

A Practical Test of Diagnostic Reasoning Skills

The argument is perennial. Students need to learn how to think and not just memorize and spit back facts. Simple recall of factual, crystalline information tests nothing more than the students' ability to store and retrieve data. Unfortunately, students rarely learn how to think when fact acquisition plays a significant role during testing. Clearly, it is difficult to encourage students to think when they're tested with the reward system, i.e., grades, largely revolving around fact recall.

I teach neuromusculoskeletal diagnosis and place a premium on the reasoning skills which are pivotal to the diagnostic process. I use factual diagnostic information as a means to practice diagnostic thinking. My classes are less of a didactic lecture and more of a soliloquy where I "think out loud" while I think through the diagnostic process. Anyone can read about diagnostic tests and diagnoses, but few are the neophytes who can think through the process. My classroom is the think tank, the thought laboratory where we experiment with the relationships between diagnostic entities and diagnostic tests.

Given this scenario it would behoove me to challenge my students to think on a practical examination. I would need to assess their ability to use their facts in a meaningful and "thoughtful" way. Many instructors, however, test practical skills on a basic recall level. I've been tested this way myself and I've seen many instructors test this way.

For example, the student walks into the practical exam and is confronted with 50 index cards. On each index card is an orthopedic test. The cards are arranged face down and the student picks a card randomly and is asked to perform the test. Here the student is simply being asked to recall a "motor program." This would be like drawing a card that asked me to "tie my shoe." I'd be assessed on my ability to "go through the motions" without being asked to reason my way through a useful problem.

If I wanted to assess someone's ability to tie a shoe and assess their reasoning processes behind the recall of the skill, I might give them a problem to solve. They could demonstrate the skill (recall) and adapt the skill in an attempt to solve the problem (thinking). In the case of assessing "shoe tying" I could say your patient has pain over the instep, demonstrate how you would tie this patient's shoe so that it would give support to the foot while not exacerbating the instep pain. Now that's quite different than simply recalling a mindless motor program.

I attempt to assess my student's ability to think through neuromusculoskeletal testing and diagnosis on my practical exams. I do this by giving them a differential pair which they must distinguish using neuromusculoskeletal tests and maneuvers. Here's an example of my mid-term practical. I write 12 differential pairs, i.e., 12 pairings of similar diagnoses numbered consecutively. On the day of the practical, the student rolls a 12-sided dice to determine on which differential pair they will be assessed. The differential pairs for this mid-term are:

1. lateral axillary hiatus syndrome versus C5 nerve root entrapment;
2. proximal biceps brachii tendinitis (long head) versus anterior deltoid strain;

3. supraspinatus strain versus middle deltoid trigger point;
4. pectoralis minor syndrome versus costoclavicular syndrome;
5. scaleneus anticus syndrome versus anterior scalene trigger points;
6. superior sulcus carcinoma versus costoclavicular syndrome;
7. cubital tunnel syndrome versus flexor carpi ulnaris muscle trigger point;
8. supinator syndrome versus radial head subluxation;
9. traumatic olecranon bursitis versus supracondylar fracture;
10. ulnaris neuropathy (tunnel of Guyon) versus cubital tunnel syndrome;
11. carpal tunnel syndrome versus pronator teres syndrome;
12. cheiralgia paresthetica versus extensor carpi radialis longus trigger point.

Every student is given this list of pairings a week in advance of the practical assessment. It's great to watch as the students collect information and debate over the "best" set of tests and procedures to clinically differentiate one diagnostic entity from the other. In preparing for the assessment the students are unknowingly using diagnostic facts and maneuvers to think diagnostically. They are supporting and defending their diagnostic "arguments" with factual diagnostic information. They are becoming diagnosticians.

During the practical assessment, students are asked to give features which would distinguish these differentials one from the other. For instance, a distinguishing historical feature differentiating lateral axillary hiatus syndrome (LAHS) from C5 nerve root entrapment (NRE) would be a history of shoulder and neck pain with C5 NRE while LAHS would exhibit only shoulder pain. This is reasonable since LAHS is an entrapment of the axillary nerve in the quadrangular space, thus limiting its involvement to the lateral shoulder structures. C5 NRE, on the other hand, involves both the neck and the shoulder, which is subserved by the C5 nerve root.

Distinguishing orthopedic features are then pursued. Given differential pair #1, the distinguishing orthopedic features might include Spurling's test being "positive" with C5 NRE reproducing or exacerbating both the neck and shoulder pain. The same maneuver would not provoke pain in a patient suffering with LAHS. The student is constantly asked to justify their choice of maneuver(s) and to describe the pertinent biomechanical anatomy. At this point the student is asked to demonstrate either the test they described, or a test of the examiner's choice which is related to

the differential pair.

Distinguishing neurological features are investigated next. C5 NRE can be distinguished from LAHS by testing the biceps brachii reflex. In the case of C5 NRE the reflex is sharply diminished, whereas with LAHS the reflex is unaffected. Some students might choose to test the muscle strength of the deltoid in abduction. This would be a mistake since the deltoid muscle is subserved by the C5 nerve root though the axillary nerve. The clinician would expect there to be weakness in active and resisted deltoid abduction with both of these differentials, therefore making this test of differentiation inappropriate in this instance. The student is again asked to justify their choice of maneuver(s) and to describe the pertinent biomechanical and anatomical relationships. At this point the student is asked to demonstrate either the test they described or a test of the examiner's choice which is related to the differential pair.

Distinguishing palpatory features is the final area tested. C5 NRE can be distinguished from LAHS by noting heightened pain and tenderness in key regions. LAHS would be particularly tender over the posterior shoulder in the confluence between the arm and the scapula, roughly the quadrangular space. No tenderness or exacerbation of LAHS pain would be elicited by palpation of the C5 vertebra and its contiguous motion units. The student is held accountable and asked to justify their choice of maneuver(s) and to describe the pertinent biomechanical anatomy. Predictably, the student is asked to demonstrate either the test they described or a test of the examiner's choice which is related to the differential pair.

This entire process takes 2-5 minutes for each student. It also requires the examiner to understand his subject matter very well and to be comfortable with the reality that there is more than one way to solve any diagnostic problem. I ask my students to quickly and accurately argue their point while I rapidly fire questions that are directly related to their line of reasoning. There is no time for daydreaming on the examiner's part. You must be what you ask your students to be; conscious and present in each moment, attentive and observant to those around you.

This method of teaching and testing places a greater emphasis on thinking through the diagnostic process. In addition, it respects the fact that each student will see, arrange and think through the diagnostic process differently. It is hoped that freedom to think as an individual will still enable the student to arrive at a logical and defensible conclusion. In fact, given some reflection on the differentials and the vast number of provocative tests at the clinician's disposal, it is possible to have several approaches to the differential diagnosis for each differential pairing. This type of testing hinges on analysis of the problem, synthesis of a diagnostic approach and the evaluation of diagnostic results. It is more than simply asking the student to perform, from memory, by rote, an orthopedic test.

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OCTOBER 1996