NEUROMUSCULAR CASES: WHY DID I MISS THE DIAGNOSIS?

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(A neuromuscular case where the speaker missed the diagnosis will be presented, with a discussion of the potential reasons for missed diagnosis.)

In 1999, the landmark Institute of Medicine (known now as the National Academy of Medicine, NAM) report "To Err is Human: Building a Safer Health System" defined medical errors as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim" and highlighted the fact that at least 44,000, and up to 98,000 people die every year in hospitals due to preventable medical errors.[1] This report categorized medical errors as diagnostic, therapeutic, preventive care, and others (failure to communicate with patients, mechanical failure etc).[1] A subsequent report in 2015 from the IOM/NAM "Improving Diagnosis in Healthcare" provided some sobering facts about the prevalence of diagnostic errors in medicine.[2] In clinical practice, accurate and timely diagnosis sets the stage for appropriate management. The IOM/NAM report defined diagnostic error as the failure to (a) establish an accurate and timely explanation of the patient's health problem(s) or (b) communicate that explanation to the patient. The report found evidence that most people will experience at least one diagnostic error in their lifetime. Approximately 5 percent of U.S. adults experience a diagnostic error in the outpatient setting each year. Diagnostic errors constitute the most common type of paid medical malpractice claims, are almost twice as likely to have resulted in the patient's death compared to other claims, and comprise the largest fraction of payments.[2] Diagnostic errors are more common in the three disciplines in which diagnostic uncertainty appears to be the highest: internal, family, and emergency medicine. [3-6] This can probably be extrapolated to neurology as well given the similarities in the practice of neurology to these disciplines.

Although the usual tendency is to assume that diagnostic errors are a clinician's failure, the 1999 IOM/NAM report also emphasized systems errors.[1] Graber et al. categorized diagnostic error into three major types: no-fault, systems, and cognitive. No-fault diagnostic errors occur when the disease is silent, appears in an atypical fashion, or mimics another, more common disease.[7] Examples of systems errors include information or policies, environment or equipment design, communication failures, and human resources including staffing and training. Systems errors are usually significantly reduced by systems changes. It is much more challenging to reduce cognitive errors because of their complexity.

The neurocognitive basis of decision making is complex, and various theories have been proposed. One such theory, the Dual Process theory, proposes two systems of thinking: A fast, subconscious, intuitive, automatic process (Type 1) and a slow, conscious deliberate, logical process (Type 2).[8-10] Type 1 has also been called "flesh and blood" decision making, which we practice routinely in the clinical setting at the front line, when resources are in short supply, when time constraints apply, and when shortcuts are being sought. Intuitive processes are generally either hard-wired or acquired through repeated experience. Heuristics are informal problem- solving methods- "rules-of thumb" or educated guesses that lead quickly to solutions. These decision making patterns are indispensable to clinical practice; they are also the primary source of cognitive failure. Many biases and thinking failures arise from the intuitive mode. This process is routinely used in pattern recognition: In relatively straightforward, or common situations diagnoses are made by recognizing disease patterns, and testing and treatment are initiated based on customary practice.

The second type of cognitive reasoning follows the rules of science and logic and therefore is more likely to be rational and reliable. It is conscious, deliberate and slow. [8-10]Analytic failures can occur, when the wrong rules are followed or other factors come into play, such as cognitive overload, fatigue, sleep deprivation, or emotional perturbations. The biggest downside of analytic reasoning is that it is time-intensive. In most clinical situations it would be impractical to deal with each decision analytically. Type 2 processes provide the structured, quantitative, analytical methodology in more complex cases.

Types of Heuristic Errors:

The term "cognitive predispositions to respond" (CDRs) is used to describe the biases and heuristics that influence clinical decision making.[10, 11] Errors due to CDRs are due to 2 main factors: the first is the failure to consider all relevant possibilities. This may occur due to faulty data collection, faulty observation or interpretation, faulty knowledge base or faulty synthesis of information. The second is the faulty assessment of pre-test probability (overestimating or underestimating disease likelihood, usually due to faulty knowledge base).There are several types of CDRs that increase the probability of diagnostic errors.[10, 11] Some examples of CDRs are discussed below.

Availability error occurs when clinicians misestimate the prior probability of disease because of recent experience. Experience often leads to overestimation of probability when there is memory of a case that was dramatic, involved a bad outcome or a lawsuit. For example, a clinician who recently missed the diagnosis of SAH in a healthy young woman who had severe but not the typical thunderclap HA and no other findings could overestimate the risk of SAH in similar patients and become more likely to order head CT in all patients with headache despite a small probability of SAH. Experience can also lead to underestimation. For example, a junior resident who has seen only a few patients with occipital and neck pain all of whom turned out to have benign causes, may begin to do cursory evaluations of that complaint, and miss vertebral dissection. **Premature closure** is probably the most common error; clinicians jump to a conclusion and make a diagnosis often based on pattern recognition, fail to consider other possible diagnoses, and stop collecting data: "when the diagnosis is made, the thinking stops". The suspected diagnosis may not even be confirmed by appropriate testing. Premature closure errors are particularly common when patients seem to be having an exacerbation of a known disorder—e.g., if a woman with a long history of migraine presents with a severe headache (and actually has a new subarachnoid hemorrhage), the headache may be mistakenly assumed to be another attack of migraine. A variation of premature closure occurs when subsequent clinicians (e.g,, consultants on a complicated case) unquestioningly accept a previous working diagnosis without independently collecting and reviewing relevant data. Electronic medical records may exacerbate premature closure errors because incorrect diagnoses may be propagated until they are removed. A closely-related error is termed **anchoring**. The clinician becomes wedded to a diagnosis despite the presence of conflicting data that weighs against that diagnosis and/or suggests an alternate diagnosis. Overconfidence in the original diagnosis and in one's own diagnostic capabilities is often the explanation for anchoring; clinicians steadfastly cling to an initial impression even as conflicting and contradictory data accumulate. **Attribution** errors involve negative stereotypes that lead clinicians to ignore or minimize the possibility of serious disease. Psychiatric patients who develop a physical disorder are particularly likely to be subject to attribution errors because not only may they be subject to negative stereotyping but they often describe their symptoms in unclear, inconsistent, or confusing ways, leading unwary clinicians to assume their complaints are of mental origin.[10, 11]

How can we reduce cognitive errors? "Cognitive Pills for Cognitive Ills": [12]

Several strategies have been suggested to reduce cognitive errors. These include increasing knowledge and experience, immediate feedback, debiasing techniques, improving clinical reasoning by interventions such as metacognition (thinking about thinking) and reflection, and using decision support tools.[10, 11, 13-16] It has been suggested that cognitive forcing strategies can be developed through a sequence of 4 maneuvers: 1. Thinking about and analyzing our decision making processes: metacognition. 2. Learning *about common cognitive errors. Premature closure is probably the most important of these. 3. Identification of specific clinical* contexts in which diagnostic errors are most likely to occur (clinical "pitfalls", e.g., acute onset of vertigo mislabeled as vestibular neuronitis and missed posterior circulation stroke, or acute headache and missed subarachnoid hemorrhage). 4. Routine use of a cognitive forcing strategy into a clinical context that we recognize as likely to be error prone (e.g., consciously refusing to anchor onto a diagnosis of vestibular neuronitis in the patient presenting with vascular risk factors and acute vertigo and vomiting).[11]

Studies of the effectiveness of these techniques are limited. Research is required into the effectiveness of these techniques in reducing cognitive error, and in turn improving clinical diagnostic accuracy. However, a thorough, complete history, clinical examination is a prerequisite to minimizing diagnostic errors.

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