

Introduction

• A Multiple Sclerosis (MS) Specialist Neurologist's (MSN) decision to change treatment relies on a patient's clinical presentation and magnetic resonance imaging (MRI) reporting. Variability of the MSNs interpretation of the MRI report can lead to differing clinical decisions, impacting patient outcomes and healthcare utilization.

Objective

Understand the consistency of MSN's clinical decisions for treatment change based on standard-of-care brain MRI reports.

Methods

- 90 de-identified MS subjects with 2 (median 1 year apart) MRI exams from 2012 to 2019 were retrospectively enrolled from the University Hospital Basel. Enrolled subjects were randomly selected to represent varying levels of disease activity.
- Within the included subjects, 64.4% were female and the mean age was 51.7 ± 10.4 years old. Patients had an average EDSS score of 3.3 ± 1.7.
- Three board-certified neuroradiologists (NRs) visually interpreted raw images to provide a standard of care structured report.
- The 270 reports prepared by the NRs were randomized 1:1:1 to 3 groups of 2 MSNs. To measure intra-rater variability, 30 of the 90 patient reports were repeated for a total of 120 report ratings per MSN (Figure 1).
- MSNs reviewed the standard of care MRI report alongside a brief clinical summary of the patient and the survey.
- The clinical summary included Age, Sex, Current DMT, Disease Duration, Disease Course, EDSS, EDSS change from previous year, Time to last relapse on MRI, Relapse within 120 days, # of clinical relapses in the past year & in the past 2 years, and Current & Prior MRI dates.
- The first section of the survey rating the clarity, completeness, usefulness, & satisfaction for each report. The second section addressed clinically impactful treatment decisions, such as the MSN's comfort and confidence in the MRI report for decision making, classification of disease activity, level of concern, treatment changes, test orders, time to next visit, and follow-up communication. 5 of 6 MSNs completed the survey to date.
- Descriptive statistics were reported as frequency and percentage for the responses of all survey questions.

Results

- MSNs recommended a change in treatment plan for 200 of 600 MRI reports (Figure 2A). The 5 MSNs had 100% agreement for 33 patients (10 change, 23 no change). The remaining 57 patients had at least one MSN recommend a change and at least one MSN not recommend undergoing treatment change (Figure 2B).
- Intra-rater analysis showed that all 5 MSNs had conflicting recommendations on treatment change for repeated patients (7-13%).
- Case examples of MSNs reporting differing opinions on the same patient (Table 1 & Table 2):
- Patient A
- MSN 1 and MSN 2 both changed their decision on whether to make a treatment change and what that recommended change would be when presented with a repeated report for the patient. MSN 1 also altered their decision on the follow-up care for Patient A when recommending a treatment change, reducing the amount of time to the patient's next scheduled visit and the next scheduled MRI.
- Patient B
- 5th MSN recommended a treatment change for both reports.

Variability in Clinical Impressions and Decisions by **Neurologists Interpreting MS MRI Brain Reports**

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• All 5 MSNs rated Patient B twice. 2 MSNs consistently classified the patient as stable, 1 MSN consistently classified the patient as progressive, while the remaining 2 MSNs switched between progressive and stable. 4 out of 5 MSNs recommended a treatment change only once, while the

Figures







Figure 1. Flow diagram of study design.

Figure 2. A) Distribution of treatment change recommendation at individual report level (N=600). B) Variability in the number of MSNs who recommended a treatment change across 90 patients.

			Patier	nt B						
Survey Questions	MSN 1		MSN 2		MSN 3		MSN 4		MSN 5	
	Initial Report	Repeat Report	Initial Report	Repeat Report	Initial Report	Repeat Report	Initial Report	Repeat Report	Initial Report	Repeat Report
I feel comfortable making a clinical decision/impression based on the MRI report.	Strongly Agree	Agree	Neutral	Neutral	Agree	Agree	Agree	Neutral	Agree	Disagree
I require further consultation with the Radiologist.	Strongly Disagree	Disagree	Neutral	Neutral	Disagree	Disagree	Disagree	Disagree	Disagree	Disagree
I have confidence in the MRI report without reviewing the patient's MRI images.	Agree	Agree	Disagree	Disagree	Agree	Agree	Disagree	Disagree	Disagree	Disagree
How would you classify the current disease status of the patient?	Stable	Stable	Progression	Stable	Progression	Progression	Stable	Stable	Stable	Progression
How would you rate your level of concern for the patient?	Slight	Slight	Moderate	Moderate	Very	Very	Very	Slight	Slight	Very
Would you consider making changes to the patient's overall treatment plan?	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes
Would you consider changing the patient's medication/DMT?	No	New DMT	New DMT Discontinue DMT	None	No	Consider Discontinuing DMT	New DMT	No	New DMT	Undecided
Will you order any additional testing within six months?	Blood test	None	PIRA	Blood test	Blood test	Blood test	Blood test	Blood test	Blood test Spinal Cord MRI	Spinal Cord MRI
When do you want the patient to schedule their next visit?	6 months	3 months	1-3 months	6 months	6 months	6 months	3 months	6 months	< 1 month	1-3 months
When do you want the next MRI to be performed?	1 year	6 months	1 year	> 1 year	1 year	1 year	1 year	1 year	1 year	6 months
How would you follow up with the patient upon receipt of this report?	EMR message Nurse call	In-person visit	In-person visit	Nurse call Doctor call	In-person visit	EMR message	In-person visit	In-person visit	EMR message In-person visit	Doctor call

Table 2. Responses from 5 MSNs performing 2 ratings of a single patient with progressive disease. Note both Intra- and inter-rater variability present among key clinical impressions such as current patient disease status, level of concern, recommended treatment change, time to next follow up visit and next MRI, as well as type of follow-up with the patient.

Conclusions

• There is evidence of differences within & between MS Neurologists when reporting clinical decisions based on standard-of-care patient outcomes and cost of care.





IMG13

Blood tes

MSN 2

DM

Blood t



	medication/DMT?					
	Will you order any additional testing within six months?					
	When do you want the patient to schedule their next visit?					
	When do you want the next MRI to be performed?					
5 MSNs	How would you follow up with the patient upon receipt of this report?					

Survey Questions

Radiologist

the patient?

I feel comfortable making a clinical

I require further consultation with the

reviewing the patient's MRI images.

patient's overall treatment plan?

decision/impression based on the MRI report.

I have confidence in the MRI report without

How would you rate your level of concern for

Would you consider making changes to the

Would you consider changing the patient's

Table 1. Case study: Demonstration of intra- and inter-rater variability in clinical impressions for a patient with Relapse- Remitting MS.

Nurse call

EMR message

Patient A

Strongly

Disagree

Slight

Rlood .

MSN 1

New DMT

3 month

structured MRI reports. Discrepancies in clinical impressions, treatment recommendations & follow-up orders may significantly impact