RISK FACTORS
Since the clinical outcome of osteoporosis is bone fracture, attention now increasingly focuses on identifying patients at high risk of fracture rather than those with osteoporosis as defined by BMD alone (Kanis et al, 2008; Siris and Delmas, 2008).

Although osteoporosis is defined in terms of BMD and micro architectural deterioration of bone tissue, BMD is just one component of fracture risk. Accurate assessment should ideally take into account other risk factors that add further information (Kanis et al, 2008; Siris and Delmas, 2008).

Osteoporosis has been shown to have a large genetic component. A parental history of fracture (particularly hip fracture) confers an increased risk of fracture independent of BMD (Kanis et al, 2004a). Studies have demonstrated that weight in infancy is a determinant of bone mass in adulthood (Cooper et al, 1997).

Physical inactivity, a sedentary lifestyle and impaired neuromuscular function (such as reduced muscle strength, impaired gait and balance) are risk factors for fragility fractures (Albrand et al, 2003; Nguyen et al, 1998). Smoking can lead to lower bone density and higher risk of fracture and this risk increases with age (Kanis et al, 2005a). High alcohol intake confers a significant risk of future fracture (for example, over four units of alcohol per day can double the risk of hip fracture) (Kanis et al, 2005b).

Prolonged use of corticosteroids is the most common cause of secondary osteoporosis. An estimated 30-50% of patients on long term corticosteroid therapy will experience fractures (Reid, 1997), with a two fold increased risk of hip fracture in women and 2.6 fold in men (Kanis et al, 2004b).

Proton pump inhibitors can reduce the absorption of calcium from the stomach and long term use can significantly increase the risk of osteoporosis related fractures (Targownik et al, 2008). Low body weight and weight loss is associated with greater bone loss and increased risk of fracture (De Laet et al, 2005). Some young women, particularly those training for elite athletic competition, exercise too much, eat too little, and experience amenorrhoea, which puts them at risk of low bone mass and fractures.

After an initial low trauma fracture from a simple fall, both older men and women have an increased equivalent risk of all types of subsequent fractures, especially in the next 5-10 years (Centry et al, 2007).

Falls contribute to fractures, and around 90% of hip fractures result from falls (Tinneti, 2003). A third of people over 65 fall annually, with approximately 10-15% of falls in older people resulting in fracture, and almost 60% of those who fell the previous year will fall again (Tinneti, 2003).

FRACTURE RISK ASSESSMENT
The adoption of the WHO (1994) definition of osteoporosis brought enormous benefits to the routine clinical application of bone densitometry, and was a major factor behind its rapid expansion. Not only did this offer a method of identifying high risk patients before they sustained a fracture, the WHO T-score algorithm is also easy and simple to apply in practice.

Marshall et al (1996) reported on how well BMD predicted occurrence of osteoporotic fractures. This led to the widespread acceptance that a hip BMD measurement is the most reliable method of assessing hip fracture risk and spine BMD is optimal for assessing vertebral fracture risk. A limitation with using T scores, however, is that age as well as BMD is an important factor when deciding patients’ short term risk of osteoporotic fracture (Kanis, 2002). It may be more appropriate to treat at the age of 50 but not at 90 for the same T score.

The WHO Fracture Risk Assessment (FRAX) approach seeks to improve clinical decision making on treatment by basing assessment on the 10 year probability of osteoporotic fracture, and DEXA scan results, if available, can also be incorporated in the decision making pathway.

The FRAX algorithm is based on a series of meta-analyses of data from 12 independent fracture studies covering North America, Europe, Asia and Australia. A further validation study incorporated data from another 11 independent population based patient cohorts.

The FRAX tool (www.she.ac.uk/FRAX) incorporates BMD information from hip DEXA scans. Although femoral neck BMD was used to develop the algorithm, the