Correlation of Validated Frailty Instruments With and Without Cognitive Metrics in a General Neurosurgery Population

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Author’s Disclosures

None
Introduction

- Neurosurgical patients may suffer from a variety of physical and cognitive deficits.
- Common instruments capturing patient functionality and cognition are individually validated, but not tested for concordance.
- This study aims to assess the contribution of cognitive measures to frailty metrics in a general neurosurgery population.
Methods

1. Adults scheduled for any neurosurgery intervention invited to participate (Jun-Oct 2019, New York Presbyterian Hospital).

2. Pre-operatively assessment with 6 validated indices (ASD-FI, MoCA, EQ-5D-5L, Karnofsky Performance Scale objective and subjective, and Barthel Index).

3. Statistics in R: correlations corrected for multiple comparisons, dimensionality reduction with Principle Component Analysis (PCA), and k-means clustering in PCA space.
Results: Demographics

- 28 (of 30 enrolled) patients completed all indices
- 32% female
- Median age 56.5 (range: 21-84)
- 7 spinal patients, 21 non-spinal (brain or other procedure)
Results: Correlation

- ASD-FI correlated with objective EQ-5D-5L (p=6.1e-6) and Karnofsky (p=6.0e-9).
- Objective EQ-5D-5L and Karnofsky scores correlated (p=4.9e-7)
- MoCA did not correlate with other indices

*Figure 1: Heatmap demonstrating the Pearson correlation between each of the 6 indices*
Results: PCA + Clustering

- Top two PCA dimensions captured 75% of index score variance.
- Dimension 1 driven by indices primarily measuring frailty (61% contribution from ASD-FI, objective EQ-5D-5L, and Karnofsky).
- Dimension 2 was driven by a 43% contribution from MoCA. The two clusters were primarily differentiated by patient frailty scores.
**Results: PCA + Clustering**

**Figure 2:** Dimensional reduction (PCA) and clustering analysis (k-mean 2-cluster), first two principal components. Each point represents a patient. Spinal patients indicated by dark blue. Light blue cluster = relative low functionality. Red cluster = relative high functionality.

**Figure 3:** Chi-square analysis of spinal patients based upon cluster designation visualized in Figure 2 (p-value = 0.13)
Discussion

Indices primarily measuring functionality were well correlated. Relative independence of MoCA from functionality indices was supported by dimensionality reduction. Spine patients showed a trend towards higher mean cognitive scores and clustered with impaired functionality. Study was limited by only including pre-operative data.
Summary

- Cognitive index (MoCA) remains relatively independent from frailty indices.
- Spine patients clustered with lower functionality (higher frailty) and non-spine patients were more evenly split between the two groups.
- Future work should focus on tracking indices post-operatively.