I. CLINICAL GUIDELINES for Brain and Spinal Cord MRI in MS

**Suspected MS:**
Baseline evaluation:
- Brain MRI recommended (with gadolinium)
- Spinal Cord MRI if presenting symptoms are at the level of the spinal cord and have not resolved, or if the Brain MRI is non-diagnostic.

Follow-up evaluation:
- Brain MRI recommended to demonstrate new disease activity

**Established MS indications:**
Baseline evaluation:
- Brain MRI recommended (gadolinium optional)
Follow-up of MS:
- Unexpected clinical worsening
- Re-assessment of disease burden before starting or modifying therapy
- Suspicion of a secondary diagnosis

II. MRI PROTOCOLS for Brain and Spinal Cord

**Field Strength:** 1.0 Tesla or higher recommended for brain or spinal cord.
(Note: 1T open ring magnets have an effective field strength of approximately 0.7 Tesla and are only recommended when patients can not tolerate the closed magnet).

**Slice Thickness:** ≤ 3mm and no gap and in plane resolution of ≤ 1mm x 1 mm for both Brain and spinal cord. (Note: ≤ 5mm and no gap is acceptable for Brain MRI for centers that are unable to acquire 3mm slices in the allotted time).

**Scan Orientation and Coverage:**
Reproducible coverage and orientation for the axial slices using the subcallosal line as a reference on an appropriate Sagittal localizer is critical for longitudinal comparisons.
Brain MRI Sequences:
1\textsuperscript{st}: Sagittal FLAIR (fluid attenuating inversion recovery).
2\textsuperscript{nd}: Axial PD/T2 (proton density and T2 weighted T1 usually $\leq 30$ms and TE2 $\geq 80$ms)
3\textsuperscript{rd}: Axial FLAIR
4\textsuperscript{th}: Gadolinium enhanced T1 (if suspicious lesions seen on FLAIR).

Note: all 4 sequences recommended for a diagnostic MRI in suspected MS. The Sagittal FLAIR and gadolinium enhanced T1 are optional in the follow-up study for established MS.

Spinal Cord Sequences:
1\textsuperscript{st}: Sagittal PD/T2
2\textsuperscript{nd}: Sagittal pre-Gad T1
3\textsuperscript{rd}: Sagittal post-Gad T1
4\textsuperscript{th}: Axial post-Gad T1 through suspicious lesions.
5\textsuperscript{th}: Axial T2 through suspicious lesions.

Gadolinium:
- The recommended dose is 0.1 mmol/kg IV
- The minimum delay after giving gadolinium is 5 minutes before acquiring the axial T1 weighted axial post contrast images.
- Gadolinium does not need to be given for a spinal cord MRI if it follows a contrast Brain MRI study.

Time saving strategies:
- Omit the axial Fast Spin Echo PD
- Only cover the corpus callosum with the Sagittal FLAIR.
- Acquire the axial FLAIR after giving gadolinium and before the axial T1 weighted axial post contrast images.

Report:
The report should use common language and be descriptive including:
- Lesion number, location, size, shape, character and a qualitative assessment of brain atrophy.
- Comparison with previous studies for new, enlarging and/or enhancing lesions and atrophy.
- Interpretation and differential diagnosis.

An optional standardized reporting table may be helpful to the radiologist and neurologist.

Archival and Storage:
Copies of these MRI studies should be retained permanently and be available. They should be stored in a standard format (example DICOM). It may be useful for patients to keep their own studies on portable digital media.
### Table: Comprehensive MS MRI Report

<table>
<thead>
<tr>
<th>BRAIN MRI</th>
<th>MRI date:</th>
<th>MRI date:</th>
<th>MRI date:</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Follow-up</td>
<td>Follow-up</td>
<td>Follow-up</td>
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<tr>
<td>With gadolinium (check)</td>
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<tr>
<td>Normal (check)</td>
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</tbody>
</table>

**Total number of T2 lesions (> 3mm)**

**New T2 lesions compared to baseline**

**Periventricular lesions**

**Juxtacortical lesions**

**Infratentorial lesions**

**Corpus callosum lesions**

**Enlarging lesions**

**Total number of enhancing lesions**

**Non-enhancing T1 hypointense lesions**

**Brain Atrophy (no, mild, moderate, severe)**

<table>
<thead>
<tr>
<th>Other finding</th>
<th>NA: not applicable;</th>
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<tbody>
<tr>
<td></td>
<td>International Criteria for MS diagnosis (3 out of 4 of the following on brain MRI):</td>
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<tr>
<td></td>
<td>• 1 gd-enhancing lesion or 9 T2 lesions 1 infratentorial lesion</td>
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<tr>
<td></td>
<td>• 1 juxtacortical lesion 3 periventricular lesions</td>
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</tbody>
</table>

Diagnostic Follow-up MRI at ≥ 3 months following clinical attack (either of):

• 1 gd-enhancing lesion or 1 new T2 lesion

<table>
<thead>
<tr>
<th>SPINAL CORD MRI</th>
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</table>

**Number of T2 lesions**

**Number of enhancing lesions**

**Atrophy (no/yes; level)**

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<td>Adapting from Dr. J. Simon</td>
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