Overview

Fractures secondary to osteoporosis are a significant worldwide healthcare issue. Research led by the University of Sheffield has resulted in FRAX®, the first internationally-applicable fracture risk calculator. This tool provides a 10-year probability of whether an individual will suffer from a major osteoporotic fracture. This knowledge enables physicians in over 53 countries to target therapy and resources to patients at the highest risk.

FRAX® has been incorporated into many national and international guidelines for osteoporosis management. The online tool alone has processed over 9 million calculations.

Background

Osteoporosis is a condition where bone density and quality are reduced in a progressive and ‘silent’ fashion. As bones become more fragile, the risk of fractures greatly increases. Globally, one in three women and one in five men over the age of 50 will suffer an osteoporotic fracture. Moreover, it is projected that by 2050, the worldwide incidence of hip fractures will more than double.

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Therefore, there is a global health need to identify high risk individuals so that appropriate therapies can be initiated.

Although measurements of bone mineral density (BMD) remain the international standard for diagnosing osteoporosis, it is insufficient alone to accurately identify those individuals at high risk of developing a future fracture.

**Developing the FRAX® tool**

A research team from the WHO Collaborating Centre based in Sheffield and led by Professors Kanis and McCloskey at the University of Sheffield, Professor Johnell in Malmo and Professor Anders Oden with Dr. Helena Johansson in Gothenburg collated information from individuals living in Europe, North America, Asia and Australia. The initial dataset contained information on approximately 60,000 people with 250,000 subject-years of follow up.

This unique resource enabled the researchers to examine a range of individual risk factors and determine their inter-relationship. A provisional risk calculator was developed and then subsequently validated using an international cohort of approximately 230,000 individuals with 1.2 million subject-years of follow up.

This huge research effort culminated with the launch of the FRAX® tool in 2008. The algorithms calculate the 10-year probability of a major osteoporotic fracture in hip, spine, forearm or shoulder. It is available in various formats ranging from an on-line web based tool and smartphone app to several paper-based calculators. It has also been incorporated into dual X-ray absorptiometry (DXA) scanner software that is used to determine BMD in patients.

**Impact**

FRAX® is probably the single most important development in osteoporosis management since the T-score definition of BMD was introduced in 1994 (also led by the University of Sheffield). It provides an estimate of absolute fracture risk even in the absence of BMD measurements. This enables osteoporosis to be managed in the wider international community where determination of BMD may not be readily available, with therapy targeted appropriately to those at highest risk.

FRAX® has been incorporated into numerous national and international guidelines for osteoporosis (e.g. www.shef.ac.uk/NOGG) and currently provides assessment of absolute fracture risk for the primary care community in 53 countries and in 28 languages. Since its inception, the on-line tool alone has processed over 9 million calculations.