TEACHING THE NEUROLOGIC EXAMINATION IN THE 21ST CENTURY

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How important is it to teach the examination in an era of sophisticated neurodiagnostics?1-3 The pro-technology, rely on the test(s), argument can be summed up in the neurosurgical aphorism: “One ___________ (fill in the blank with MRI, CT, A/G, PEG, etc, depending on the era) is worth a roomful of neurologists.”

The anti-technology lament is also nothing new:

“There has been within recent years an interesting tendency to rely more and more on laboratory, mechanical and other such methods...at the expense of careful clinical observation.”

Sir Gordon Holmes, in a 1953 foreword to Wartenberg's Diagnostic Tests in Neurology.

The 21st century neurologist often practices “MRI negative neurology” and is asked to see patients when the imaging studies are unrevealing, but a neurologic illness is still suspected, or when neuroimaging reveals unexpected abnormalities. Other arguments supporting continuing to teach the neurologic examination can be brought to bear (see Neuro-Crossfire II, this meeting). Death of the neurological examination was probably predicted during the era of pneumoencephalography; it not only survives it is in robust use. If we conclude that the techniques of the neurologic exam are worth continuing to teach to medical students and residents, how do we go about the task?

WHO TO TEACH

A study was done of the influence of attending behavior on student learning of the neurologic examination during a neurology clerkship (not published). Attendings overseeing students use different styles and approaches to teaching the neurologic examination, some elaborate and others cursory. This study was done to determine whether different styles of teaching the clinical neurological examination affected student performance on an end of rotation practical evaluation of neurological examination technique.

Third year students at the Medical College of Virginia were required to perform a neurological examination on a patient, under the observation of a neurology resident, at the end of the rotation, for a grade. Using a survey, the entire housestaff group, all of whom had rotated with and been supervised by all of the attendings, then rated the attendings, on the basis of their own personal experience, according to their approach to teaching the examination into three groups: those who generally performed at least a focused examination on most patients, frequently demonstrated abnormal exam findings and specifically made it a point to teach exam techniques, those who did only occasional, brief examinations during the rotation and relied heavily on housestaff description of abnormalities, and those who relied almost exclusively on housestaff and student description of exam findings, rarely or never examined a patient in front of the rounding group, rarely or never demonstrated abnormal physical findings, and made no effort to teach the exam.

The entire third year class of 161 students was divided into three groups and an analysis was conducted of students’ practical examination scores according to the examination teaching style of the attending who had supervised their rotation. Neither by analysis of variance nor regression was there any demonstrable relationship between attending attributes vis-a-vis teaching students how to perform a neurological examination and student performance of a neurological examination at the time of subsequent formal competency evaluation. Students taught by attendings who rarely or never demonstrated the neurological examination performed just as well on formal testing as did students supervised by attendings who emphasized the importance of the examination, demonstrated it frequently, observed students performing the exam, and made a deliberate effort to teach exam techniques. There was no statistically significant difference in student's grades on their practical neurological examination evaluation related to their supervising attending's attempts to teach examination skills. The conclusion suggested by this study is that the attending appears not to be a particularly important source of learning about the neurological examination for medical students. Time may be better spent teaching and honing the examination skills of the residents, leaving the teaching of examination technique to the students primarily to
the residents. However, a 2003 study of internal medicine residents found that almost one third spent no time whatsoever at the bedside teaching physical examination to students.4

HOW TO TEACH

Finding time to teach anything has never been easy, and seems to be getting harder. In Time to Heal: American Medical Education from the Turn of the Century to the Era of Managed Care, K. M. Ludmerer describes the current state of medical education and how the time constraints imposed by managed care, rampant medical commercialism and other factors are compromising medical education. He calls for reform of a broken system, but it is not likely changes will be forthcoming in the near future. Performing the juggling act between teaching and patient care has always been difficult to do, but it is not impossible.

Regarding clinical teaching, there are two fundamental approaches to teaching the examination: active and passive. In using a passive approach to teaching, the student is left to learn the examination largely on their own, through trial and error, by reading textbooks, or from other students. This approach is generally not satisfactory and does not lead to very well developed examination skills. Active efforts to teach the examination can be done in at least three ways: by demonstration, by simulation, and by observation of the trainee.

INCORPORATING THE GENERAL PHYSICAL EXAMINATION INTO THE NEUROLOGIC EXAMINATION

Medical students frequently suffer from "neurophobia" and find neurology in general intimidating and the neurologic exam mystifying, arcane, complex, and time-consuming. Most medical students will not become neurologists. Especially for those going into primary care specialties, a frequent refrain is a request to be taught how to incorporate the neurologic examination into the general physical. Some have the idea that the neurologic exam is a separate process from the general physical, and they often omit it for lack of time. Some nonneurologists will actually schedule a separate appointment for a neurologic exam. I encourage students, rather than thinking about how to incorporate the neurological exam into the general physical, to turn this concept on its ear and think about incorporating the general physical into the neurological exam. Any neurological examination, even a cursory one, provides an opportunity to accomplish much of the general exam. An HEENT exam is a natural byproduct of an evaluation of the cranial nerves. After listening for carotid bruits, it requires very little additional effort to palpate the neck for masses and thyromegaly. A good motor and reflex exam, and an evaluation of gait and station provide a great deal of information about the patient's orthopedic condition. It is difficult to miss a bad knee, shoulder or hip during the process. Testing sensation and plantar responses provides an opportunity to coincidentally look at the skin and nails and feel the peripheral pulses. At the end of a good neurological exam, one only has to listen to the heart and lungs and palpate the abdomen to have also done a fairly complete general physical examination.

DEMONSTRATION TEACHING

In demonstration teaching, trainees watch the mentor examine patients. The student may be watching the resident or the attending, or the resident may be watching the attending. A great deal can be taught using this method, particularly if the examiner is able to discuss and explain what he or she is doing and why. Some attending are better than others at giving a running narrative while simultaneously examining and interacting with the patient. Lack of this narrative makes demonstration teaching much less effective. One of my colleagues trained under Dr. E. F. Gonyea, and learned how to do a neurologic examination largely by watching Dr. Gonyea do an extensive examination on patient after patient. Although trainees sometime complain that this technique is boring, they will often later admit a great deal was learned. An effective approach is to rely primarily on demonstration for the first several days to a week (assuming a four-week rotation), making an active effort to teach examination technique, and then for the remainder of the rotation to rely on a combination of simulation and observation.

Demonstration teaching must be done at the bedside. There has been a long-running debate on the pros and cons of bedside teaching. There has been an increasing tendency in recent years to gather in a conference room and "doctor the chart" and a lessening tendency to make bedside teaching rounds. This is influenced by certain externalities is over which we have little control, such as the documentation requirements for reimbursement, the short and hectic nature of an inpatient stay, as well as privacy concerns. However, the primary driver determining the approach taken is attitude and the willingness to expend effort. It is more physically, emotionally and intellectually challenging to make bedside rounds. It is simply easier to sit in a conference room with the trainees and the charts, or the computer (and the doughnuts).5 Much can be lost because of this.
I have certain rules for bedside presentations and teaching, and the students must be told beforehand what the rules of engagement are. First and foremost is that the patient must be involved in the process and interacted with, not made to feel like an object. Euphemisms must be used for any terms that may cause concern for the patient, and certain terms, such as cancer, AIDS, MS and ALS, are forbidden at the bedside. The speaker must pay careful attention to what they are about to say. Lastly, it is impossible to tell what part of the conversation the patient may misconstrue or misinterpret, so it is the duty of the student to visit the patient after rounds to answer any questions and allay any concerns that may have arisen during the bedside visit.

SIMULATION

Another approach is to use simulated patients. Here, the trainee examines a person who is not an actual patient, under the watchful eye of the teacher. A formal simulated patient, the type used in simulation centers, is a lay person trained to give a history of a particular condition, and sometimes to simulate physical exam findings, such as a Babinski sign. In simulation centers, trainees take a history and do an examination on a simulated patient while being observed, usually by remote video, by one or more evaluators. The sophistication of modern simulation centers is impressive. Some of these professional simulated patients are quite skillful, but they are in short supply, and time in simulation centers is difficult to come by.

A more practical approach for most purposes is to do an informal simulation using another member of the ward or clinic team. The best individual to act as the simulated patient, bar none, is the attending (the neurologist as patient). The attending can posit a clinical scenario, such as "I am a 70-year-old right handed man brought by his family to the emergency room because of difficulty talking" and then go on to imitate aphasia and a right hemiparesis. Depending on the level of sophistication of the trainee, the findings could vary from subtle (e.g., conduction aphasia and minimal pronator drift) to gross (e.g., global aphasia and dense hemiplegia). One approach when ward attending is to ensure that there is always a "new patient" on each rounding day, if there is no actual new patient there is a simulated new patient. Through the course of a ward rotation, each member of the rounding team is given the opportunity to serve as the examiner for a simulated patient. There are many clinical conditions that can be simulated in such a fashion. Some findings that lend themselves readily to simulation include hemiparesis, from mild to severe, facial weakness (central or peripheral, unilateral or bilateral), sensory loss in a particular distribution, visual field deficits, an upgoing toe, extinction, neglect, aphasia, other types of focal weakness (ulnar neuropathy, radial nerve palsy, foot drop), symmetrical proximal weakness, and symmetrical distal weakness. It is even possible to simulate a carotid bruit.

Some of the clinical conditions that lend themselves readily to simulation include hemispheric stroke, brainstem stroke, myasthenia gravis, polymyositis, paraparesis, quadripareisis, radiculopathy, plexopathy, focal motor seizures, various tremors and other abnormal movements, alien hand and many others. Eye movement abnormalities can be simulated by moving the hands. The limit is determined by one's imagination and acting ability. The level of complexity can vary to depending upon the sophistication of the trainee. Students might be shown relatively straightforward things such as a left hemisphere stroke or Guillain-Barré syndrome, residents such things as internuclear ophthalmoplegia or polymyositis. Neuromuscular fellows might be challenged with such things as a posterior interosseous neuropathy or and upper trunk brachial plexopathy. With some of these very complex situations it is often challenging for the simulator to accurately portray the findings, but this is part of the fun and one can be confident of the abilities of the trainee who detects errors in the simulation.

Some of the things that are very difficult to simulate include abnormal pupils and abnormal reflexes. It is actually possible to simulate an afferent pupillary defect using a neutral density filter. The following web sites are very useful for simulating eye movement and pupil abnormalities: cit.ucdavis.edu/eyes and www.richmondeye.com/eyemotil.asp. One can change reflexes subtly by taking advantage of the tonic neck reflex, turning the head ipsilaterally to exaggerate a biceps reflex and contralaterally to depress it. Otherwise it is difficult to simulate DTR abnormalities.

A variation of this technique is for one trainee to simulate findings for another trainee, again under observation by an instructor. A trainee who can accurately and convincingly simulate pronator drift has a good understanding of the underlying pathophysiology. This technique assesses both the trainee who is the simulated patient as well as the trainee who is doing the examination, and can be very efficient and productive.
THE MONTY PYTHON MINISTRY OF SILLY WALKS

An excellent method for teaching the different gait disorders is to teach trainees to simulate a particular type of abnormal gait. Examples of abnormal gaits that lend themselves readily to this sort of imitation include: hemiplegic gait, parkinsonian gait, festination, spastic diplegia, cerebellar ataxia, sensory ataxia, foot drop (mild or severe, unilateral or bilateral), Trendelenburg gait and marche a petit pas. Again, the trainee who accurately demonstrates a hemiplegic gait demonstrates a knowledge of such things as the pyramidal distribution of muscle innervation, spasticity and the clinical manifestations of a corticospinal tract lesion. More advanced trainees could be asked to imitate such things as a magnetic gait, waddling gait due to proximal weakness and the prancing gait of Huntington disease. If the teacher has a group of trainees, all imitating a hemiplegic gait, walk toward him or her, it is easy to pick out who has it right and who has it wrong. A good way to use the ordinarily wasted time traveling around the hospital from place to place is to have trainees imitating various abnormal gaits along the way, although it will draw some curious glances.

FUNDUS EXAMINATION SIMULATION

It is difficult to teach fundus examination. Many students, and even some senior housestaff in nonneurologic specialties, such as internal medicine, are nearly incapable of evaluating the fundi. Looking at slides or textbook photographs of abnormal fundi is useful, but does not closely simulate the actual clinical fundoscopic examination. A convincing simulator can be simply constructed using a single slide viewer. A piece of paper is taped over the viewing surface, and a hole punched in the paper about the size of a pupil. Slides of fundi are placed in the viewer and illuminated by the viewer as if one were looking at slides, but the student looks at the slide through the "pupil" using an ophthalmoscope (the light is best left off). This technique works very well with a small group of students, each with their own ophthalmoscope, and several viewers. The instructor places unknown slides into the viewer, and the group tries to make a diagnosis. Conditions that are very well demonstrated using this technique include: varying degrees of papilledema, drusen, and optic atrophy. Any type of fundus abnormality, such as diabetic retinopathy, could be taught with the same technique. Trainees are uniformly enthusiastic about this teaching method. Under simulation conditions, the fundi of the "patient" can be shown with the viewer.

OBSERVATION

A great deal can be learned from watching a trainee conduct an examination on a patient or on a normal control. A consistent finding in studies of clinical teaching has been the lack of direct observation of trainee interactions with patients. Many have observed that clinical skills are no longer actively taught. Few students report having been monitored while interviewing or examining more than 1 or 2 patients during their entire medical school careers, and a surprising number graduate without having been supervised or observed while working up even one patient. Frequent reports of serious skill deficiencies of interns and residents attest to the effect of the abandonment of bedside, hands-on clinical teaching. Much can be learned by watching trainees actually do an examination. In the course of watching many students and residents examine patients, and of being examined in the role of simulated patient, certain common errors and omissions have become apparent. Table 1 lists some frequent errors. It is often surprising and sometimes astounding what errors are made, e.g., stimulation of the sclera rather than the cornea for the corneal reflex, auscultating the carotids over the belly of the sternomastoid.

OTHER TECHNIQUES FOR TEACHING THE EXAMINATION

Other techniques I have found useful include the tag team examination, exam focused rounds, the cold patient exercise, and role reversal.

TAG TEAM NEUROLOGIC EXAMINATION

Since the examination is so complex, one effective technique is to have each student specialize in a given part of the examination for a set period of time, such as a week. During a given week, one student does all the cranial nerve exams, another all the motor exams, another all the reflex, sensory cerebellar and gait exams, and another all the mental status exams. This assumes four students on a ward team for a four-week rotation. The students then rotate the responsibility for different parts of the exam. When evaluating a new patient, the students do a "team" examination, under the observation of the attending (or the resident).
Occasional daily rounds can be tailored to teaching specific, often problematic, aspects of the examination. On a particular day the team makes “ankle jerk rounds,” and each student elicits the ankle jerks on every patient. Given a decent sized inpatient service, in one rounding session the students see a range of ankle jerks from absent to hypoactive to normal to spastic, and have the opportunity to markedly improved their technique in a relatively short period of time. This can be combined with teaching basic neuroscience, asking the students to describe, between patients, the pathways and neurophysiology for the ankle reflex. On another day the team may make “toe rounds,” eliciting the plantar responses on every patient, under the observation of the mentor. Likewise for eye movement rounds, pupil rounds, etc. The focus must remain very narrow for such an exercise, or it becomes too time-consuming.

THE COLD PATIENT EXERCISE

A very useful exercise is to have either the student or the resident perform a 20 to 30 minute evaluation on an unknown patient. An efficient approach is to use new patients admitted to a different student or resident, and, rather than having a formal presentation and examination by the attending, under appropriate circumstances a team member who does not know the patient is asked to the evaluation at the bedside under the observation of the remainder of the team. A period of 20 minutes works fairly well, and simulates “real life” as this is about the length of time one is allowed to evaluate a patient in the emergency-room and in many clinics. The individual assigned to evaluate the patient takes a brief focused history and does a focused examination, then comes up with a differential diagnosis. After the evaluator has completed the task, other team members are asked to critique the exam that was done, particularly noting whether any important aspects were left out. This is a way to keep the other team members engaged, as they learn quickly that this question is coming and begin to pay careful attention. At the end of this exercise, the mentor will probably have a very good idea of what is going on with a particular patient, but can conveniently ask a few questions or perform a few examination maneuvers as needed. Trainees have a “love-hate” attitude toward this 20 minute, cold unknown patient drill. They find it very useful in honing their clinical skills and in learning efficiency, but they naturally dislike being placed in the spotlight. At the end of a rotation, it is a rare trainee not willing to admit they love it more than they hate it.

RESIDENT AS ATTENDING

Another form of cold patient drill is the role reversal exercise, which can be very elucidating. For a particular new patient, the attending has the resident function as the attending; the students present to the resident, and the attending acts as an observer, trying to stay in the background as much as possible. This technique works best with senior, experienced residents. It will not be useful unless the resident has an acceptable level of clinical skill. The resident is responsible for evaluating the patient and teaching the students during a particular new patient encounter. Afterwards, the attending does what is necessary to clarify the situation, then critiques the residents performance.

RESOURCES FOR TEACHING THE EXAMINATION

There are print and electronic resources available to supplement hands on clinical instruction for teaching the exam. There is a wide range of books on the examination (Table 2), ranging from the Four-minute Neurologic Exam (56 pages, $12.95) to DeJong’s The Neurologic examination (6th edition, 2005, 640 pages, $110.00). There are many resources available on the internet (Table 3).

References

2. Flegel KM. Does the physical examination have a future? CMAJ 1999; 161:1117-1118.


<table>
<thead>
<tr>
<th>Examination component</th>
<th>Common errors</th>
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<tbody>
<tr>
<td>Visual fields</td>
<td>Failure to test</td>
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<tr>
<td>Fundi</td>
<td>Failure to test</td>
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<td>Pupil examination</td>
<td>Having the patient fix at near (simultaneous light and near stimulus, will always miss light-near dissociation)</td>
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<td>Extraocular movements</td>
<td>Omission, Using four movements rather than six, checking vertical gaze in primary position rather than eccentric position to each side</td>
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<td>Facial nerve examination</td>
<td>Relying solely on the purse your lips/puff out your cheeks technique (will only detect fairly marked facial weakness, not sensitive to mild or subtle facial weakness, poor screen for CNS disease, never detects a dissociated facial, and fails to examine upper face movements)</td>
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<td>Palatal assessment</td>
<td>Overcalling insignificant palatal deviation</td>
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<td>Tongue</td>
<td>Being duped by insignificant minor deviations or &quot;pseudodeviation&quot; due to facial weakness</td>
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<td>Motor examination</td>
<td>Failure to exert sufficient force to truly test a muscle’s strength, using only a cursory push sufficient to detect only gross weakness</td>
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<td></td>
<td>Failure to understand the MRC scale</td>
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<td>Failure to adjust for examiner/examinee strength mismatch</td>
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<td>Using only grip to test upper extremity strength</td>
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<td>Sensory testing</td>
<td>Failure to adequately instruct the patient</td>
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<td>Failure to perform double simultaneous stimulation</td>
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<td></td>
<td>Failure to check vibratory sensation</td>
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<td>DTRs</td>
<td>Poor hammer, Poor technique in general (too much elbow, too little wrist, no velocity at hammer head, &quot;its racketball, not tennis&quot;); putting the index finger on top of the handle; striking with a decelerating blow (&quot;pecking&quot;); Poor technique for specific reflexes ankle jerks - difficulty both with proper stretch on the tendon, and efficient striking (teacher and trainee switch off holding and hitting); Not using reinforcement with difficult to elicit reflexes</td>
</tr>
<tr>
<td>Plantar responses</td>
<td>Insufficiently firm stimulation, Placement of the stimulus too medially, Moving the stimulus too quickly (&quot;striking a match&quot;)</td>
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<tr>
<td>Cerebellar</td>
<td>Omission</td>
</tr>
<tr>
<td>Gait and station</td>
<td>Omission</td>
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Table 2. Books on the neurologic examination

Books devoted to the neurologic exam

Small paperbacks
  Goldberg, The 4 Minute Neuro Exam
  Fuller, Neuro Exam Made Easy
  Lewis, Field Guide to the Neurologic Exam
  Massey, et al., Diagnostic Tests in Neurology

Medium paperback
  Ross RT, How to Examine the Nervous System
  Nolan, MF (physical therapist). Introduction to the Neurologic Examination
  Alpers, Alper’s and Mancall’s Essentials of the Neurologic Examination
  Harrison, MJG, Neurologic Skills: A Guide to Examination and Management in Neurology
  DeMyer W.E, Technique of the Neurologic Examination: A Programmed Text
  Glick T, Neurologic Skills: Examination and Diagnosis

Small hardback
  Gilman, Clinical Examination of the Nervous System
  Mayo Clinic Staff, Mayo Clinic Examinations in Neurology
  Spillane and Bickerstaff, Bickerstaff’s Neurologic Examination in Clinical Practice

Large hardback
  Campbell, DeJong’s the Neurologic Examination

Physical examination books with neurologic examination sections
  DeGowin RL, et al., DeGowin’s Diagnostic Examination
  Swartz MH, Textbook of Physical Diagnosis

Large textbooks with neurologic examination chapters
  Joynt RJ, Griggs RC, Baker's Clinical Neurology

Small textbooks with neurologic examination chapters
  Gelb DJ, Introduction to Clinical Neurology
  Campbell WW, Pridgeon RM, Practical Primer of Clinical Neurology
Table 3. A selection of useful websites for teaching the neurologic examination.

**Neurological examination**

www.vnh.org/FSManual/07/02GeneralNeurol.html

cim.ucdavis.edu/eyes* (note: no www)

www.richmondeye.com/eyemotil.asp*

www.revoptom.com/handbook/section6.htm

medinfo.ufl.edu/year1/bcs/clist/neuro.html

www.neuroexam.com/

www.conntutorials.com/video.html

missinglink.ucsf.edu/lm/IDS_104_neuro_exam/NeuroExam.html

**Neurology metasites with many links to examination related sites**

www.neuroland.com

www.neuroguide.com

medlib.med.utah.edu/neurologicexam/html/home_exam.html

www.neuropat.dote.hu/neurology.htm


*wonderful interactive areas for learning about abnormal eye movements and pupils
Teaching the neurologic examination in the 21st century

• Whether to teach it
• Who to teach
• How to teach
Whether to teach it

"Is the neurologic examination becoming obsolete?"

Ziegler DK. Neurology 1985;35:559
Two countervailing sentiments

• Pro-technology
• Anti-technology

Pro-technology

Neurosurgical aphorism:
One ___________(MRI, CT, A/G, PEG, etc, depending on the era) is worth a roomful of neurologists.
Anti-technology

“There has been within recent years an interesting tendency to rely more and more on laboratory, mechanical and other such methods...at the expense of careful clinical observation."

Sir Gordon Holmes, 1953

If we conclude that the techniques of the neurologic exam are worth continuing to teach to medical students and residents, how do we go about the task.
Influence of attending behavior on student learning of the neurologic examination during a neurology clerkship

Housestaff divided attendings into 3 groups, rated as teachers of the neurologic exam

Good - made it a point to teach exam techniques

Average – cursory exams, some teaching

Poor - rarely or never examined a patient, rarely or never demonstrated abnormal physical findings, no effort to teach exam.
End of rotation neuro exam assessment

Entire 3rd year class (161 students) divided into 3 groups and analyzed according to examination teaching style of the attending who had supervised their rotation.

Analysis of variance

Linear regression

Conclusion

No demonstrable relationship between attending attributes re teaching examination technique and student performance of examination at end of rotation

Implication

Teach the residents

Encourage the residents to teach the students
However - study of internal medicine residents found that almost one third spent no time whatsoever at the bedside teaching physical examination to students.

Smith MA, et al. Medical students' perceptions of their housestaffs' ability to teach physical examination skills. Acad Med. 2003;78:80.
Finding time to teach

• Never been easy; getting harder
  – *Time to Heal: American Medical Education from the Turn of the Century to the Era of Managed Care*, K. M. Ludmerer
  – describes how time constraints imposed by managed care, rampant medical commercialism and other factors are compromising medical education.
  – reform not likely soon

• Juggling act between teaching and patient care has always been difficult to do, but it is not impossible.

Two fundamental approaches to teaching the examination

• Passive
• Active
Passive teaching
Student left to learn the examination largely on their own, through trial and error, by reading textbooks, generally not satisfactory; does not lead to very well developed examination skills.

Active teaching
At least three ways
Demonstration
Simulation
Observation
Incorporating the general physical into the neurologic examination

- Frequent request: “Teach me how to incorporate the neurologic examination into the general physical.”
- Answer: Turn concept on its ear and think about incorporating the general physical into the neurological exam.
- Works well, well received, appreciated
- Very efficient

Any neurological examination, even a cursory one, provides an opportunity to accomplish much of the general exam. Neurologic exam does not have to be a separate process
Incorporating the general physical into the neurologic examination

• Cranial nerve exam accomplishes much of the HEENT exam
• Motor, reflexes, gait and station - great deal of information about orthopedic condition
• Testing sensation/plantar responses - opportunity to coincidentally examine skin and nails and feel the peripheral pulses

Incorporating the general physical into the neurologic examination

• Auscultate carotids - little additional effort to palpate the neck for masses and thyromegaly.
At the end of a good neurological exam, one only has to listen to the heart and lungs and palpate the abdomen to have also done a fairly complete general physical examination.

Demonstration teaching

- Trainees watch mentor examine patients
  - Student watching resident or attending
  - Resident watching attending
- Requires running narrative while simultaneously examining and interacting with the patient
- Lack of narrative degrades effectiveness
- Perceived as boring
Demonstration teaching best done at the bedside

- Debate on pros and cons of bedside teaching
- Conference room rounds, "doctoring the chart"

Rules for bedside presentations and examinations

- Students must understand the rules of engagement
- Patient must be involved in the process, not made to feel like an object
- Euphemisms used for any terms that may cause concern for the patient
More rules for bedside presentations and examinations

- Certain terms (e.g., cancer, AIDS, MS, ALS) are forbidden at the bedside
- The speaker must pay careful attention to what they are about to say; pre-edit
- Visit to the patient after rounds to answer any questions and allay any concerns that may have arisen during the bedside encounter

- Rely primarily on demonstration for the first several days to a week (assuming a four-week rotation)
- Making active effort to teach examination technique
- For remainder of rotation rely on combination of simulation and observation.
Simulation teaching

• Trainee examines a person who is not an actual patient, under the watchful eye of the teacher.
• Formal simulated patient (e.g., simulation center) – lay person trained to give a history of a particular condition, and sometimes to simulate physical exam findings, such as a Babinski sign.

Informal simulation

• Another member of clinical team
  – Attending – best by far
  – Resident
  – Student
• Posits a clinical scenario
• Imitates exam findings
• Use simulated new patient if no actual new patient
Examples of findings readily simulated

• Hemiparesis, from mild to severe
• Facial weakness (central or peripheral, unilateral or bilateral)
• Sensory loss in a particular distribution
• Visual field deficits
• Upgoing toe and certain other pathological reflexes

Findings readily simulated

• Higher cortical function deficits – aphasia, agnosia, extinction, neglect
• Other types of focal weakness (ulnar neuropathy, radial nerve palsy, foot drop), proximal weakness, distal weakness
• Abnormal movements, tremor, etc
• Carotid bruit
Central facial
Peripheral facial

Simulation of eye movement abnormalities

• Hand movements
• Web sites
  – cim.ucdavis.edu/eyes
Muscle Settings
- Right Eye
  - Superior rectus
  - Inferior rectus
  - Medial rectus
  - Lateral rectus
  - Superior oblique
  - Inferior oblique
- Left Eye
  - Superior rectus
  - Inferior rectus
  - Medial rectus
  - Lateral rectus
  - Superior oblique
  - Inferior oblique

Cranial Nerve Settings
- Right Eye
  - CN III
  - CN IV
  - CN VI
- Left Eye
  - CN III
  - CN IV
  - CN VI

Enable Ptosis
Check boxes to enable muscles and cranial nerves

Quiz Mode | EyeTheory | Credits

www.richmondeye.com/eyemotil.asp
The Monty Python Ministry of Silly Walks
Abnormal gaits easily imitated

- Hemiplegic gait
- Parkinsonian gait, festination
- Spastic diplegia
- Cerebellar ataxia
- Sensory ataxia
- Foot drop (mild/severe, unilat/bilat)
- Trendelenberg gait
- Marche a petit pas

Fundus examination simulation
Conditions well demonstrated using fundus simulation

- Papilledema (varying degrees, acute, chronic)
- Drusen
- Optic atrophy
- Diabetic/hypertensive retinopathy
Teaching by observation

• Watching a trainee conduct an examination on a patient or a normal control.
• Consistent finding in studies of clinical teaching has been the lack of direct observation of trainee interactions with patients.

Few students report having been monitored while interviewing or examining more than 1 or 2 patients during their entire medical school careers, and a surprising number graduate without having been supervised or observed while working up even one patient.
• Errors often surprising, sometimes astounding, e.g., stimulation of the sclera rather than the cornea for the corneal reflex
• Common errors and omissions (see handout)

**TAG TEAM NEUROLOGIC EXAMINATION**

• Each student specializes in a given part of the examination for a set period of time (e.g., 1 week)
• During a given week, one students does all the cranial nerve exams, another all the motor exams, etc
• Students rotate responsibility for different parts of the exam.
• Evaluating new patient, students do a “team” examination
EXAMINATION FOCUSED DAILY WARD ROUNDS

• Single part of exam done on every patient by every trainee
  – Ankle jerk rounds
  – Toe rounds
  – Eye movement rounds
• Marked improvement in technique in a relatively short period of time.

THE COLD PATIENT EXERCISE

• Trainee performs 20 minute evaluation on an unknown patient under observation of attending and rounding group
• Use new patient admitted to another team member
• Other team members critique exam
• Attending does whatever is necessary to clarify situation
• Trainee “love-hate” relationship
Resident as attending

• Role reversal exercise, can be very elucidating
• Resident functions as attending; students present to resident, attending observes
• Resident responsible for evaluating the patient and teaching the students during a particular new patient encounter

Resident as attending

• Afterwards, attending does what is necessary to clarify the situation, then critiques the residents performance
• Works best with senior, experienced residents
RESOURCES FOR TEACHING THE EXAMINATION

• Print
• Electronic

Books devoted to neurologic exam

• Small paperbacks, e.g., Goldberg, S. The 4 minute neuro exam
• Medium paperback, e.g., Ross RT, How to examine the nervous system
• Small hardback, e.g., Mayo clinic examinations in Neurology
• Large hardback, Campbell WW. DeJong’s The neurologic examination
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<th>Omega</th>
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<tr>
<td><img src="image" alt="Four-Minute Neurologic Exam" /></td>
<td><img src="image" alt="The Neurologic Examination" /></td>
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<tr>
<td>56 pages, $12.95</td>
<td>640 pages, $110.00</td>
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- Physical examination books with neurologic examination sections
  - Bates B, et al, Bates’ guide to physical examination & history taking
  - DeGowin RL, et al, DeGowin's diagnostic examination
  - Swartz MH. Textbook of physical diagnosis
- Large textbooks with neurologic examination chapters
  - Joynt RJ, Griggs RC, Baker’s clinical neurology
- Small textbooks with neurologic examination chapters
  - Gelb, Introduction to clinical neurology
  - Campbell and Pridgeon, Practical Primer of clinical neurology
Useful websites

- Neurology metasites with many links to examination related sites
  - www.neuroland.com
  - www.neuroguide.com
  - medlib.med.utah.edu/neurologicexam/html/home_exam.html
  - www.neuropat.dote.hu/neurology.htm

http://www.neuropat.dote.hu/neurology.htm
Sample of neurological examination websites

- www.vnh.org/FSManual/07/02GeneralNeurol.html
- cim.ucdavis.edu/eyes
- www.richmondeye.com/eyemotil.asp
- www.revoptom.com/handbook/section6.htm
- medinfo.ufl.edu/year1/bcs/clist/neuro.html
- www.neuroexam.com
- www.conntutorials.com/video.html
- missinglink.ucsf.edu/lm/IDS_104_neuro_exam/NeuroExam.html
Muscles of Facial Expression and Taste (CN VII)

Look for asymmetry in facial shape or in depth of furrows such as the nasolabial fold. Also look for asymmetries in spontaneous facial expressions and blinking. Ask patient to smile, puff out their cheeks, clench their eyes tight, wrinkle their brow, and so on. Old photographs of the patient can often aid your recognition of subtle changes.

40. Facial Muscles