Non-invasive Vascular Testing

1. Inspect the skin of both lower extremities; observe for:
    a. Absence or change of hair growth; shiny or dry skin changes
    b. skin discoloration, varicosities, edema
    c. toenail growth abnormalities
    d. foot deformities; calluses
    e. temperature changes (can use back of hand to feel for changes from foot and up the leg)
    f. sensory changes (use monofilament or fishing line; 5.07 protective sensation)
2. Palpate for pulses: dorsalis pedis, posterior tibial, popliteal, femoral (a pulse is not definitive of good blood flow, but may help you identify poor flow, abnormal, or absent pulses)
3. Ankle Brachial Index (ABI) is a quick screening tool that determines the systolic pressure or arterial flow in the lower extremities. This assessment requires a Doppler probe, gel, and blood pressure cuff. The ABI can help you determine the presence and severity of arterial occlusive disease, identify the need to refer to a specialist, and determine the patient's ability to heal. It is also a good indication of safety for compression with a patient. The patient should lie in either supine or a semi-Fowler's position, and be comfortable for 10-15 minutes prior to performing the ABI. Using the Doppler probe and blood pressure cuff, the examiner listens for the systolic blood pressure on each arm and at both arteries on each ankle (the Dorsalis Pedis and Posterior Tibialis arteries). The calculation is performed by dividing the highest value of each ankle SBP by the highest arm SBP. Compression therapy is generally contraindicated when the ABI is less than 0.8 due to poor circulation or >1.3 due to suspected calcified vessels (presence of diabetes may alter results).
4. Rubor of dependency (Buerger's Test) This test determines the adequacy of arterial blood flow in the leg by evaluating color changes in the skin during elevation and dependency. With the patient in supine, note the color of the soles of the feet – they should be pink. Elevate the leg for 1 minute at a level above the head, 45-60 degrees. When arterial insufficiency is present, pallor develops in the foot due to inadequate pressure and compromised blood flow, which indicates a positive finding for the Buerger's Test. Now place the limb in a dependent position. With arterial insufficiency, reactive hyperemia (rubor of dependency) occurs to compensate for tissue hypoxia. Rubor of dependency may also be observed in residents who are just sitting. However, this test is not as accurate if the resident also has venous insufficiency and/or the skin color changes may not be readily observable in dark skinned individuals.
5. Claudication time. Claudication, or pain in the calf, thigh, or hip muscle that occurs after walking a certain distance, is another factor to consider in patients. Claudication is caused by a lack of blood flow to the lower extremities. When the patient stops walking and rests, the pain subsides. Pain caused by claudication usually subsides after about the same amount of rest time each time it occurs. In order to test for claudication, ask the patient to ambulate, and measure how long it takes until the muscle "cramps" and the patient reports pain. This amount of time is the claudication time.
6. Capillary Refill Test (CRT) is a quick test that monitors for dehydration and blood flow to the tissues. To perform a CRT, the clinician applies pressure to the nail bed until it turns white, and then times how long it takes for the nail bed to return to normal once pressure is removed. This should take less than 2 seconds when there is good blood flow to the area. A delayed response is indicative of arterial insufficiency. A CRT of 3 seconds or more is an important warning sign for serious illness and risk of death.
7. Venous Filling Time This test starts by observing the veins on the dorsum of the foot when the resident is supine. Then the limb is elevated ~60 degrees for about a minute, or until the effects of gravity have drained the veins. Next the limb is placed in a dependent position and the time for the superficial veins to refill is recorded. Normal venous filling time is 5-15 seconds. Chronic venous insufficiency (CVI) is indicated if the veins fill immediately. Arterial insufficiency is indicated if the veins take longer than 20 seconds to refill. Note: the venous system must be intact to perform the arterial test.