Osteoporosis in 2021: What Every Clinician should know

“We need to move beyond standard setting... and make those standards a reality for people everywhere” - Dr Mary Robinson, former President of Ireland

Osteoporosis is Greek for a ‘bone with too many holes’. Hippocrates described several rheumatic diseases thousands of years ago but osteoporosis was not one of them. Despite the availability of proven quality testing, effective therapies and multiple guidelines for decades, sadly the majority of patients today are neither diagnosed nor treated for their disease, and unfortunately many therefore go on to have further fractures, hospitalisations, loss of independence and in some cases death1-4. Today the status of osteoporosis care worldwide has been described as a (avoidable) ‘crisis’5, a ‘war’7 and we may be heading towards a ‘perfect storm’. In this paper we provide a concise review for clinicians what is currently known about osteoporosis in Ireland, and how to address this common life-altering, life-threatening illness for Irish patients. We address this using 4 headings which are prerequisites for the effective management of any disease:

1. Identification of those at risk;
2. Diagnosis of those who have it;
3. Treatment of those diagnosed;
4. Monitoring over time to ensure treatment is adequate.

Osteoporosis is one of the commonest diseases worldwide today whose prevalence and incidence are rising as the planet’s population ages5, 6, 9-14. This disease results in loss of skeletal mass and quality, resulting in fragility fractures5, 6, 11, 14, 9. Although the entire skeleton is at risk, the most common sites of fracture are the proximal femur, wrist and forearm, humerus and vertebrae5. Although the entire skeleton is at risk, the most common sites of fracture are the proximal femur, wrist and forearm, humerus and vertebrae5, 11. These fractures are associated with substantial morbidity, mortality and healthcare costs3, 11, 12. Many proven assessments and treatments are available, complete with guidelines, standards and official positions to effectively manage osteoporosis in 20212, 4, 10, 11, 13, 15-21.

A 2017 report containing almost 1% of the EU population noted almost 3 million osteoporotic fractures occurred at a cost of almost €40 billion which suggests EU wide around 4 million occurred at a cost of €50 billion. In the same year a US report noted healthcare costs in the year following fracture for an individual were almost €20,000 and significantly greater than the preceding year2. Although osteoporotic fractures are more common than other diseases such as stroke, cardiovascular disease and breast cancer, and result in a similar or greater illness burden and economic cost, they receive considerably less attention22-24.

World reports suggest Ireland has one of the highest rates of hip fractures in the world15, 14, 35, but detailed robust information of the epidemiology, burden of illness and economic cost for patients and society in Ireland are lacking26, 29. A 2008 estimate of the direct and indirect costs related to managing these fractures was almost €400 million, based on data gleaned from 6,813 public hospital admissions for a fragility fracture26. A national report the same year suggested this cost would be €1 billion in 2020 and €2 billion in 203030. While acknowledging public hospital admissions and bed occupancy in Ireland for people ≥50 years with fragility fractures have increased substantially over the past decade39, the true number is much higher as data on many fractures not admitted to public hospitals are unavailable, others go unreported40, while details of long-term costs are lacking2, 29. Public hospital bed occupancy for fragility fracture admissions in Ireland amongst adults ≥50 years increased by 43% between 2008 and 2017 (H.I.P. data on file with author), contemporaneous with a dramatic reduction in our bed capacity since the financial crash in 2008. According to O.E.C.D. statistics in 2008 Ireland had a total of 21,789 hospital beds, but in 2017 only 14,073, a 35.4% reduction, whilst nurse to bed ratio increased from 1.12 to 1.7433.

Screening is required to identify people at risk. This involves identifying individuals with early disease before they come to clinical attention. Screening is beneficial if the benefits of testing positive outweigh the harms, and both clinical and cost effective interventions are available to prevent or delay the onset, or reduce the severity of the disease.41, 29 This usually involves ‘testing’ healthy people or groups deemed at risk by public health experts or clinicians. A simple test-based strategy such as mammography for breast cancer is often used, or more complex multifactorial algorithms such as the Framingham risk score for cardiovascular disease. An array of tools have been developed for osteoporosis and fracture prediction, all with strengths and limitations42. Age, low BMD and weight to identify those most likely to have osteoporosis. Our results show this algorithm performed best in those without fractures or other risk factors, which could reduce the number requiring testing and hence the long waiting times for quality public DXA in Ireland30.

Clinicians in practice diagnose osteoporosis in one of 2 ways: the presence of low bone density measured by central DXA in the appropriate clinical context, the presence of a fragility fracture, or both11, 22. DXA scans measure bone mineral density at the femoral neck, total hip and lumbar spine. These measurements can be converted to standard deviations using a reference standard to derive T-scores and Z-scores which are the values used in most population clinical guidelines for diagnosis. The recommended reference is the NHANES III female Caucasian population for T-scores for men and women. T-scores are recommended for use in postmenopausal women and men ≥50 years, while Z-scores are recommended for younger adults and children16, 37. Importantly a diagnosis in these groups should not be based on DXA criteria alone, an error we see very commonly. In certain circumstances other

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DXA can perform lateral spine scans to diagnose vertebral fractures too. Here is an example showing multiple vertebral fractures (arrows).

skeletal sites may be used or CT densitometry using similar validated quality assurance procedures6, such as the distal 1/3 radius. A significant amount of training and experience is required to perform on interpret DXA scans whose importance should never be overlooked as there is no substitute for quality7-9.

Errors in DXA performance and interpretation are common in Iceland and other countries, which are mostly avoidable with training and attention to detail. ICD training courses are provided each year by the Irish DXA Society. In Ireland >70,000 DXA (Dual-energy X-ray Absorptiometry) scans are performed each year in public and private facilities but limited information is available on who is being scanned, why, and how the results affect management10. The Irish DXA-CHIP project is currently attempting to answer some of these questions, while also addressing the validity of recommended diagnostic criteria, reference standards and fracture risk algorithms for men and women in Ireland11, 12, 13, 14.

A fragility fracture is one that occurs from a force that would not be expected to break a healthy bone. Although most fractures occur following a fall, the majority of spine fractures do not15. A common misconception amongst clinicians and patients is that people who have a fragility fracture but whose T-score is >-2.5 do not have osteoporosis. This fallacy is borne out regularly in practice and the appropriate interpretation of their DXA scan result is that the patient has the disease but they have a ‘false positive test’. The opposite occurs sometimes in young healthy people who have a test and should not have but do where they have a ‘false positive test’, i.e. the test shows they are ‘positive’ for osteoporosis but the aged or their bones are normal. The DXA test is similar to COVID or any other testing whereby many people who have the disease ‘test’ negative while others may ‘test’ positive. Overdiagnosis and the associated costs, burden and worry for patients who do not have it, including unnecessary testing and treatment is just as important as underdiagnosis and should not be overlooked11, 16, 17. Once a patient has a fragility fracture the DXA test is no longer useful for diagnosis, rather for assessing prognosis and for monitoring therapy18.

The treatment gap in osteoporosis reflects the failure to diagnose and treat people for osteoporosis following a diagnosis or fragility fracture1, 2, 6, 13, 14. Fracture liaison services can help bridge these gaps and are clinically and cost-effective11. A national fracture liaison programme has now been established to help gain much needed focus and resources for this massive healthcare issue for Irish people. The DXA HIP Project has identified large gaps in treatment rates for men and women and further study of these data are needed. In our public hospitals only 10% to 16% of discharges following a fragility fracture include a diagnosis of osteoporosis amongst aged >50 years between years 2008 and 2017, and a similar number receive treatment. In Galway fracture liaison programmes have been in place for outpatients (The Secondary Prevention of Osteoporotic Fractures, SPOOF, Programme) and inpatients (Hospital Outcomes following Osteoporotic Fractures) for more than a decade which have shown they can comprehensively close these gaps in diagnosis and treatment. However a large increase in resources are needed to manage the workload, and reduce inefficient health systems and the burden of unnecessary administrative tasks currently supplanting efficient, effective clinical work.

Stock-piling the system with trainees is not the answer, rather providing resources where they are needed based on evidence rather than politics, with trained clinicians, nurses, physiotherapists and administrators.

Treatment of osteoporosis today involves appropriate patient assessment for any underlying causes including falls risk, low bone mineral density, medications and other medical conditions contributing to falls or skeletal fragility such as rheumatoid arthritis, corticosteroids and smoking. Treatment provides education for patients on diet, lifestyle choices, weight-bearing exercises and fall prevention strategies, addressing their unique concerns about their disease and its treatment, and for those likely to benefit and without contra-indications, appropriate osteoporosis pharmacologic therapy10, 11, 21, 44, 45. Another myth which has been propagated for decades is that calcium and vitamin D are a cure-all for osteoporosis. While they are crucial for bone health, and replacement of deficiency has been shown to reduce the risk of fracture in very elderly non-independent patients45, there is very little evidence that extra calcium and vitamin D have any benefit over and above a diet sufficient in both46, while there is evidence from the largest clinical trial ever done that supplemental calcium and vitamin D increases the risk of fracture in younger post-menopausal women47. Currently available osteoporosis medications have the greatest reduction on spine fractures (40%-80%) followed by hip (40%-53%) and non-spine (20%-50%), depending on the treatment, patient profile and specific fracture risk10, 11, 18, 49. Oral and intravenous bisphosphonates remain the mainstay of treatment today, while biologic therapies such as parathyroid hormone analogues and monoclonal antibodies may be preferable for people with more severe disease or unable to tolerate oral therapy. It has been more than a decade since a new osteoporosis therapy has become available in Ireland, while several have been withdrawn (strontium ranelate, calcitomin, and a couple of S.E.R.M’S). New more effective therapies are needed. A potent monoclonal antibody (romosozumab) is effective and superior to alendronate for fracture prevention50, while available in North America, Asia and some European countries it has not been approved for use in Ireland to date. Surgery may be required for more severe fractures, often for patients who are high risk due to their advanced age, frailty and co-morbidities10, 11, 50. Sadly potential risks of treatment have received considerably greater attention in recent years, unlike the toll of osteoporosis and the fractures, and while the benefits far outweigh the risks, and the risk of many other life-altering events, poor communication, failure to address patients concerns and media reports have made many fearful of adequately effective proven safe interventions10, 21, 51-57, 52. If side-effects do occur, as with...
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any treatment, then appropriate action can and should be taken.

Studies addressing the burden of illness and the effect of osteoporotic fractures on patients’ health status, quality of life and financial independence are urgently needed in Ireland. Funding to ascertain a better understanding of why people are tested or not, hospitalized or not, require long-term care, and who gets treated for osteoporosis and why or why not is urgently needed. A strategy and resources for primary prevention and essential management for all patients for secondary prevention are urgently needed. When we see how the country and world responded to the COVID crisis, it is clear this can be done. Unlike COVID, we have years of experience, facts and proven interventions yet although the concept of “flattening the curve” in

Fracture Risk, Age and Impact of Additional Risk Factors

New research led by a professor at NUI Galway is set to change how doctors treat some patients with high blood pressure - a condition that affects more than one in four men and one in five women.

The study by researchers at NUI Galway, Johns Hopkins University and Harvard Medical School found no evidence that diastolic blood pressure - the bottom reading on a blood pressure test - can be harmful to patients when reduced to levels that were previously considered to be too low.

Lead researcher Bill McEvoy, Professor of Preventive Cardiology at NUI Galway and a Consultant Cardiologist at University Hospital Galway, said the findings have the potential to immediately influence the clinical care of patients.

Professor McEvoy said, “We now have detailed research based on genetics that provides doctors with much-needed clarity on how to treat patients who have a pattern of high systolic values - the top reading for blood pressure - but low values for the diastolic, or bottom, reading.”

This type of blood pressure pattern is often seen in older adults. Old studies using less reliable research methods suggested that the risk for a heart attack began to increase when diastolic blood pressure was below 70 or above 90. Therefore, it was presumed there was a sweet-spot for the diastolic reading.”

Professor McEvoy and the international research team analysed genetic and survival data from more than 47,000 patients worldwide. The study, published in the prestigious medical journal Circulation, showed:

- There appears to be no lower limit of normal for diastolic blood pressure and no evidence in this genetic analysis that diastolic blood pressure can be too low.
- There was no genetic evidence of increased risk of heart disease when a patient’s diastolic blood pressure reading is as low as 50.
- The authors also confirmed that values of the top, systolic, blood pressure reading above 120 increased the risk of heart disease and stroke.

Blood pressure medications reduce both systolic and diastolic values.