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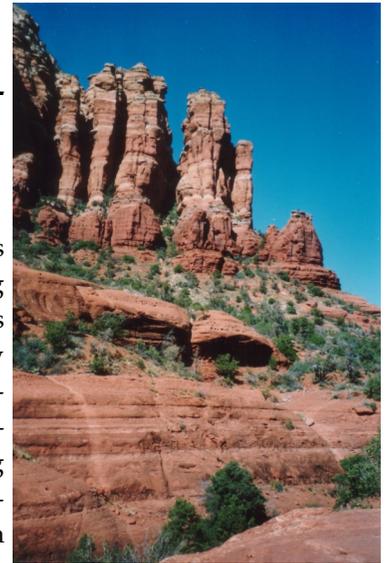
Robert Folzenlogen MD

Hospitalist Update

Taking the Myth and Mystery out of Diagnostic Decision Making

William Steinmann MD

Several recent books have addressed “How Doctors Think,” with emphasis on diagnostic decision making and the sources of diagnostic error. National venues now target the problem of diagnostic error and new studies highlight the high levels of costly and unnecessary test ordering, much of which is related to ineffective diagnostic processes. And, finally, teaching clinical reasoning is still considered a difficult curriculum to master. Why do physicians have difficulty in making a diagnosis?



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Is making a diagnosis unique to medical decision making?

Given the fact that every day we use “diagnostic decision making” to solve problems at work, at home or at play, why is clinical reasoning and diagnostic decision making in the clinical setting so difficult to learn and master? And why is diagnostic decision making any different than the reasoning we use to solve problems in our daily lives? Doesn’t finding your car keys require diagnostic decision making? Clearly, any adult is faced with problems that require solutions on a daily basis and is it not reasonable to use the term “diagnostic decision making” to explain these processes? Is there something uniquely different or difficult when we solve problems in the practice of medicine? Are physicians any different from auto mechanics who use reasoning and diagnostic tools to identify problems under the hood? I don’t think so.

In summary, as human beings, we have the capacity to reason and have been constantly solving problems since childhood; clearly, some of us are better diagnosticians than others. However, there is absolutely no rationale that the modus operandi for clinical reasoning and decision making in medicine is unique or different from that used in daily life.

So what is the nature of the problem?

I believe there are three fundamental steps in effective decision making that, if unmet, result in an ineffective diagnostic process and potential diagnostic error. First is command of knowledge about the subject; if you don’t know what something (continued)

(cont) looks like, you are not going to recognize it. In clinical diagnosis, knowledge of the clinical and epidemiologic characteristics that define a condition or diagnosis and knowledge about the patient that address these characteristics are fundamental. Second is the practice of hypothetical deductive probability-based reasoning that focuses on ruling-in a single, most likely diagnosis. And third, is awareness and consideration of the obstacles or distractions that bias reasoning and contribute to cognitive errors in the diagnostic process.

Regarding the first, clinicians are more likely to diagnose a condition that they have studied or seen; this is why specialists are able to diagnose unusual or rare disorders that generalists might miss. Successful diagnostic decision making requires knowledge of clinical and epidemiologic characteristics of each of the possible candidate conditions and consideration of these characteristics in evaluating the patient's risks and clinical presentation. Do you know what the condition that you are seeking looks like? Have you systematically considered all necessary related pertinent positive and negative clinical and historical findings that relate to the single best diagnosis. My experience today is that many clinicians do not know and systemically consider the characteristics that define each and every specific diagnosis under consideration.

Second, efforts must be directed to the process of deductive reasoning and ruling-in the single best diagnosis. Too much effort seems to be spent ruling-out unlikely and less probable conditions rather than basing the process on the increasing weight of evidence. While consideration of possible serious and life-threatening albeit rare conditions is warranted, identification of the key characteristics of the single best, most likely, diagnosis should rule-out unlikely conditions early in the workup. The key here is increasing certainty (confidence) in a single, most likely diagnosis. Even late in the diagnostic process, clinicians can relate unlikely conditions (the rule-out mentality) but still specify three or four conditions under consideration; they have not yet focused on acquiring the information that will yield a single best diagnosis. In this regard, epidemiologic characteristics, if not unknown, are often not considered by many clinicians. Yet, assessing risk characteristics greatly increases the precision of probability estimates.

The third issue arises from the many distractions that disrupt the reasoning process. Kassier and Koppleman offer a good description of the errors that occur in cognition; most are manifested by biases in clinical reasoning. For example, we tend to consider diagnoses that we recently missed or encountered, no matter how unlikely they may be. Rather, focusing on gathering data to rule-in the single, most likely diagnosis is the key to successful and effective decision making.

There are several other considerations that deserve attention. A diagnosis consists of a pathological or functional process, e.g. metabolic, infectious, neoplastic, and an involved organ or system, e.g. lung, vascular system, etc. I am often struck by the number of discharge diagnoses that do not indicate the nature of the problem; non-specific chest pain or unspecified abdominal pain are not diagnoses but symptoms that require the application of a diagnostic pathway to identify a specific process and organ system. Failure to identify the cause of non-specific chest pain is a major reason that myocardial ischemia is a leading cause of malpractice litigation. Another consideration is our variable capacity to deal with the uncertainties of diagnostic decision making. The key to dealing with such discomfort is to embrace the above practices in order maximize the likelihood that you will focus on the single best diagnosis. As hospitalists, we often know little about our patients prior to admission and must recognize our limitations. In an attempt to garner the information that is necessary to rule-in a diagnosis, we often rely on modern references which, unlike textbooks, provide only cursory descriptions of clinical characteristics associated with specific disorders; taking the time to review the detailed information in textbooks will improve our diagnostic skills. It is also important to know the prevalence of diseases in the population that you serve; combined with data from your history, physical and lab testing, this should help to direct you toward the most likely, best-fit diagnosis.

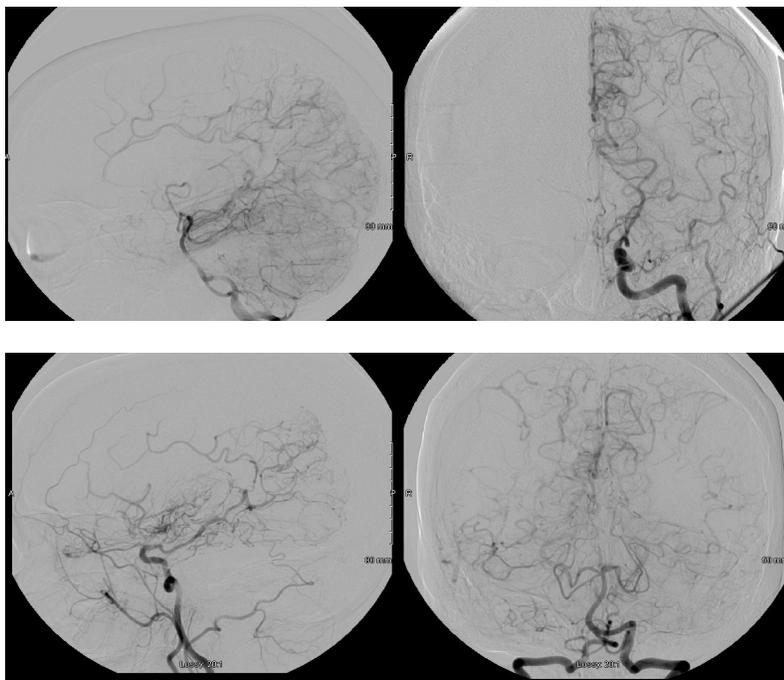
REFERENCES: 1. How Doctors Think, Jerome Groopman, Houghton Mifflin, 2007 2. How Doctors Think, Kathryn Montgomery, Oxford University Press, 2006 3. Learning Clinical Reasoning, Jerome P. Kassier and Richard L. Koppleman, Williams & Wilkins, 1991

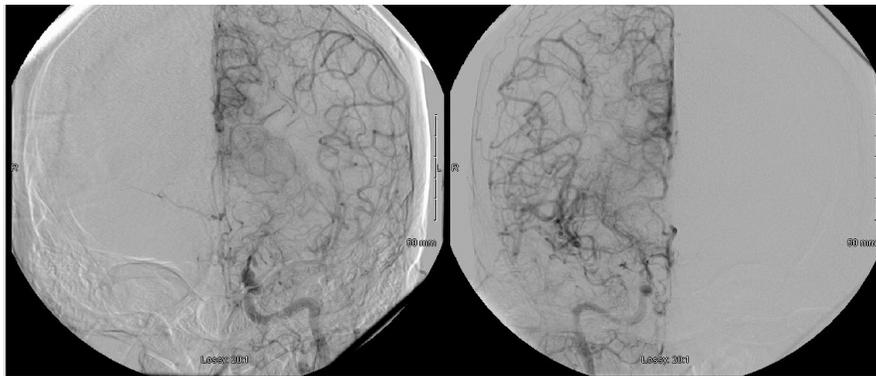
CASE OF THE MONTH Molly Lewandowski MD, Ahmad Tuffaha MD & Sunpreet Rakhra**COCAINE INDUCED MOYAMOYA**

Moyamoya is a disease that was first reported in Japan, in the 1960s. It is a rare and progressive disorder that affects the arteries at the base of the brain, leading to the occlusion of the distal internal carotids and their major branches, including the proximal segments of the middle and anterior cerebral arteries. The stenosis that occurs leads to poor blood flow to those areas that each artery serves. A “hazy puff of smoke” is the characteristic appearance on imaging studies, resulting from the irregular perforating vascular networks found near these stenotic vessels.

CASE PRESENTATION:

A 36 year old African American female presented to Truman Medial Hospital with complaints of aphasia, right-sided weakness, dizziness and nausea over the past 24 hours. Her past medical history was significant for hypertension, depression, alcohol abuse, polysubstance abuse and noncompliance. Medications included albuterol, hydrochlorothiazide, lisinopril, ibuprofen and promethazine. Family history was unremarkable. Physical exam revealed a BP of 183/120. Neurological examination was remarkable for a right-sided facial droop, 0/5 strength in both right upper and right lower extremities and an expressive aphasia. A urine drug screen was positive for cocaine and marijuana. A non-contrast CT of the head showed multiple ill-defined hypodense areas in the frontal lobe; a followup MRI of the head and neck revealed acute infarcts in the left precentral gyrus cortex and scattered throughout the left centrum semi ovale. MRA of the head showed markedly small bilateral anterior cerebral arteries and middle cerebral arteries past the bilateral cavernous carotids, along with irregularity and drop out of signal in the proximal bilateral posterior cerebral arteries. A transthoracic echo, obtained to rule out an embolic stroke, was normal. A hypercoagulable workup did not reveal any abnormality. A 4-vessel cerebral angiogram (images below), performed at St. Luke’s Hospital, in Kansas City, was consistent with Moyamoya Disease; the latter was thought to be secondary to chronic cocaine use. The patient was started on ASA 162 mg by mouth daily and was transferred to an outpatient rehabilitation center.





DISCUSSION:

Cases of Moyamoya have been described throughout the world, including Africa, Europe, Australia and the United States. Recent studies showed that this disease is more common in the Japanese population, with a prevalence of 10.5 per 100,000 patients and a bimodal age distribution in the first and fourth decades. Four categories of Moyamoya have been described, including ischemic, hemorrhagic, epileptic and "other." Ischemic symptoms predominate in the young while hemorrhagic symptoms predominate in the elderly. The most common cause of death in Moyamoya patients, demonstrated in autopsies, is intracerebral hematoma. The classic presentation of this disease is multiple attacks of weakness, paralysis or seizures. Less common manifestations include visual disturbances, altered consciousness and abnormal speech.

It is unclear what factors predispose to this condition. One theory postulated that there is a genetic susceptibility that results from mutations in chromosome 17. As in our case, some reports have linked the disease to chronic cocaine abuse; cocaine induces spasm of the cerebral vessels which, over time, leads to the formation of irregular collateral networks that characterize Moyamoya. In addition, prolonged cocaine use may cause endothelial injury, exposing damaged vessels to enhanced platelet activity with subsequent acute thrombosis.

While milder cases of Moyamoya may be treated conservatively, patients who experience severe symptoms may need surgical correction. There are three types of surgical procedures utilized in treating this condition: indirect, direct and combined bypass. In the indirect procedure, healthy, new vasculature from adjacent tissue are redirected to ischemic zones. The direct procedure involves the creation of a middle cerebral artery-superficial temporal artery bypass. If chronic ischemia persists after either procedure, a combination of these interventions may be attempted.

CONCLUSION: This case highlights one of the less common complications of cocaine abuse. It also emphasizes the importance of considering Moyamoya Disease in young patients who have recurrent strokes. Moreover, it demonstrates the diagnostic value of cerebral angiography in Moyamoya disease, revealing the stenotic vessels and new collaterals that characterize this condition. As technology progresses and imaging modalities become more sensitive, more patients might be diagnosed with this disease.

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- Bonduel et al., *Prothrombotic disorders in children with moyamoya syndrome*, Stroke 2001, 32:1786-92
- Kurijayma et al., *Prevalence and clinicoepidemiological features of moyamoya disease in Japan: findings from a nationwide epidemiological survey*, Stroke 2008, 39:42-47
- Yamauchi et al., *Linkage of familial moyamoya disease (spontaneous occlusion of the circle of Willis) to chromosome 17q25*, Stroke 2000, 31:930-935
- Burke, GM et al., *Moyamoya disease: a summary*, NY Medical College, Valhalla, NY, USA, Neurosurg Focus 2009 Apr; 26(4): E 11 <http://thejns.org/doi/full/10.3171/2009.1.FOCUS08310>

FROM THE JOURNALS

Jaya Buddineni MD

The following articles should be of interest to hospitalists:

Decrease in Long-term Survival for Hospitalized Patients with Community-acquired Pneumonia

Chest, August 2010, 138:279-283 doi:10.1378/chest.09-2702

Does this Patient have Delirium? Value of Bedside Instruments

JAMA 2010; 304(7):779-786 doi:10.1001/jama.2010.1182

Redefining the "Planning" in Advance Care Planning: Preparing for End-of-Life Decision Making

Annals Intern Med, August 17, 2010; 153:256-261

Relationship between quality improvement processes and clinical performance

Damberg, CL et al., Am J Manag Care, 2010 Aug; 16(8):601-606

Liability Claims and Costs before and after implementation of a Medical Error Disclosure Program

Kachalia, A et al., Annals Intern Med, August 17, 2010; 153:213-221

HOSPITAL MEDICINE VIRTUAL JOURNAL CLUB

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

Abstracts & full text links from recent journals of interest to Hospitalists

<http://beckerinfo.net/JClub>

ID CORNER

William Salzer MD

A H1N1 2009 FLU PANDEMIC

A nice review of last year's flu pandemic; this year's seasonal flu will probably be a descendent of that strain.

WHO Clinical aspects of Pandemic 2009 influenza A (H1N1) infection, NEJM 2010; 362:1708-1719

<http://www.nejm.org/doi/pdf/10.1056/NEJMra1000449>

**MISSOURI
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MISSOURI HOSPITALIST CALENDAR



12th Annual Critical Care Update, Saturday, September 11, Drury Hotel, Chesterfield, MO; Washington University Medical Center; register online at: <http://cme-online.wustl.edu> **LOCAL**

Missouri Chapter ACP Scientific Meeting, Updates in Internal Medicine, Tan Tar A Resort, Osage Beach, September 23-26; Hospitalist Luncheon at 12:15, September 25; contact Patrick Mills 573-636-3366, pmills@msma.org **LOCAL**

Update on Current Management of Aortic Valve Disease, Saturday, October 2, Ritz-Carlton, St. Louis; Washington University Medical Center; register online at: <http://cme-online.wustl.edu> **LOCAL**

Redefining Death in the 21st Century, 6th Annual Health Ethics Conference, University of Missouri Center for Health Ethics, October 7-9, 2010, The Reynolds Alumni Center & Holiday Inn Select Executive Center, Columbia; registration form at som.missouri.edu/CME or call 573-882-5661 **LOCAL**

Annual Update in Cardiovascular Diseases, October 9, Chase Park Plaza, St. Louis, MO Chapter of ACC; register via <http://cme.wustl.edu> **LOCAL**

Brain Attack! 2010, Comprehensive Stroke Care Door-to-Door, Saturday, October 9, Eric P. Newman Education Center, Washington University Medical Center, St. Louis, register at <http://cme-online.wustl.edu> **LOCAL**

Please direct all comments, ideas and newsletter contributions to the Editor:

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Please forward this newsletter to Hospitalists that you might know!