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The Clinical Frailty Scale predicts inpatient mortality in older hospitalised patients with idiopathic Parkinson's disease

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Abstract

Parkinson's disease and frailty are both common conditions affecting older people. Little is known regarding the association of the Clinical Frailty Scale with hospital outcomes in idiopathic Parkinson's disease patients admitted to the acute hospital. We aimed to test whether frailty status was an independent predictor of short-term mortality and other hospital outcomes in older inpatients with idiopathic Parkinson's disease.

Method We conducted an observational retrospective study in a large tertiary university hospital between October 2014 and October 2016. Routinely measured patient characteristics included demographics (age and sex), Clinical Frailty Scale, acute illness severity (Emergency Department Modified Early Warning Score), the Charlson Comorbidity Index, discharge specialty, history of dementia, history of depression and the presence of a new cognitive impairment. Outcomes studied were inpatient mortality, death within 30 days of discharge, new institutionalisation, length of stay ≥ 7 days and readmission within 30 days to the same hospital.

Results There were 393 first admission episodes of idiopathic Parkinson's disease patients aged 75 years or more; 166 (42.2%) were female. The mean age (standard deviation) was 82.8 (5.0) years. The mean Clinical Frailty Scale was 5.9 (1.4) and the mean Charlson Comorbidity Index was 1.3 (1.5). After adjustment for covariates, frailty and acute illness severity were independent predictors of inpatient mortality; odds ratio for severely/very severely frail or terminally ill = 8.1, 95% confidence interval 1.0–63.5, p = 0.045 and odds ratio for acute illness severity: 1.3, 95% confidence interval 1.1–1.6, p = 0.005). The Clinical Frailty Scale did not significantly predict other hospital outcomes.

Conclusions The Clinical Frailty Scale was a significant predictor of inpatient mortality in idiopathic Parkinson's disease patients admitted to the acute hospital and it may be useful as a marker of risk in this vulnerable population.

Keywords: Clinical Frailty Scale, hospital outcomes, Parkinson's disease

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Introduction

Idiopathic Parkinson's disease (PD) is a neurodegenerative disorder that affects 1–2% of the UK population > 65 years, and is characterised by bradykinesia, tremor, rigidity, postural instability and a myriad of non-motor manifestations. PD patients vary in the way motor function and disability worsens over time. The hospital outcomes of PD patients are variable and having predictive tools may be important to inform discussions with patients and relatives, and possibly to help decision making about treatment escalation options.

Frailty is a state of increased vulnerability to stressors, caused by impaired homeostasis and loss of reserve across multiple physiological systems.[1] The two main validated methods to measure frailty in older people are the phenotype model (i.e. three or more of the following: exhaustion, unexplained weight loss, low handgrip strength, low gait speed and low physical activity), and the accumulation of deficits (i.e. proportion of health deficits – symptoms, signs, comorbidities, disabilities and/or laboratory deficits – that are present in a patient out of a list of 30–70 items). Another validated frailty tool is the Clinical Frailty Scale (CFS), which is based on clinical judgement.[2] The CFS is a tool that correlates well with the

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two main measures of frailty. It does not really measure the construct of frailty itself but because it correlates well and is easy to use, it may be a useful tool for clinical practice.

PD and frailty are both prevalent in older people and may underpin a situation of clinical vulnerability. In PD patients, gradual decline in motor and non-motor physiological systems may give rise to frailty, but PD is by no means a synonym of frailty. A previous study with 50 PD patients showed that the phenotype of frailty is more prevalent in PD patients, but their clinical picture may overlap.[3]

There has been very little research on frailty in PD, and previous reports have focused on the frailty phenotype.[3–6] To our knowledge, no studies have addressed the associations of the CFS with the outcomes of PD patients admitted to the acute hospital. We aimed to test whether frailty status was an independent predictor of short-term mortality and other hospital outcomes in older inpatients with PD.

Methods

Study population

We conducted a retrospective observational study in a large tertiary university hospital in England. We analysed all emergency admission episodes of patients with PD aged over 74 (in all specialities) between October 2014 and October 2016. Data were obtained via the hospital's electronic patient records. Only first admissions were analysed. PD patients were identified based on discharge diagnosis (made prior to admission or during admission by a senior clinician).

Clinical Frailty Scale

Since 2013, our hospital has routinely collected the CFS in patients aged over 74 admitted non-electively to the hospital.[7] The 9 levels of the CFS are: 1: very fit; 2: fit; 3: managing well; 4: vulnerable; 5: mildly frail; 6: moderately frail; 7: severely frail; 8: very severely frail; 9: terminally ill.[8] The admitting medical team scores the patient, making a judgment about the degree of a person's baseline frailty (i.e. prior to the onset of the acute illness triggering the admission) based on information from the initial clinical assessment. The CFS is collected electronically. The CFS and other covariates were extracted for the purpose of service evaluation from the hospital's electronic patient records.

Patient characteristics

Other routinely collected anonymised patient characteristics included demographics (age and sex), discharge specialty, the presence of dementia, a new cognitive impairment, depression (based on established clinical diagnosis), the Charlson Comorbidity Index (CCI), and acute illness severity on admission as per the Emergency Department Modified Early Warning Score (ED-MEWS). In our hospital, patients aged over 74 admitted non-electively undergo a routine assessment for delirium and dementia.[7] In our analyses, dementia refers to a known, previously diagnosed dementia; and new cognitive impairment refers to an abnormal 4-item Abbreviated Mental Test (at least one error in date of birth, age, place, year), or a clinically identified acute confusional state, in the absence of a previously diagnosed dementia.

Outcomes

The following outcomes were extracted from the hospital's electronic patient records: inpatient mortality, prolonged length of stay (LoS) (≥ 7 days), new institutionalisation, death within 30 days post-discharge, and readmission within 30 days. New institutionalisation was defined as discharge to a residential or nursing home when this was not the usual place of residence on admission. For readmissions, we only looked for readmission to the same hospital. Our hospital's electronic patient records system is routinely linked to the NHS Spine (https://digital.nhs.uk/spine) and this is how the hospital knows if someone dies within 30 days of discharge.

Statistical analysis

Anonymised data were analysed using IBM SPSS v23 (IBM, New York, USA). Descriptives are given as count (with percentages, %), mean (with standard deviation, SD) or median (with interquartile range, IQR). Multivariate analyses were based on binary logistic regression. The method for the logistic regressions was stepwise forward selection. Due to low numbers, we categorised the CFS as follows: 1–4 (i.e. up to vulnerable) as the reference (non-frail) category, 5–6 as mild-moderate frailty, and 7–9 as severe, very severe frail or terminally ill. In the description of the CFS, the word 'frail' does not appear until category 5 (i.e. 'mildly frail'). In the multivariate logistic regression models, the following variables were entered on step one: age, sex, CFS categories, ED-MEWS, CCI, new cognitive impairment, depression and dementia.

The level of statistical significance for bivariate comparisons and multivariate predictors was set at $p < 0.05$. P values were 2-tailed.

Ethics

This service evaluation audit was registered with our centre's Safety and Quality Support Department (project register number 3962/6708). Formal confirmation was received that Ethics Committee approval was not required.

Results

Between October 2014 and October 2016, there were 393 first admission episodes of PD patients aged over 74 years, of which 166 (42.2%) were female. The mean age (SD) was 82.8 (5.0). Other patient characteristics including the distribution of CFS scores and the hospital outcomes are summarised in Table 1.

The results of the multivariate regression models in Table 2 suggest that, after adjustment for covariates, frailty was an independent predictor of inpatient mortality: odds ratio (OR) for severely/very severely frail or terminally ill: 8.1, 95% confidence interval (CI) 1.0–63.5, $p = 0.045$. The CFS did not significantly predict other hospital outcomes.

Table 1 Sample characteristics

Patient characteristics	
Age: mean (SD)	82.8 (5.0)
Male Female	227/393 (57.8%) 166/393 (42.2%)
Charlson Comorbidity Index Median (IQR)	 1.0 (2.0)
Clinical Frailty Scale score Median (IQR) 1: very fit 2: fit 3: managing well 4: vulnerable 5: mildly frail 6: moderately frail 7: severely frail 8: very severely frail 9: terminally ill	 6.0 (2.0%) 1/393 (0.3%) 5/393 (1.3%) 20/393 (5.1%) 37/393 (9.4%) 68/393 (17.3%) 131/393 (33.3%) 98/393 (24.9%) 22/393 (5.6%) 11/393 (2.8%)
Known dementia New cognitive impairment	82/393 (20.9%) 59/393 (15.0%)
Depression	30/393 (7.6%)
Maximum ED-MEWS Median (IQR)	 2.0 (2.0)
Discharge ward: General Medicine	117/393 (29.8%)
Discharge ward: Geriatric Medicine	145/393 (36.9%)
Patient outcomes	
Inpatient death (%)	28/393 (7.1)
Length of stay Median (IQR) Length of stay ≥ 7 days	 7.0 (14.0) 199/393 (50.6%)
Discharge to usual place of residence	257/393 (65.4%)
New institutionalisation	66/393 (16.8%)
Death within 30 days post-discharge	20/393 (5.1%)
Readmission within 30 days	47/393 (12.0%)

PD: Parkinson's disease; SD: standard deviation; IQR: interquartile range; ED-MEWS: emergency department modified early warning score.

Table 2 Multivariate predictors of outcomes in Parkinson's disease patients

	Odds ratio (OR) with 95% CI for OR	**p**
Inpatient mortality		
CFS 1–4: up to vulnerable	–	0.008
CFS 5–6: mildly/ moderately frail	2.46 (0.30, 20.22)	0.402
CFS 7–9: severely/very severely frail/terminally ill	8.14 (1.04, 63.45)	0.045
ED-MEWS (per point)	1.30 (1.08, 1.56)	0.005
Death within 30 days of discharge		
New cognitive impairment	8.70 (3.21, 23.61)	<0.001
New institutionalisation		
Dementia	2.90 (1.63, 5.17)	<0.001
Length of stay ≥ 7 days		
Age (per year)	1.05 (1.00, 1.10)	0.034
Female sex	1.62 (1.03, 2.54)	0.037
New cognitive impairment	24.21 (7.34, 79.84)	<0.001
Readmission within 30 days		
CCI (per point)	1.35 (1.12, 1.63)	0.002

CFS: Clinical Frailty Scale; ED-MEWS: Emergency Department modified Early Warning Score; CCI: Charlson Comorbidity Index

In the multivariate logistic regression models, the following variables were entered on step one: age, sex, CFS categories, ED-MEWS, CCI, new cognitive impairment, depression and dementia.

The other significant predictor of inpatient mortality was acute illness severity on admission (OR for acute illness severity: 1.3, 95% CI 1.1–1.6, p = 0.005). In this sample of PD patients, new cognitive impairment was a significant predictor of death within 30 days of discharge (OR 8.7, 95% CI 3.2, 23.6, p < 0.001) and LoS ≥ 7 days (OR 24.2, 95% CI 7.3–79.8, p < 0.001). Dementia predicted new institutionalisation upon discharge (OR 2.9, 95% CI 1.6–5.3, p < 0.001), and CCI was a significant predictor of readmission within 30 days of discharge (OR 1.4, 95% CI 1.1–1.6, p = 0.002).

Discussion

To our knowledge, our study was the first to look at the association of the CFS with hospital outcomes in older PD patients. In our sample of 393 PD patients with a mean age of 83, the prevalence of patients classified as at least mildly frail (84%) was much higher than the prevalence of 33% previously reported with the frailty phenotype in an ambulatory sample of PD patients.[3] Additionally, a third of our sample were severely frail or worse. Previously, studies have shown that in community-dwelling older adults, the prevalence of frailty by the CFS is known to be higher than that by the frailty phenotype.[9]

The prevalence of frailty using the CFS in our PD sample was also higher than that reported in the overall population of patients aged over 74 years admitted in our hospital (57%).[7] A possible reason for this is that PD and frailty may have a shared underlying pathophysiology. Indeed, it has been argued that in PD, many motor and non-motor symptoms are difficult to explain in terms of a purely ascending degeneration process, and dysregulation in many other physiological systems may be implicated in the physiopathology.[10] Another

reason for the higher prevalence of frailty in PD may be that an acute illness presentation could exacerbate PD symptoms, giving the assessor a worse impression of the patient's functional baseline, and therefore patients may be allocated a higher frailty score than they deserve. The latter hypothesis merits prospective investigation.

Our results suggest that in our context the CFS may be valid in the ≥ 75 year age group as a predictor of inpatient mortality and death within 30 days of discharge, which strengthens the argument for increased awareness of diagnosis and treatment of frailty in this patient group. The association with post-discharge mortality should be understood in light of that fact that our patients with reduced life expectancy can access continuing healthcare funding for end-of-life care outside the hospital.[11] Thirty-three percent of our sample were severely frail or more. These patients are a high-risk group and may benefit from an early palliative care review, advance care planning and a focus on end-of-life care.

The presence of a new cognitive impairment in our sample of PD patients was very strongly associated with prolonged LoS and death within 30 days of discharge. Delirium is known to carry a poor prognosis in terms of morbidity and mortality. In PD, systemic inflammation frequently occurs in the context of an acute illness, which often results in delirium in the advanced stages of the disease.[12] Delirium in turn can lead to cognitive and functional decline, institutionalisation, and mortality, especially in older people. The early identification and management of delirium during hospital admission may prevent a prolonged LoS and complications, including, but not limited to, medication errors, falls, fractures and chest infections. To help achieve this, PD patients who are frail may benefit from early transfer to wards that operate a model of comprehensive geriatric assessment,[7] early supported discharge and a review by a PD specialist nurse.

Dementia was a moderate predictor of institutionalisation upon discharge. The rate of institutionalisation in our cohort was 16.8%, which is relatively high in comparison to the overall (hospital-wide) institutionalisation rate in patients over 74 years old (9.9%).[13] This may reflect the high clinical complexity of older PD patients requiring admission to our hospital. This is also consistent with previous observations that the progressive nature of PD often results in patients seeking long term care sooner than non-PD patients.[4] Early recognition and management of dementia and delirium in PD may minimise functional decline during the hospital stay and may in turn reduce LoS and delay institutionalisation.

It has been proposed that the CCI may be the optimum scale for measuring comorbidity burden in PD patients.[14] However, in our analyses CCI was not associated with mortality. This may be due to the older nature of our sample, as previous studies have demonstrated that a greater association of the CCI with mortality was found within the first four years of diagnosis with no significant association thereafter.[14] The fact that the CCI was a predictor of 30-day readmission rate is in keeping with previous analyses.[7]

Our study had several strengths. It had a relatively large sample size. Previous studies looking at frailty in PD used smaller samples of 15–50 patients.[3–5] No previous study had used the CFS when investigating frailty in PD patients. In using the CFS, we may capture more symptomatic and functional aspects providing a more detailed insight into frailty in PD. Our findings provide new information about frailty in PD and the need for further research and vigilance, especially surrounding delirium and dementia in this group of patients.

Our study had major limitations, including its single-centre, retrospective observational design. Therefore, causality and external validity cannot be inferred from our study. Another limitation was that our database did not include information on the severity of PD according to the Unified Parkinson's Disease Rating Scale, and the inclusion of this variable in the model may have changed results.

It is challenging to identify frailty in PD due to its presentation and difficult to know how best to assess frailty in these patients, but early identification could enhance quality of life and may delay or reverse frailty-associated dependencies. It may be useful to know a patient's frailty score, using the e-Frailty Index score collected in the primary care setting, when conducting future studies as this is not affected by acute illness at time of admission. These patients could then be targeted early to prevent frailty progressing and thus in turn potentially prevent negative hospital outcomes when they are admitted.

There is a need for further research into the usefulness of geriatric evaluation for the identification of frailty in PD, for improving care and treatment in this multifaceted disease.

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