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# A quality improvement initiative on the management of osteoporosis in older people with Parkinsonism

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## ABSTRACT

The risk of falls is higher in patients with people with Parkinsonism (PwP) compared to those without Parkinsonism, and leads to adverse outcomes including fragility fractures. Osteoporosis is under-recognised, and the prevalence of fragility fractures is not well studied. The primary aim of this project is for 100% of new patient referrals to, and 80% of follow up patients within the movement disorder (MD) service with osteoporosis to be treated in accordance with evidence based osteoporosis guidance.

Routinely captured information regarding demographics and fragility fractures was retrospectively extracted from the clinical workstation, clinic letters, and clinical coding between July and November 2015. The prevalence of fragility fracture was 22.6% (68/300), and only 40% (27/68) were on appropriate treatment for osteoporosis.

A quality improvement (QI) methodology based on the model of improvement, Plan-Do-Study-Act (PDSA) cycles were used, and a monthly multidisciplinary team (MDT) meeting was introduced.

This QI initiative has shown that MDT input can reduce referrals to physiotherapists; and also 100% of new patients, and 91% of follow up patients received evidence based osteoporosis treatment.

geriatrician, an associate specialist, geriatric medicine registrar, PD nurse specialist, and band 5 nurses. There are two clinics each week to assess two to three new referrals and review 12 to 14 follow up patients. Evaluation of the MD service revealed that about 20% of the PwP cohort had already suffered fragility fractures, and more than half were not on appropriate secondary prophylaxis. A higher number of patients were referred to the falls and bone health clinic. The increased referral rate created demand that was not being met, raising patient safety and quality concerns.

The primary aim of this project is for 100% of new patient referrals to, and 80% of follow up patients within the MD service with osteoporosis are treated in accordance with evidence based osteoporosis treatment. A specific objective of this quality improvement project is also to closely monitor the prevalence of vertebral/fragility fractures in PwP attending the local MD clinic over time.

## PROBLEM

Parkinsonism and Parkinson's disease (PD) increase the risk of falls, and are associated with poor clinical outcomes including fragility fractures, hospital admission, and institutionalisation.<sup>1 2</sup>

The association between Parkinsonism and osteoporosis has been clearly established in the literature,<sup>3-8</sup> and Parkinsonism has shown to increase the risk of fragility fractures above other long term medical conditions.<sup>1</sup> The current national clinical guidelines do not adequately address risk assessment of osteoporosis or its management in patients with Parkinsonism.<sup>3</sup>

The existing outpatient movement disorder (MD) service has a patient cohort of more than 400 people with Parkinsonism (PwP), and is provided by a consultant

## BACKGROUND

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterised by bradykinesia, rigidity, tremor, and postural instability. The prevalence of PD increases with age. The prevalence of PD is nearly 1% among people aged 65 to 69 years, rising up to 3% among people aged above 80 years.<sup>9</sup> We expect to see a higher number of PD patients due to ageing populations and improved survival in view of advances in diagnosis and management of PD.

The disorders of gait and balance are the most common neurological diagnoses associated with falls.<sup>10</sup> The risk of falls is particularly associated with PD (62%), which is higher than other neurological disorders including polyneuropathy (48%), spinal disorders (41%), or stroke (22%).<sup>11</sup> There is an exponential increase in the falls risk with age, from 35% in older adults above 65 years



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to 45% in older people over the age of 80.<sup>12</sup> The majority of patients with PD experience falls,<sup>13</sup> which increases the risk of admission of PD patients to hospitals and nursing homes.<sup>2</sup> Not only does the falls risk double in patients with PD compared to those without PD,<sup>10 13</sup> they also have a significantly greater rate of age adjusted mean annualised total hip bone loss.<sup>5</sup> A higher incidence of hip fracture has been reported in patients with PD.<sup>3 4 7 14–18</sup> Hip fracture is associated with poor outcome, and survival declines following hip fracture.<sup>19 20</sup>

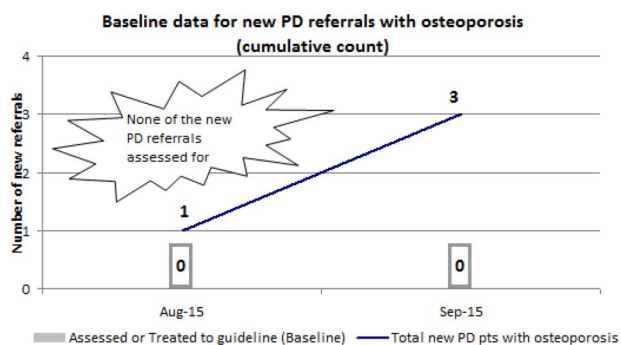
However, fragility fractures are often underdiagnosed in PD overall, and current prevalence of fragility fractures in PD patients is not very well studied, and thus is not always treated according to guidance.<sup>6 7</sup>

### BASELINE MEASUREMENT

The primary outcome measure for this project is the number/percentage of patients with Parkinson's disease who are being treated in the MD clinic that have been identified as having osteoporosis, and who have been assessed and treated for osteoporosis according to evidence based guidance.

Baseline data were collected to highlight the nature of the problem as outlined below, and were then collected regularly and in real time as part of the multidisciplinary team (MDT) meeting process.

The data for all new referrals to MD clinic were studied. It was noted that none of the new referrals was assessed for osteoporosis, and were thus not treated according to guidance. Case notes, clinic letters, and radiology reports were assessed for all new referrals assessed in the MD clinic in August 2015. The baseline data showed that only one of the new PwP had osteoporosis, but their osteoporosis was not addressed. Similar data was collected for all new referrals assessed in September 2015. Two of the new PwP had osteoporosis, and neither had been assessed for osteoporosis (figure 1). The lack of osteoporosis assessment has been noted anecdotally in the MD, service and has been reported in the literature.<sup>3</sup> This clearly raises patient safety and quality concerns as PwP are at high risk of falls, and therefore fragility fractures.



**Figure 1** Baseline data for all new referrals (PwP and Osteoporosis)

### DESIGN

Quality improvement methodology based on the model of improvement and PDSA cycles were used to ensure there was a reliable process for delivering evidence based osteoporosis treatment for all patients attending the MD clinic (supplementary figure 2).

The primary driver for the change was to assess all new patients referred to the MD clinic for falls risk as per NICE recommendations, and to ensure osteoporosis is treated.<sup>21</sup> The secondary driver for the change was to find the prevalence of osteoporosis in the PD clinic, and ensure more than 80% of patients are treated to guidance by setting up a regular MDT meeting (supplementary figure 3). A team including a consultant geriatrician with an interest in falls and osteoporosis, a consultant geriatrician with an interest in MD, a PD nurse specialist (PDNS), and a senior physiotherapist (PT) was formed.

The meeting initially took place every week at midday, but its regularity changed as the meeting became more efficient. During the meeting the team carried out case based discussions for all new and follow up patients already in the system. An MDT triage process ensured that only appropriate patients were referred for physiotherapy. Any further referrals to other services were dictated during the meeting. As part of the meeting, real time patient level data was collected and held on an anonymised spreadsheet. This spreadsheet enabled identification and tracking of patients, and was also used as an audit tool. Data were collected regarding the number of patients referred, and the number of existing follow up patients with Parkinsonism in the system. Fragility fracture data was collected from existing electronic health board data, and all x ray reports were reviewed for each patient included in the study.

### STRATEGY

The strategy for making the change was based on the key Prudent healthcare principles set out by the Bevan Commission: care for those with the greatest health need first; reduce inappropriate variation through evidence based approaches; maximum use of existing resources through coproduction; and do what is needed.<sup>22</sup>

There were two strands to our strategy to test the effectiveness of the intervention. Initially, the focus was on new patients referred to the MD clinic. These numbers were smaller, and enabled us to develop and test the case based discussions at the regular multidisciplinary meetings; this was then extended to include follow up patients. The primary aim of the project was to ensure that patients received clinically effective treatment, and a regular multidisciplinary meeting was introduced using PDSA cycles to achieve this. The number of patients receiving appropriate treatment formed the outcome measure for this project.

It was important to develop a multidisciplinary meeting that made the best use of clinician time, in that

it was efficient enough to discuss the care for all PwP in a short period of time, and included a minimum number of relevant professional staff (supplementary figure 2 and 3). In order to measure the efficiency of each multidisciplinary meeting, the meeting duration was measured on each occasion.

**PDSA 1 (October 2015):** the aim of the PDSA was to ensure all new patients referred to the MD clinic with osteoporosis are assessed, treated, and referred as appropriate. The theory of change was that in introducing a regular case based review of these patients, they would receive appropriate treatment for osteoporosis. Two consultants with an interest in osteoporosis and MD planned to meet on a weekly basis to have a “case based discussion” (CBD) for all new referrals, and agree on the treatment plan for osteoporosis: to refer on to a physiotherapist where necessary, and to collect ongoing patient level data. These meetings took place at midday following the falls and bone health clinic, and prior to the MD clinic. At each meeting a computer list of all patients was updated with the relevant outcomes of each discussion. PDSA 1 was studied after two weeks, and was found to be very time consuming to record the data and outcomes of the case based discussion.

**PDSA 2 (October 2015):** the aim of this PDSA was to reduce the time taken to carry out a CBD for each patient. Our theory was that in having a definitive list of patients under review, the CBD would be faster. CBD for new referrals were carried out using a list updated by the administrative staff. A medical secretary was introduced to update the data sheet and record the number of referrals. This was less time consuming, but there was a delay in dictating referrals, and we noted a higher number of physiotherapist referrals (figure 2).

**PDSA 3 (November 2015):** the aim of this PDSA was to further reduce the time taken to carry out a CBD for each patient. Our theory was that if we continued to update the worksheet and dictate referrals during the CBD, the time taken would be reduced. PDSA 3 was studied and the time taken was less, but generated a high number of physiotherapist referrals. It was agreed to stop CBD and test the change by introducing a multidisciplinary meeting (MDM) with the physiotherapist and PD Nurse Specialist (PDNS), to assist in triaging the falls referrals (figure 2).

**PDSA 4 (December 2015):** the aim of this PDSA was to reduce the number of inappropriate referrals to physiotherapy. Our theory was to continue to update the worksheet and dictate during the MDM, but also that including a wider MDT triage of referrals would be more effective. A weekly MDM with the consultants, physiotherapist, PDNS, and a secretary was introduced. The data sheet was updated for new on Microsoft Excel, dictation was done for the osteoporosis treatment plan, and any appointments to the bone clinic were arranged if needed. This PDSA cycle was studied, and the process had become streamlined: the MDM was completed in 30 minutes compared to an hour, and generated fewer new

referrals to physiotherapy. It was agreed to reduce the MDMs to twice a month, and the secretary was no longer needed as dictation was self sufficient.

Twenty new referrals received between October 2015 and December 2016 were assessed following the introduction of the quality improvement initiative. Following the MDM it was agreed that 10 patients (50%) were at low risk of falls, and did not need a referral to the physiotherapist. Four patients were considered at risk of falls in view of the associated risk factors, and were referred to a physiotherapist for muscle strengthening and balance training.

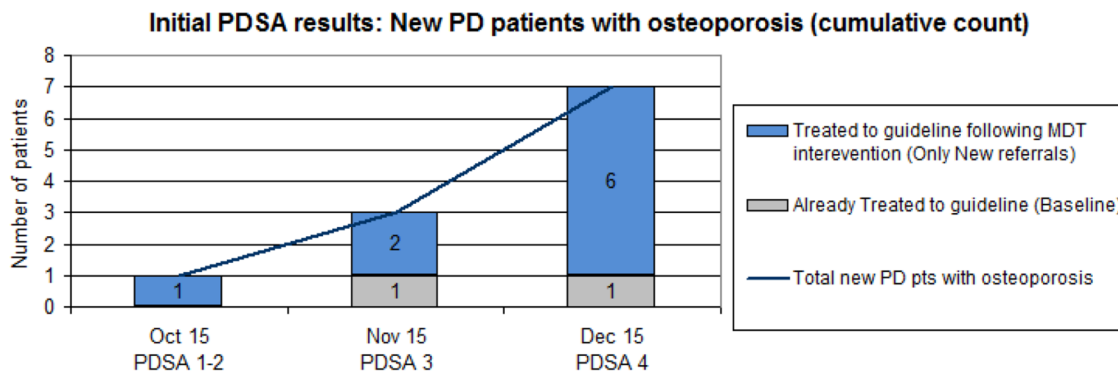
Seven out of 20 new referrals assessed in the MD clinic between October and December 2015 had evidence of fragility fracture, but only one was on osteoporosis treatment. Following MDM discussion, the other six new PwP were assessed and started on appropriate bone protection treatment (figure 2).

By December 2015 (PDSA 4), all new PD patients were assessed for falls risk and appropriately referred, and 100% of new PwP patients were not only assessed for fragility fractures, but also commenced on evidence based treatment. The results of the initial PDSA cycles were reviewed, and the team agreed that the intervention met the Prudent Healthcare principle: “care for those with the greatest health need first,” by treating those patients who already had fragility fracture and were at high risk of falls. In addition, the intervention also reduced the inappropriate referrals to a physiotherapist.

**PDSA 5 (December 2015):** the aim of this PDSA was to reduce the number of meetings. The theory tested was that the meetings were carried out efficiently, and could be reduced while still ensuring all patients had a CBD. This was tested by multidisciplinary meetings for both new and follow up patients taking place every two weeks in December 2015. The team included two consultants, a physiotherapist, and a PDNS. A pre-prepared list for new patients was used, dictation was done straight away following triage for patients with high falls risk, osteoporosis investigations including dual energy X-ray absorptiometry were requested, and all agreed there was no need for the secretary to continue attending. The MDM was completed in 25 minutes. The team agreed to continue the final PDSA quality improvement initiatives on a wider scale, and test the change widely for both new and follow up patients (n=364) attending the MD clinic with one monthly meeting for January 2016, and continuing to monitor osteoporosis treatment according to guidance.

## RESULTS

The data was collated after the final PDSA cycle for 384 patients (20 new and 364 follow ups; mean age=76.14  $\pm$  9.53; 46% females). Seventy eight percent (300/384) had Parkinsonism, and 80% (240/300) had idiopathic PD. All existing follow up patients and new referrals were discussed in the monthly MDM (Final PDSA) over the six months between December 2015 and May 2016.



**Figure 2** Initial PDSA - New PD patients with Osteoporosis

Out of the 364 follow up patients, 168 (46%) attending the MD clinic were not assessed by the physiotherapist as per NICE recommendations until November 2015. Following the quality initiative, 74 out of 168 follow up patients (44%) were considered low risk, and 16/168 (10%) were considered as not appropriate for, or previously declined, physiotherapist intervention. The remaining 78 patients (46%) were either referred to a physiotherapist, falls clinic, osteoporosis clinic, community occupational therapist, or to a PDNS.

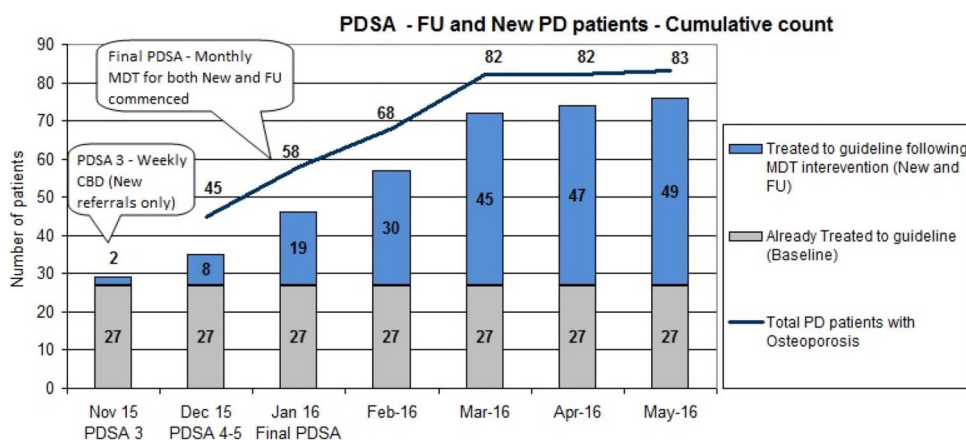
The prevalence of fragility fracture was 22.6% (68/300), and mean age was 79.65  $\pm$  12.37 years (females = 68%). The sites of fractures were: vertebral 47% (32/68); hip 26.5% (18/68); wrist 19% (13/68); pelvis 5% (3/68); and humerus 3% (2/68). Thirty four percent of patients (23/68) had a fracture before the diagnosis of Parkinsonism. Forty five PwP out of 68 (66%) had sustained a fragility fracture during the course of Parkinsonism, with a mean lapse of 4.36  $\pm$  3.78 years (range zero to 12 years) from initial diagnosis. Only 27 PwP out of 68 (40%) were on appropriate treatment as per guidelines until November 2015. However, 91% were on evidence based treatment due to the new quality initiative by the end of May 2016.

In the first month (December 2015), eight patients were discussed, and an osteoporosis treatment plan was

agreed. In the subsequent five months, the team continued to assess new referrals and follow up patients for osteoporosis. The initial assessment showed that the total number of patients with Parkinsonism who had osteoporosis was 68; however, further retrospective case note reviews showed that more PwP were noted to have underlying osteoporosis, and the majority were not treated to guidance. Therefore, the total number of PwP with osteoporosis increased from 68 to 83, of whom 76 (91%) were on evidence based treatment due to the new quality initiative by the end of May 2016 (figure 3).

### LESSONS AND LIMITATIONS

Lessons have been learnt. Parkinsonism is a long term progressive neurodegenerative condition, with extensive non-motor and motor problems. Therefore, any MD clinician is likely to concentrate on the management of Parkinsonism. When considering the human factor, even if gait and balance are assessed for each PwP, or moreover if falls history is explored as well, it is possible that osteoporosis and previous fragility fractures are not being assessed. Osteoporosis is a hidden disease and often diagnosed following a fragility fracture, but patients do not always receive evidence based treatment, or treatment according to guidance.



**Figure 3** Spread of final PDSA to new and follow up patients and impact on appropriate osteoporosis treatment



This quality improvement project supports previously reported findings that PD is an important associated risk factor for osteoporosis, but is under recognised and under treated. Approximately one fourth of patients attending the MD clinic had evidence of fragility fracture, and only 40% patients were on appropriate osteoporosis treatment. The observed increased risk of fragility fractures in PD has important clinical implications in terms of providing comprehensive person centred care. Therefore, we would recommend that osteoporosis should be assessed for each PwP. Physiotherapists are discussing introducing group exercises for those patients classed as being at low to moderate risk of falls, as evidence recommends all Parkinson's patients have access to physiotherapy. PDNS have found this project very helpful in tracking very high risk PwP.

Our study has numerous strengths. Fragility fracture data was collected from existing electronic health board data, and all x ray reports were reviewed for each patient included in the study. The team included key multidisciplinary professionals, including consultants with an interest in osteoporosis and MD, a physiotherapist, and a PD nurse specialist. Ongoing data collection has also been built into the regular meeting process, and offers a real time opportunity to ensure that all patients are treated to guidance, and to understand the effectiveness of this intervention. Ongoing data collection is also important to support further work to assess the long term effectiveness, in terms of reduced patient harm. The results of the intervention have been sustained over six months. The current process is sustainable due to the dedication of the current staff; should there be a change in staff, the process may become unsustainable. It has been proposed to include monthly MDM in the consultant job plan to make the process more sustainable. The project was supported by the quality improvement team within the health board, and a team is working to spread monthly MDMs to other clinics within the organisation. While this intervention has proved to be effective for patients with osteoporosis attending the MD clinic, it is generalisable to other areas and specialities, where early multidisciplinary input supports improved assessment, triage, and treatment practice. The costs of this intervention have not been formally assessed; this intervention has been incorporated into the normal working day, so has not accrued any additional costs other than staff time.

Our project also has several limitations. This is a retrospective study based on existing data. There is a likely chance that there is a higher proportion of patients with osteoporosis we had not diagnosed, as we only assessed osteoporosis based on the radiological evidence for one health board. We have reviewed GP letters to ensure reliability, but we acknowledge this is a limitation of the project, as we may have missed fragility fractures if any x rays had been carried out outside the health board. The most common reported fracture in PD patients in literature is the femur,<sup>7</sup> but we observed the highest incidence of vertebral fractures (47%). We acknowledge the

fact that we had a low number of patients from one centre, and that the incidence rate for the site of fracture may vary between different centres.

## CONCLUSION

There is a high prevalence of osteoporotic fractures in patients attending movement disorder clinics, and only 40% of PwP received evidence based medical treatment for the underlying osteoporosis until November 2015. Following this quality initiative, a monthly multidisciplinary meeting for all PwP to assess falls and osteoporosis between December 2015 and May 2016, more than 90% of PwP had underlying osteoporosis treated according to guidance: a 56% increase.

Considering complex Parkinsonism and unrecognised osteoporosis on the background of human factors, regular efficient MDMs have ensured systematic assessment, review of falls risk, and osteoporosis treatment in line with national guidance (100% of new referrals and 91% of total patients), thus not only simplifying, but also standardising the osteoporosis/falls assessment in people with Parkinsonism.

We recommend that osteoporosis risk should be assessed in movement disorder clinics for all PwP, and our next step is to test the change in two other movement disorder clinics within the same health board. This project is due to be presented in the Welsh Parkinson's disease sub-group and Welsh British Geriatrics society this year to share and spread the learning.

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**Declaration of interests** No external funding was applied; quality initiatives and multidisciplinary team meetings were done during contracted hours at a cost neutral basis within the health board. None of the authors has any financial or any other personal conflicts with this article.

**Ethical approval** This work does not constitute a research study, and is classed as a service improvement project according to the Health Research Authority decision tool; however, all questions and forms required to carry out the study and service evaluation were sent to the research and development (R&D) department and the health board to assess risks to patient identification. R&D approved the study, and confirmed that no further need for ethical approval was required as no patients were directly involved.

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