1. Imaging Parameters:
	1. Epilepsy-specific Protocol: *(Check only one)* [ ]  Yes [ ]  No
	2. Sequences Obtained:
	3. Date Scan Performed: / / m m dd yyyy
2. Imaging Normality: *(Check only one)*

[ ]  Normal

[ ]  Abnormal

[ ]  Incidental (not relevant for epilepsy evaluation)

* 1. If Abnormal, number of abnormality types:
	2. If Abnormal, describe type(s):
1. Lateralization: (Check only one) [ ]  Left [ ]  Right [ ]  Bilateral
2. Distribution: (Check only one) [ ]  Unifocal [ ]  Multilobar [ ]  Hemispheric

 [ ]  Multifocal [ ]  Diffuse / generalized

1. Location:

Table for Recording Locations - Cortical

| Cortical (Check only one) | Side (Check only one) |
| --- | --- |
| [ ]  Basal occipital (BO) | [ ]  Left [ ]  Right |
| [ ]  Dorsal lateral frontal (DLF) | [ ]  Left [ ]  Right |
| [ ]  Dorsal lateral parietal (DLP) | [ ]  Left [ ]  Right |
| [ ]  Frontal Polar (FP) | [ ]  Left [ ]  Right |
| [ ]  Insula (INS) | [ ]  Left [ ]  Right |
| [ ]  Lateral occipital (LO) | [ ]  Left [ ]  Right |
| [ ]  Lateral temporal (LT) | [ ]  Left [ ]  Right |
| [ ]  Mesial frontal (MF) | [ ]  Left [ ]  Right |
| [ ]  Mesial occipital (MO) | [ ]  Left [ ]  Right |
| [ ]  Mesial parietal (MP) | [ ]  Left [ ]  Right |
| [ ]  Mesial temporal (MT) | [ ]  Left [ ]  Right |
| [ ]  Orbital frontal (OF) | [ ]  Left [ ]  Right |
| [ ]  Temporal polar (TP) | [ ]  Left [ ]  Right |

Table for Recording Locations - Subcortical

| Subcortical (Check only one) | Side (Check only one) |
| --- | --- |
| [ ]  Basal ganglia | [ ]  Left [ ]  Right |
| [ ]  Callosum | [ ]  Left [ ]  Right |
| [ ]  Grey-white matter junction | [ ]  Left [ ]  Right |
| [ ]  Periventricular | [ ]  Left [ ]  Right |
| [ ]  Thalamus | [ ]  Left [ ]  Right |
| [ ]  White matter-other | [ ]  Left [ ]  Right |

1. Features (Check all that apply):

[ ]  Agenesis
[ ]  Atrophy
[ ]  Cortical thinning

[ ]  Cystic (including multicystic)

[ ]  Decreased grey-white matter distinction

[ ]  Dysgenesis (includes dysmorphology of cortical mantle)

[ ]  Heterotopic tissue versus migration abnormality

[ ]  Hypertrophy

[ ]  Hyperplasia (grey or white matter)
[ ]  Hypoplasia (grey or white matter)
[ ]  Loss of architecture (specific to hippocampus)
[ ]  Malformation related white matter signal abnormality

1. Contrast enhancement(Check only one):[ ]  Yes [ ]  No
2. Impression of Specific Abnormalities(Check all that apply):
	1. [ ] Mesial Temporal Sclerosis

If applicable, specify:
[ ]  Hippocampal sclerosis

[ ]  Hippocampal sclerosis plus inter-lateral temporal dysplasia/atrophy

[ ]  Hippocampal sclerosis with remote dual pathology (i.e., remote lesion)

* 1. [ ] Malformation of cortical development (MCD)

If applicable, specify:

[ ]  Band heterotopias

[ ]  Development tumor-like lesion

[ ]  Focal cortical dysplasia

[ ]  Hemimegalencephaly

[ ]  Heterotopia / heterotopion (other)

[ ]  Hypothalamic hamartoma

[ ]  Lissencephaly

[ ]  Microcephaly

[ ]  Pachygyria

[ ]  Partial Hemimegalencephaly

[ ]  Periventricular nodular heterotopias

[ ]  Polymicrogyria

[ ]  Schizencephaly (malformation related only)

[ ]  Transmantle focal cortical dysplasia

[ ]  Tuberous sclerosis

Comments:

1. **[ ]** Vascular

If applicable, specify:

[ ]  Arterial stroke

[ ]  Arterial vascular malformation

[ ]  Cavernoma

[ ]  Hemorrhage (including post hemorrhage evidence, e.g. periventricular)

[ ]  Venous stroke

[ ]  Vascular malformation (other)

1. **[ ]** Neoplasm[[1]](#footnote-1)

If applicable, specify:

[ ]  Primary [ ]  Secondary

1. [ ] Inflamatory/infectious

If applicable, specify:

[ ]  Abcess

[ ]  Cysticercosis

[ ]  Encephalitis (other)

[ ]  Limbic encephalitis

[ ]  Sarcoidosis

[ ]  Vasculitis

1. [ ] Atrophy or tissue loss

If applicable, specify:

[ ]  Encephalomalacia (related to surgery, abscess, radiation, trauma)

[ ]  Focal or lobar atrophy (other)

[ ]  Trauma related

[ ]  Vascular related (If caused by Stroke, see Vascular to classify)

## GENERAL INSTRUCTIONS

Provided below are the minimum requirements for MRI epilepsy evaluation to evaluate cause for seizures and confirm or direct investigations to the seizure focus. They are directed at identifying the most common causes of focal epilepsy: Malformations of cortical development, MTS, tumor, vascular, and inflammatory causes. As malformations of cortical development are the most common causes of epilepsy in children emphasis should be on T2 (including FSE) images; FLAIR imaging gains in importance in adolescence and adulthood when mesial temporal sclerosis and gliosis are of greater concern.

If the 1st MRI scan is performed between ages 8 and 18 months is normal, then the MRI study should be repeated at age 24-30 months if seizures persist (the cerebral cortex is difficult to evaluate in children imaged 8-18 months due to on-going myelination and relatively poor of contrast between cortex and white matter).

General sequences are listed, but not specific imaging parameters as they depend on make of scanner and magnetic field strength. Suggestions are provided for adult, children and infants (<1 years age).

In addition to these basic imaging protocols, consideration should be given to:

* Axial magnetization transfer T1 weighted images in children <14 y.o.
* High resolution coronal turbo/fast spin echo T2 weighted images of the hippocampal formations (orthogonal to the long axis), 3 mm skip 0.
* Contrast need not be routinely used unless characterization of vascular, tumor or inflammatory lesion is considered necessary.
* Perfusion, diffusion sequences are optional.
* Turbo / fast spin echo proton density sequences (4-5 mm thick) can be useful in detection of subtle transmantle dysplasias.

## Adults (14 and older)

* Axial turbo / fast spin echo T2-weighted images (2 mm skip 0), whole brain
* Coronal turbo / fast spin echo T2 weighted high resolution coronal oblique sequence (512 x 512, maximum slice thickness of 4 mm), whole brain
* Coronal fast FLAIR T2 weighted (and axial for children if possible)
* Sagittal or coronal 3D T1 weighted gradient echo volume sequence (256 x 256, maximum slice thickness of 1.5 mm, preferably 1.0 mm for isotropic voxels). Sagittal preferred, coronal acceptable, axial is not advised. The quality of this sequence is critical since it is relied upon for post-processing–reformatting for evaluation of cortical thickness, image registration and segmentation, including volumetry.
* Standard sagittal T1-weighted sequence images (if gradient echo volume sequence is not acquired in the sagittal plane)

All coronal sequences should be acquired in an oblique plane orthogonal to the long axis of the hippocampus.

## Children for 1-14 years:

* Axial turbo / fast spin echo T2-weighted images (2 mm skip 0), whole brain
* Coronal turbo / fast spin echo T2 weighted high resolution coronal oblique sequence (512 x 512, maximum slice thickness of 4 mm), whole brain
* Axial fast FLAIR T2 weighted (and coronal if possible)
* Sagittal or coronal 3D T1 weighted gradient echo volume sequence (256 x 256, maximum slice thickness of 1.5 mm, preferably 1.0 mm for isotropic voxels). Sagittal preferred, coronal acceptable, axial is not advised. The quality of this sequence is critical since it is relied upon for post-processing– reformatting for evaluation of cortical thickness, image registration and segmentation, including volumetry.
* Standard sagittal T1-weighted sequence images (if gradient echo volume sequence is not acquired in the sagittal plane)

All coronal sequences should be acquired in an oblique plane orthogonal to the long axis of the hippocampus.

## Infants (< one year)

* Children younger than one year require special sequences as immature myelination affects the ability to identify common causes of epilepsy. MR imaging (especially high resolution T2 images) performed early in the first year of life in infants with epilepsy is important to identify areas of cortical or subcortical dysplasia,.
* Axial turbo / fast spin echo T2-weighted images (2 mm skip 0), whole brain
* Coronal turbo / fast spin echo T2 weighted high resolution coronal oblique sequence (512 x 512, maximum slice thickness of 4 mm), whole brain
* Axial fast FLAIR T2 weighted
* Sagittal turbo / fast spin echo T2-weighted images (2 mm skip 0), whole brain
* Standard sagittal T1-weighted sequence images (if gradient echo volume sequence is not acquired in the sagittal plane)
* (Volumetric T1 weighted sequences are less useful prior to age one year due to incomplete myelination on T1 sequences)
1. If Developmental tumor-like lesion, see MCD to classify [↑](#footnote-ref-1)