LeMeReND

Leveraging medical records to identify patients at risk of neurodegenerative disease

Neurodegenerative diseases represent one of the main public health issues in our western societies and one of the greatest challenges in drug development. Prevention policies have become essential to address these issues: primary prevention to prevent disease onset by acting on actionable risk factors, or secondary prevention to slow disease progression with very early therapeutic interventions, ideally at pre-symptomatic stages. Key to the implementation of such prevention measures is the identification of at-risk patients, at the point of care, and preferably long before disease onset. Our project, LeMeReND, proposes to use electronic health records (EHR) to identify biomedical risk factors through studying previous diagnoses (pre-clinical comorbidities), drug prescription, clinical care usage, and biological test results. This analysis will use longitudinal data in EHR registries including millions of patients who have been followed for at least 10 years before diagnosis in 4 different healthcare systems: Australia, France, the UK and Sweden and across 4 therapeutic areas: Alzheimer's disease, Parkinson's disease, dementia with Lewy bodies and motor neuron diseases. We will identify the biomedical risk factors that are common to these diseases and the ones differentiating them. We will stratify patients based on the progression profile of their exposure to the set of risk factors, in order to design tailored primary prevention measures. We will also design a screening tool which will give each patient a propensity score to develop one of these neurodegenerative diseases. Such a tool could be deployed at the point of care to prioritise at-risk individuals for further inclusion in secondary prevention trials. We will evaluate the economic and social benefits of this new generation of precision prevention measures. We will study the public acceptability of a secondary-prevention effort, among the French population, and the feasibility of its implementation in primary care practices in France, Australia, and Sweden. Eventually, we will progress our understanding of the genetic and imaging markers of the disorders by studying the identified prodromal biomedical factors, using the UK BioBank and GWAS summary statistics. This will progress our understanding of the pathological processes which result in an increased risk to develop a specific neurodegenerative disease. LeMeReND gathers a multidisciplinary research group with a leading expertise in epidemiology, statistics and machine learning, in particular for the analysis of longitudinal EHR data. Partners have demonstrated a strong track record on neurodegenerative diseases (Sweden, France, Australia), analyses of large-scale data including neuroimaging (France), genetics (Australia), longitudinal modelling (Sweden, France), and machine learning (Australia, France). An expert team in health economics and health policy complements the consortium. LeMeReND will therefore provide invaluable insights to inform health policies and highlight possible new therapeutic targets. It will provide unique screening tools to facilitate the large-scale recruitment of patients in secondary prevention trials.

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Coordinator : Stanley Durrleman
✉ : stanley.durrleman@inria.fr

Consortium Members

	Stanley Durrleman	Inria, Paris Brain Institute, Hôpital Pitié-Salpêtrière, Paris, France
		The University of Queensland, Brisbane, Australia
		Karolinska Instituet, Stockholm, Sweden
		Université Aix-Marseille, Marseille, France