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Invited Plenary Abstract
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Goodbye T and Z, Welcome to the absolute risk on the Y-axis

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Osteoporosis is described as 'a disorder characterised by low bone mass and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk'. From an operation view osteoporosis has been defined in terms of bone mineral density (BMD), namely a BMD that lies 2.5 SD or more below the average value for young healthy women. Diagnostic thresholds have been best validated for femoral neck BMD using dual energy X-ray absorptiometry.

A diagnostic test has clinical value if it provides information that is useful to direct intervention strategies or inform on prognosis. In this context, the risk of fracture increases approximately 2 to 3-fold for each SD decrease in femoral neck BMD. There are, however, well recognised limitations to the use of T-scores. The first is that the test lacks sensitivity over most ranges of assumptions. Thus, at acceptable specificity, the majority of patients who will fracture would be designated to be at low risk at the time of testing. Secondly, the performance characteristics of the test varies with age. For any BMD, fracture risk is much higher in the elderly than in the young. For example, in men and women at the threshold of osteoporosis (T-score = -2.5 SD), the 10-year probability of hip fracture ranges from 1.4 to 10.5% depending on age. A third limitation is that the predictive value of BMD tests at the hip vary according to the Z-score. For the prediction of any osteoporotic fracture, the risk increases by 2.0/SD with a Z-score of -3, but the gradient of risk is 1.3 with a Z-score of +3.

These limitations can be partially resolved by taking account of factors that influence fracture probability. The use of fracture probability as the clinical metric also permits the consideration of prognostic risk factors over and above that provided by BMD and age. Independent risk factors include a prior fragility fracture, a parental history of hip fracture, the use of glucocorticoids, rheumatoid arthritis, smoking and excessive alcohol consumption. If these risk factors are to be used, their multiplicity demand the use of fracture probability as the measurement of clinical relevance. In addition, the output from multiple techniques and sites for BMD assessment (all with different gradients of risk) can be standardised. The acceptance of fracture probabilities in clinical practice will render T-scores and Z-scores less relevant.