MS Journal Appendix for MRI methodology

Hardware	
Field strength	1T, 1.5T or 3.0T
Manufacturer	Siemens / GE / Philips / Toshiba / Picker
Model	- Siemens - Symphony 1.5T - Espree 1.5T - Essenza 1.5T - Avanto 1.5T - Verio 3T - Spectra 3T - GE: - Horizon 1.5T - Excite 1.5T - Excite HD 1.5T - HDe 1.5T - HDxt 1.5T - Optima MR360 1.5T - Optima MR450w 1.5T - Excite HD 3T - HDxt 3T - Philips: - Intera 1T - GyroscanNT 1.5T - Intera 1.5T - Achieva 1.5T - Ingenia 1.5T - Intera 3T - Achieva 3T - Ingenia 3T - Toshiba: - Excelart 1.5T - Picker: - Eclipse 1.5T
Coil type (e.g. head, surface)	Quadrature or Multichannel (each scanner scanning with only one coil)
Number of coil channels	If multichannel: 4 to 24 (*)

Acquisition sequence: PD-weighted		
Type (e.g. FLAIR, DIR, DTI, fMRI)	2D Turbo Spin Echo Proton Density weighted	
Acquisition time	3:03 to 5:30	
Orientation	Axial / Oblique	
Alignment (e.g. anterior commissure/poster commissure line)	AC-PC	
Voxel size	0.98 mm x 0.98 mm x 3mm (slice thickness)	
TR	2050 ms to 3200 ms (*)	
TE	8 to 15 ms (*)	
TI	-	
Flip angle	111° to 180° (*)	
NEX	1	
Field of view	AP: 250mm RL: 187.5mm to 250mm (*)	
Matrix size	256	
Parallel imaging	~~Yes~~	No
If used, parallel imaging method: (e.g. SENSE, GRAPPA)	N/A	
Cardiac gating	~~Yes~~	No
If used, cardiac gating method: (e.g. PPU or ECG)	N/A	
Contrast enhancement	~~Yes~~	No
If used, provide name of contrast agent, dose and timing of scan post-contrast administration	N/A	

Acquisition sequence: PD-weighted

Other parameters:	Phase encoding direction: R/L
	60 slices
	Turbo factor (ETL) = 3 or 4 (*)

Acquisition sequence: T2 weighted

Type (e.g. FLAIR, DIR, DTI, fMRI)	2D Turbo Spin Echo T2 weighted
Acquisition time	2:48 to 5:38
Orientation	Axial / Oblique
Alignment (e.g. anterior commissure/poster commissure line)	AC-PC
Voxel size	0.98 mm x 0.98 mm x 3mm (slice thickness)
TR	3850 ms to 7301 ms (*)
TE	60 ms to 91 ms (*)
TI	-
Flip angle	120° to 180° (*)
NEX	1
Field of view	AP: 250 mm RL: 187.5 mm to 25 0mm (*)
Matrix size	256

Acquisition sequence: T2 weighted		
Parallel imaging	~~Yes~~	**No**
If used, parallel imaging method: (e.g. SENSE, GRAPPA)		
Cardiac gating	~~Yes~~	No
If used, cardiac gating method: (e.g. PPU or ECG)		
Contrast enhancement	~~Yes~~	**No**
If used, provide name of contrast agent, dose and timing of scan post-contrast administration		
Other parameters:	Phase encoding direction: R/L 60 slices Turbo factor (ETL) = 7 to 15 (*)	

Acquisition sequence: T1 weighted pre contrast

Type (e.g. FLAIR, DIR, DTI, fMRI)	3D spoiled gradient echo T1 weighted pre contrast
Acquisition time	4:13 to 9:02
Orientation	Axial / Oblique
Alignment (e.g. anterior commissure/poster commissure line)	AC-PC
Voxel size	0.98 mm x 0.98 mm x 3mm
TR	28 or 30 ms (*)
TE	4 to 11 ms (*)
TI	-
Flip angle	27° or 30° (*)
NEX	1
Field of view	AP: 250mm RL: 187.5 to 226.5mm (*) SI: 180mm
Matrix size	256

Parallel imaging	~~Yes~~	No
If used, parallel imaging method: (e.g. SENSE, GRAPPA)	N/A	
Cardiac gating	~~Yes~~	No
If used, cardiac gating method: (e.g. PPU or ECG)	N/A	
Contrast enhancement	~~Yes~~	No
If used, provide name of contrast agent, dose and timing of scan post-contrast administration	N/A	

Acquisition sequence: T1 weighted pre contrast

Other parameters:	Phase encoding direction: R/L 60 slabs

Acquisition sequence: 2D T2 Flair

Type (e.g. FLAIR, DIR, DTI, fMRI)	2D T2 Turbo Flair (Turbo Spin Echo with Inversion Recovery Pulse)	
Acquisition time	4:31 min to 9:01 min	
Orientation	Axial / Oblique	
Alignment (e.g. anterior commissure/poster commissure line)	AC-PC	
Voxel size	0.98 mm x 0.98 mm x 3mm (slice thickness)	
TR	7559 ms to 9820 ms (*)	
TE	58 ms to 99 ms (*)	
TI	2000 ms to 2500 ms(*)	
Flip angle	100° to 180° (*)	
NEX	1	
Field of view	AP: 250 mm RL: 187.5 mm to 250 mm (*)	
Matrix size	256	
Parallel imaging	~~Yes~~	No

Acquisition sequence: 2D T2 Flair		
If used, parallel imaging method: (e.g. SENSE, GRAPPA)	N/A	
Cardiac gating	~~Yes~~	No
If used, cardiac gating method: (e.g. PPU or ECG)	N/A	
Contrast enhancement	Yes	~~No~~
If used, provide name of contrast agent, dose and timing of scan post-contrast administration	2D T2 Flair acquired during the 10' delay from the end of the injection to the start of the 3D T1 post contrast (see next sequence)	
Other parameters:	Phase encoding direction: R/L 60 slices Turbo factor (ETL) = 7 to 12 (*)	

Acquisition sequence: T1 weighted Post Contrast	
Type (e.g. FLAIR, DIR, DTI, fMRI)	3D spoiled gradient echo T1 weighted post contrast
Acquisition time	4:13 to 9:02
Orientation	Axial / Oblique
Alignment (e.g. anterior commissure/poster commissure line)	AC-PC
Voxel size	0.98 mm x 0.98 mm x 3mm
TR	28 or 30 ms (*)
TE	4 to 11 ms (*)

Acquisition sequence: T1 weighted Post Contrast		
TI	-	
Flip angle	27° or 30° (*)	
NEX	1	
Field of view	AP: 250 mm RL: 187.5 to 226.5 mm (*) SI: 180 mm	
Matrix size	256	
Parallel imaging	~~Yes~~	No
If used, parallel imaging method: (e.g. SENSE, GRAPPA)	N/A	
Cardiac gating	~~Yes~~	No
If used, cardiac gating method: (e.g. PPU or ECG)	N/A	
Contrast enhancement	Yes	~~No~~
If used, provide name of contrast agent, dose and timing of scan post-contrast administration	10' post contrast dose: according to the weight of the participant (0.1 mmol/kg). Contrast agent could be: Gadovist, Magnevist, Optimark, Omniscan, Multihance, etc (*)	
Other parameters:	Phase encoding direction: R/L 60 slabs	

(*) Note that when a range or several values are provided, each individual scanner uses a fixed value.

Image analysis methods and outputs

Lesions

Type (e.g. Gd-enhancing, T2-hyperintense, T1-hypointense)	New, enlarging T2 lesion count
Analysis method	Semi-automated with human interface: A New T2 Lesion Count enumerates the number of T2 lesions that are new or enlarging with respect to the timepoint of reference. A New T2 lesion is a T2 lesion that was not present at the reference timepoint. Focal enlargement that is contiguous with an existing T2 lesions is included in the count of "New T2 lesions". Minor lesion growth at the borders of existing lesions is not counted. A new T2 lesion must be at least 3 contiguous voxels in size. The MRI Reader performs a thorough review of all slices and corrects the labels provided by software as necessary.
Analysis software	Software developed in-house at NeuroRx
Output measure (e.g. count or volume [ml])	Count

Lesions

Type (e.g. Gd-enhancing, T2-hyperintense, T1-hypointense)	Gd-enhancing lesion count

Image analysis methods and outputs	
Analysis method	A Gadolinium-enhancing lesion is an area of increased signal intensity on a post-contrast T1-weighted MRI that is not due to normal structures. Gadolinium-enhancing lesions must meet the following criteria: The lesion must have at least 3 contiguous voxels that enhance by at least 20% on the post-gadolinium T1-weighted image relative to the pre-gadolinium T1-weighted image. The enhancing voxels on the post gadolinium T1-weighted image must partially co-localize with, or must be adjacent to, a T2-weighted lesion. Two MRI readers independently perform a thorough review of all brain slices and identify the Gadolinium-enhancing lesions. Once both independent reads are performed, saved and locked, the MRI readers meet to perform a Consensus read (which involves the review of all lesions that were labeled to ensure not only that the count is the same but also that the same lesions were identified).
Analysis software	Manual method
Output measure (e.g. count or volume [ml])	Count
Tissue volumes	
Type (e.g. whole brain, grey matter, white matter, spinal cord)	N/A
Analysis method	
Analysis software	
Output measure (e.g. absolute tissue volume in ml, tissue volume as a fraction of intracranial volume, percentage change in tissue volumes)	
Tissue measures (e.g. MTR, DTI, T1-RT, T2-RT, T2*, T2', ¹H-MRS, perfusion, Na)	
Type (e.g. whole brain, grey matter, white matter, spinal cord, normal-appearing grey matter or white matter)	N/A
Analysis method	

Image analysis methods and outputs	
Analysis software	
Output measure	
Other MRI measures (e.g. functional MRI)	
Type (e.g. whole brain, grey matter, white matter, spinal cord, normal-appearing grey matter or white matter)	N/A
Analysis method	
Analysis software	
Output measure	

Other analysis details: