Date Received	Requestor Information	Research Plan Summary
4/6/2016	Dr. Fred Lublin, School of Medicine, Mount Sinai	**Goal:** To determine the earliest, most reliable indicators of secondary progressive disease onset in order to develop meaningful outcome measures that could be integrated into clinical trials. **Plan:** Develop clinical metrics of durable worsening and unrelenting progression in well characterized, complementary cohorts of MS patients. The placebo data from MSOAC will be
4/25/2016	Dr. Robert McBurney, Accelerated Cure Project, Inc; iConquerMS, the MS Patient-Powered Research Network	**Goal:** To develop information to support the design of MS clinical studies that involve one or more of the outcomes included in this dataset. **Plan**: Includes analyzing 1) graphical representations of outcome measures to examine distributions, 2) descriptive statistics of the distributions, 3) multivariate clusters, including classification analyses to determine which factors are responsible for separating subgroups; and 4) powers to detect specific effect sizes for specific cohort sizes and specific outcome measures separately or in combination.
5/1/2016	Dr. Jasvinder Kandola, Imperial College London	**Goal:** To distinguish severe MS patients from those with mild to moderate disease. **Plan:** Apply machine learning classification techniques to analyze the MSOAC dataset.
5/10/2016	Dr. Andrew Shem, George Washington University	**Goal:** To understand if there are any principal components within the multivariate dataset in order to evaluate courses of treatment. **Plan**: Investigate the data set using Principal Component Analysis to identify relationships that have not been previously observed.
6/7/2016	Dr. Kathryn Fitzgerald, Johns Hopkins School of Medicine	**Goal:** To develop group-based trajectories for changes in patient-reported outcomes and disability measures. Understanding normative and atypical patterns of changes in PROs will improve our ability to identify at-risk individuals and the processes or other factors by which these individuals become vulnerable. **Plan:** Use PROs (e.g. SF-36), clinical disability measures (EDSS) and performance measures (e.g. T25FW) to 1) identify distinctive trajectories of PROs/disability outcomes in patients with MS; and 2) to examine factors (comorbidity, depression) predicting individual latent trajectories of PROs/disability outcomes and assess the distribution of changes in other PROs/disability within each trajectory. 5

6/8/2016	Hosein Khazaei, Islamic Azad University Karaj	**Goal:** To develop new methods of predicting MS. **Plan:** Apply data mining algorithms that are based on classification and regression tree (cart).
10/27/2016	Dr. Joseph Geraci, Queen's University	**Goal**: To model placebo responders versus non-responders in MS clinical trials. **Plan:** Apply my novel machine learning paradigm that was originally developed to model placebo response in cancer and for mood disorders. Based on a combination of statistics and dynamical systems, the paradigm is particularly suited for complex populations.
1/4/2017	Dr. Ayse Kuspinar, McMaster University	**Goal:** To identify symptom profiles or phenotypes in MS, the clinical course of these phenotypes over time and their impact on quality of life. **Plan:** Apply 1) group-based trajectory modelling to identify distinctive groups of individuals with similar trajectories; 2) cluster analysis; 3) hierarchical and non-hierarchical methods with a Squared Euclidean Distance Logistic regression models to estimate the association between clinical variables and MS phenotypes; and 4) linear regression analysis to evaluate the impact of these phenotypes on quality of life.
3/22/2017	Dr. Koshy George, PES Institute of Technology (Indian Institute of Science, Bangalore, India)	**Goal:** To use the more recent deep learning techniques to better classify datasets. **Plan:** Test the claim that deep learning is more suitable than conventional artificial neural networks for classifying datasets.
3/27/2017	Dr. George Haig, AbbVie, Idaho State University	**Goal:** To design a clinical trial for an investigational compound, using the analyses of the placebo data to inform the selection of primary and secondary endpoints, and sample sizes. **Plan:** Extract the following information from the database: 1) natural progression of EDSS by demographic group (age, gender, baseline disease severity, duration of illness, etc.); 2) correlation of EDSS change from baseline to 24 months; 3) correlation of the change in T25FT and 9HPT to the change on EDSS; 4) natural progression of T25FW and 9HPT; 5) sensitivity of other clinical endpoints compared with EDSS.10

5/17/2017	Emil DiGuilio Regis University Denver, Colorado	**Goal:** To develop a predictive model for estimating the likelihood of developing MS. **Plan:** Use supervised and unsupervised machine learning to predict the likelihood of developing MS based on specific criteria used in diagnosing MS and neuromyelitis optica.
8/9/2017	Afzal Shahid National Institute of Technology, Patna, India	**Plan:** To apply machine learning techniques. **Goal:** To classify and differentiate the different types of MS by finding the most significant attributes (e.g. symptoms, history, test results) associated with the different types of disease.
8/17/2017	Dr. Lindsey De Lott, University of Michigan Medical School	**Plan:** To build a multivariable regression model to predict the risk of relapse in patients with relapsing remitting MS, using standard regression diagnostics to assess model performance. Bootstrapping-based internal validation techniques will be applied; the variance inflation factor will be assessed; multiple imputation will be used to address missing data. **Goal:** To inform estimates of the risk of relapse in patients with relapsing remitting MS.
10/13/2017	Dr. Jonathan Walsh, Unlearn AI.	**Plan:** Specific Aims include 1) Develop technological infrastructure necessary to process data from the MSOAC database; 2) Build and test a computational model of disease progression in MS; 3) Use the computational model of MS disease progression to simulate and optimize clinical trial designs. **Goal:** To build a computational model of disease progression in MS that can be used to simulate MS clinical trials.
10/30/2017	Dr. Jodie Gawryluk, University of Victoria, Canada	**Plan/Goal:** Examine the relationship between depression scores (measured via the BDI) and information processing speed (measured via the SDMT)
11/6/2017	Luis Hernandez, University of Groningen	**Plan:** Derive predictive equations for disability scales that are significant predictors of quality of life and apply those equations to modeling interrelated changes of disability scales and the occurrence of relapses. **Goal:** To develop a natural history model that can be used in economic models of disease-modifying therapies.
3/5/2018	Dr. Jagadeswara Earla University of Houston	**Goal:** Assess the differential impact on relapse rate, disability progression, and health-related quality of life based on gender in MS patients. **Plan:** Compare data from men and women with MS

3/21/2018	Dr. Joanna Holbrook Benevolent AI	**Goals:** To model the disease/symptom trajectory at a patient level, to define multi-parameter outcomes across endpoint measures and access linearity of endpoints, to cluster patients by trajectories of composite outcomes in order to define endotypes; to determine predictive signatures of endotypes at baseline. **Plan:** Apply deep learning methodologies.
4/2/2018	Alex Purring Argosy University	**Goal:** Examine the relationship between the number of relapses and cognitive impairment. **Plan:** TBD
4/17/2018	Dr. Kathryn Fitzgerald Johns Hopkins School of Medicine	**Goal:** Investigate how MS-related disability and symptoms of depression change over time **Plan:** Use multivariate finite mixture latent trajectory modeling to identify subgroups of the MSOAC population that exhibit similar patterns of change over time in depression and disability severity.
5/28/2018	Pavlos Kolias Aristotle University of Thessaloniki	**Goal:** Find the underlying factors of MS **Plan:** Use stochastic methods (semi-Markov models) to evaluate the goodness of fit and to forecast.
6/7/2018	Dr. Hans-Martin Schneble Servier Forschung und Entwicklung GmBH	**Goal:** To design a clinical trial for an investigational compound, using the analyses of the placebo data to inform the selection of primary and secondary endpoints as well as sample sizes. **Plan:** Extract the following data: 1) Change in the EDSS and each performance measure from baseline to 24 months; 2) Correlation between EDSS and other clinical endpoints.
9/12/2018	Dr. Xinyan Zhang Sanofi	**Goal:** To use the placebo data to assist the study design for a new compound **Plan:** Examine the relapse rate, 6-month confirmed disease progression and other efficacy endpoints in different populations; Estimate sample sizes based on the hypothesized hazard ratio.23

11/5/2018	Dr. Myla Goldman University of Virginia	**Goal:** To explore the possible importance of blood pressure variability in MS subjects **Plan:** Data will be analyzed to correlate those disability and/or fatigue responses to clinical BP measurements obtained**.**
12/11/2018	Dr. Nahla Belal Arab Academy for Science, Technology, and Maritime Transport	**Plan:** Data analysis, problem definition, proposed approach and implementation by July 2019. **Goal:** To improve the diagnosis and treatment of multiple sclerosis through machine learning.
1/2/2019	Eric Mellum, Melisma Consulting Inc.	**Plan:** To understand data not yet captured which may lead to a better understanding of MS causes, dispositions, triggers, treatments, and ultimately a cure. **Goal:** To identify patterns in MS patient data that may serve to identify risk factors or common traits that may shed light on possible underlying causes of MS.
2/14/2019	Dr. Michael Kane, Yale University, Biostatistics Faculty	**Plan:** To apply statistical methods to identify prognostic subtypes and examining how subtypes are related to measured clinical values. **Goal:** To apply prognostic and predictive statistical subtyping to rare diseases, especially MS, understand the interaction with those subtypes with various treatment strategies, and provide small-sample trial design for MS studies.
2/28/2019	Ms. Jessica Hinman, Stanford University, Health Research and Policy, Epidemiology	**Plan:** The use of a hypothesis-driven approach to modeling the transition probabilities between progression states directly, as well as a data-driven approach to unsupervised clustering of progression patterns will be used in pursuit of the research goal. **Goal:** The goal of this study is to develop a more robust understanding of MS disease course through an identification of the factors associated with progression and transition to secondary progressive MS.
2/28/2019	Anissa Kalinowski Stanford University, Health Research and Policy, Epidemiology	**Plan:** To compare the sensitivity and specificity levels of future ambulatory tests to the T25FW and to propose sample sizes needed to support the qualification and validation of these tests in at-home environments. Test and re-test variability over time and between patients will also be examined. **Goals:** Characterize the data related to the T25FW outcome measurement for the 2495 MS patients in the MSOAC database and establish targets for validation of digital tools in clinical research.
4/11/2019	Dr. Georgia Salanti, Faculty University of Bern, Institute of Social and Preventative	**Plan:** To develop a statistical framework in which the evidence obtained from different study designs is pooled in order to summarize treatment effects and provide personalized information about the benefits and harms of the various treatment options when administered in real world settings.

	Medicine (ISPM)	**Goal:** To enrich the methodological arsenal related to the use of evidence synthesis methods to facilitate Health Technology Assessment and make real-world predictions of health outcomes at the population and individual level. The methods developed will be inspired by and applied to the decision problems observed in various clinical areas, including MS.41
8/5/2019	Emily Bih, Stony Brook University	**Plan/Goal:** To investigate metformin and other pre-existing drugs that can possibly be used as novel multiple sclerosis treatments.
8/27/2019	Dr. Mahmoud Abdel Razek, Harvard Medical School, Mount Auburn Hospital	**Plan/Goal:** To explore the following hypotheses: 1) Inter-person variabilities in the degree of BBB permeability correlate to MS disease development and disease severity; 2) MS-related progression of disability with disease duration is partly explained by the increasing BBB permeability as we age.
9/19/2019	Dr. Lokesh Rukmangadachar, Saint Louis University	**Plan/Goal:** To develop a relapse prediction score using patient characteristics.
9/23/2019	Dr. Deja Rose, Thomas Jefferson University	**Plan:** To match African-Americans with MS with non-African Americans with MS by age, gender and comorbidities and then analyze differences in outcomes and progressions. **Goal:** To investigate comorbidities, trial participation, relapses/disease progression and outcomes in African Americans with MS.
10/18/2019	Charles Van Liew, Arizona State University	**Plan/Goal:** To evaluate clinical and demographic predictors of falls history and (depending on availability of that primary outcome) measures that predict falls (e.g., T25FWT) in those with MS.
10/23/2019	Dr. Kevin Patel, UCLA	**Plan:** To develop and characterize several disability specific biometric measures based on our analyses of the MSOAC database. The rate of change of motor, cognitive, and visual disabilities individually in progressive MS patients will be characterized.37 **Goal:** To design novel clinical trials in progressive MS to improve disabilities.

Data as of January 23, 2020