gathers patient assessment data and compares it to that of either the textbook definition of disease or a previous patient seen with the diagnosis and then makes a judgement about how likely it is that the patient has the ailment (Scordo, 2014). The next heuristic, availability, can be described as a tendency. When a clinician recalls from memory a case that presented similarly to the case at hand, there is a tendency to suspect the same disease process. The process of anchoring/adjustment is when the clinician formulates one hypothesis (differential) and adjusts the hypothesis as data is gathered until a final diagnosis/answer is decided upon.

While these techniques can allow the practitioner to make a diagnosis quickly, these “shortcuts” are also prone to errors. To avoid errors, it is imperative that the clinician
IMPROVING DIAGNOSTIC ACCURACY IN HEALTH CARE

incorporates other clinical reasoning skills, while considering the patient’s individuality. Both representativeness and availability heuristics pose a potential risk for diagnostic error in that not all patients with the same disease present with the same symptoms, or vice versa, not all with the same symptoms have the same disease (Scordo, 2014). With anchoring, the clinician sticks with the first diagnosis without adjusting as data is gathered, increasing the likelihood of diagnostic error. It is imperative that more than one potential diagnosis is formulated as failure to consider multiple etiologies for the patient’s problem can lead to the final heuristic, premature closure.

Premature closure is described as closing the list of potential differential diagnoses without sufficient data to do so (Scordo, 2014).

**Cognitive bias**

In addition to heuristic error, cognitive biases can potentiate diagnostic error. “Biases are universal, numerous and diverse, therefore must be accounted for in the diagnostic process to prevent skewed results” (Commonwealth of Massachusetts, Quality and Safety Division, 2016). Common biases that can potentiate diagnostic error include: attribution, confirmation, diagnostic momentum, and framing (Scordo, 2014). Attribution is the process of stereotyping the patient, which can lead to inaccurate diagnosis. Next, confirmation bias occurs when the clinician focuses on only confirming evidence, instead of also considering evidence to rule out a potential cause. To avoid confirmation bias, the clinician should ask “What is the worst-case scenario?” and then decide if that worst-case scenario needs to be ruled out. Diagnostic momentum can lead the clinician down the completely wrong path of decision making, as it assumes that once a patient is labeled with a disease, it does not go away, oftentimes making it difficult for the clinician to consider other potential causes. Finally, framing occurs when the clinician attempts
IMPROVING DIAGNOSTIC ACCURACY IN HEALTH CARE

to come up with pieces of the diagnostic puzzle to only support a diagnosis, rather than attempting finding data to refute one (Scordo, 2014). For example, a “frequent flier” 48-year-old female patient who has a long-standing history of uncontrolled anxiety presents to the Urgent Care. Her chief complaint is her “usual chest pain.” She is given a prescription for Ativan and sent home without additional work-up. Her chest pain does not resolve, and the ambulance is called to her house. A 12-lead EKG reveals ST elevation in inferior leads, confirming a missed diagnosis of myocardial infarction. This case displays examples of attribution bias as the patient was stereotyped as a “frequent flier”; confirmation bias, as the only elements of the patient’s history relevant to the diagnosis of anxiety was considered, preventing the clinician from considering other causes of chest pain; and, diagnostic momentum, seeing as though the patient has a documented history of uncontrolled anxiety, prompting the provider to assume this was the patient’s anxiety causing her chest pain, rather than a emergent heart condition. Attached, Appendix C provides additional examples of cognitive bias.

Additional cognitive biases that may contribute to errors in clinical reasoning are status quo bias, blind spot bias, and overconfidence. Status quo bias infers that clinicians make decisions based only on previous clinical experience. Blind spot bias is the false belief that clinicians are not vulnerable to bias (Commonwealth of Massachusetts, Quality and Safety Division, 2016). Finally, overconfidence can occur when the clinician assumes diagnostic accuracy when indeed it is inaccurate (Commonwealth of Massachusetts, Quality and Safety Division, 2016). Clinical reasoning can improve diagnostic accuracy; however, it is also prone to error. Therefore, clinicians must have a thorough understanding of, and appreciation for the clinical reasoning process to avoid making errors.
Awareness of these common biases is the first step, but comprehending how to avoid them poses an additional challenge. Scordo (2014) suggests the use of “metacognition,” to avoid falling into these biases and to avoid error in differential diagnosis (p. 234). Essentially, metacognition is “thinking about thinking.” Based on this concept, Scordo (2014) provides guidelines that clinicians should use prior to arriving at a final diagnosis. These guidelines consist of explicitly describing heuristics and how they affect clinical reasoning, the use of “diagnostic time-outs,” the ability to embrace the potential of the “worse-case scenario,” the use of systematic approach to problems, asking “why,” emphasizing the value of the clinical history and physical exam, slowing down, and admitting mistakes (Scordo, 2012, p. 235). The diagnostic process is rigorous and error prone due to multiple factors. Being cognoscente of bias, taking diagnostic time-outs, application of high-level evidence, and utilization of clinical support tools will assist the provider in overcoming common errors.

**Differential diagnosis**

The formulation of the differential diagnosis is one of the most crucial elements of clinical reasoning. Differential diagnosis is the foundation of clinical decision making, guiding the clinician’s actions to solve the clinical problem. Formulation of the differential diagnosis is a dynamic process in which a medical provider utilizes their clinical expertise in conjunction with patient-specific clinical findings to develop a list of potential causes of the patient’s complaint (Wilson, Henderson, & Smetana, 2005). For example, when a patient presents with a sore throat, the list of differentials might include strep throat, viral pharyngitis, peritonsilar abscess, or rhinitis. Once the list of potential diagnoses is formed, the clinician can then utilize data, diagnostic tests, or a combination of the two to either confirm or reject the potential diagnoses.
IMPROVING DIAGNOSTIC ACCURACY IN HEALTH CARE

(Wilson, et al., 2005). Szafarski (as cited in Baid, 2006) recommends practitioners develop an exhaustive list of differential diagnoses in order to keep an open mind towards potential causes and, consequently, decreasing the risk of diagnostic error.

Utilizing an organized, systematic approach in data collection will assist the practitioner in broadening their list of differential diagnoses. A review of literature reveals several mnemonic options to guide the clinician in a systematic approach. One option was created by Zabidi-Hussin (2016), which is the VITAMINSABCDEK mnemonic, which represents:

- “V” for vascular,
- “I” for Infectious,
- “T” for Trauma,
- “A” for Autoimmune/allergy,
- “M” for metabolic,
- “I” for idiopathic/iatrogenic,
- “N” for neoplasm,
- “S” for social (e.g. abuse, neglect, economic deprivation),
- “A” for alcohol,
- “B” for behavioral,
- “C” for congenital,
- “D” for degenerative/drug
- “K” for karyotype

Zabidi-Hussin (2016) confirms that using this mnemonic as a guide will broaden the differential diagnosis, allowing for “…more accurate management of a patient” (p. 248). Use of
a systematic, non-biased approach must be utilized for the development of a broad list of differentials, keeping the clinician open-minded during the clinical reasoning process and allowing for a higher likelihood of accurate diagnosis.

Evidence-based medicine

In the past decade, it was acknowledged that practiced medicine based on traditional methods often lacks the most recent evidence. A review of medical practice found that health care practices were variable and often impacted by Physician preference, and thus, interventions were sometimes outdated based on current research (Facchiano & Hoffman Synder, 2012). Facchiano and Hoffman Synder (2012) discuss a statement from the Institute of Medicine in 2008 which stated that a reliable, informative database was needed to confront several issues in healthcare, including costs, variability, and quality of care. The response to this appeal was the birth of evidence-based practice guidelines (Facchiano et al., 2012).

Evidence-based medicine allows research from meta-analysis of clinical trials to be integrated and implemented in clinical practice. Evidence is presented on a hierarchy system with level I and II evidence being the strongest, as it is derived from meta-analysis and Randomized Control Trials. Sackett, Rosenberg, Gray, Haynes, and Richardson (as cited in Facchiano & Synder, 2012), defined evidence-based medicine “as the conscientious, judicious, and explicit use of current best-evidence in making decisions about the care of the individual patient” (p. 580). Though the Institute of Medicine called for “unbiased and reliable” information to help decrease rising health care costs, standardize practice regardless of geographic region, and improve the overall quality of the health care (Facchiano et al., 2012), evidence-based practice was found to have its limitations (Sniderman, LaChapelle, Niodem, Rachon, & Furberg,
While evidence-based medicine can assist clinicians in following the most recent and high-level evidence to improve patient outcomes, unfortunately, there are great discrepancies in the quality, reliability, and validity of evidence found in today’s literature. Some evidence presented in literature is not obtained from reliable research such as clinical trials and meta-analysis, “…but rather [are] the products of inappropriate extensions of mechanistic reasoning and selective recall of personal experience. Beliefs, sometimes, became evidence” (Sniderman et al., 2013, p. 1108). Because many recommendations and guidelines are not necessarily drawn from well-designed, sound clinical trials or other high-caliber research, each clinician must be able to assess the source and validity of the evidence to deem the guideline irrelevant or relevant prior to implementing that data into clinical practice (Facchiano & Hoffman Synder, 2012).

As integration of high-level evidence is imperative to the clinical reasoning process, the clinician needs to remain cognoscente of the two take away points in regards to evidence-based guidelines. Not all evidence is trustworthy, and regardless of what a guideline might indicate, treatment plans still need to be individualized to each patient. Evidence-based guidelines and the differential diagnosis are said to be the foundation in clinical reasoning (Sniderman et al. 2013). These foundations are assistive tools to the critical thinking and cognitive processes not “cookie cutter” medicine, or the only elements that should be utilized in medical decision making.

Evidence-based guidelines cannot be generalized to all patients, clinical reasoning can be prone to error, and failure to develop an exhaustive list of different diagnosis places the patient at risk for improper treatment or a missed diagnosis. While each of these three fundamental elements have a margin of error when used in isolation, when used together, they create a pillar for optimal patient care. Competent clinicians are those with the ability of employ each of the
fundamental elements mentioned above. Scordo (2014) reaffirms this thought, stating, “Clinicians with the ability to use multiple methods to critically reason make better decisions, are better problem solvers, and are professionally more competent” (p. 230). Utilization of valid, evidence-based guidelines, extensive consideration of differential diagnosis, and intuitive and analytical thinking allows clinicians to provide high quality, competent care while reducing the likelihood of diagnostic error.

**Application of the process**

Explanation will now be given to the clinical reasoning process I utilized during my encounter with the 88-year old female mentioned in Appendix A.

The information I knew prior to entering the room was that this was an 88-year old female with stable vital signs who had a cough. The patient had been seen previously and was given a course of antibiotics and an inhaler to control symptoms. Due to the treatment prescribed, I assume that the previous provider was treating the patient for either asthma, bronchitis, or pneumonia. Because the patient’s history did not reveal wheezing or productive cough with fever, this case shows a classic example of a missed diagnosis with inaccurate treatment. I also knew that the patient was on Lisinopril (the ACE medication). Per UpToDate (2017),
ACE induced cough usually begins within a week of instituting therapy, suggesting this newly developed cough was unlikely related to the ACE. This additional information, in conjunction with the patient’s history, decreased the diagnostic suspicion for an ACE induced-cough.

Had I stopped my clinical reasoning at pattern recognition (non-analytical) and not pursued the second component of dual-process cognition (analytical), I might have prematurely ended the differential diagnosis process, thus leading to a missed diagnosis and subsequently, treatment error. Assuming it was an ACE-induced cough I may have opted to discontinue the patient’s ACE to alleviate the cough, even though the ACE had been effectively controlling her blood pressure for several years.

Although the likelihood of the ACE inhibitor causing the patient’s cough was low, it remained on the list of differentials until it could be completely ruled out. While I initially used intuitive/non-analytical thinking, I recognized that the patient’s cough warranted further evaluation. Now, analytical thinking was initiated. When initially evaluating a patient, I like to start by ruling out any potential alarm symptoms, to alleviate concern for an acute life threatening condition. Per Maselli and Anzueto (2012), alarm symptoms with cough include hemoptysis, fever, purulent sputum production, wheezing, shortness of breath, chest pain, and weight loss. In a systematic patient history intake, the patient denied all alarm symptoms. Confirming my intuitive thought that the patient was not in any immediate danger, was the patient’s appearance—well appearing, alert, oriented, and able to provide a thorough history. In addition to her reassuring appearance were her stable vital signs. The next important piece of information was identifying the duration of the cough – in this case, three months, deeming the cough “chronic” in nature. Adding to the chronicity of the cough, the patient’s symptoms did not
subside with a course of antibiotics and inhaler therapy. Previously described, the most common etiologies of chronic cough include upper airway cough syndrome (UACS), Asthma, and GERD. All three of these potential causes of cough were added to the list of differentials.

Next, with four potential causes on my differential, and having ruled out alarm symptoms, I began to ask the patient focused questions to either confirm or disprove each differential. The patient denied dyspnea on exertion and wheezing, and I did not appreciate any wheezing on exam, making the diagnosis of asthma less likely. The patient denied mucous in her throat, rhinitis, sinus pressure, recent upper respiratory infection, fever, and chills, making UACS less likely. The patient did confirm heart burn (for which she used Tums), a sour taste in her mouth, a dry cough that worsened at night, burning in her throat at night, excessive caffeine intake, and a relatively normal physical examination—all confirmatory for GERD. Based on this clinical reasoning, I chose to treat the patient with Zantac and asked her to follow-up in two weeks.

The decision to treat a diagnosis does not mean that the diagnosis is concrete without need for potential adjustments. While GERD is the working diagnosis in this case, if the patient’s symptoms do not subside with the prescribed treatment and within the designated time, she would return to the clinic and the clinical reasoning process and working through diagnoses would continue. With the patient’s history of hypertension and tobacco use, it is imperative to consider both Congestive Heart Failure (CHF) as well as lung cancer. The patient had mild pedal edema on physical examination, which she described as chronic. The patient had no historical complaints of CHF, deeming it low suspicion but still a potential cause. Any history of smoking should cue the clinician to question lung cancer. While this diagnosis was low on the differential
as the patient did not have any characteristic alarm symptoms, it is still a possibility to consider if her symptoms do not improve.

Clearly, the diagnostic process is extremely complex and prone to error due to numerous cognitive biases, inappropriate integration of low-level clinical practice guidelines, and failure to formulate an exhaustive differential diagnosis. Diagnostic accuracy should be of utmost importance for the clinician to improve patient outcomes. In this case, I used prior knowledge, review of high-level evidence, and both analytical and non-analytical reasoning, to develop a differential diagnosis to work toward and determine the most appropriate diagnosis and individualized treatment plan for the patient. I ruled out potential alarm features and weighed the benefit/risk of initiating treatment for the patient. After exhaustive research on clinical reasoning, evidence-based practice guidelines, and the concept of differential diagnosis, it has been confirmed that each of these elements must be integrated in the clinical decision making process to improve patient outcomes and decrease the likelihood of diagnostic error. Integration of working knowledge, clinical experience, appraisal of high-level evidence, clinical reasoning skills, and metacognition is crucial for improving diagnostic accuracy. Clinicians should focus on thorough clinical reasoning and diagnostic process rather than rushing to a diagnosis without considering all factors and potential differentials. As Scordo (2014) reminds us, “Remember that clinical experience is a process, not a product” (p.235). It is the moral responsibility for healthcare providers to obtain the ability to provide safe medical care. The diagnostic process is rigorous and dynamic, requiring integration of multiple types of sound reasoning – and avoidance of bias errors -- for success. The fundamentals of clinical reasoning discussed in this paper provide the clinician with a solid foundation in improving patient outcomes via correct
diagnosis and accurate treatment plans, decreasing health care costs, and increasing patient satisfaction.
References


E.L. (4/7/1929) Female

Chief Complaint: Cough that won’t go away x 3 months

HPI:

E.L. is an 88-year old female who presents with complaints of a cough which she states has been occurring for three months. The patient was treated with Bactrim 2 weeks ago for her cough, she reports no improvement of symptoms with the course of antibiotics. E. reports that her cough is non-productive and worse at night, oftentimes waking her from sleep. She often experiences a burning sensation in her throat with a sour taste in her mouth associated with her coughing. In addition, the patient reports a “tickled” in her throat and feels the need to clear her throat frequently throughout the day. E. has tried Tums (up to three times a day on average), cough medicine, and the above-mentioned course of antibiotics, however, none of these measures have seemed to provide adequate symptom relief. E. reports poor quality of sleep because of the cough, burning in her throat, and sour taste in her mouth which is causing her quite a bit of frustration. She presents seeking an answer as to why these symptoms are occurring.

Past Medical History

Hypertension

Medications

Lisinopril 10 mg daily

Allergies

NKDA

Family History

Not reviewed or pertinent to today’s visit

Social History

Retired; worked at a local hotel serving breakfast up until 3 months ago. Lives in her home with her daughter.

Smoking history: 50 pack year (smoked 1 ppd x 50 years)

Alcohol/Drug use: social drinker with 1-2 glasses of wine on special occasions. Denies illicit drug use

Caffeine intake: drinks 1-2 pots (8 cups per pot) of coffee daily

Review of Systems
**General:** Negative for unexplained change in weight, fever, chills, weakness, and night sweats. Reports some fatigue as she has been losing sleep secondary to symptoms mentioned in HPI.

**Eyes:** Negative for change in vision, diplopia, tinnitus, or ear pain.

**Ears, nose, and throat/mouth:** Positive for hearing aid use; denies nasal and sinus symptoms, complaints of a “tickle” in her throat, sensation of needing to clear her throat frequently, and also for a “burning sensation” in the throat, worse at night.

**Cardiovascular:** Denies chest pain, palpitations, dyspnea on exertion and orthopnea

**Respiratory:** Denies dyspnea. Complains of cough, worse at night. Denies sputum production with cough.

**Gastrointestinal:** Denies abdominal pain, nausea, change in bowel habits, melena, hematochezia, and vomiting. Complains “burning in the throat and chest”.

**Genitourinary:** Denies dysuria

**Musculoskeletal:** Denies arthralgia. Complaints of “manageable” aches and pains which she attributes to arthritis. Uses walker for assistance with ambulation.

**Neurological:** Denies numbness, tingling, weakness, headaches, and gait disturbances

**Psychiatric:** Complains of sleep disturbances secondary to cough as mentioned in HPI. Denies depression and anxiety.

**Endocrine:** Denies polyuria, polydipsia, polyphagia, and temperature intolerance.

**Hematologic/lymphatic:** Denies easy bruising and bleeding, no history of anemia.

**Allergy/immunological:** Deferred for this visit.

**Physical Examination:**

**Vitals:** 130/80, 76, 12, 97.8

**General:** Alert, well-appearing elderly female. Reliable historian.

**Skin:** Warm and dry. No rashes on face, neck or arms.

**HEENT:** The head is normocephalic and atraumatic; Ears/eyes/nose deferred. Mouth/throat: oral mucosa is pink and moist without any open areas. No edema or exudate in the oropharynx.

**Neck:** Supple without any appreciation for thyromeagaly. The trachea is midline. No cervical adenopathy is appreciated. No appreciation for JVD

**Respiratory:** Normal breathing effort, symmetrical chest rise noted, normal diaphragmatic excursion. Lungs are clear and equal throughout anterior and posterior fields.
Cardiovascular: S1 & S2, regular rate and rhythm. No appreciation for shifted PMI, no appreciation for murmur, rubs, clicks, or gallops. Peripheral edema in bilateral lower extremities, left leg: 1 +, right leg: trace

Abdomen: Obese. Normoactive bowel sounds in all four quadrants. No tenderness appreciated in the epigastric area. No tenderness to light and deep palpation in any quadrant.

Genitourinary: Deferred

Musculoskeletal: Deferred

Neurological: A/O x 4

Psych: Normal mentation with bright affect.

Labs & Diagnostics:

Assessment:

1. Hypertension- well controlled on Lisinopril
2. Chronic cough (greater than 8 weeks)
   a. Differentials include: GERD, ACE induced cough, Congestive heart failure, Upper Airway Cough Syndrome

Plan of Care:

1. Continue Lisinopril 10 mg daily
2. Eat smaller meals, try not to eat within two hours of lying down, elevate the head of your bed at night when sleeping, try to identify foods that increase your symptoms and avoid them, try to cut down on coffee intake. Other foods to try and avoid: fatty foods, spicy foods, chocolate, acidic foods, and carbonated beverages.
3. Start using Zantac 150 mg by mouth daily. Use Maalox as needed for breath through symptoms.
4. Follow-up in two weeks, sooner with new or worsening symptoms or if not getting any relief.

Melissa DeVries, NP student
The committee’s conceptualization of the diagnostic process (The Institute of Medicine, 2015)
## Appendix C

### Bias Description Example Corrective Strategy

<table>
<thead>
<tr>
<th>Bias</th>
<th>Description</th>
<th>Example</th>
<th>Corrective Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchoring</td>
<td>Staying with 1 diagnosis</td>
<td>A clinician treats a patient who presents during flu season with nausea and vomiting for gastroenteritis, but the patient later presents with appendicitis</td>
<td>Ask: What else can this be? Is there some other explanation for these data? Could 2 things be going on at once?</td>
</tr>
<tr>
<td>Attribution</td>
<td>Stereotyping a patient or gender bias</td>
<td>An intoxicated homeless man presents with a large ulcer on his foot. The assumption is some sort of trauma and unhealthy lifestyle, when he actually has uncontrolled diabetes</td>
<td>Ask: Am I stereotyping this person? Am I biased because of his appearance? How should I acknowledge my interactions?</td>
</tr>
<tr>
<td>Availability</td>
<td>Familiarity with a clinical entity</td>
<td>A clinician suspects appendicitis in a patient with pancreatitis</td>
<td>Ask: What is the likelihood of the diagnosis? What is the prevalence of the diagnosis?</td>
</tr>
<tr>
<td>Confirmation</td>
<td>Tendency to look for confirming evidence to support a diagnosis rather than looking for evidence to refute it</td>
<td>A clinician treats a young female patient who takes birth control pills for calf muscle strain, and she presents later with a pulmonary embolus.</td>
<td>Ask: What is the worst-case scenario? What other differentials should I consider to evaluate whether my diagnosis correlates with my findings?</td>
</tr>
<tr>
<td>Diagnostic momentum</td>
<td>Once diagnostic labels are attached to a patient they stick</td>
<td>Nurses in the emergency department as you see a “frequent flyer” who seeks narcotics for abdominal pain. All believe him to be seeking drugs when in essence he has an acute abdomen.</td>
<td>Ask: Did I perform a thorough history and physical examination? Did I arrive at my decision independent of others? Is a diagnostic time-out in order?</td>
</tr>
<tr>
<td>Framing</td>
<td>Assembling elements that support a diagnosis</td>
<td>A clinician assumes pustules area the result of poison ivy in a patient who recently returned from a camping trip</td>
<td>Ask: What other information do I need? What other differential diagnoses could this be?</td>
</tr>
<tr>
<td>Premature Closure</td>
<td>Failing to search for additional information after reaching a diagnostic conclusion</td>
<td>A clinician assumes that a patient who presents with sudden abdominal pain with vomiting after attending a party where others became ill portends food poisoning, whereas in reality, the patient has a small bowel obstruction.</td>
<td>Ask: What other information do I need? What other differential diagnoses could this be? What is the worst-case scenario? Whose opinion should I seek?</td>
</tr>
</tbody>
</table>

Based on data from Engel, Croskery and Wellbery. In Scordo 2014