

Frailty is a Predictor of Short-Term Complications from Deep Brain Stimulation (DBS) Surgery in Parkinson's Disease (PD) Patients

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Introduction

- PD is one of the most common neurodegenerative diseases affecting more than 10 million individuals worldwide with many pharmaceutical and surgical options.
- DBS is a common PD therapy and has shown convincing symptom mitigation and minimal complication rates in aggregate.
- **Frailty:** reduced physiologic reserve and function affecting multiple systems
 - Used as a predictor of short-term post-operative morbidity and mortality.
- The **Modified Frailty Index-5 (mFI-5)** is a post-operative morbidity predictor based on 5 factors: history of diabetes, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), hypertension (HTN), and dependent functional status.
- **Objective:** With the prevalence of DBS for PD, this study applied the mFI-5 to assess and predict post-operative morbidity in this patient population.

Methods

- The American College of Surgeons National Surgical Quality Improvement Program 2010-2019 Database was queried for ICD-9 and ICD-10 CPT codes pertaining to DBS in PD.
- Each patient was scored by the mFI-5 protocol and stratified into groups of:
 - No Frailty (mFI-5 = 0 morbidities)
 - Moderate Frailty (mFI-5 = 1 morbidity)
 - Significant Frailty (mFI-5 ≥ 2 morbidities)
- The no frailty group was used as a reference in multivariate binary logistic regression analysis of post-operative complication rates in the groups (p<0.05).

Results

- 1,645 patients included
- Mean age: 65.82 ± 9.39 yrs
- No Frailty group
 - 877 (53.3%) patients
 - Mean age: 64.09 ± 9.81 yrs
- Moderate Frailty group
 - 561 (34.1%) patients
 - Mean age: 67.32 ± 8.67 yrs
 - HTN was most common criterion (72.5%)
- Significant Frailty group
 - 207 (12.5%) patients
 - Mean age: 69.08 ± 7.84 yrs
 - HTN was most common criterion (90.8%)
 - Substantially more likely to have:
 - COPD (11.1%, p<0.001)
 - Dependent function status (37.2%, p<0.001)
 - Diabetes (68.1%, p<0.001)

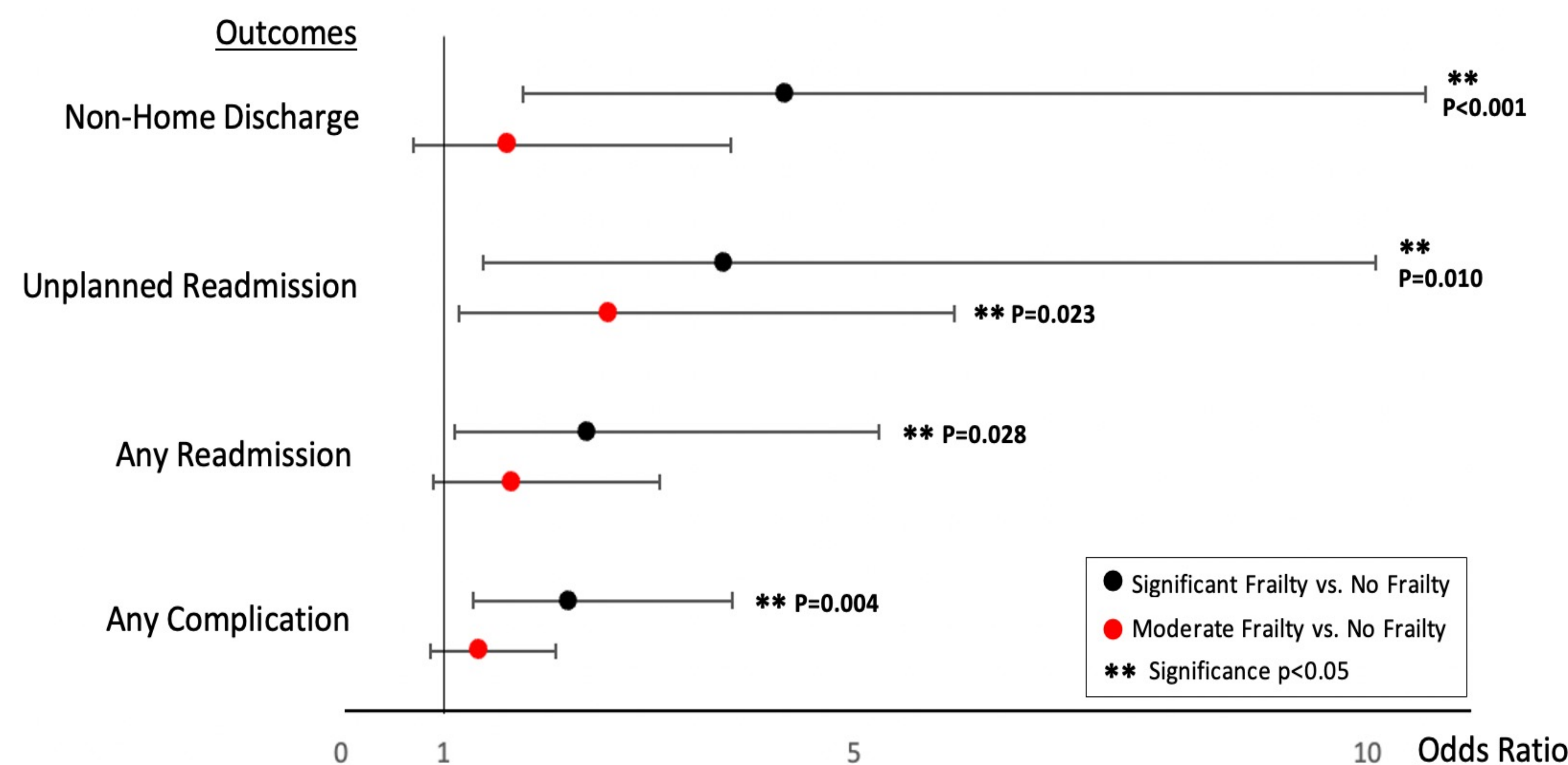
Results

- Using the No Frailty group as a reference in multivariate analysis:
- Moderate Frailty group experienced greater:
 - Unplanned readmission (OR 2.613, 95% CI 1.143-5.973, p=0.023)
 - Significant Frailty group experienced greater:
 - Non-home discharge (OR 4.317, 95% CI 1.765-10.562, p<0.001)
 - Unplanned readmission (OR 3.723, 95% CI 1.376-10.073, p=0.010)
 - Any readmission (OR 2.396, 95% CI 1.098-5.230, p=0.028)
 - Any complication in aggregate (OR 2.211, 95% CI 1.285-3.806, p=0.004)

Discussion

- Higher frailty scores were positively associated with independent predictability of the mFI-5 rating scale for general post-operative outcomes
- Moderate Frailty was an independent predictor of likelihood for unplanned readmission with reference to No Frailty
- Significant Frailty was an independent predictor of likelihood for non-home discharge, unplanned readmission, any readmission, and any complication when using No Frailty as a reference
- The mFI-5 offers neurosurgeons a clinical tool that rapidly stratifies PD patients for DBS implantation with minimal medical history to predict post-operative outcomes, especially in significantly frail patients

Figure 1. Forest Plot of Odds Ratios from Binary Logistic Regression. Significant Frailty and Moderate Frailty using No Frailty as a Reference.



Future Prospects

- Given the chronicity and progressiveness of PD, future studies should include analysis of long-term post-operative outcomes in follow-up lengths extending to months or even years.
- As of now, a patient with well-controlled hypertension and well-controlled diabetes is considered 'more frail' by the current guidelines than a patient with completely dependent functional status with no other conditions. A more robust mFI-5 scale that factors severity of disease may yield more practical clinical results.