Clinical Diagnostic Reasoning

TO THE EDITOR: Bowen's review of educational strategies that can be used to promote clinical diagnostic reasoning (Nov. 23 issue)[1] does not sufficiently emphasize the concept of premature closure. Acceptance of a diagnosis before sufficient verification has occurred and failure to consider plausible alternatives once a diagnosis has been reached[2,3] are common causes of diagnostic error and can occur at any level of training.[3,4] One possible effect of anchoring — the inability to assimilate subsequent or evolving data — is a particularly important contributing factor in premature closure and may lead to faulty synthesis of information.[5] The risk of premature closure may be greatest when learners are pressed for time or expected to have a level of expertise they have not yet attained. Premature closure may be just as likely to result from an "unlucky" adherence to an illness script as from gaps in knowledge. Clinical educators should encourage learners to continuously integrate new information into the decision-making process.

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TO THE EDITOR: We agree with Bowen that clinical educators need to understand and analyze the varied diagnostic reasoning strategies applied by novices such as medical students to help them improve their performance. However, the diagnostic reasoning schema in Figure 1 of the article appears to oversimplify this process. Because of minimal clinical experience, the novice generally has poorly formed illness scripts and will often generate hypotheses using a pathophysiological, probabilistic, or rule-based representation of the problem (skills acquired during problem- or case-based learning).[1,2] Such hypotheses are often more numerous, broader, and less accurate than those of experts and must be refined by the novice during the interview with the patient and during the physical examination, while the novice looks for the specific symptoms, risk factors, and signs that allow for iterative reweighting of the clinical diagnostic possibilities. We believe that acknowledgment of alternative bases for hypothesis generation and of the iterative nature of hypothesis refinement will further assist educators in improving students' diagnostic reasoning strategies.

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TO THE EDITOR: We use the technique outlined by Bowen in our own teaching. However, Bowen does not address the possibility of an incorrect diagnosis obtained through valid diagnostic reasoning. The clinical teacher should allow for this possibility as part of the case presentation. Correcting an incorrect diagnosis is a critical skill that requires the identification of alternative steps in the development of a representation of the problem and reevaluation of the differential diagnosis to include other conditions that may have features similar to those of the case under consideration. Thus, Figure 1 of the article should have included a final step in which diagnostic reasoning leads to either a correct or an incorrect diagnosis. When a diagnosis is incorrect, the reasoning process expands to include the pertinent data for the missed diagnosis, leading the learner to improve the problem representation or illness script.

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TO THE EDITOR: Bowen's article excludes consideration of the fact that the diagnostic thought process depends on the situation. In some situations (e.g., a medical emergency or a one-time consultation), it is more parsimonious to use a reverse paradigm: identify and rule out (and treat) the most urgent or life- or health-threatening possibilities, and carry this approach through multiple iterations over time. In other words, instead of initially seeking the "right" diagnosis through an elaborate diagnostic process, one seeks to avoid the "wrong" one.

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TO THE EDITOR: Bowen addresses the challenge of how educators can facilitate learning as their trainees acquire diagnostic reasoning skills. The primacy of information-gathering skills was recently illustrated when our diabetes consulting service was asked to see an elderly man with a long history of diabetes mellitus. The clinical information obtained was that despite twice-daily administration of premixed insulin, the capillary glucose readings performed at home were often in the range of 20 mmol per liter. At the bedside, I asked the patient how much insulin he took in the morning. His response was most instructive: "I give myself 40 units when my sugar reading is high." My next question was what he did when his sugar reading was not high. He replied that he skipped his dose, thereby revealing the source of the problem. My trainee learned that determining that something does not occur is as important as determining that it does occur.

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TO THE EDITOR: Bowen describes the analytic portion of diagnostic reasoning primarily as a discrete step occurring between the acquisition of data and the determination of the most probable diagnosis. In our experience, diagnostic reasoning is almost invariably a dynamic, iterative process. The probabilities of several competing diagnoses are assessed and then concurrently refined and amended on the basis of further inquiry.

Clinical diagnostic reasoning should be considered a tool to maximize the quality of care in a cost-effective manner. The most probable diagnosis is frequently not the most important diagnostic consideration in achieving this goal. Although gout was the most probable diagnosis in the case presented in Bowen's article, the expert resident might have been well advised to address the less likely but more worrisome possibility of septic arthritis by further examining the history of episodes.

Bowen's endorsement of cognitive tools such as illness scripts and anchoring prototypes warrants qualification. These are certainly essential assets in the diagnostician's armamentarium. However, they can also easily lead to fallacious reasoning, occasionally with disastrous consequences.[1,2]

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THE AUTHOR REPLIES: I agree with Grossman and Rodríguez that diagnostic reasoning is "a dynamic" process. However, illness scripts, anchoring prototypes, and pattern recognition are descriptions of mental processes, not diagnostic tools, as these authors suggest. McColl and Groves note that novices may tend to use a pathophysiological strategy for reasoning more often than they use pattern recognition. Neither strategy is likely to be used entirely in isolation. Both are conceptual models for the reasoning process. Similarly, Echols and colleagues note that coming to the wrong conclusion is the last stage of diagnosis, suggesting a change in Figure 1 of our article. The figure is not meant to represent an external view of a teacher observing a learner make a correct or incorrect diagnosis. Rather, it is one of many possible schematics for the steps clinicians are likely to take in their minds during the reasoning process.

Clinicians miss diagnoses for many reasons,[1] premature closure among them, as Levy and colleagues point out. Clinical teachers must recognize that learners may come to premature closure and must probe learners' thinking and interview and examine patients directly when there is sufficient doubt about the accuracy of a diagnosis. All clinicians are at risk for premature closure,[2] whether or not they are trainees, when experience with the clinical problem at hand is lacking or when the clinician is pressed for time. With increasing age and experience, physicians are more, not less, likely to go with their first hypothesis.[3] This increasing reliance on early data does not necessarily result in poorer diagnosis.[4] For complex, ill-defined clinical problems, new diagnostic considerations can be triggered at any point, and new questioning strategies emerge as a result. Once the clinician is satisfied, a diagnosis is rendered with more or less certainty about the conclusion. If the clinician is not satisfied, the reasoning process continues.

Diagnostic reasoning depends on the context. The context includes "the situation," as Marsh describes. Clinical teachers also teach weighting of the diagnostic possibilities, "ruling out" must-not-miss diagnoses while continuing to search for the correct diagnosis. The situation can also influence which diagnoses learners consider. For example, learners who can readily recognize community-acquired pneumonia in hospitalized patients may not recognize the same presentation in the outpatient clinic until the teacher points it out.

Sorisky reminds us of the importance of role modeling. From experience, we build in memory repositories of questioning strategies that work particularly well and those that fail us. Sorisky's learner might benefit from a deliberate discussion about interviewing strategies. One cannot assume that the clinical teacher's "aha" is the same as the learner's.

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Acromegaly

TO THE EDITOR: In Melmed's otherwise excellent review of acromegaly (Dec. 14 issue),[1] the clinical myth that headache is due to a local tumor effect is perpetuated in Table 1. It has been established in a prospective study that the size of a pituitary tumor does not determine the headache presentation.[2] Moreover, the phenotype of headache presentations is wide, including migraine and the trigeminal autonomic cephalalgias, particularly cluster headache.[3] An important clinical lesson in this context is the overrepresentation of cluster-headache–like presentations in patients with acromegaly and thus the higher yield in searching for pituitary-tumor–related disease when one sees atypical headache presentations.

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TO THE EDITOR: Melmed does not emphasize the unique and highly characteristic visual abnormalities in patients with acromegaly. Nearly 20% of patients with this condition have some sort of visual-field abnormality.[1] Most of these defects occur because of compression of the optic chiasm by the enlarged pituitary.[2] Bilateral visual defects are more common than unilateral defects, with bitemporal hemianopsia and superior bitemporal quadranopsia being the most commonly detected defects.[3] Other, less common defects include unilateral temporal hemianopsia, superotemporal quadranopsia, and inferotemporal quadranopsia. The earliest visual-field defect is usually in the superior temporal quadrant. In general, patients with visual-field defects tend to have higher levels of growth hormone and are usually younger than patients without such defects.[4] Also, larger