1. Date of Study: //20 m m dd yyyy
2. Last seizure occurrence in relation to study: //20 m m dd yyyy : (HH:MM) AM PM 24-hr clock
3. Scanner: (Check only one) 1.5T  3.0T Other
   1. If Other, specify:
4. Technique: (Check only one) BOLD ASL Other
   1. If Other, specify:
5. Complicating Factors: (Check all that apply)

Postictal

Mass

Vascular malformation

Carotid stenosis

1. Paradigm Task Design: (Check all that apply) Block Design Event Related
2. Behavioral Monitoring: (Check only one) Yes No
3. Domain Tested: (Check all that apply)

Motor

Somatosensory

Visual

1. Language:

Expressive Receptive Both

1. Memory:

Explicit

Implicit

Recall

Encoding

Verbal

Visual spatial

Both

1. Analysis: Native space Standard space (Talairach, MNI, other)
   1. If Standard space, specify:

Analysis software: (Check all that apply)

SPM AFNI FSL MEDX Other

Analysis:

Visual blinded Visual unblinded

Analysis:

ROI Mask VBM

* 1. If ROI, specify hemisphere:
  2. If ROI, specify region:
  3. If ROI, specify activation mean:

1. Language: (Check only one)

* 1. Frontal Laterality:

Right Left Bilateral Unknown

* 1. Temporal Laterality:

Right Left Bilateral Unknown

* 1. Hemisphere Laterality:

Right Left Bilateral Unknown

1. Memory: (Check only one)
   1. Hemisphere Laterality:

Right Left Bilateral Unknown

1. Description of Language and Memory Paradigms (TBD-list if Visual or Auditory)

## General Instructions

fMRI should be performed in the awake conscious state. There is some evidence that information can be obtained from the sleep or the sedated state. The deeper the anesthesia the less reliable data is the data obtained. When possible it is helpful to monitor response. When there is an issue when activation maps are peculiar it is helpful to know how well the task was performed. However, there are times when effort is more important than performance success. Also unmonitored cognitive paradigms may be robust and reliable. It is important that the patient can perform the task. Simple tasks often give robust activation of the expensive network. Fancy control conditions may remove desired responses. If a patient is visually impaired, has a field cut, or is illiterate then auditory tasks may be preferred. Null datasets are not informative; they should either not be used, the study should be repeated, or other (invasive means) used.

Task paradigms may be block designs or event related designs. Most language and sensory/motor fMRI employ block design. Memory paradigms usually employ event related designs as data may be analyzed based on successful encoding of test items. Hemicycles should be 20-40 seconds, must be divisible by TR, and usually are 3-5 cycles, 3 is the minimum and used for more robust tasks (motor), 4 is usually adequate. If compliance is an issue it is better to use many short runs and combine, then one long run. For event related designs one needs 30 successfully answered/encoded items and similar number of controls.

Image data may be processed by any number of software programs. Data may be analyzed in native (individual) space or in a standard anatomical atlas. The former is more helpful for individual surgical planning, the later makes it easier to compare results across a group of patients. Image ratings may be visual or they may be semi-quantitative. If visual then, for research purposes, it is best if the rater is blinded to patient identity and circumstances. There are several methods for regional of analysis approaches. Hemispheric and regional indices have been used but it is helpful to recall that crossed dominance can be found and it is helpful to target task and rating to intended surgical field. Some use anatomical regions (e.g. Broca’s, Wernicke’s), some sue functional regions based on normal volunteers data. Methods include those based on voxel counts that exceed a particular threshold, t-scores for region, or bootstrap methods that adjust thresholds on an individual basis that are data driven. To gain signal by minimizing multiple comparisons and degrees of freedom a Mask approach analysis is sometimes used (where the primary analysis is constrained to the regions selected).

There are four circumstances when BOLD fMRI signal may be attenuated and thus result in spurious interpretation; they are 1) post ictal state 2) mass lesion with edema 3) vascular steal 4) critical carotid stenosis (usually elderly). It is thus important to know when previous seizure occurred, and how severe, e.g. cluster or prolonged.

* Motor tasks include tapping fingers, wiggling tongue (motor cortex), or foot.
* Sensory tasks include brushing face, hand or foot (somatossensory cortex); tones (auditory cortex), or flashing/alternating checkerboard (visual cortex).
* Memory tasks have material specificity (verbal, visual spatial), and may use novel or familiar items, may involve implicit or explicit memory, and may image encoding or retrieval (hippocampal formation and mesial temporal structures).
* Language/Speech tasks take several forms. Fluency tasks (may be semantic or phonemic) generally target anterior “expressive” areas (IFG), and are usually free fluency (generate words to letters (CLFPRW, a phonemic task; generate words to categories (animals, food), or may be paced (generate a noun to a presented verb; or generate a rhyme, or antonym; or stem completion. For these tasks it helps to have an outside scanner measure of ability, it is hard to generate signal if the patient can not generate 3 words over 30 seconds to any one stimuli.

Other tasks involve a decision which allow for in scanner monitoring, but change the activation maps. This indicate (push button, raised finger) if a presented word matches a pre-specified category (e.g. animals). Tasks may also decide whether presented items match in some way, or whether a sentence is grammatically or syntactically correct. Tasks that employ phrases, sentences, or paragraphs are more likely to “activate” temporal “receptive cortex” also superior temporal sulcus. They may be passive (listening to stories) or require some action on the item(s) presented (is this sentence grammatically correct, is this definition of a word correct).