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Supportive skeletons:

addressing bone health in Parkinson's to improve outcomes

An outcomes report from the Parkinson's Advanced MasterClass projects 2021

May 2022

Neurology Academy®

NEUROLOGY ACADEMY: EDUCATION WITH IMPACT

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Foreword

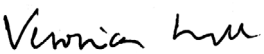
This report produced by Neurology Academy shines a light on the importance of managing bone health in people with Parkinson's. Gait and balance dysfunction are key features of the condition and the downstream consequences of falls and fractures negatively impact an individual's quality of life and wellbeing. Pandemic-related restrictions have likely worsened many factors that enable older people with Parkinson's to maintain their mobility, fitness, independence and social interactions and we should expect to see the downstream negative sequelae for considerable time to come.

It is hugely encouraging to see that the importance of bone health assessment in Parkinson's is increasingly recognised. Assessment of fracture risk and the initiation of appropriate investigation and treatment of osteoporosis should be considered core business in Parkinson's care and this report highlights many examples of good practice across the UK.

The inclusion of bone health assessment within a framework of a holistic and individualised approach to care in Parkinson's is a new horizon and offers people with the condition the best possible care and support.

The real, practical approaches illustrated in this report demonstrate how local teams are taking steps to ensure that their patients have access to better bone health. At the same time, work is going on through the UK Parkinson's Excellence Network Bone Health Project, applying the BONE-PARK algorithm approach to patient assessment and treatment across 40 services. The National Osteoporosis Guideline Group (NOGG) new updates in April 2022 further support targeted risk assessment and treatment for people at higher risk of fractures.

The championing of bone health in Parkinson's brings real opportunity to reduce the burden of fractures and their associated consequences, supporting the maintenance of health and independence for people with Parkinson's.



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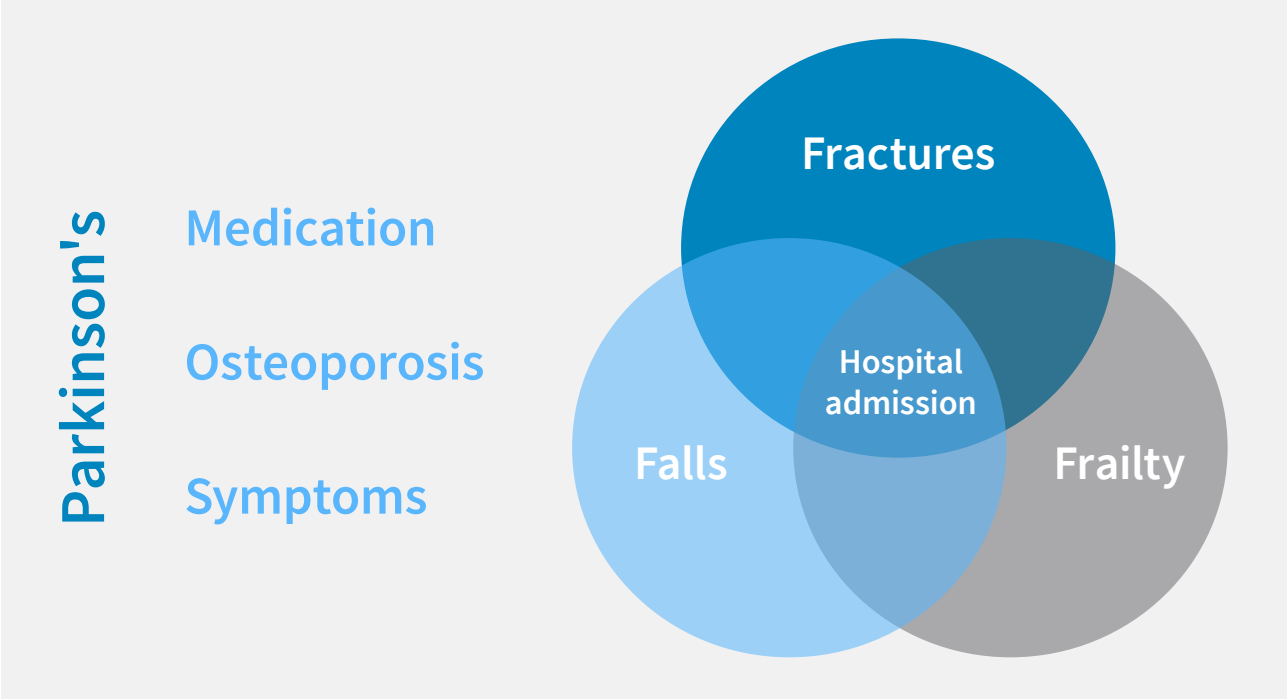
Why bone health matters in Parkinson's

Parkinson's is the second most common age-related neurodegenerative disorder after Alzheimer's, with between seven and 10 million people worldwide currently living with the condition [1], and around 145,000 in the UK - a number expected to double in the next 40 years [2].

People with Parkinson's cost the NHS roughly £3,000 more per annum than individuals of the same age without the condition [3], and they have higher rates of emergency admissions associated with longer hospital stays, higher costs and in-hospital mortality [4]. In comparison to those without Parkinson's, they generally require higher levels of care during a hospital stay, and are more likely to experience serious health problems - including falls and fractures themselves - during that stay [5].

Figure 1: Interrelationship of multiple factors in Parkinson's impacting bone health leading to hospital admissions



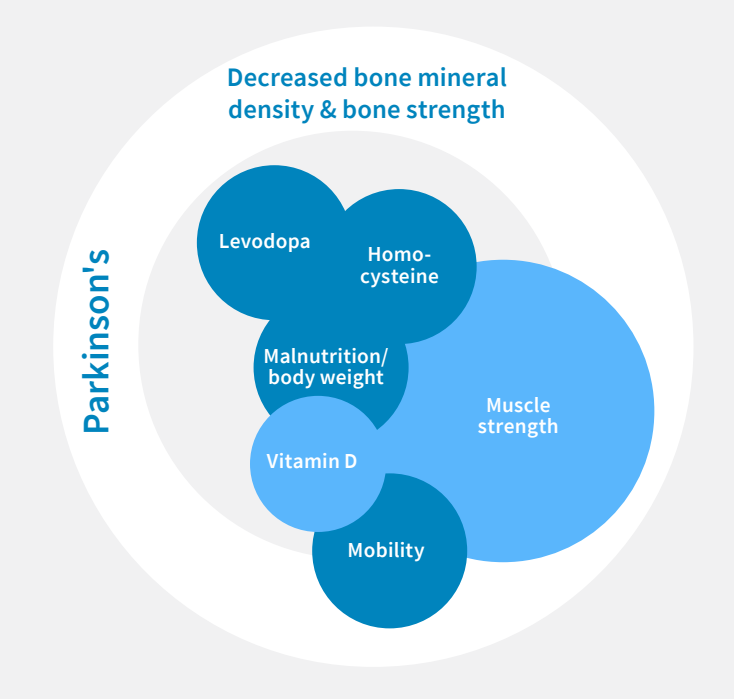
A third of hospital admissions for people with Parkinson's are due to fractures [6] - indeed, someone with Parkinson's is twice as likely to experience an osteoporotic fracture with an increased weighting towards a hip fracture [7]. This is significant - in the general populace, a woman in her 50's already has a 30% likelihood of a fracture in her lifetime, whilst a man of the same age has a 20% likelihood [8,9].

Hip fractures alone account for 4% of Parkinson's admissions, costing the NHS £14 million each year [4] and are considered the most consequential fracture type, associated with increased risk of mortality, subsequent fracture and increased requirement of another care setting [10,11].

Increased risk: interconnected factors

There is a complex interrelationship of multiple factors affecting the bone health of people with Parkinson's, all impacting their likelihood of fracture, and their level of risk associated with it (figures 1 and 2).

Figure 2: Interrelationship of various symptoms, comorbidities or complications related to Parkinson's and impacting bone health

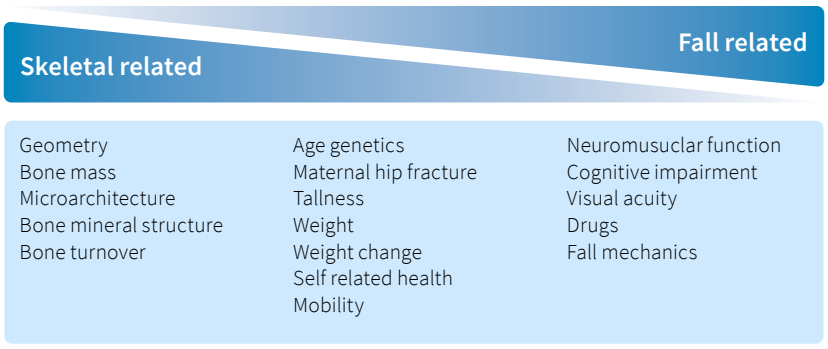


People with Parkinson's are at increased risk of osteoporosis and have a lower bone mineral density [12]. This is related to various factors, including vitamin D deficiency, symptoms and medication:

- Vitamin D deficiency can be detected in people with Parkinson's for decades prior to diagnosis [13]. Its lack has a huge impact on calcium absorption and bone density.
- Symptoms such as dysphagia, sialorrhea and poor emotional health can impact nutrition and body weight [14,15,16]. Reduced mobility and muscle strength decrease weight-bearing and further lower bone density, and orthostatic hypotension may cause dizziness and increase risk of falls.
- Medication choices can also have an impact; side effects such as nausea may impact nutritional intake whilst Levodopa can cause hyperhomocysteinemia, another risk factor for osteoporosis [17].

A lower bone density means that a fracture is more likely to occur as a result of a fall - and result in hospital attendance - whilst the range of factors impacting falls in Parkinson's is varied and complex in itself (figure 3).

Figure 3: Reproduced from Masud & Morris [18] p5 diagram of factors impacting falls in Parkinson's



Following best practice

A team of clinicians recently used the updated guidance from the National Osteoporosis Guideline Group (NOGG) [19] to review use of two fracture prediction tools, Qfracture® [20] and FRAX® [21], and develop an up-to-date algorithm to guide the management of bone health and fracture risk in people with Parkinson's [22].

The algorithm is designed to be as simple as possible so that everyone can - and will - incorporate it into their current Parkinson's practice (figure 4).

Figure 4: Four simple steps to optimise bone health and reduce risk in people with Parkinson's: the BONE-PARK algorithm

Step 1	Optimise **VITAMIN D** and **CALCIUM** intake Address **LIFESTYLE** factors: **alcohol, smoking and physical activity**
Step 2	Assess **FALLS**, previous **FRACTURES** and **BACK PAIN** **Include spine imaging if occult vertebral fracture suspected**
Step 3	Using **FRAX**, calculate the risk of MOF and hip fracture **Include PD as a secondary cause of secondary osteoporosis** For comorbid or life-limited patients, consider using Qfracture
Step 4	Use the **NOGG** treatment algorithm (as weblink)

Dr Veronica Lyell, consultant geriatrician at Royal United Hospitals Bath NHS Foundation Trust, gave a thorough overview of bone health in Parkinson's and the BONE-PARK algorithm [22] at the Parkinson's Cutting Edge Science conference in November 2021. You can find out much more about the topic by reading the event report from her session, freely accessible online [23].

5 things to do right now

1. Print off the 4 steps for the BONE-PARK algorithm as a reminder of how to carry out optimal fracture assessments in Parkinson's
2. Create a shortcut link to the FRAX assessment risk calculation tool webpage from your desktop [24]
3. Sign up for the UK Parkinson's Excellence Network free online course for managing bone health in Parkinson's (approximately 10 hours of study time) [25]
4. Replicate or adapt one of the examples of bone health quality improvement from around the country in your own area
5. Consider working with Parkinson's UK on their Bone Health National Service Improvement Project.

Learning from across the country

Around the country, healthcare professionals are beginning to recognise the importance of bone health in Parkinson's and to tailor or transform their services in a variety of ways to better promote, support or manage this essential component of health.

In a recent Parkinson's Advanced MasterClass [26], around a third of workplace projects addressed bone health, frailty or falls. Each project provides insight into this topic, and, seen collectively, they promote service models to learn from, adapt, or replicate more widely across the UK and beyond.

(You can read the full projects and references, and review the author's poster submissions via https://neurologyacademy.org/projects - just pop the author's name in the search function there.)

Image: Google map highlighting location at a glance of the PD40 projects

Table: Overview of the authors, project titles and their locality, as they appear in this report

Author	Title	Location
Dr Helen Smith	An observational study of patients with Parkinson's presenting with fractured hip in 2020	Swindon
Deborah Thurman	Audit of notes regarding falls & bone health	Gloucestershire
Gill Carter	Managing bone health in Parkinson's	Stoke-on-Trent
Dr Catherine Nicolson Duncan	Assessing bone health in Idiopathic Parkinson's	Glasgow
Dr Beatriz Contreras	Analysis of pharmacology and osteoporotic fracture prevalence	Lincolnshire
Andrea Stutt	Encouraging activity reducing risk	Northumbria
Dr Sarah Mello	Frailty and Parkinson's	Dublin

An observational study of patients with Parkinson's presenting with fractured hip in 2020: characteristics, outcomes, and rates of prior bone health assessment

Dr Helen Smith, consultant geriatrician, Great Western Hospitals NHS Foundation Trust, Swindon

Helen set out to identify people with Parkinson's in Swindon and North Wiltshire who presented with a hip fracture to the Great Western Hospital between 1 January to 31 December 2020. She wanted to understand their characteristics and outcomes, and to review rates of bone health assessment amongst them, to inform service improvement plans. She utilised data from the National Hip Fracture Database and the Parkinson's disease nurse specialist's current caseload to find those people with Parkinson's who had sustained a hip fracture. She reviewed Hospital Episodic Statistics (HES) data and GP records to ascertain if bone protection had been considered prior to the fracture. She then used the BONE-PARK algorithm to conduct a retrospective estimate of osteoporosis risk.

Helen found that, whilst numbers of patients within her study were small, there had clearly been missed opportunities to evaluate bone health in these patients at both primary and secondary care levels, and she found high rates of delirium and subsequent contralateral hip fracture occurred amongst those patients.

Service development

As a result of her findings, Helen has made a series of recommendations for service development:

1. Blood panel for all patients newly diagnosed with Parkinson's disease to include serum vitamin D and eGFR measurement
2. Education for all doctors and nurses within the Parkinson's service at GWH on bone health
3. Assessment and implementation of BONE-PARK algorithm to be considered on an annual basis
4. Height and weight to be recorded at all face-to-face contacts to enable FRAX assessment
5. Resumption of Parkinson's nurse inpatient reviews for all inpatients with Parkinson's disease, with increased frequency as staffing permits
6. Parkinson's nurse to review all patients who do not take up written invitations to make an appointment for their annual physiotherapy review and to identify those who may benefit but who may have apathy or other barriers to booking an appointment
7. Creation of Parkinson's disease-specific patient information leaflets on bone health to be distributed during clinics.

Audit of notes regarding falls & bone health

Deborah Thurman, Parkinson's nurse specialist practitioner, Gloucestershire Hospital NHS Foundation Trust, Gloucestershire

Deborah suspected that many of her Parkinson's patients who were at a high risk of falls and fractures were not on bone health medication, nor that they were aware of osteoporosis being more common in those with Parkinson's. She decided to carry out an audit to determine if this was the case - and to understand if her service needed to improve in this area.

Of patients recently in an outpatient facility or requiring home visits, she randomly selected 20 sets of patient notes and reviewed their history of falls, bone medication and vitamin D use, gait assessment inclusion in consultations, whether reason for falls had been asked about and / or was documented, onward referrals and other topics discussed.

Deborah found that patients were not routinely asked if they had fallen recently, and that osteoporosis was not commonly discussed, and noted that, as clinic conversations are often led by the person with Parkinson's, this may highlight a reduced understanding of fracture risk in those patients. She found that patients were regularly referred to physiotherapy for strength and balance training and to occupational therapy for environmental assessments, but that no referrals were made to GPs for fracture risk screening or to falls specialists.

Service development

As a result of her findings, Deborah has suggested that Parkinson's practitioners within the Trust:

1. Consider making onward referrals to falls specialist practitioners as needed
2. Refer to GP's for assessment of risk and need of bone protection
3. Routinely ask questions regarding falls in consultations
4. Direct patients to osteoporosis information as necessary

Managing bone health in Parkinson's

Gill Carter, Community Parkinson's specialist nurse, South Cheshire and Vale Royal

Gill's caseload is specifically people with Parkinson's in the community who are unable to get to in-patient clinics due to deteriorating health, and therefore includes people who are older or more frail, or have had Parkinson's for many years. She wanted to know what percentage of her caseload was taking vitamin D or bone protection medication.

Gill conducted a comprehensive review of 109 sets of paper casenotes and noted age, gender, and whether or not they were taking a form of bone protection including medication or vitamin D.

She discovered that just under a fifth (n=21) of her caseload were taking vitamin D or another form of bone protection, whilst the remaining 80% were not.

Service development

As a result of her findings, Gill has decided to learn more about bone health in Parkinson's and to implement changes in her personal practice. She has begun to:

- discuss bone health, Vitamin D supplementation and food sources with people with Parkinson's
- request Vitamin D prescription in clinic letters with standard paragraph citing research.

Additionally, she has:

- undertaken further training in bone health via a 10 hour virtual course (Parkinson's Excellence Network)
- begun a further project to establish how many people with Parkinson's who are admitted to the local District general hospital with fractures take a vitamin D supplementation.

Assessing bone health in idiopathic Parkinson's disease

Dr Catherine Nicolson Duncan, consultant geriatrician, Queen Elizabeth University Hospital, Greater Glasgow and Clyde

Catherine was already undertaking an outpatient review of people with a documented diagnosis of idiopathic Parkinson's disease (IPD) and decided to review the documentation around bone health within this. She also wanted to find out whether osteoporosis risk was being formally assessed with the Qfracture assessment tool in Parkinson's outpatient follow up clinics.

Catherine conducted a retrospective review of electronic case records for 50 patients with a formal diagnosis of IPD across three hospitals covered by the Movement disorders team she works within. She reviewed every clinic letter for bone health documentation spanning from their diagnosis until Autumn 2021.

She found that 66% of the patients reviewed had reported at least one fall since diagnosis, with 33% having a fracture recorded in their history. However, only 22% had a documentation of at least one discussion around bone health recorded in their notes, and there was no documented evidence of osteoporosis risk assessment through either Qfracture or alternative tools (ie QFRAX).

Service development

Catherine notes clearly the limitations of her study, including the small sample and the reliance on clear documentation of conversations in notes. However, it demonstrates a lack of routine assessment and uniform approach to bone health.

The Movement disorders team she is part of are considering:

- Adopting a uniform clinic proforma to prompt bone health assessment using the Qfracture algorithm
- A review as to how best to document bone health assessments in patient records to limit duplication and ensure patients receive the best possible treatment.

Analysis of pharmacology and osteoporotic fracture prevalence in Lincolnshire patients with Parkinson's disease: bone protection, anticholinergic burden and polypharmacy

Dr Beatriz Contreras, consultant geriatrician, Lincoln County Hospital, United Lincolnshire Hospitals NHS Trust, Lincoln

Beatriz wanted to understand the prevalence of various elements which can impact on a person with Parkinson's including cognitive impairment, postural hypotension, polypharmacy, osteoporotic fracture, anticholinergic burden and the prescription of bone protection. She conducted an audit of those people with Parkinson's aged 65 or over attending the Movement disorders clinic during a two month period. This covered 55 people.

Beatriz used patient's clinic letters and Summarised care records (SCR) held within the NHS Portal. Osteoporotic fractures counted were hip, vertebrae and Colles fracture, and whilst history of falls had been an area for audit, it was found to be seldom recorded and so removed from the study.

Only 16% of the total sample had any kind of bone protection (referring to bisphosphonates, calcium and vitamin D supplementation). 28% of those reviewed (n=14) had had an osteoporotic fracture at some point. A sub-analysis of this group found that 66.7% of these patients did not have any bone protection prescribed and a third had a previous history of postural drops, over half of whom had not been assessed for this. 50% of this sample had a diagnosis of cognitive impairment or dementia.

Service development

Beatriz notes clearly that, despite Parkinson's being related to recurrent falls, at present there is no regular falls assessment being conducted or recording of falls in patient records (SCR) even when this led to a fracture. She recommends:

- a comprehensive geriatric assessment be carried out on this population of people (65 and over, with Parkinson's, under the Movement disorders clinic)
- a quality improvement project be taken on to optimise the management of polypharmacy and primary and secondary prevention of falls and fractures in this same population.

Encouraging activity, reducing risk

Andrea Stutt, Parkinson's nurse specialist, Northumbria Healthcare NHS Foundation Trust, Northumbria

This project took place within a pilot site for the UK Parkinson's Excellence Network Bone Health National Service Improvement Project. The initiative has since been rolled out nationally.

Andrea wanted to improve people with Parkinson's' engagement with physical activity in order to reduce their risk of falls and fractures. She chose to equip staff with both knowledge of the benefits of physical activity for people with Parkinson's, and of programmes available that they could refer to, in order to ultimately improve balance and reduce risk of falls amongst Parkinson's patients.

Andrea set about raising awareness and providing informal education to staff in her team. For bone health, this was around appropriate assessment, access to advice and interventions to support better monitoring, and for physical activity, was around awareness of available initiatives, and encouraging lateral thinking and creativity to consider movement for patients.

This project combines improvements around bone health and physical activity to ultimately improve outcomes for people with Parkinson's. Early assessment of fracture risk should allow for early advice and intervention to minimise longer-term complications. By then adding advice on physical activity and lifestyle changes, this should reduce the individuals' risk profile as well as their risk of longer term complications from fractures.

Service development

Andrea's service provider, Northumbria Healthcare, had committed to being part of both the Bone Health National Service Improvement Project, and the Active Hospitals initiative.

Her project, sitting within both these initiatives, was the first step towards both improved bone health assessment, monitoring and intervention, and improved provision and encouragement of physical activity in people with Parkinson's.

The impact of both will be assessed in time, within their respective initiatives.

Efficacy of an elective period of in-patient rehabilitation for patients living with Parkinson's disease & frailty

Dr Sarah Mello, consultant geriatrician, Tallaght University Hospital and Peamount Healthcare, Dublin

Sarah wanted to find out if an elective two-week in-patient rehabilitation programme would have a short-term impact on frail Parkinson's patients' function, mobility, and self-reported quality of life.

She conducted a pilot study which assessed all frail people with Parkinson's admitted for elective rehabilitation who could mobilise independently (with or without an aid or a person's assistance), and were cognitively able to participate. The two-week programme consisted of a consultant-led Comprehensive Geriatric Assessment and daily physiotherapy and occupational therapy sessions. Sarah measured frailty using the Clinical Frailty Index, and took functional outcome and health related quality of life measurements on admission and discharge, comparing the two using a paired t-test.

12 people with Parkinson's completed the programme within these parameters (4 male, 8 female), with an average age of 79 and an average frailty score of 5.5 (indicating mild to moderate frailty). Sarah found that all patients had a significant improvement in activities of daily living, overall mobility, gait speed and balance from admission to discharge from the programme, as well as improved health-related quality of life indicators.

Service development

Sarah notes that whilst early data is positive around this two-week programme, longer term follow-up is needed to ascertain whether these improvements are sustained, and whether the intervention is cost-effective.

Follow up data at four months for these same patients has found that those who completed the programme had a sustained improvement in their quality of life at the four-month mark, as well as having a statistically significant reduction in fall rates as compared to the months prior to completing the programme.

Thinking more broadly

Interventions wider than Parkinson's itself, such as in improved hospital practice, or interventions in orthopaedics could also have a positive impact on Parkinson's patients as well, whilst initiatives to improve Parkinson's care during hospital visits, such as with a 'Get it on Time' campaign [27], may have a risk-reducing effect on in-hospital fractures and falls.

For example, an initiative on an acute orthopaedic ward in Nottingham has reduced falls, pressure ulcers and complaints using enhanced supervision and #EndPJparalysis. Staff are keeping patients physically mobile and socially engaged through two distinct initiatives which have resulted in a 37.5% reduction in falls and an 55.6% reduction in pressure ulcers [28]. This initiative, whilst not aimed at people with Parkinson's specifically, is likely to have a positive impact on those patients with Parkinson's who find themselves on that ward.

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