Site Certification  When designing multicenter imaging trials, it is best to control as many factors as possible so that the hypothesized treatment effect is not obscured by scanner variations within and between study centers. The first step in the process of limiting site variability is to design and finalize the MR protocol prior to study launch. The protocol should be feasible for implementation at multiple centers while suitable for addressing the hypothesis the trial is testing. If the MR protocol is too ambitious, the number of sites that will qualify may be too few to meet recruitment goals. On the other hand, one must avoid the tendency towards a protocol that will serve as the least common denominator among the sites that wish to participate. With the MR protocol finalized, the next step is to have each study center implement the protocol locally and submit a phantom scan to ensure that the center has sufficient technical oversight and leadership. Many centers repeatedly fail at this step. After the site demonstrates the ability to implement the protocol, they should scan a subject and submit the scan for central review. The site has completed the certification process when they have implemented the protocol and submitted an acceptable set of images of a subject.

Quality Assurance  It is imperative that each center routinely collects data to assess the stability of scanner performance. Historically, one used a doped fluid phantom to assess SNR and image homogeneity. However, modern trials that utilize advanced acquisition and image processing methodology usually require more stringent image quality assurance. With wide spread use of stereotactic image analysis methods, it has become necessary to perform longitudinal measurements of geometric distortion within the field of view. Typically, these measurements are made on a monthly basis or in association with each subject’s scan if recruitment will be infrequent. To assess intersite differences, the same geometric phantom should be distributed to each of the study centers. Since many of the metrics we wish to measure are hard to simulate in a phantom, some trials are sending a “traveling human phantom” to each center during the site verification process and annually thereafter. This is a great way to assess scanner effects on complex measurements such as cortical thickness or fractional anisotropy. Whenever possible, each subject should be imaged on the same scanner for each visit. In a perfect world, scanner upgrades would not be allowed during the period of longitudinal assessment. Reality dictates that scanner modifications/upgrades will occur during the study. One effective strategy for assessing the impact of upgrades on the longitudinal data is to perform the phantoms scans of SNR, uniformity and geometric distortion before and after each upgrade. It is beneficial to implement common sense QA procedures that the technologist/investigator can perform at the scanner while the subject is still in the magnet to ensure that images are free for artifact and subject motion. Finally, the trial will benefit greatly if there is rapid central review of image quality for each subject visit so that timely repeat scanning can be performed and thereby limit data loss.