Received: 7.11.2010 **Accepted: 30.2.2010**

Educational Article

Evidence-based history taking under "time constraint"

Alireza Moayyeri[a], Akbar Soltani[b], Hamideh Moosapour[b], Mohsin Raza[c]*

Abstract

Physicians all through the world visit patients under time limitations. The most important troubled clinical skill under "time constraint" is the diagnostic approach. In this situation, clinicians need some diagnostic approaches to reduce both diagnostic time and errors. It seems that highly experienced physicians utilize some special tactics in this regard. Evidence-based medicine (EBM) as a relatively new paradigm for clinical practice stresses on using research evidences in diagnostic evaluations. The authors aimed to evaluate experts' strategies and assess what EBM can add to these tactics. They reviewed diagnostic strategies of some veteran internists in their busy outpatient clinics and proposed an evidence-based diagnostic model engaging clinical experience and research evidence. It appears that every clinician utilizes a set of "key pointer" questions for decision-making. In addition to use of evidence-based resources for making differential diagnosis and estimating utility of various diseases, clinicians should use "key pointers" with significant likelihood ratios and from independent systems to reduce time and errors of history taking. Clinical trainees can improve their practice by constructing their own set of pointers from valid research evidences. Using this diagnostic model, EBM can help physicians to struggle against their "time constraint".

KEYWORDS: Clinical Competence, Diagnosis, Evidence-Based Medicine, Outpatient Clinics, Hospital, Time Management.

JRMS 2011; 16(4): 559-564

Physicians throughout the world consult with patients under time limitations.[1,2] Alongside with several consequences for both patients and physicians (such as decreased satisfaction and increased risk of errors),[2-4] clinical diagnosis and history taking under "time constraints" could be strongly flawed.[3] Can Evidence-Based Medicine (EBM) help physicians in this regard?

Clinical Scenario

At your clinic, a moderately obese 25-years-old lady complains of about ten kilograms weight gain during the last six months. Patient narrative indicates that she has positive family history of obesity, a relatively sedentary lifestyle, and moderate and stable socioeconomic status. She has no history of recent drug use or surgery. Even with the high probability of genetic or environmental origin of obesity in this patient, you decide to rule out depression, hypothyroidism, and Cushing syndrome in this patient. Using an evidence-based approach, how can you make the diagnosis with the least possible time, cost and probability of error?

Outpatient Diagnostic Approaches

Decision-making processes can be defined as forward reasoning based on opinion revision with imperfect information obtained from the clinical evidences.[5] Several cognitive models have been developed to explain the strategies that clinicians use to reduce the time required for diagnosis in their busy clinics, while minimizing associated errors.[6-8]

However, the tools that clinicians use to reach a diagnosis (such as estimation of pretest probability, power of clinical tests, and diag-

[a] Department of Public Health and Primary Care, University of Cambridge, Cambridge, United Kingdom.
[b] Evidence Based Medicine and Critical Thinking Working Team, Endocrinology and Metabolism Research Center, Tehran University of Medical Sciences, Tehran, Iran.
[c] Applied Neuroscience Research Center, Baqiyatallah Medical Sciences University, Tehran, Iran.
* Corresponding Author
E-mail: dr_moosapour@yahoo.com

nostic thresholds) are prone to bias. Some principles of EBM may help physicians confronting these shortcomings. A variety of cognitive errors that accompany the clinical experiences are now well established,[9] which diagnosticians should recognize and correct with various debiasing techniques.[10] An evidence-based diagnostic model (like the one presented in figure 1) that integrates personal skills and research evidences may significantly help physicians to decrease both diagnostic time and errors.

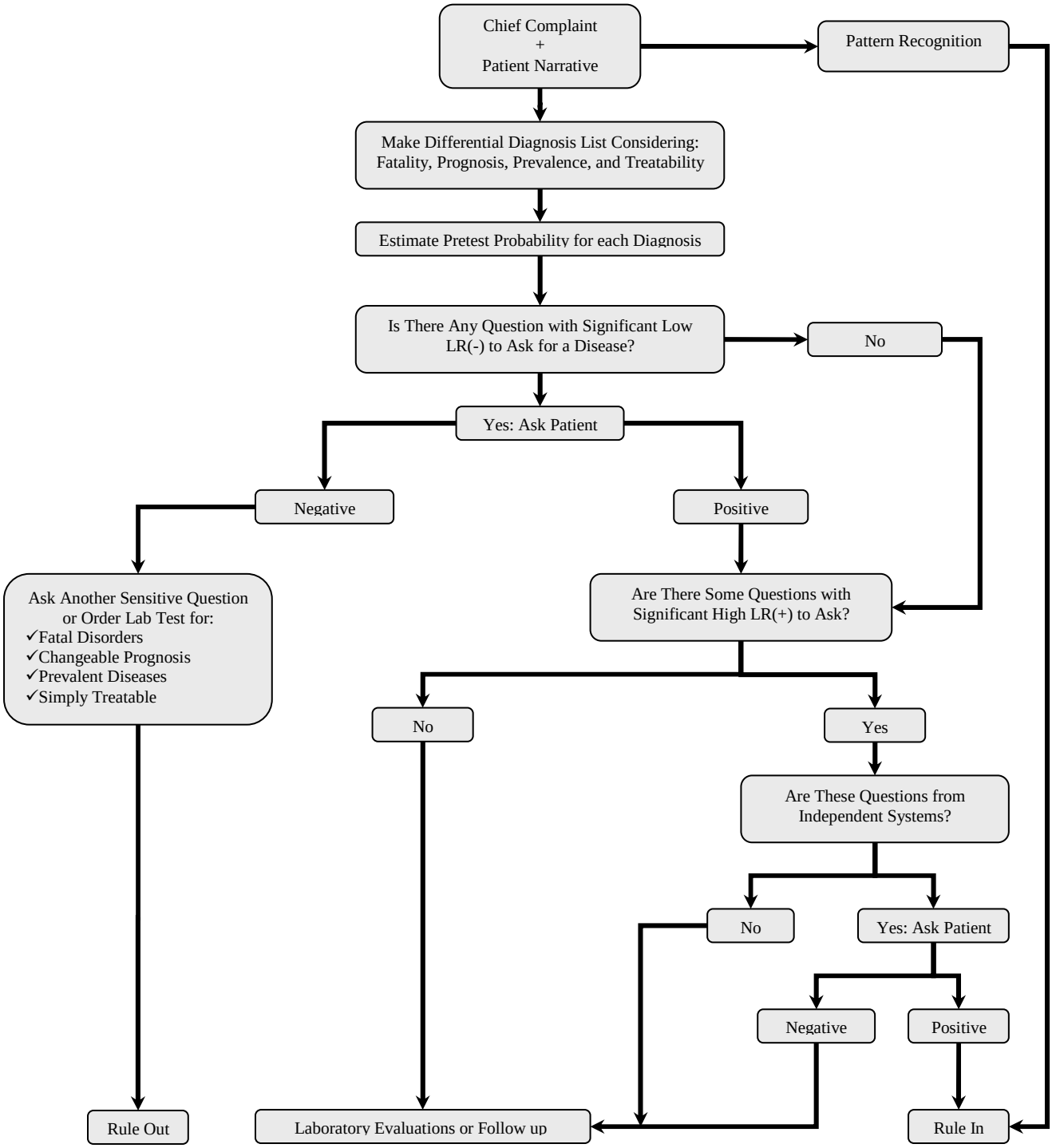

Figure 1. An evidence-based diagnostic model that integrates personal skills and research evidences

Evidence-Based Diagnostic Model

Three different outcomes (Figure 1) could be expected for each diagnosis in the process of history taking: rule in, rule out, and unconfirmed (leading to laboratory evaluation or just follow up). After construction of the differential diagnosis list, clinicians first plan to rule out some of them. This is partly because of the more complex process of rule in (showed as more complexity in the right side of figure 1). However, experienced clinicians also search for specific clues in the patient's history to match the clinical picture of the ailment with a known disease.[11,12] This "pattern recognition" is based on matching the case to a specific instance or to a more abstract prototype.[5] For instance, if the obese patient of our scenario has a surgical scar on her skull or reports a craniotomy, an experienced clinician will directly ask her about her pituitary tumour.

Making a differential diagnosis list is a complex process based on clinicians' knowledge, experience, and familiarity with the clinical presentation. However, several factors such as fatality, prognosis, prevalence, and treatability of diseases are important in prioritizing this list.[6] While a typical physician would become fluent with these factors after several years of experience, EBM can underscore them clearly and helps less experienced physicians with a particular presenting problem to quantify the utility of various diseases and making an unbiased list.[13]

Using Bayesian thinking, the two major classes of diagnostic errors arise from the misestimation of pretest probability and strength of evidence of different clinical features. In the first case, EBM reminds physicians' of the common errors in the estimation of pretest probability (such as rarity, recency, and ascertainment biases) [9,14] and the need for re-estimation of this measure in each clinical setting, employing its unique characteristics.[15]

In testing a hypothesis, clinicians use some "key pointer" questions to improve their estimate of probability of a disease in a patient (such as asking about easy bruising for Cushing syndrome). These questions essentially should be strong clinical evidences (speaking in EBM language, tests with strong positive and/or negative likelihood ratios) [16] and should have great impact on pretest probability of diseases. Likelihood ratios (LRs) are the preferred means to present the quantitative strength of clinical tests, and evidence-based teachers have highlighted their values.[14,16] These dynamic figures, when obtained from valid research findings, can be used straightforwardly for a sequence of clinical and paraclinical tests and guide physicians through the diagnostic pathway.

Each clinician (even the most unskilled and beginner one) has his/her own set of "key pointers" and utilizes them in decision-making. These "key pointers" are usually refined via the process of trial and error during long years of clinical practice.[12] Several medical curricula have been developed (such as the one at the University of Calgary) emphasizing these pointers from expert-based resources.[17,18] However, the major concern is the accuracy and quality of these "key pointers". For instance, irregularity of menses that many seasoned clinicians use as a symptom of hypothyroidism is shown to have a positive LR of 1, that is no diagnostic power at all.[19] Collecting the value of these pointers from evidence-based sources and describing them in terms of LR would induce a great improvement in decreasing the diagnostic errors.

Another imperative point, put forth by EBM and illustrated in figure 1, is the concept of independence of the tests for reaching a diagnosis in a multi-organ disease.[14,16] "Independence" of two tests (or signs or symptoms) means that among people who have the disease, knowing the result of the first test tells us nothing about the probability of different results of the second test, and that the same is true among people who do not have the disease. However, this assumption may be unreasonable when the tests measure the same biological phenomenon.[6,16] In systemic diseases (typical of internal medicine), signs and symptoms from a particular system are very likely to be dependent.

For instance, suppose that you found a recent article about clinical diagnosis of hypothyroidism, indicating that changes in the speed of thinking, difficulty of mathematics, memory access, and tiredness during the previous year have LRs equal to 2.5, 5.4, 2.6, and 2.1, respectively.[19] Given a patient with all these symptoms, can you multiply your initial estimation of odds of hypothyroidism by 73.7 (simple multiplication of all above LRs)? Certainly not. These are all neurological symptoms that seem highly "dependent" and the magnitude of the presence of all may differ very little from the presence of each alone (the number should be adjusted). In contrast, by asking equal number or even less questions, each of them from one unrelated system (such as dryness of hair, deep voice, constipation, and sleepiness), you can notably increase your certainty in arriving at the most probable diagnosis. Especially for the novice, many of the "key pointers" are dependent and could be safely omitted from history taking process under "time constraint". There are several statistical methods that give reliable clinical predictions rules which account for such dependencies and provide an efficient set of diagnostic questions.

Resolution of The Scenario

Unlike ruling in depression in this patient which needs comprehensive evaluation, you can rule out depression by negative answers to just two questions ("key pointers") with negative LR of about 0.04.[20] To rule in hypothyroidism, as described earlier, you will ask some questions from independent systems. To rule out hypothyroidism, however, you cannot rely only on clinical signs and symptoms (in contrast to positive LRs, negative ones are all insignificant).[19] In this case (no "key pointer"), an appropriate laboratory test (serum TSH) can clearly help you to decide about the presence or absence of the disease.

Pretest probability of Cushing syndrome is far behind the diagnostic threshold; however, presence of symptoms with large positive LRs (such as easy bruising and striae as "key pointers") can change the position of the estimate across the threshold.[21] Given absence of these symptoms, and to rule out Cushing syndrome more confidently, you have no clinical sign or symptom at hand. Likewise, laboratory tests (such as dexamethasone suppression test) have high probability of false positive in obese people.[21,22] Moreover, in this symptom-less patient, the prognosis of the disease does not alter significantly with three months of lack of treatment. So you can safely follow up this patient for a while to see if any specific sign of Cushing syndrome appears or not. Hence, in the busy clinic, we can reduce the diagnostic rule out process to 2 questions about depression, a single blood test (TSH), and an arranged follow-up time, and then focus on the likely non-pathological causes of her weight gain.

Application

We have tried to summarize a general mental stream followed by experienced clinicians when encountering clinical problems. Merging the principles of evidence-based diagnosis to this course, one can be more confident in making most probable diagnosis in the least possible time.

Omission of unnecessary "dependant" questions and utilizing "key pointers" with significant LRs can significantly help physicians to reduce the time and error of history taking. Many experts intuitively employ the first concept and ask a set of questions from independent organs when approaching systemic diseases. Novices, however, seem to be less familiar with this concept. Concerning the quality of "key pointers", clinical trainees can improve their practice by searching evidence-based literature and extracting their own set of pointers from valid research evidences. Although this may seem too lengthy at the first look, utilization of the returns of this approach can significantly decrease the time of history taking in the future.

Extracting and teaching "key pointers" from expert-based resources have shown promising results in one medical curriculum [18]; however, "key pointers" from critically appraised re-

search evidences rather than pure personal experiences would be more reliable.[8,9] The number of different clinical presentations have been estimated to be around 120.[17] Given this, a comprehensive list of "key pointers" for this set of clinical presentations could be derived systematically. With this approach, EBM can significantly aid physicians at busy clinics in their struggle against "time constraint".

Acknowledgements
We would like to thank Paul Glasziou (Center for Evidence Based Medicine, Oxford) for helpful comments on several drafts of this paper.

Conflict of Interests
Authors have no conflict of interests.

Authors' Contributions
AM carried out the design and prepared the manuscript. AS proposed the hypothesis, provided assistance in the design of the study, and participated in manuscript preparation. HM participated in manuscript preparation. MR had substantial contributions to concept and design, and provided assistance for manuscript preparation. All authors have revised the manuscript critically for important intellectual content and have read and approved its content.

References
1. Bensing JM, Roter DL, Hulsman RL. Communication patterns of primary care physicians in the United States and the Netherlands. J Gen Intern Med 2003; 18(5): 335-42.
2. Dugdale DC, Epstein R, Pantilat SZ. Time and the patient-physician relationship. J Gen Intern Med 1999; 14(Suppl 1): S34-40.
3. Davidoff F. Time. Ann Intern Med 1997; 127(6): 483-5.
4. Gross DA, Zyzanski SJ, Borawski EA, Cebul RD, Stange KC. Patient satisfaction with time spent with their physician. J Fam Pract 1998; 47(2): 133-7.
5. Elstein AS, Schwarz A. Clinical problem solving and diagnostic decision making: selective review of the cognitive literature. BMJ 2002; 324(7339): 729-32.
6. Sackett DL, Haynes RB, Tugwell P, Guyatt GH. Clinical epidemiology: a basic science for clinical medicine. 2nd edition. Philadelphia: Lippincott Williams & Wilkins; 1991.
7. Norman GR. The epistemology of clinical reasoning: perspectives from philosophy, psychology, and neuroscience. Acad Med 2000; 75(10 Suppl): S127-35.
8. Elstein AS. Clinical problem solving and decision psychology: comment on "the epistemology of clinical reasoning". Acad Med 2000; 75(10 Suppl): S134-6.
9. Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. Acad Med 2003; 78(8): 775-80.
10. Bornstein BH, Emler AC. Rationality in medical decision making: a review of the literature on doctors' decision-making biases. J Eval Clin Pract 2001; 7(2): 97-107.
11. Norman GR, Coblentz CL, Brooks LR, Babcook CJ. Expertise in visual diagnosis: a review of the literature. Acad Med 1992; 67(10 Suppl): S78-83.
12. Coderre S, Mandin H, Harasym PH, Fick GH. Diagnostic reasoning strategies and diagnostic success. Med Educ 2003; 37(8): 695-703.
13. Richardson WS, Wilson MC, Guyatt GH, Cook DJ, Nishikawa J. Users' guides to the medical literature: XV. How to use an article about disease probability for differential diagnosis. Evidence-Based Medicine Working Group. JAMA 1999; 281(13): 1214-9.
14. Friedland DJ. Evidence-based medicine: a framework for clinical practice. 1st ed. Boston: McGraw-Hill Medical; 1998.
15. Richardson WS, Polashenski WA, Robbins BW. Could our pretest probabilities become evidence based? A prospective survey of hospital practice. J Gen Intern Med 2003; 18(3): 203-8.
16. Sackett DL, Straus SE, Richardson WS, Rosenberg W, Haynes RB. Evidence-based medicine: how to practice and teach EBM. 2nd ed. Edinburgh: Churchill Livingstone; 2000.

17. Mandin H, Harasym P, Eagle C, Watanabe M. Developing a "clinical presentation" curriculum at the University of Calgary. Acad Med 1995; 70(3): 186-93.
18. Woloschuk W, Harasym P, Mandin H, Jones A. Use of scheme-based problem solving: an evaluation of the implementation and utilization of schemes in a clinical presentation curriculum. Med Educ 2000; 34(6): 437-42.
19. Canaris GJ, Steiner JF, Ridgway EC. Do traditional symptoms of hypothyroidism correlate with biochemical disease? J Gen Intern Med 1997; 12(9): 544-50.
20. Arroll B, Khin N, Kerse N. Screening for depression in primary care with two verbally asked questions: cross sectional study. BMJ 2003; 327(7424): 1144-6.
21. Arnaldi G, Angeli A, Atkinson AB, Bertagna X, Cavagnini F, Chrousos GP, et al. Diagnosis and complications of Cushing's syndrome: a consensus statement. J Clin Endocrinol Metab 2003; 88(12); 5593-602.
22. Findling JW, Raff H. Diagnosis and differential diagnosis of Cushing's syndrome. Endocrinol Metab Clin North Am 2001; 30(3): 729-47.