



## STUDENT PRIMER FOR PRESENTING ON THE STROKE SERVICE

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### Overview of Neurological Diagnosis

The neurological diagnostic method, like that of all medical fields, has two aspects: the **anatomical diagnosis** (*where* is the lesion?) and the **etiological diagnosis** (*what* is the lesion?). Neurology differs, however, in that anatomical diagnosis is more formal and explicit. This is because the scope and complexity of the nervous system makes it difficult or impossible to render an etiologic diagnosis without first determining the location of dysfunction.

Following is a primer on how to approach stroke patients within this framework, with specific emphasis on the oral presentation. Although the main goal is to provide guidance to students rotating on our stroke service, the basic principles are generally applicable to most neurological services.

Regarding anatomical diagnosis, we are concerned with disorders affecting the brain, spinal cord, nerve roots, plexi, cranial and peripheral nerves, neuromuscular junction, muscle, and sensory organs. Vascular neurology additionally concerns itself with the heart, vasculature, and coagulation system. The anatomical diagnosis is made by considering:

- **Symptoms:** These, of course, come from the chief complaint and history of present illness (HPI). For example, the symptom of diplopia suggests dysfunction of brainstem, cranial nerve, neuromuscular junction, oculomotor, or ocular structures. Limb weakness implicates either central structures such as the corticospinal tract, or peripheral ones such as the nerve roots, peripheral nerves, or muscles.
- **Signs:** Fluctuating ptosis specifically suggests upper eyelid muscle weakness due to neuromuscular junction pathology. Ptosis with miosis, however, points to a sympathetic pathway lesion. Weakness with spasticity and hyperreflexia points to a central lesion, but weakness with muscular atrophy, hypotonia, and hyporeflexia points to a peripheral lesion.

The etiological diagnosis is made by first considering the **types of pathology** that are likely to affect the dysfunctional area of the nervous system (see two example lists in the table below). Then, we focus on the type(s) of pathology that best match the syndrome's **time course**. Finally, we narrow and rank a list of specific disorders based on the **prevalence** and **risk factors** for the pathologies under consideration.

From the Integrated Neuroscience Course	Mnemonic: (MD-SHIT) <sup>2</sup>
<ul style="list-style-type: none"> <li>• Vascular</li> <li>• Epileptic</li> <li>• Mechanical</li> <li>• Neoplastic</li> <li>• Infectious</li> <li>• Autoimmune</li> <li>• Toxic</li> <li>• Metabolic</li> <li>• Nutritional</li> <li>• Idiopathic and genetic developmental</li> <li>• Idiopathic and genetic degenerative</li> <li>• Idiopathic and genetic non-degenerative</li> </ul>	<ul style="list-style-type: none"> <li>• Migraine</li> <li>• Metabolic</li> <li>• Demyelinating</li> <li>• Degenerative</li> <li>• Stroke</li> <li>• Seizure</li> <li>• Heritable</li> <li>• Hysterical</li> <li>• Infectious</li> <li>• Inflammatory</li> <li>• Tumor</li> <li>• Toxic / metabolic (and trauma)</li> </ul>

Table. Two useful schemata for placing neurological diseases in etiologic categories.

- **Time course: It is under-appreciated how crucial this dimension of the history is to arrive at the correct diagnosis.** Most often, when patients relate their histories they provide not the time course of the *illness* but rather that of their *medical odyssey*. One of the most common mistakes novice neurologists make in presenting cases is then to reiterate this history of medical odyssey rather than the HPI. There are actually a few aspects of the time course to consider:
  - Speed of onset: Was it sudden over seconds or minutes (stroke, seizure, migraine) or more gradual over days, weeks, months, or years (Guillain-Barré, brain tumor)? It's important to realize that patients frequently state that their symptoms are abrupt when in fact they have been developing for some time because the patient often fixates on the moment when they crossed a threshold to, for example, feeling definitely weak or having double vision when before it was just blurry. It can be very helpful to invest ample time exploring the transition from the patient's being normal to not normal.
  - Subsequent course: Did the symptom spread from one part of the body to another or from one modality to another? (Seizure, migraine, and many other diseases but usually not stroke) Did it develop quickly and then slowly improve? (Stroke, MS, and others but not Parkinson's disease) Has it continued to progress? (Alzheimer's disease, diabetic polyneuropathy, brain tumor but not stroke).
  - Multiplicity of events: Is this a monophasic illness (stroke, Guillain-Barré) or are there discrete spells? (Seizure, migraine, MS). If discrete spells, are they stereotyped (migraine, seizure) or is each one different? (MS). Are they happening several times each day (seizure), a few times each week (migraine), or a few times a year? (MS).

- **Prevalence:** It is very important to consider whether the pathologies under consideration are common or not. Even if the patient has some features of prion disease, for example, this is quite rare and will usually not be the diagnosis. Stroke, however, is very common, and so if the patient has acute, focal symptoms, stroke may end up being the diagnosis even if some of the details of the history and exam are atypical.
- **Risk factors:** Many types of pathology and specific disorders are associated with risk factors, both modifiable and non-modifiable. Such risk factors can be identified in the following:
  - Demography: Stroke is common in the elderly; migraine is common in the young.
  - Past medical history (PMH): For a spell of acute, focal neurological dysfunction, stroke is more likely when the patient has diabetes and hypertension; migraine is a consideration when the patient has a history of migraines.
  - Medications: Neurological symptoms are common among medication side effects. For example, anticholinergic drugs can cause bihemispheric cerebral cortical dysfunction that we call delirium.
  - Social history (SH): The use of tobacco, alcohol, and many recreational drugs increases the risk for many diseases, including ischemic stroke, intracerebral hemorrhage, and subarachnoid hemorrhage.
  - Family history (FH): Many disorders have a genetic contribution, and some are genetically determined.

## New Patient Presentations

The goal of the new patient presentation in neurology is to succinctly describe the patient’s symptoms and signs in such a way as to suggest a **neuroanatomical localization** (or convey specifically that there isn’t one) and to describe the time course and pertinent risk factors in such a way as to suggest an **etiologic diagnosis**. Although the presentation will usually take the general form of the traditional “history and physical” (H&P), **it is highly undesirable to verbalize the entirety of the written H&P on rounds**. In the RIME framework<sup>1</sup>, this is called reporting; it is the basic level of clinical performance—necessary to learn but to be surpassed as soon as possible. We’re looking for you to become *interpreters* and then *managers* of your patients’ problems.

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<sup>1</sup> Pangaro LN. A shared professional framework for anatomy and clinical clerkships. Clin Anat. 2006;19:419-28.

## The History

- **Chief Complaint:** Please begin your presentations with the chief complaint and not the medical history.
  - *Desirable:* Mr. Jones is an 82 year old man admitted last night for left sided weakness.
  - *Undesirable:* Mr. Jones is an 82 year old man with a history of diabetes, hypertension, coronary disease status post-coronary bypass surgery in 1999 with an ejection fraction of 50%, GERD, and CLL, who was in his usual state of health until last night when . . .
- **History of Present Illness:** The objective in communicating the HPI is to describe the appearance and severity of each of the patient’s symptoms over time. Remember the difference between the chronology of the *illness* and that of the patient’s *medical odyssey*.
  - *Desirable:* He was in his usual state of health until 7pm two nights ago, when he was sitting at the dinner table and suddenly felt weak on the left side. His face felt funny and he was drooling out of the left side of his mouth. His left arm and leg were weak and when he tried to use them, the limbs bounced about with poor coordination. He was seen in a local urgent care center that night and again yesterday, with plans made for further outpatient workup. The weakness progressed and so his wife finally called EMS to bring him here.

In the above example, the focus is on the symptoms and the time course of the illness—abrupt onset with progression over the course of a day. The HPI above isn’t encumbered by irrelevant detail. Note in particular that it doesn’t even have his relevant past medical history (e.g., vascular risk factors), much less the irrelevant items. That’s perfectly acceptable—you can segue to the PMH right after.

- *Undesirable:* He normally wakes from a nap at 5pm and has dinner at 5:30. However, he wasn’t feeling well that day and slept longer than usual. He still felt poorly when he sat down for dinner at 6:45, but at 7pm he suddenly developed left sided weakness. His face felt funny and he was drooling out of the left side of his mouth. His left arm and leg were weak and when he tried to use them, the limbs bounced about with poor coordination.

*At first, his wife thought this was just because he had overslept or maybe slept on the limb, but their daughter came over later that night and was worried, so they called their health plan’s nurse triage line. They recommended that EMS be called, but he didn’t want the embarrassment of the ambulance in their driveway, so they went to an after-hours urgent care center instead. The doctor there told them that it might be a TIA, so he arranged for a CAT scan and a carotid ultrasound.*

*The next day, he was feeling no better and the CAT scan wasn’t scheduled until later this week, so they went back to the urgent care center. The doctor told them that maybe it wasn’t a TIA, maybe it was a stroke, and they should get the CAT scan sooner and see their PCP as soon as possible. They went home, but his weakness had progressed such that he couldn’t walk up the stairs into the house and the daughter insisted that they call EMS.*

In this example, the truly important information about the time course of the *illness* is buried in a lot of blow-by-blow verbiage regarding the patient’s *odyssey*. When eliciting the history, it’s important to listen carefully to these details and pick out the relevant information—patients and families tell us a lot

of important things if we listen well, and doing so also builds the doctor-patient relationship. However, having put in the effort to wade through the long story, your objective is to synthesize and *interpret* it in order to generate anatomical and etiologic diagnoses—not to regurgitate it in its entirety on rounds the next day, leaving the higher cognitive task of interpretation to other team members.

Of course, in these early stages of your education and training, your judgments about what is important and what isn't and how the facts fit together will often be wrong. At this time, being wrong is good! Being wrong shows your teachers where your mental models of neurology are incorrect and creates opportunities for learning. Dutifully reporting every datum that you elicited from the patient lessens the chance of your “missing something important”, but does not create opportunities for learning. Moreover, it's actually easier for your teachers to notice that important information is missing or likely to have been misinterpreted in a concise presentation than it is for us to digest and interpret a comprehensive, but raw presentation.

- **Past Medical History:** The goal here is to identify those medical diagnoses that bear on the differential diagnosis (the etiological diagnosis) and omit the irrelevant ones. In a case of stroke the obviously pertinent medical history is the vascular risk factor profile.
  - Desirable: *The past medical history is significant for diabetes, hypertension, and dyslipidemia. He also has atrial fibrillation.*
  - Undesirable: *The past medical history is significant for diabetes, hypertension, dyslipidemia, GERD, peptic ulcer disease s/p Nissen fundoplication in 1967, osteoarthritis s/p hip replacement in 2002, kidney stones, actinic keratosis, etc.*

In this example, the PMH is littered with items that aren't relevant if you're building a case that your patient has had a stroke. This is not to say that the PMH can be otherwise ignored—the written H&P should be more complete and the electronic medical record should be comprehensive. **Should the case turn out to be challenging, then it's always a good idea to revisit the comprehensive PMH in search of clues to a less common etiologic diagnosis** (although usually, it's a re-visiting of the *HPI* that has the highest yield).

- **Medications:** For stroke patients, the most important ones are antithrombotics (aspirin, clopidogrel, warfarin) and the drugs used to manage vascular risk factors (antihypertensives, statin, etc.) It's also important to identify drugs that may increase stroke risk, such as oral contraceptives and sympathomimetics.
  - Desirable: *He's on aspirin 81 and clopidogrel for his coronary stents, as well as atorvastatin, metformin, carvedilol, and lisinopril.*
  - Desirable: *He's on aspirin, a statin, a beta blocker, and an ACE inhibitor.*  
*Desirable: He's on warfarin for his atrial fibrillation, but his family reports poor INR maintenance.*
  - Undesirable: *Meds are aspirin 325 mg/day; atorvastatin 80 mg/day; metformin 500 mg bid; lisinopril 40 mg daily; pantoprazole 20 mg daily; timolol eye drops bid; calcium and vitamin D supplements; acyclovir prn cold sores; nystatin cream prn; multivitamins, etc.*

- **Allergies:** For stroke patients, the most important allergy is to iodinated contrast, as we often perform CT angiograms. The occasional patient will be allergic to aspirin (although often, this is simply a GI intolerance and not truly an allergy). Outside of these, most allergies can be omitted from the *oral* presentation—not from the H&P or the medical record.
- **Social History:** Many people describe the substance use history here, which is important, but that is only a small part of the social history. A full social history includes the place of birth, the home environment growing up (one vs. two parent household, any abuse, etc.), the extent of education, military service, work history, marital status, legal history, and yes, substance history. If you want to see a great social history, read an initial psychiatry evaluation sometime. For our purposes, we don't need a book-length biography of the patient, but there should be enough to know where the patient comes from and if they have any functional limitations in basic or instrumental activities of daily living (ADLs and IADLs), **especially as these relate to his ability to return home after having suffered a stroke.**
  - *Desirable:* Mr. Jones lives with his wife in Wausau; he was previously independent for all ADLs and IADLs. They have a ranch house that has 3 steps to get in, but then everything is on the one floor. They have 3 grown kids who are at the bedside this morning. He's a retired dairy farmer who fought in WWII and went to college on the GI bill. He used to smoke heavily but quit 10 years ago. He has 1-2 beers each night with dinner.
  - *Undesirable:* He doesn't smoke and doesn't drink.
- **Family History:** For stroke cases, this usually isn't of high importance. The patients are often elderly and have ample additional vascular risk factors themselves such that the vascular profile of their family members doesn't add much to the assessment. On the other hand, if the stroke patient is young, it's very important to inquire about hypercoagulable or atherogenic states in the family—not just stroke, but also early-onset coronary disease, DVT, PE, and recurrent miscarriage. In other neurological disorders, of course, the family history is of crucial importance since some exhibit Mendelian inheritance or strong genetic contributions (e.g., Charcot-Marie-Tooth disease, among many others).
  - *Desirable (elderly patient):* There is a strong family history of vascular disease.
  - *Desirable (young patient):* Ms. Jones's sister had an MI when she was 32. She's also had multiple DVTs and PEs. Her mother had 4 second trimester miscarriages and died of an MI at age 48.
  - *Undesirable (elderly patient):* Mr. Smith's father died of an MI when he was 72. His mother had a stroke at age 75 and died at 77 from pneumonia. His paternal grandfather had a stroke when he was in his 60s, but he was a heavy smoker . . .

The information in the last example is arguably important in a full H&P, but reciting it in an oral presentation regarding an elderly patient who's obviously at risk for stroke usually doesn't add much value.

- **Review of Systems:** The ROS is a strange beast. It superficially makes sense that asking about a variety of symptoms will potentially unearth important information that either leads to an etiologic diagnosis for the problem at hand or suggests the need for further investigation of another problem.

Moreover, insurers usually tie their rating of your “level of service” (i.e., payment) in part to the extent of your ROS.

However, the ROS may lack both sensitivity and specificity. Ask a patient about her vision and you’ll be regaled with the saga of her refractive problems. Ask about temperature and you’ll hear that she’s always hot or always cold. Rarely are these reports helpful in making a neurological diagnosis. At the same time, patients will often deny having symptoms that are potentially important. Ask about migraines and many will deny having them. Ask about headaches even, and some will still deny it. Ask a third time, “Are you *sure* you don’t ever get headaches?” and then the patient says, “Well, not really—just my sinus headaches, you know?” Most “sinus” headaches are actually migraines.

While taking the history of present illness, you will implicitly and explicitly develop hypotheses about the localization and etiology of your patient’s problem. These will generate follow-up questions chosen to confirm (or, arguably more important, disconfirm<sup>2</sup>) your hypotheses. If something is important to a case, such as knowing whether the patient might have migraines, then you need to ask about it, often several different ways, when taking the HPI. If it’s not important, then asking about it in a superficial way during the ROS for the purpose of being able to bill a higher level of service is likely to generate false positive responses.

- *Desirable: [Nothing]*
- *Acceptable: In taking the review of systems, I picked up that he’s had progressive difficulty with near vision, especially reading—we may want to let his PCP know about it.*
- *Undesirable: On review of systems, he denies fever, weight loss, or night sweats. He denies cough or shortness of breath. He denies belly pain, constipation or diarrhea. He feels the occasional twinge of sharp pain on the right side of his chest, provoked by abduction and external rotation of the arm, etc.*

## **The Exam**

Just as a well-presented history builds a case for localization and diagnosis, so too does a well-presented exam (mainly for localization). Ideally, your objective is to perform the component maneuvers of the exam and then, rather than simply reciting the findings in list format, integrate them into a pattern of deficits suggesting as specific a localization as possible. Doing this well—knowing which findings are important and which aren’t, which ones go together and which are part of a different pathology, which need to be stated explicitly and which can be rolled into a summary statement—takes a lot of practice and varies by patient and by neurologist. Come join us for neurology residency if you really want to learn how to do this expertly. ☺ So, we don’t expect of medical students as much integration of the exam as we do for the history. Following are examples of a bullet point neurological exam and then an integrated exam (the general physical exam is discussed on page 13, under “Follow-Up Presentations”).

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<sup>2</sup> Vickrey BG, Samuels MA, Ropper AH. How neurologists think: A cognitive psychology perspective on missed diagnoses. *Ann Neurol.* 2010;67:425-33.

- **Raw exam presentation:**

- Mental status: The patient was alert. He had non-fluent aphasia, trying to speak but being unable to and getting frustrated. I couldn't test his memory or other functions due to the aphasia.
- Cranial nerves: There was a right sided hemianopia. The pupils were equal and reactive. The eyes were deviated to the left. Facial sensation was reduced in V1, V2, and V3 on the right. There was right facial droop. Hearing was intact. I didn't test his gag reflex. The palate elevated in the midline. Tongue movements were normal. He was mildly dysarthric.
- Motor: On the right, the strength was 1/5 at the deltoids; 3/5 biceps; 2/5 triceps; 2/5 wrist flexion and extension; 1/5 finger extension; 2/5 finger flexion; 3/5 hip flexion, etc.
- Reflexes: He had 2+ reflexes at the left biceps and patella and no reflex at the ankle. On the right, he had 3+ at the biceps and patella and 1+ at the ankle. There was no clonus. There was a right extensor plantar response.
- Sensation: He had diminished pain, temperature, and vibration perception on the right; normal on the left.
- Coordination: Finger-to-nose testing was normal on the left but I couldn't test it on the right due to his weakness.
- Gait: I didn't test this because he was so weak on the right—it would require another person's assistance to get him up.

- **Processed exam presentation:**

- Exam showed him to be wide awake, but neglectful of the right. He had severe non-fluent aphasia; comprehension was intact for simple commands but impaired for complex ones. There was leftward gaze deviation, right hemianopia, and right hemiparesis, arm graded 2/5 proximally and 1/5 distally and leg graded 3/5 proximally and 5/5 distally. The right side also had a little spasticity and an extensor plantar response, as well as severe sensory loss. He required two person assist to sit up and stand; he couldn't walk.

While the first exam is perfectly acceptable for a medical student, it does require more effort by the listener to process the information and determine the localization. The second one, **focusing on the abnormal findings**, immediately conveys to the listener, “So what I’m saying is, this person has a severe anterior left hemispheric lesion”—examiner and listener are here speaking the same language of neurology.



## The Formulation

It is common to next state your assessment and plan. However, a formal neurological presentation proceeds instead to a synopsis of the case called the **formulation**. The formulation consists of three statements, with vascular neurology having four:

- **What is the problem?** This is a succinct statement of the main symptoms and their time course. It is not your presumed diagnosis or, as is so often mistaken, a restatement of the PMH and HPI. Think about the case titles in the NEJM feature, “Case Records of the Massachusetts General Hospital”.
  - *Desirable:* This is a case of acute aphasia and right sided weakness.
  - *Desirable:* This is a case of slowly progressive headache and spells of altered awareness.
  - *Desirable:* Mr. Jones presents with coma.
  - *Undesirable:* So in summary, this is a 52 year old man with a history of diabetes, hypertension, and dyslipidemia, who presents after being found down in his home. In the ED, his exam showed . . . etc.
- **Where does it localize?** The important thing to remember here is that even for a stroke case in which brain imaging has already shown a lesion, we first want a **neuroanatomical localization** of the patient’s problem. Only if we determine (below) that the problem is vascular will we concern ourselves with vascular territories.
  - *Desirable:* This problem localizes to the left frontal, temporal, and parietal lobes.
  - *Desirable:* This problem localizes to the peripheral nerves in a length-dependent manner.
  - *Desirable:* This problem localizes diffusely to the cerebral cortices.
  - *Desirable:* This problem is not localizable.
  - *Undesirable:* The problem localizes to the left middle cerebral artery
- **What is the etiologic diagnosis?** Next, we combine our **neuroanatomical localization** with the **time course** of the illness and the patient’s **risk factors** to arrive at the etiologic diagnosis (refer back to the etiologic categories in the table on page 2). The convention here is to state your favored diagnosis first, followed by a few (not ten) alternative possibilities.
  - *Desirable:* I think the most likely diagnosis is acute ischemic stroke. Less likely are intracerebral hemorrhage, seizure with post-ictal paralysis, and hemiplegic migraine.
  - *Desirable:* I think the most likely diagnosis is an anamnestic response due to urinary tract infection. A recurrent ischemic stroke is less likely, as is seizure.

- Desirable: I think the most likely diagnosis is diabetic polyneuropathy. Neuropathy due to vitamin B<sub>12</sub> deficiency is less likely, as is a late-manifesting familial polyneuropathy.
  - Undesirable: The diagnosis is stroke or migraine or seizure or brain tumor or encephalitis or neuropathy or psychogenic or . . .
- **What is the stroke mechanism?** In vascular neurology, there is a fourth component to the formulation—the vascular pathology. This is the *sine qua non* of vascular neurology; secondary stroke prevention hinges on an understanding of the stroke mechanism.
    - Desirable: I think the stroke mechanism is most likely artery-to-artery embolism due to carotid atherosclerosis.
    - Desirable: I think the stroke mechanism is most likely cardiogenic embolism due to atrial fibrillation.
    - Desirable: I think the stroke mechanism is most likely microvascular occlusion due to lipohyalinosis.
    - Undesirable: The cause is embolism.

## The Plan

It is helpful to consider the diagnostic and treatment plan as having two aspects—one **pathophysiology**-based and one **function**-based. Acute stroke treatment and secondary prevention are particularly well-suited to a pathophysiology-based approach and your plan should address the following:

- **Acute reperfusion therapy:** Is the patient a candidate for intravenous thrombolysis with tissue plasminogen activator? Why or why not? How about endovascular recanalization options? Since you'll generally be assuming care of these patients on the morning after admission, these considerations usually won't apply—they will have either already been done or been determined to be inappropriate.
- **Prevention of secondary neurological injury and medical complications:** Regardless of whether reperfusion can be effected, is the patient at risk for secondary brain insults such as malignant cerebral edema, hydrocephalous, and seizures? Is he at risk for complications related to his neurological deficits, such as infection, venous thromboembolism, pressure sores, or falls? What steps may be taken to mitigate those risks?
- **Revascularization:** Is the stroke due to a vascular pathology that is amenable to surgical or endovascular treatment? The best-supported intervention here is endarterectomy for symptomatic carotid atherosclerosis. Angioplasty and stenting of carotid atherosclerosis or dissection or intracranial atherosclerosis have much weaker scientific support, but can be considered on a case-by-case basis.

- **Antithrombosis:** Almost all patients with ischemic stroke will require an antithrombotic drug. Which is most appropriate for your patient— aspirin, clopidogrel, warfarin, others? What do you recommend for **DVT prophylaxis**?
- **Risk factor modification:** What are your patient’s modifiable risk factors and what is your plan for each? Be sure to address the following:
  - *Diabetes: What is the fasting glucose (if not known to be diabetic) or the hemoglobin A1c (if known to be diabetic)?*
  - *Hypertension: What have the blood pressures been running overnight? Do we know what they run at home?*
  - *Dyslipidemia: What is the fasting LDL? What should the goal be for this patient?*
  - *Tobacco dependence: If your patient is a smoker, is she ready to consider quitting? Consider aids such as nicotine replacement (gum or patch) and drugs such as varenicline.*
  - *Obesity: What is the body mass index? Has the patient ever met with a nutritionist? Does he exercise regularly? Might he be a candidate for our Stroke Prevention Exercise Program?*

From a function-based perspective, please address the following:

- **Swallow:** Dysphagia is one of the most important consequences of stroke. The ability to eat and drink is not only of obvious importance to a person’s well-being, but also bears directly on his discharge planning. Before a patient goes home or to a rehabilitation facility, he needs to have either been cleared for an oral (perhaps modified) diet or have a feeding tube in place (usually a gastrostomy tube—patients generally don’t discharge with nasogastric tubes in place). Accordingly, an important piece of information to convey on rounds is your patient’s dietary status and the plan for the day in that regard.
  - *Desirable: Mr. Jones remains NPO pending his swallow evaluation this morning.*
  - *Desirable: Ms. Smith was cleared in the ED for a pureed diet with honey-thick liquids. We did place a Dobhoff tube, however, since she’s not awake enough to meet her caloric needs . Calorie counts have been ordered, and we’ll reassess her need for the tube feedings tomorrow.*
- **Basic activities of daily living:** Can your patient walk? Can he feed and groom himself? Essentially, can he return home in his present state, or might he require a course of rehabilitation first? Our physical and occupational therapy colleagues are experts in these assessments and are consulted on most stroke patients.
  - *Desirable: Mr. Smith is ambulating about his room and grossly appears to be fully functional; PT and OT assessments are pending this morning.*
  - *Desirable: I observed Mr. Smith’s PT session this morning, and he required two person assist to stand and walk. It appears likely that he’ll need a course of inpatient rehabilitation before returning home.*

- **Instrumental activities of daily living:** Even if your patient can handle the basic tasks of self-care, can he balance his checkbook? Are his reaction times and executive function sufficient to allow him to return to work or drive? Occupational therapists are invaluable in these assessments.
- **Higher cognitive and affective functions:** Will your patient be able to return to her administrative job? Her studies? Will post-stroke depression affect her well-being and performance? We receive input on these matters from our occupational and speech therapy colleagues, both of whom incorporate cognitive assessments into their evaluations. UW also has a unique post-doctoral fellowship in neuropsychology that is focused on cerebrovascular disease. Accordingly, patients who appear to have significant cognitive deficits can undergo neuropsychological testing as inpatients, with expedited outpatient follow-up as well.
  - *Desirable:* Ms. Davis appears to be physically capable of managing her basic needs, but she does have significant cognitive impairment. She'll likely require supervision at home, and it may be helpful for her to undergo neuropsychological testing to get a clearer picture of her strengths and weaknesses.

## Follow-Up Presentations

The goal of the follow-up presentation is to remind the team who the patient is and then proceed with an update following the familiar subjective→objective→assessment→plan format.

- **Introduction:** The key thing here is to introduce the patient by reminding us of his *disease* rather than the presenting symptoms or hospital course.
  - *Desirable:* Mr. Smith is our 85 year old man who's on hospital day #2 for a right MCA territory infarct due to atrial fibrillation.
  - *Undesirable:* Mr. Smith is our 85 year old man who presented with left sided weakness.
  - *Undesirable:* Mr. Smith is our 85 year old man who was admitted to the unit and was moved to the floor yesterday.
- **Subjective:** Self-explanatory.
- **Vital signs:** The most important items are the **heart rhythm** (telemetry) and **blood pressure**. Pulse readings are important if the patient has atrial fibrillation or otherwise has abnormal readings. Temperature, respirations, oxygen saturations, intake and output, etc. can be omitted *if they are normal*.

- *Desirable: Overnight, his rhythm remained sinus. Systolic pressures have been running mostly in the 180s. He did get a dose of labetalol for one spike to 225/110.*
- *Desirable: Overnight, his rhythm remained sinus. Systolic pressures were in the 130-150 range. He did spike a temperature of 38 centigrade and was pan-cultured. Pulse at that time was 90; respirations 18; oxygen saturations in the mid-90s.*
- *Desirable: Overnight, his systolic pressures were in the 140s. He remained in atrial fibrillation with a pulse mostly in the high 90s, with a few readings in the 140s. He received a dose of labetalol for that.*
- *Desirable: Vitals overnight were normal, except for one BP spike to 170/100.*
- *Undesirable: Overnight, his Tmax was 37 centigrade. Pressure this morning was 140/90; pulse 72 and sinus; respirations 16; oxygen saturation 98% on room air. Intake was 700 cc; output 1100 cc.*

The difference between the desirable and undesirable examples above is subtle but important. The first four convey processed information—it's clear that the presenter knows the importance of the heart rhythm and blood pressure. She knows that if a stroke patient spikes a fever, the cardiopulmonary status can't be skipped over but rather take on particular importance. She knows the importance of rate control for a patient with atrial fibrillation. She doesn't waste time reciting normal input and output values for a patient in whom they aren't expected to be an issue (as they would be for a patient with say, congestive heart failure).

- **General exam:** The most important items are the cardiac and pulmonary exams, the former because cardiogenic embolism is such a common stroke mechanism and the latter because pneumonia is one of the most common complications of stroke. Of course, there may be many other physical exam findings of importance; the main point is to tailor the exam and your presentation thereof to the patient's individual circumstances. Again, we essentially want to hear the **abnormal findings**.
  - *Desirable: Ms. Davis's heart and lung exam was normal.*
  - *Desirable: Heart exam was normal. Lung auscultation revealed bibasilar crackles. I also note swelling and erythema of the right leg.*
  - *Desirable: The general exam was normal except for a distended abdomen with reduced bowel sounds.*
  - *Undesirable: HEENT: Normocephalic and atraumatic. Pupils equally round and reactive to light. No thyromegaly. No cervical adenopathy. Regular S1 and S2 with no murmurs, rubs, or gallops. Lungs clear to auscultation bilaterally, etc.*

By now it should be clear that the last example is merely a checklist of exam maneuvers and doesn't reflect any higher-level determination by the presenter of what the important findings are.

- **Neurological exam:** Whereas in the new patient presentation, a bullet point, comprehensive exam as outlined above is perfectly acceptable, this should be avoided on subsequent daily rounds unless the case is complicated. Having followed the patient for at least a day you should now have a more processed understanding of the exam findings, and your daily presentation should focus on day-to-day *changes* therein.
  - *Desirable:* Mr. Jones's exam continues to show severe non-fluent aphasia, leftward gaze, right hemianopia, and severe right hemiplegia. I found no change from yesterday.
  - *Desirable:* Mr. Jones's aphasia has improved a little—whereas he was mute yesterday, he can now utter a few vocalizations, although there aren't any actual words and his comprehension remains impaired. His gaze deviation has lessened as well, but his hemianopia and hemiplegia remain unchanged.
- **Test results:** Most stroke patients will undergo brain imaging to help determine the stroke mechanism. As with the neurological exam, it's preferable to have a high-level understanding of what the imaging shows and what it means, rather than simply reading to the team the radiology report. Although it's always a good idea to look at your own radiographic studies, we don't expect you to be able to render an accurate independent interpretation of a multi-modal CT or MR exam. If you have the chance to review the scans with your resident before rounds, you may summarize what you know. Regardless, we'll generally look at the images together on rounds, so it's best not to spend a lot of time trying to describe them—as they say, “a picture is worth a thousand words”.

Other pertinent tests include echocardiography and fasting lipids and glucose, as well as video fluoroscopic swallowing studies.

- *Example:* Ms. Smith underwent MRI yesterday, which I understand shows a moderate-sized right frontal and parietal lobe infarction. The carotids were patent. Fasting glucose was 113; A1c was 6.3; LDL was 110.
- **Assessment and Plan:** This should have the same format as for the new patient presentation, except that you needn't re-formulate the patient each day. Just list the diagnoses and your plans for each.
  - *Example:* Mrs. Jones has suffered a right middle cerebral artery territory ischemic stroke, most likely due to atheroembolism from a stenosing right carotid bifurcation plaque. Endarterectomy is planned for two weeks from now. In the meantime, she's on aspirin, along with low molecular weight heparin for DVT prophylaxis. Stroke risk factors include diabetes, which is well-controlled on glipizide. She has hypertension, which is not optimally controlled; I suggest increasing her lisinopril from 20 to 40 mg daily. Her fasting LDL was 110, so I suggest that we discuss with her the merits of adding a statin to her regimen. She's passed a swallow evaluation. As we discussed at interdisciplinary rounds earlier this morning, PT and OT have seen her and think that she'll be a good acute rehab candidate; we will consult their service today.

**Good luck, and have fun!**

