

Improving Patient Outcomes through a Comprehensive Care Management Platform

Measuring Outcomes and Value: an Integrated, Novel solution for Generating insights in MS (MOVING MS)

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The MOVING MS Study

Unmet Need:

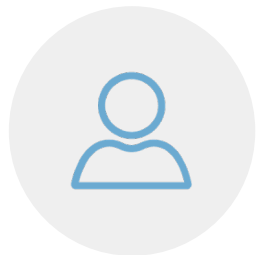
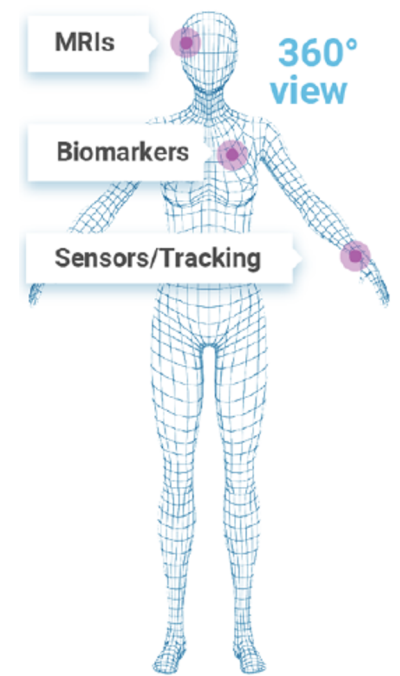
- Standard-of-care neurology visits for multiple sclerosis (MS) are 6 months apart, which can lead to gaps in care and missed opportunities to improve patient function.
- MS is marked by periods of increased healthcare utilization during relapses, ultimately leading to disability progression.

Our Solution:

- Implement the **Octave Care Platform**: A comprehensive approach to MS care that includes a human-tech service which supports symptom and medication tracking, nursing interventions, laboratory monitoring for subclinical disease activity and curated longitudinal MRI reports.

Objective:

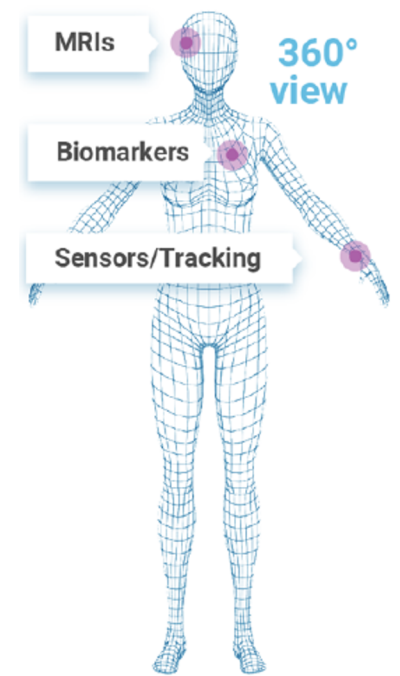
- To quantify the magnitude and significance by which the Octave intervention relieves a healthcare system from unplanned MS-related interactions while retaining patient and physician satisfaction in the quality of care.



Intervention: The Octave Care Platform

Octave Care Platform: A healthcare management system designed for multiple sclerosis (MS) patients. The platform features a multifaceted approach to MS care management that provides value to both physicians and patients, and includes:

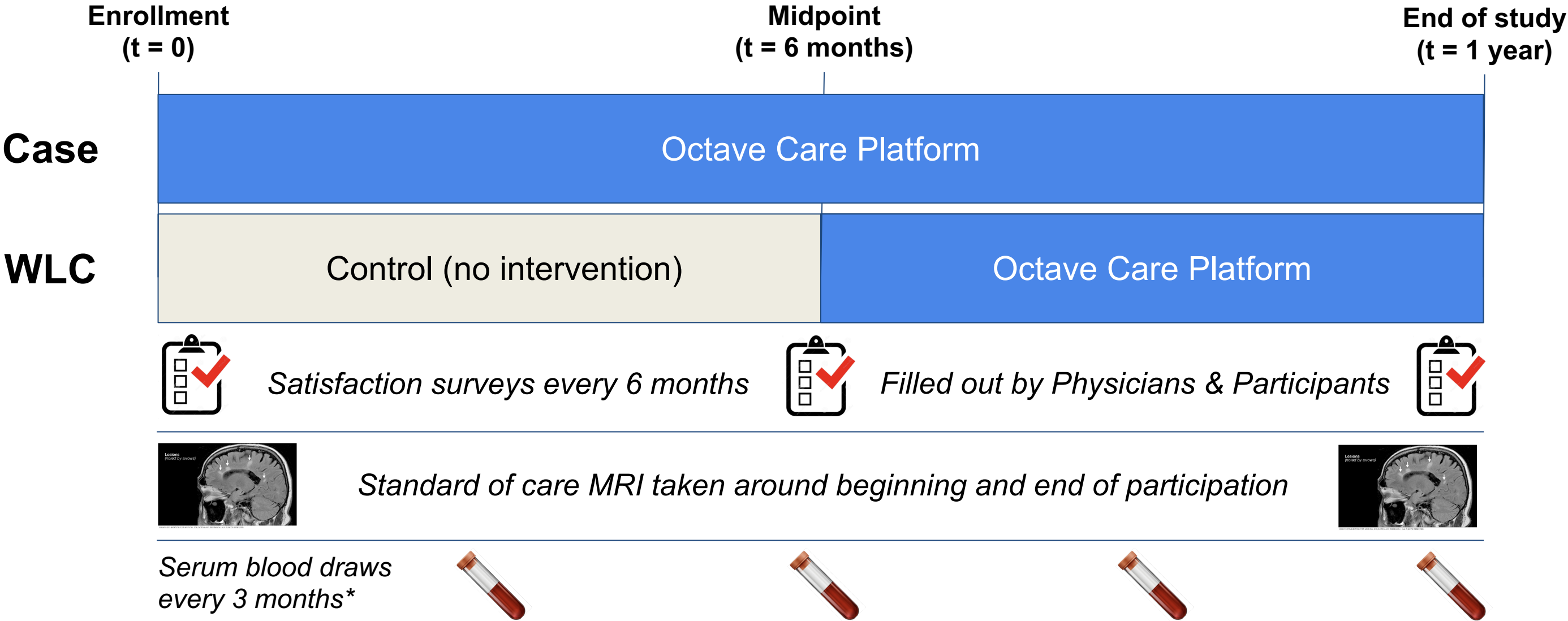
- A **mobile app** where patients can track their medication administration, MS symptoms, and communicate with their Care Partner
 - Participants can text or call their Care Partner, an MS-certified nurse, with questions or concerns about their disease
 - Structured patient app information is securely available to the Care Partner in order to bring context to each conversation
- A curated physician **MRI Report** and **Patient Report**
- A proteomic biomarker **MS disease activity test**



Study Design

Objective: Test the Octave integrated MS care platform for efficacy in reducing unplanned healthcare utilization (UHU) and improving patient and physician satisfaction.

Study Design: Prospective, single-blind, randomized waitlist-control (WLC) design



*Essential study adapted to continue during COVID-19 pandemic

Primary Aim: Unplanned Healthcare Utilization

Primary Outcome: Unplanned Healthcare Utilization (UHU) is a cost-weighted, per-patient summation of:



Unplanned office visits
(in-person or virtual)

+



Phone Calls

+



Electronic Messaging
(E-mails, MyChart, etc.)

Both cross-sectional (case vs. WLC) and longitudinal (waitlist crossover) perspectives will be used to test our hypotheses:

$$\begin{aligned} H_0: & \text{UHU}_{\text{case}} = \text{UHU}_{\text{WLC}} \\ H_1: & \text{UHU}_{\text{case}} < \text{UHU}_{\text{WLC}} \end{aligned}$$

$$\begin{aligned} H_0: & \Delta\text{UHU} = 0 \\ H_1: & \Delta\text{UHU} < 0 \end{aligned}$$

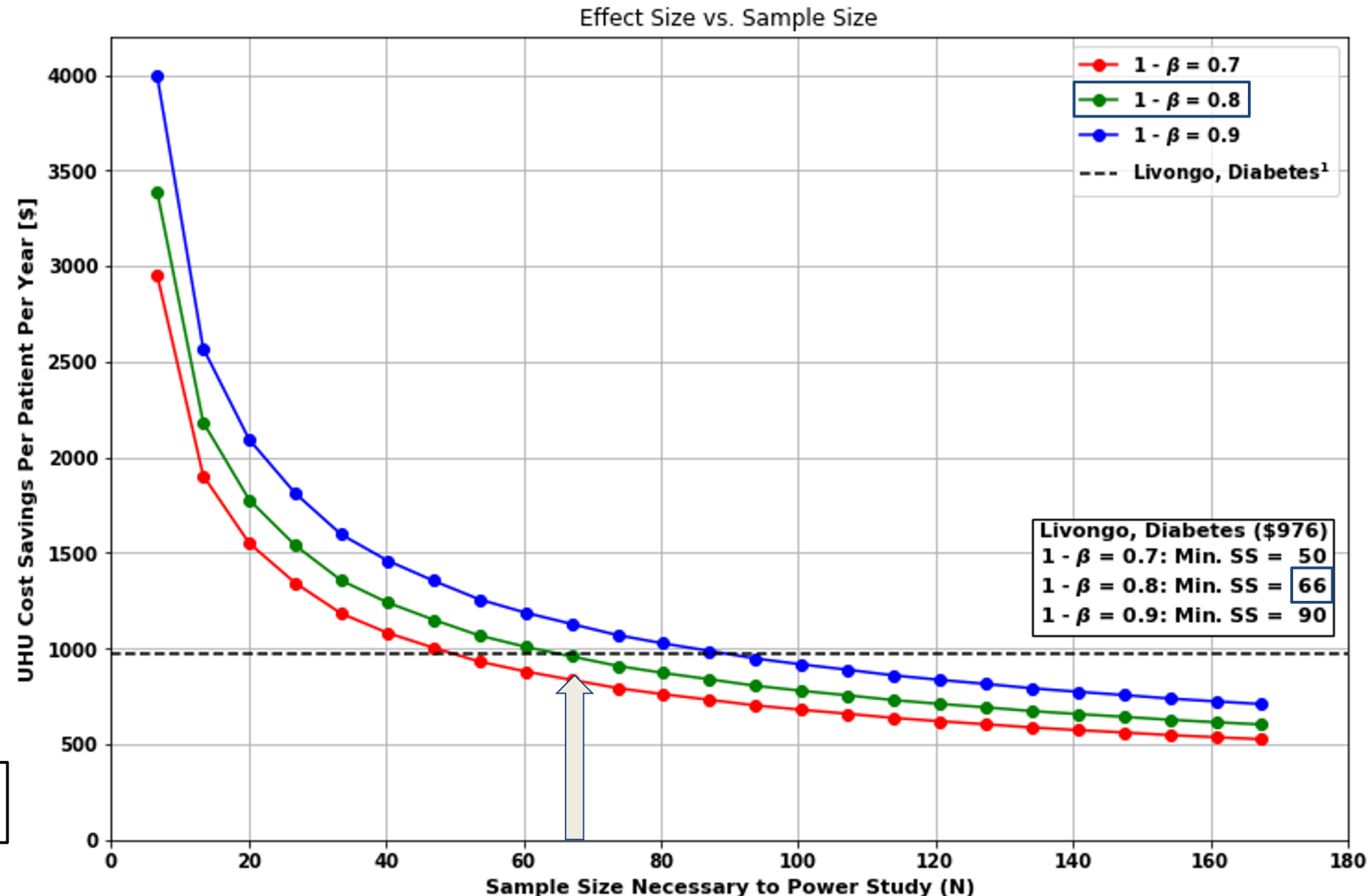
Interim and end-of-study analyses will be used to assess the magnitude and significance to which the Octave intervention affects UHU burden.

*Unplanned hospital visits (ER visits, hospitalizations, outpatient visits) factor into a patient's MS journey unexpectedly, so they will be tabulated as a separate exploratory endpoint in consideration of biases due to COVID-19.

Sample Size Calculation

- Significance Threshold: $\alpha=0.05$
- Power: $1-\beta=0.8$
- 1:1 enrollment ratio (random)
- At least 66 samples needed to power the study (33 in WLC arm; 33 in case arm with two 6-month periods)
- Anticipated Dropout: 15%

Target Enrollment: n=80 patients



1. A chronic care solution for diabetes demonstrated 5.8% decreased yearly medical spending using measurement/management tools on its patient population. Retrieved from <https://www.livongo.com/impact.html>.

2. Sicras-Mainar et al. 2017 quantifies the impact of healthcare resource utilization of MS patients in Spain. This serves as the per-patient UHU baseline. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/29284493/>.

3. Poisson fluctuations based on priors from 2018-2019 UCSD health records were used to assess the power of event counts underlying UHU: virtual/in-person office visits, phone calls, e-mails (MRI's, ER and hospital visits fall outside telehealth scope)

Secondary Aim: Patient & Physician Satisfaction

Secondary Outcome:

Questionnaires with a Likert rating scale will be used to analyze satisfaction between Case and WLC groups

- Administered during clinic visits
- Based on validated Press Ganey
- Quantified with a 2-sample t-test

Ex. Patient Survey

MOVING MS
12-MONTH VISIT

Case Questionnaire

Subject ID:
Date:
Neurologist:
Please rate the following questions on a scale from 1 to 10, 1 meaning that you were very unsatisfied, and 10 meaning that you were very satisfied.
Physician
Explanations the physician gave about your problem or condition
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
Physician's efforts to include you in decisions about your treatment
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
Information the physician gave you about medications (if any)
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
Information the physician gave you about follow-up care (if any)
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
Amount of time the physician spent with you
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
Amount of your health concerns addressed by the physician
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*

Ex. Physician Survey

MOVING MS
12-MONTH VISIT

Physician Questionnaire
~ Case ~

Physician:
Study ID:
Date:
Please answer the following questions about your patient's office visit on a scale from 1 to 10, 1 meaning that you were very unsatisfied, and 10 meaning that you were very satisfied.
Office Visit
The amount of educational information you were able to convey to your patient about their MS.
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
The amount of time you were able to spend with your patient overall.
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
The amount of time you spent speaking with the patient face-to-face vs. typing on the computer.
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
The positive impact that this visit had on your relationship with your patient.
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
How productive this office visit was, in terms of goals you wanted to accomplish.
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*
The amount of overlap between information from this office visit and the last office visit.
1 2 3 4 5 6 7 8 9 10 N/A
Very Unsatisfied *Very Satisfied*

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Exploratory Aim: Blood-based Biomarkers

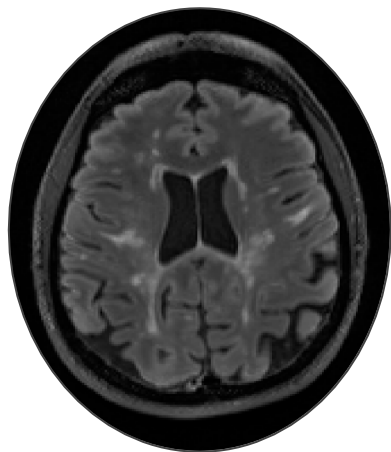
- Octave’s **blood-based MS Disease Activity test** will be analyzed in longitudinal serum samples
 - 21-plex of proteins
 - Association with MS endpoints (Gad-enhancing lesions, ARR, and clinical relapse status) in multiple feasibility studies alongside computational biology modeling led to Octave’s custom assay development
 - See P0063: “Development of a Custom Multivariate Proteomic Serum Based Assay for Association with Radiographic and Clinical Endpoints in MS”
- Exploratory endpoints** include associating the MS Disease Activity test measurements with:
 - Gadolinium-enhancing lesions,
 - New or Enlarging T2 lesions,
 - Symptom Progression (e.g. EDSS) with or without MRI changes,
 - Integrative analyses with the platform capturing proxies for disease activity and progression

Biomarkers in Custom Assay Panel

Protein	Alias	Associated Pathways, Cell Types
APLP1	Amyloid Beta Precursor Like Protein 1	Synaptic maturation during cortical development, regulation of neurite outgrowth
CCL20	MIP-3 alpha	Immunoregulatory and inflammatory processes
CD6	Cluster of Differentiation 6	T cell, Th1, Th17
CDCP1	CUB domain-containing protein 1	T cell migration
CNTN2	Contactin 2	Cell adhesion, proliferation, migration, and axon guidance of neurons
COL4A1	Collagen alpha-1(IV) chain	Cell proliferation, migration, ECM
CXCL13	C-X-C Motif Chemokine Ligand 13, BLC	Immune activation, B cell homing
CXCL9	CXCL9, Monokine Induced by Gamma Interferon, MIG	Immune Response, Inflammation
FLRT2	Leucine-rich repeat transmembrane protein	Cell-cell adhesion, cell migration and axon guidance
GFAP	Glial Fibrillary Acidic Protein	Demyelination and neuro-axonal injury
GH	somatotropin, Growth Hormone	Growth, cell reproduction and regeneration
IL-12B	Interleukin 12B	Innate & adaptive immunity, Th1, overexpression observed in CNS in MS
MOG	Myelin-oligodendrocyte glycoprotein	Oligodendrocyte, immune-mediated demyelination
NfL	Neurofilament Light	Neurodegeneration
OPG	Osteoprotegerin, TNFRSF11B	Inflammation, T cell activation, IFN-B treatment
OPN	Osteopontin	Immune modulation
PRTG	Protogenin	Neurogenesis, demyelinating
SERPINA9	serpin family A member 9	B cell
TNFRSF10A	TRAILR1, DR5 - Death Receptor 5	Cell Signaling and Apoptosis
TNFSF13B	BAFF	B cell, Inflammation
VCAN	Versican, versican proteoglycan	Cell motility, growth and differentiation, cell adhesion, proliferation, proliferation, migration and angiogenesis

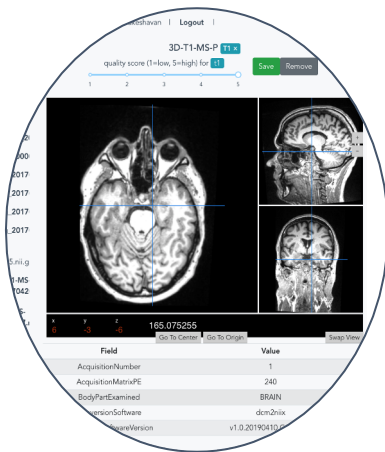
*Due to the ongoing COVID-19 pandemic situation, baseline blood-draws may be delayed.

Exploratory Aim: Enhanced MRI



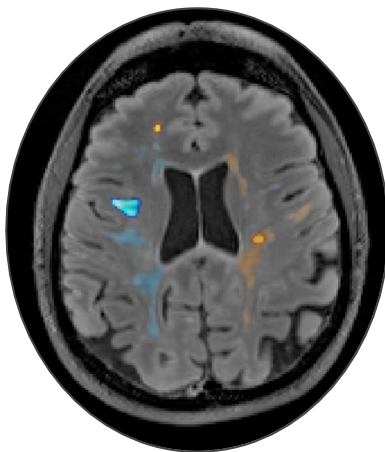
Standard MRI

Standard of Care MRI collected during study and up to 5 years of retrospective MRI



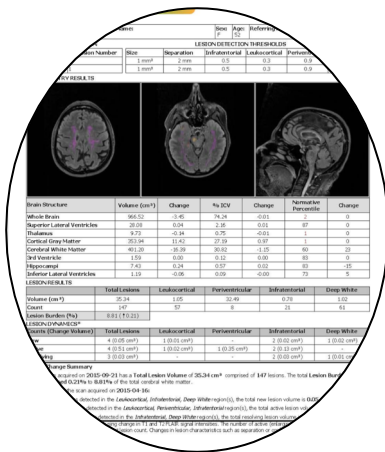
Pre-processing

Anonymize all MRI data and rate each series on image quality



Segmentation

3D T1, 3D T2 FLAIR and optional T1 Post-Gd+ sent to FDA-cleared segmentation software



QC Results

Evaluate accuracy of segmentation overlays and semi-automated quantitative metrics



**Expert
Neuroradiology**

MRI Report generated by board-certified Neuroradiologist with expertise in Multiple Sclerosis



**Referring
Physician**

The MRI report is delivered to the referring Neurologist in addition to the standard of care MRI report performed by local Radiologist

Exploratory endpoints include:

- Associating subclinical MRI metrics with proteomic and clinical measures (including novel structured data elements measured via the Octave Care Platform) for disease activity and progression.
- Identifying unique MRI markers that correlate with patient disease progression.

Discussion & Conclusions

- The novel UHU definition is a useful metric to quantify the magnitude and significance to which solutions like Octave's Care Platform affect existing care at a given health center while still retaining satisfaction with patient-provider interactions.
- The MOVING MS trial is actively enrolling participants. We expect the results of the study to be presented in the future.
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Thank you for your time!

