1 (A) Is AQ at risk for stroke based on the information in the problem statement?

There are several risk factors in AQ’s history that make him at risk for stroke: He leads an inactive lifestyle, working at a sedentary job 50-60 hours a week and spending his off-time napping and watching television. His weight is 320 pounds, his recent total cholesterol was 210 and he has borderline HTN, with a recent BP of 150/90. His lifestyle factors put him at risk for thrombotic, hemorrhagic, and lacunar strokes.

1(B) What is the specific pathophysiology of this disease (stroke)?

Ischemic Stroke

This type of stroke accounts for about 80 to 85 percent of all strokes in the U.S. With ischemic stroke, the blood supply to a part of the brain becomes blocked. This prevents oxygen and nutrients from reaching brain cells. Within a few minutes, these cells may begin to die. The underlying cause for this type of obstruction is usually atherosclerosis, a condition in which plaque or fatty deposits within the wall of the arteries in the brain and neck can lead to obstruction or narrowing. These fatty deposits can cause cerebral thrombosis (leading to a thrombotic stroke) or cerebral embolism (leading to an embolic stroke).

- **Thrombotic stroke**
  A thrombotic stroke occurs due to plaque formation in cerebral vessels within the brain. This plaque damages vessel walls, and fibrin and platelets adhere to the damaged sites. This creates a build-up of material in the vessel, and when pieces break off and travel to and occlude distant, smaller vessels, a stroke occurs. *Large-vessel thrombosis* occurs when the blockage is in one of the brain’s large blood-supplying arteries (e.g., carotid artery), while *small-vessel thrombosis* involves blockage in small vessel of the brain. This latter type of stroke is also called lacunar stroke.

- **Lacunar Stroke**
  A lacunar stroke involves small arteries in the basal ganglia, pons, and internal capsules and is caused by the thickening of arterial walls (associated with HTN and smoking).

- **Embolic stroke**
  An embolic stroke is caused by a clot within an artery, but other location in the circulatory system, not in the brain itself. Often from the heart, these clots travel in the bloodstream and they become lodged in an artery in the brain.

Hemorrhagic Stroke

Hemorrhagic strokes are caused mainly by hypertension damaging cerebral vessels. Blood leaks from damaged vessels within the brain and damages the brain tissue it encounters. This is called an *intracerebral hemorrhage*. When blood leaks under the lining of the brain, it is called a *subarachnoid hemorrhage*. This is often caused by a small bubble on an artery known as an aneurysm.

Transient Ischemic Attack (TIA)

Transient ischemic attack is defined as a neurologic deficit lasting less than 24 hours that is presumed to be of vascular origin and attributed to focal cerebral or retinal ischemia. Typical symptoms include hemiparesis, hemiparesis, dysarthria, dysphasia, diplopia, circumoral numbness, imbalance, and monococular blindness. TIsAs are often referred to as ministrokes, warning strokes, or transient strokes because they resolve quickly.
2. What history, PE, and lab tests could be used to diagnose stroke in AQ?

**History**
AQ’s temporary onset of one-sided weakness is one symptom of a transient ischemic stroke.
- Borderline hypertension
- Elevated cholesterol levels
- Obesity/sedentary lifestyle
- Stress
- Occasional alcohol

**Physical Exam**
- Neuro: PEARL-WNL, normal gait, alert and appropriate response
- CV: RRR, no murmurs or gallops (normal heart rate); EKG normal-no arrhythmia’s or MI
- Resp: CTA bilateral, no accessory muscles or flaring (O2-WNL)-non smoker
- Skin: WNL-no signs of dvt
- Weight: obese, elevated BMI
- Vitals: Hypertension

**Labs and Other Diagnostic, Imaging Studies**
- Labs, repeat EKG, and CT scan are some of the diagnostic and should be performed. A CT scan can reveal bleeding in the brain or damage to the brain’s cells caused by a stroke. An MRI can be performed to assess for similar findings. An EKG may reveal heart problems such as A-fib, which could cause stroke. An echocardiogram may also be used to assess the heart’s chambers and determine whether any clots are present in the heart or aorta.
- Labs such as CHEM-7, CBC, aPTT, PT/INR, Lipids, Cardiac Enzymes should be drawn. Low glucose levels can cause symptoms similar to stroke, while elevated levels can lead to stroke. Abnormal platelet levels may cause bleeding (too low) or clotting (too high) disorders. A PTT will assess whether AQ’s blood is clotting normally.
- Other factors to consider include AQ’s family history of stroke, and a physical assessment that includes a neurological exam, auscultation of carotid arteries for bruit (which could indicate carotid artery disease, a major cause of ischemic stroke). Carotid ultrasound and angiography may also be used to assess for plaque formation in the carotid arteries.

3. What non-pharmacologic treatments would you recommend to prevent stroke in AQ? Specifically, what dietary, exercise, and other strategies would you recommend for AQ?

Prevention of stroke should be based on treating an individual’s underlying, modifiable risk factors for stroke. Modifiable risk factors of AQ include high blood pressure, obesity, lack of exercise and physical activity, and high serum cholesterol levels (i.e., hyperlipidemia).

**Exercise and Physical Activity**
Exercise tends to decrease the aggregability of platelets, increase sensitivity to insulin, reduce weight, increase high-density lipoprotein cholesterol levels, and lower blood pressure. As per guidelines endorsed by the Centers for Disease Control and Prevention and the National Institutes of Health, regular, moderate-intensity exercise helps to reduce comorbid conditions that may lead to stroke. The recommended frequency and duration of the exercise is at least 30
minutes per session, preferably all days of the week. Types of the exercise include brisk walking, slow jogging, cycling, or other aerobic activity. Each exercise session may include warming-up and cooling-down phase. Level and duration of the exercise should be increased gradually. In addition, medically supervised program to reduce weight or joining support group would be helpful for AQ.

**Diet**

In general, a diet containing at least 5 servings of fruits and vegetables per day is recommended to reduce the risk of stroke. No more than 2 alcohol drinks per day is also recommended.

Diet modification to treat hyperlipidemia is very important because of strong relationship between high serum cholesterol level and risk of stroke. Goal of treating hyperlipidemia should be to lower serum cholesterol levels below 160mg per deciliter by lowering the intake of cholesterol and saturated fat. Evidence of effectiveness of intake of unsaturated fats (both monounsaturated and polyunsaturated fats) on risk of stroke is still uncertain and result of relates studies are inconsistent. In general, however, unsaturated fatty acids lower total and LDL cholesterol level when substituted for saturated fatty acids. Diets high in omega-6 (e.g., linoleic acid) and omega-3 fatty acids (commonly found in fish oil) can reduce blood pressure. The consumption of regular fish may inhibit stroke through decreased platelet aggregation and blood viscosity, increased fibrinolytic activity, and decreased blood pressure. However, tuna or other broiled or baked fish is recommended rather than intake of fried fish or fish sandwiches. Other foods containing unsaturated fats include peanut, olive oils, canola, avocados, and other nuts. Modifiable oils including low-saturated fat, zero-saturated fat soybean, canola oils could be beneficial without requiring significant dietary changes. Dietary fiber from cereal sources (not from fruits and vegetable sources) could be beneficial to lower risk of stroke. Sodium and alcohol intake should be restricted. Potassium (e.g., fruits, vegetables, poultry, fish, dairy products) and magnesium (e.g., green leafy vegetables, nuts, whole-grain foods) intake may also reduce risk of stroke. Sugar-sweetened soft drink and any food containing high fructose corn syrup should be avoided.

Because diet is the one of the key treatment to reduce the risk of stroke, AQ should follow strict diet modification. By referring him to a registered dietitian would be effective to treat complex risk factors (i.e., obesity, hyperlipidemia, and high blood pressure).

**Life behavioral change**

It is critical to modify lifestyle in addition to diet and physical activity. Work-related or other source of stress should be removed by many options of therapies. Regular annual health check-up and monitoring of blood pressure level (goal: SBP <140 mm Hg, DBP <90 mm Hg), total blood cholesterol level with HDL and LDL, and BMI every three or six months.

4. What pharmacologic treatments (including ASA, statins) would you recommend (if any) to prevent stroke in AQ? If you would recommend any Rxs, be specific as to dosages, duration of treatment, potential risks or side effects, and costs of Rxs.

I would recommend an antiplatelet such as aspirin or clopidogrel for AQ, however cost of clopidogrel may be an issue. An antihypertensive and an antilipidemic may also be
needed pending labs and continued blood pressure monitoring. Depending on AQ’s glucose level, antidiabetics such as metformin or a sliding scale insulin may be needed. Determining whether or not stroke has occurred and the cause of the stroke is necessary in order to form AQ’s treatment plan.

**Antiplatelet**

**Aspirin**

The most common antiplatelet used. Interferes with formation of thrombi, reducing risk of stroke. Proven to prevent ischemic stroke and cardiovascular events in high-risk patients, reduces risk of secondary stroke, MI or vascular death in patients with prior TIA or stroke. It is recommended for preventing recurrent noncardioembolic stroke. Would recommend this treatment for AQ pending echocardiogram. Aspirin is preferred over warfarin for noncardioembolic stroke. Aspirin is indicated in patients with low risk of stroke (i.e., CHADS score = 0 or 1)

- **Dose:** 50-100 mg/day is recommended to reduce risk of bleeding associated with higher doses.
- **Duration of treatment:** ongoing
- **Potential risks/side effects:** GI bleed (significantly diminished risk with dose <200 mg/day), intracranial bleeding.
- **Cost:** About $12/month

**Clopidogrel**

It may be more effective for patients with recent stroke, MI and especially those with symptomatic peripheral artery disease. It inhibits platelet aggregation. Combined use with ASA does not have statistically significant benefits to patient for preventing stroke and does increase risk of bleeding. For example, in two separate studies ACTIVE-Wand the ACTIVE-A trials an adverse effect of hemorrhage was significantly higher in aspirin–clopidogrel combination therapy compared to aspirin or warfarin.

Dual antiplatelet therapy of aspirin and clopidogrel is recommended for 90 days for patients with recently intracranial large artery disease. Recommended over ASA alone. Recommended for preventing recurrent noncardioembolic stroke and patients with a history of noncardioembolic stroke or transient ischemic attack (TIA) of atherothrombotic, lacunar (small vessel occlusive type), or cryptogenic type.

- **Dose:** 75 mg/day
- **Duration of treatment:** ongoing
- **Potential risks/side effects:** rash, diarrhea. GI upset, bleeding (less than with aspirin), neutropenia
- **Cost:** About $166/month

**Others**

a. **Dipyridamole:** Inhibits platelet function and may also cause vasodilation. Combined therapy with dipyridamole and aspirin is better than aspirin alone. There is no clinical meaningful difference between clopidogrel and the combined therapy of dipyridamole and aspirin.

- **Dose:** 50 – 100 mg immediate release form TID (not recommended), or Aggrenox which is 200 mg extended-release form 25 mg aspirin formulation BID (this formulation is recommended over ASA alone for patients with a history of noncardioembolic stroke or transient ischemic attack (TIA) of atherothrombotic, lacunar
(small vessel occlusive type), or cryptogenic type).

- Duration of treatment: ongoing
- Potential risks/side effects: Headache, GI upset and diarrhea. GI bleed (ASA containing formulation)
- Cost: Aggrenox (dipryidamole extended-release/ASA formulation) - $186/month

Selection of aspirin, clopidogrel, or a combination of aspirin and dipyridamole depends on cost of treatment, tolerance of adverse effects, compliance to medications, and other comorbidities. Because the effect of antiplatelet agents is modest, at best, for secondary stroke prevention, patient education and management of other vascular risk factors (e.g., hypertension, dyslipidemia, and smoking) are equally important.

b. Ticlopidine: Works similarly as clopidogrel. Significantly more effective than ASA in reducing rate of stroke. Not considered a first-line antiplatelet drug due to its side effects and cost.
   - Dose: 250 mg daily
   - Duration of treatment: ongoing
   - Potential risks/side effects: Neutropenia (pts must undergo bi-weekly blood count first three months of therapy). Rash, diarrhea.
   - Cost: About $32/mo

c. Cilostazol: Used for intermittent claudication in patients with peripheral artery disease. Safety and efficacy for use in Asian populations for preventing stroke have been proven, however non-Asian groups not studied. Less tolerable and more expensive than ASA.
   - Dose: 100 mg BID
   - Duration of treatment: ongoing
   - Potential risks/side effects: Headache, diarrhea, palpitations, dizziness, tachycardia.
   - Cost: About $13/mo

d. Triflusal: Antiplatelet agent available in Europe and Latin America. Still in investigation in the U.S. Studies show it is as effective as 325mg/day ASA at preventing stroke and has lower incidence of hemorrhagic complications.

Antihypertensives

Hypertension is the top risk factor for stroke. 50% of persons with hypertension need more than 1 antihypertensive drug in clinical practice. A secondary analysis of the International Verapamil SR-Trandolapril (INVEST) study of patients with diabetes and coronary artery disease did not show any association of tight BP control (average SBP during study <130 mmHg) with improved overall cardiovascular outcome or specifically stroke occurrence compared to usual BP control (average SBP during study 130 mmHg to <140 mmHg). If AQ does have borderline hypertension, he would benefit from antihypertensive therapy.

Benzapril hydrochloride (Lotensin)

It is used for treatment of hypertension and stroke prevention.
- Dose: 10 mg daily initially. Maintenance dose 20-40 mg/day
- Duration of treatment: ongoing
- Potential risks/side effects: Nausea, cough
- Cost: About $40-$70/month

Lisinopril
- It is used for treatment of hypertension (cheaper than lotensin)
- Dose: 10 mg daily initially. Maintenance dose 20-40 mg/day
- Duration: ongoing
- Potential risks/side effects: Headache, dizziness, insomnia, fatigue, GI irritation, cough.
- Cost: about $6.00/mo

Antihyperlipidemics
AQ may benefit from an antihyperlipidemic such as crestor pending labs. In patients with a history of non-cardioembolic stroke or TIA without known CHD, the Stroke Prevention by Aggressive Reduction in Cholesterol Levels (SPARCL) trial showed that atorvastatin (80 mg) compared with a placebo lowers overall stroke recurrence by 16%, regardless of the ischemic stroke subtype at entry.

Crestor
- It is indicated as a adjunct to diet in treatment of elevated cholesterol
- Dose: 10 mg initially with titration up to 40 mg daily based on serum lipid levels monitored every 2-4 weeks until desired level achieved.
- Duration: ongoing
- Potential risks/side effects: Headache, nausea, diarrhea, pharyngitis, rhinitis, flulike symptoms.
- Cost: About $60/mo.

Antidiabetics
AQ may require an antidiabetic pending labs. Hyperglycemia is a risk factor for stroke and increases mortality rate from stroke. A study conducted in Northern Ireland showed undiagnosed DM and hyperglycemia in stroke patients is under-reported and affects almost 50% of stroke victims. A 2012 study of 13,000 patients (comparing metformin and diet alone in obese patients with type 2 DM) regarding metformin and cause of mortality (including stroke as secondary cause) showed benefit/risk ratio for mortality uncertain.

Metformin
- Dose: 500 mg BID or 850 mg daily. Dose adjusted based on response and glucose level
- Duration of treatment: ongoing
- Potential risks/side effects: hypoglycemia, anorexia, nausea, epigastric discomfort, heartburn, diarrhea, allergic skin reactions.
- Cost: About $30/mo

Insulin aspart (novolog)
- Dose: weight based sliding scale
- Duration of treatment: ongoing
- Potential risks/side effects: hypoglycemia
Cost: About $150/10 ml vial

**OTC options**

**Vitamin B complex and Folic Acid**

High homocysteine levels are associated with increased risk of both stroke and coronary heart disease. Homocysteine increases thrombotic risk, as evidenced by its association with venous thromboembolism. Homocysteine levels can be lowered with Vitamin B and folic acid combination. Folate and vitamin B12 combination can decrease homocysteine levels than folate alone.

- Dose: 50 mg of B6 and 1mg of B12, Folic Acid 2.5 mg q day
- Duration of tx: ongoing
- Potential risk/ side effects: given with caution with renal failure and decreased GFR patients
- Cost: $10/ 200 tablets

**Niacin (Vitamin B3)**

Extended-release niacin and statin treatment had increased HDL cholesterol and lowered triglyceride levels compared to participants who took a statin alone.

- Dose: 500-2000 mg q day (titrate up 500 mg every four weeks)
- Duration of tx: ongoing
- Potential risk/side effects: flushing, redness, burning, tingling of skin, headaches. contraindicated with gout, angina, stomach ulcers or gallbladder, kidney or liver disease, hypotension. If you have allergies, taking niacin may increase the severity of your symptom
- Cost: $ 5-10/ 120 tablets

**Medications for Patients with Cardioembolic Strokes**

Aspirin is indicated in patients with low risk of stroke (i.e., CHADS score = 0 or 1). Anticoagulation (e.g., warfarin) remains the treatment of choice. Dual antiplatelet agents are indicated in patients who are unsuitable for treatment with oral anticoagulant. No relation between risk of hemorrhage and baseline or recent LDL cholesterol level was observed in patients treated with statin, and only those with hemorrhagic stroke at entry appeared not to benefit from statin treatment

**Warfarin (Coumadin)**

A treatment for atrial fibrillation for patients at high risk for stroke. Warfarin is a narrow therapeutic index drug (NTI). When the INR falls below 2.0 thrombosis risk increases and when the INR rises above 4.0 serious bleeding risk increases (70% higher risk than with aspirin). Close blood monitoring is required weekly. Extensive education is required on medication that alters therapeutic levels of PT/INR such as commonly used drugs (ie. certain antibiotics, antinflammatories).

- Dose: Initiate therapy with the estimated daily maintenance dose (2-5 mg.) once a day however elderly or debilitated patients often require low daily doses of warfarin (2-4 mg.)
- Duration of treatment: long term and varies on patient
- Potential risk/side effects: occult and overt bleeding or hemorrhage at any site has been reported the most frequently. Bleeding complications may present as paralysis,
paresthesia, headache, chest, abdominal, joint, muscle or other pain, dizziness, shortness of breath, difficulty breathing or swallowing, unexplained swelling, weakness, hypotension, or unexplained shock. Bleeding may result in hematomas, melena, hematuria, ecchymoses, epistaxis, and hematemesis. rash, gangrene, abrupt and intense pain in the leg, foot, or toes, foot ulcers, myalgia, penile gangrene, abdominal pain, flank or back pain, hematuria, renal insufficiency, hypertension, cerebral ischemia, spinal cord infarction, pancreatitis, symptoms simulating polyarteritis, or any other sequelae of vascular compromise due to embolic occlusion. Hemopericardium and cardiac tamponade have also been reported. Hypotension, edema, angina syndrome, and chest pain have been reported infrequently.

- Cost: $30-$50/ month plus required blood testing costs
- Significant changes in INR can usually be achieved by small changes in dose (15% or less) and 4-5 days are required after any dose change or any new diet or drug interaction to reach the new antithrombotic steady state.

For those who cannot use anticoagulation, use of anti-platelet therapy for patients with atrial fibrillation has been studied.

Aspirin alone reduces strokes in atrial fibrillation by ~22%

**Dabigatran (pradaxa)**

It is a direct thrombin inhibitor for prevention of stroke and thromboembolism associated with nonvalvular atrial fibrillation. More clinical trial studies are needed to test its effectiveness including side effects and long-term effects.

- Dose: 150 mg po BID (decrease to 75 mg PO bid with renal impairment). Dabigatran administered at a dose of 150 mg, as compared with warfarin, was associated with lower rates of stroke and systemic embolism but similar rates of major hemorrhage.
- Potential risk/ side effects: dyspepsia, serious bleeding events (FDA clinical trial of 18,000 pts, Dec 2011), joint pain/swelling, headache dizziness, weakness, swelling, hives, rash, itching
- Cost: $200.00 / month

5. What educational interventions would you recommend to prevent stroke in AQ? Be very specific with your recommendations.

AQ has several risk factors for stroke: obesity, hyperlipidemia, borderline hypertension, and sedentary lifestyle. AQ requires a comprehensive lifestyle modification and educational intervention plan to prevent stroke and other major cardiovascular events. AQ needs counseling and appropriate education on these risk factors and proposed lifestyle changes. Most importantly, AQ must be a part of the strategic planning and implementation of these changes in order to be successful. AQ should feel that his healthcare team is attempting to understand his lifestyle, his needs, and ambivalence toward change in order to make any proposed health and lifestyle modification and that he is supported and his autonomy is respected before we can achieve compliance with our proposed lifestyle changes outlined below. AQ needs to understand that
his healthcare team is here to help him develop attainable goals and achievements and that ultimately, the responsibility for making successful changes belongs to him.

Based on the data provided, AQ has a BMI of 45.9 indicating obesity. His girth is recorded as 55 inches. According to the American Stroke Association a waist circumference of more than 40 inches is considered excessive and presents a significant increase in risk of stroke. AQ needs a dietary and exercise assessment to determine what foods he is eating and how modifications to his diet can be made. Small incremental changes in dietary habits can be introduced during his appointment. These changes include but are not limited to: increasing consumption of fresh vegetables, preferable leafy green, yellow, orange, and red vegetables. Recommended daily servings of vegetables for adult males are 10 servings per day. Some examples from the ADA include: 1 glass (250 mL) of orange juice = 1 serving
1 omelette with 125 mL (½ cup) of mixed vegetables = 2 servings, 250 mL (1 cup) of fruit salad = 2 servings, 125 mL (½ cup) of coleslaw = 1 serving, 50 ml (¼ cup) of dried fruit = 1 serving, 250 mL (1 cup) of stir-fried vegetables = 2 servings, 1 small bunch of grapes (20 grapes) = 1 serving. Reducing consumption of animal based products such as meat and dairy to less than 4 -6 servings a day and limiting fried, processed and sugary foods will also contribute to weight loss and girth reduction over time.

A specific, attainable goal should be set for weight loss. Ideally, AQ’s BMI should be between 18.5 and 24.9 with a weight between 129 and 173 pounds (MayoClinic.com: Normal Weight Obesity). A good start for AQ would be the general recommendations set out by the American College of Sports Medicine which are 5-10% of body weight or one to two pounds per week. AQ needs to reduce his consumption of alcohol during one sitting. Alcohol consumption for men in his age group should be limited to 2 servings per day. Even if AQ is only drinking “occasionally”, 6-8 beers in one sitting is excessive and contributes to his other pre-existing risk factors. AQ could consider reducing his alcohol consumption by one to two drinks per sitting at first and then continue to reduce by one drink per week. This will allow him to feel like he isn’t depriving himself of something he enjoys but rather reducing the actual amount and moving toward the recommended maximum intake.

Exercise is another important component of a healthier lifestyle and risk reduction for disease and disability. AQ spends the majority of his hours presumably at a desk and in the car. On most weekends, he watches TV and naps. An assessment of AQ’s interests and preferences should be obtained before developing a fitness plan. Does he like sports? Do they have a family dog? Does he enjoy the outdoors or prefers an indoor environment? Do they have a yard that requires upkeep? A minimum exercise routine would include 2 ½ hours of vigorous exercise per week. Ideally, 30 minutes of aerobic exercise each day is recommended. Perhaps AQ’s workplace has a gym, or he could take a brisk walk during lunch time or on short breaks. He could take the stairs instead of the elevator, employ simple stretches at his desk. On the evenings or weekends, he could take brisk walks in the neighborhood or local park, do manual labor in the yard or around the house, play basketball or golf, or try a new hobby that includes physical exertion. Exercise and dietary modifications are very important in preventing catastrophic illness.

However, these lifestyle changes take time and commitment. AQ is already symptomatic and seems to be experiencing TIA’s and may require more aggressive treatment. Educational counseling should include a detailed discussion on pharmaceutical options as well to control his hyperlipidemia and hypertension. Anticoagulants such as baby aspirin and anti-hypertensive medications should be considered for short term approaches to controlling symptoms. The
discussion needs to include risks, benefits; side effects and AQ will need to have enough information to make an informed decision on whether or not he wishes to pursue this therapeutic course. His lifestyle and time management will need to be considered as well, for example, when will he be taking these medications? What are the dietary considerations when taking medications? Does he take supplements that may interact? For example, he has GERD, he will need counseling on when the best time to take an aspirin? With meals vs on empty stomach, all of these components need to be included in a treatment regimen. The information needs to be presented in a manner that allows AQ to make autonomous decisions and direct the course of any short or long term pharmaceutical treatment.
References

Journals:


Website:
Antiplatelet therapy for secondary prevention of stroke (Uptodate.com)
Another Reason to Avoid a Sugar High: Study Links High Blood Sugar to Mortality After Stroke (NIH.org)
Hyperglycaemia monitoring and management in stroke care: policy vs. practice (Diabetic Medicine)
Reducing your risk for stroke (American College of Physicians)
CARE clinical research website
American Dietetic Association: http://www.eatright.org/
American Stroke Association: www.stroke.org/
http://www.nhlbisupport.com/bmi/
http://www.mayoclinic.com/

Books:
Lippincott’s Nursing Drug Guide
2013 Ferri’s Clinical Advisor, Elsevier