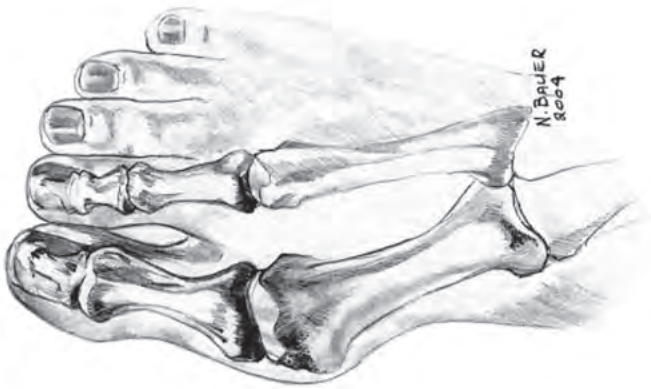
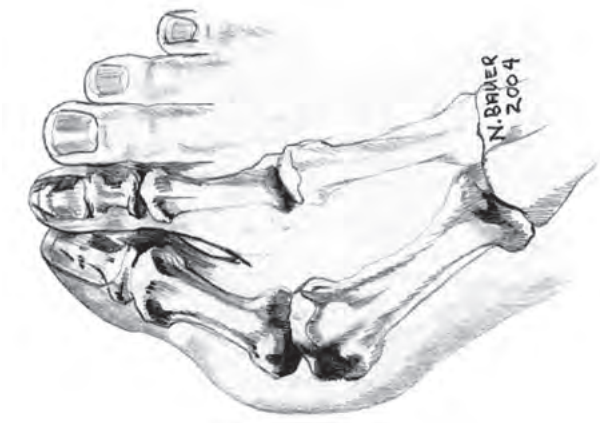
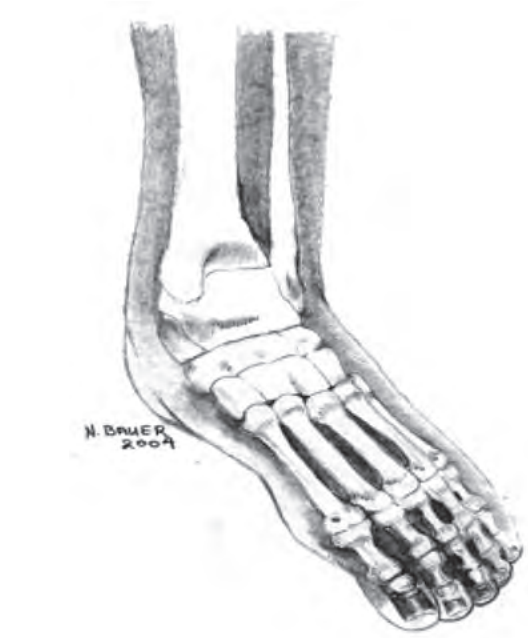
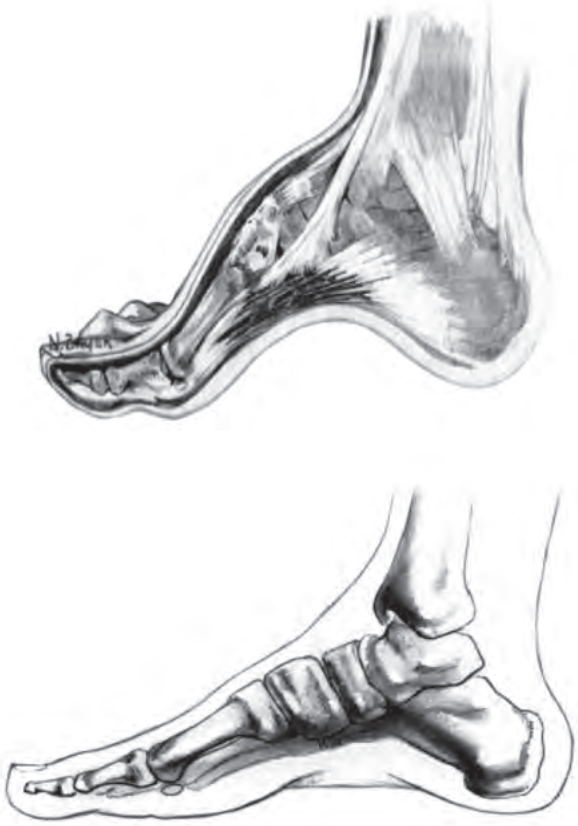
Appendix H: Description of Foot Deformities

The following table provides the description for several foot deformities: hammer toe, claw toe, hallux deformity, pes planus, pes cavus and charcot arthropathy.

DEFORMITY	DESCRIPTION
* Hammer Toe – bent middle joint  	With atrophy of the intrinsic muscles of the foot, especially the toe plantar flexors, the flexor/extensor balance at the metatarso-phalangeal joints is altered. This causes clawing at the toe and possible subluxation of the metatarso-phalangeal joints. As a result, the submetatarsal fat pads are displaced and there is reduced pressure absorbing subcutaneous tissue at the metatarsal heads. In addition, glycosalation of collagen from hyperglycemia results in thickened, waxy skin that affects joint mobility. All these factors contribute to foot deformity and ulcer risk (Bennett, Stocks & Whittam, 1996; Shaw & Boulton, 1997).
* Claw Toe – joint at base of toe is bent up and middle joint is bent down  	

DEFORMITY	DESCRIPTION
* Halgus Valgus or Small Bunion (Mild/ Moderate) – joint at the base of big toe is pushed to the side 	
** Hallus Valgus or Large Bunion (Severe) – big toe may move under second toe 	

DEFORMITY	DESCRIPTION
Pes Planus (vs normal arch):  	Pes planus produces flattening of the foot. Pes planus feet have increased lateral talometatarsal angle and increased second metatarsal length (Ledoux et al., 2003). There are many reasons for this condition, the first of which is heredity. Many have this condition and never experience problems of any kind. However, others will have this condition created through years in soft, unsupportive shoes on hard surfaces, injury, pregnancy, or other factors. A broad band of fibrous connective tissue, called the longitudinal ligament, causes the arch in the foot. A ligament is nothing more than connective tissue that connects bone to bone. The longitudinal ligament connects the metatarsal phalangeal joints to the os calcis or heel bone. Like a string on a bow, they hold the two ends together and create an arch. This arch is a shock absorption structure and it also helps to maintain all the tarsals in proper erect anatomic position. As this arch decreases, impact from the concrete becomes worse. When the arch ligament stretches or tears, the arch falls. If it falls far enough, the tarsals may begin to shift to the inside or create pronation or a valgus (greater than 90 degree erect) position at the ankle. This can cause problems in the origin area (the metatarsals) or in the heel. It also may cause pressure on the medial (inner) knee and perhaps the hip and back. It is like pulling the string on a marionette too tight, the result is a kinked mass on one side. The human body is much the same; place too much tension on major muscle groups and the joints kink and yell back.

DEFORMITY	DESCRIPTION
Pes Cavus (vs normal arch): 	In pes cavus, the arch is abnormally high on weight bearing. The heel is often tilted inwards at the ankle (but not always). In many, the toes will appear clawed. When not standing, the front half of the foot (forefoot) will appear to be dropped below the level of the rear foot. Ledoux et al. (2003) identified biomechanical differences among pes planus and pes cavus feet in persons with diabetes. They found pes cavus feet had more prominent metatarsal heads, bony prominences, hammer/claw toes, increased hallux dorsiflexion and pes cavus decreased hallux plantarflexion.

DEFORMITY	DESCRIPTION
*Charcot Arthropathy (vs normal arch):    	One in 680 people with diabetes develop Charcot joint with an incidence of 9 to 12% individuals with documented diabetic peripheral neuropathy (Royal Melbourne Hospital, 2002). Charcot joint is a form of neuroarthropathy that occurs most often in the foot. Nerve damage from diabetes causes decreased sensation, muscle and ligamental atrophy and subsequent joint instability. The charcot joint process can affect many areas of the foot. Most commonly it affects the Lisfranc joint (tarsometatarsal) region. The deformity in this area manifests as the typical rocker bottom type foot. The second most commonly affected area is the rear foot, or the talar-navicular region. The ankle joint and forefoot are more rarely involved. It is also important to note that charcot may affect more than one region of the foot, and these different areas may each be at a different stage of the progression of the deformity. Walking on this insensitive and weakened joint can cause even more damage to the foot structure. In the acute stage there is inflammation and bone reabsorption that destroys the bone. In later stages, the arch falls and the foot may develop a rocker bottom appearance. Weight distribution of the sole is altered causing deformities leading to pressure points that enhance ulcer development. Signs of charcot arthopathy include swelling of the foot and leg, changes in the shape of the foot or ankle, feeling of instability, crunching feelings or sounds, and marked increase in temperature of the foot. Symptoms include pain or discomfort, pain at rest and burning sensations. It is important that the charcot foot is recognized early so that appropriate treatment of the foot can be provided to prevent further injury and promote a stable foot (Lavery et al., 1998). For patient information on charcot arthropathy, visit http://rnao.ca/bpg/guidelines/assessment-and-management-foot-ulcers-people-diabetes

DEFORMITY	DESCRIPTION
Limited Joint Mobility	Progressive stiffening of collagen-containing tissues leads to thickening of the skin, loss of joint mobility, and potential fixed flexor deformity. Up to 30% of people with diabetes may have limited joint mobility. Reduction in mobility of the ankle joint may cause increased plantar pressure when walking and be a major risk factor in the pathogenesis of diabetic foot ulcers (Fernando, Masson, Veves & Boulton, 1991; Zimny, Schatz & Pfohl, 2004). Achilles tendon contracture is a common cause of limited joint mobility causing increased pressure on the forefoot during ambulation (Armstrong, Lavery & Bushman, 1998; Mueller, Sinacore, Hastings, Strube & Johnson, 2004).

Above illustrations provided by Nancy A. Bauer, BA, Bus Admin, RN, ET.
* Reference: Diabetes Nursing Interest Group & RNAO, (2004). Diabetes foot: Risk assessment education program. Images of the diabetic foot. Toronto: Registered Nurses' Association of Ontario. Retrieved from: http://rnao.ca/bpg/guidelines/resources/diabetes-foot-risk-assessment-education-program