Gabriel Martínez Tirado

Abstract

Progression of cognitive decline in the longitudinal Luxembourg Parkinson's study

Gabriel Martínez Tirado(1)

1) Luxembourg Centre for Systems Biomedicine (LCSB), University of Luxembourg, Esch-sur-Alzette, Luxembourg

Cognitive impairment is one of the most prevalent non-motor symptoms in Parkinson's disease (PD). Approximately 20% to 33% of PD patients already experience mild cognitive impairment (MCI) at the time of PD diagnosis, and up to 80% develop dementia within 20 years after disease onset. MCI is a known risk factor for the development of dementia and is associated with increased mortality. Therefore, it is important to screening the presence of MCI in the early stages of the disease, as this will allow clinicians to better personalize patient's treatment and their follow-up visits.

While clinical guidelines for MCI screening are available, the complexity and extensive testing required often restrict their use in larger populations. The primary objective of this study is to develop a clinical decision support tool using data-driven models to assist clinicians in diagnosing and managing cognitive impairment in Parkinson's disease (PD). By leveraging multimodal data from the Luxembourg Parkinson's Study (LuxPark) cohort, this tool aims to enhance early intervention strategies and improve patient outcomes. Additionally, the study seeks to identify key impairment profiles and determine the most relevant features for early MCI screening. The longitudinal data from LuxPark includes demographic, risk factors and clinical data, with a focus on a comprehensive battery of cognitive assessments. These range from domain-specific clinical tests to global cognitive evaluations or subjective cognitive decline. Additionally, genetic, omics, and medication data are also available. To initially assess the performance of the data-driven model, we conducted an exhaustive comparison with the widely accepted clinical guideline of the Movement Disorder Society (MDS), considered as the gold standard for MCI screening. This analysis demonstrated a comparable performance, establishing the model's "non-inferiority" in predictive strength. Subsequently, we focused on the model's potential for enhancing early MCI screening by identifying patients who were not captured by traditional clinical guidelines. Follow-up longitudinal analyses revealed that this subgroup exhibited distinct differences in cognitive decline progression compared to PD-NC patients identified by the model, supporting its value in detecting early-stage MCI.