Application for QIBA Project Funding

Title of Proposal: A Web-based Tool for Creating DSC Digital Reference Objects (DROs)		
QIBA Biomarker Committee/Task Force: MRI-PDF – DSC Task Force		
NIBIB Contract Objective(s):		
PI (Project Coordinator or Lead Investigator Information)		
Last Name: Erickson	First Name: Bradley	Degree(s): MD, PhD
e-mail:		Tel #:
Institution/Company: Mayo Clinic		
Total Amount Requested:		

Project Description

This project will provide a web-based interface to several software packages that create DSC simulations. We will collect at least 3 open source packages for creating images that create simulated DSC perfusion data which can be used for creating simulated images (hereafter referred to as Digital Reference Object Generators or DROGs). We will create a web front end to them, such that users will be able to input parameters common to all packages and parameters for the selected package. The signal intensity profiles computed from the selected package will then be mapped to a 3D brain model producing a 4D image, to which a DICOM header is added, and this is then downloaded by the user. As a side-note, this would also be a demonstration of adding compute capability to the web front end of QIBA/QIDW, which is a capability that other QIBA members have asked for.

This project will allow investigators to study the impact of various assumptions about how DSC works, and the impact on analysis software. One may also study the impact of acquisition parameters like field strength, repetition time (TR), echo time (TE), flip angle (FA), slice thickness, acquisition type (gradient echo vs spin echo). They may also model different leakage rates of the contrast material injected and perhaps relaxivity. Physiologic variables such as bolus properties may also be included. No one package that we are aware of models all of the variables, but rather, each will have its own set of parameters that can be selected. Each model has its merits, and we do not feel we can or should select just 1. This website will enable the user to select the package(s) they wish to use, and that will then enable/disable the parameters that the selected package includes in its model. Once those parameters are selected, the software will be executed, and the images will then be created as DICOM objects that may be downloaded by the user. We will build this website in a modular fashion, allowing others to easily add other types of simulation software. For instance, it should be straightforward to adapt the site to add DCE phantom creation using the DRO software from Barboriak/QIBA.

Most of the work of QIBA to date has focused on the performance of physical imaging devices (e.g. MR or PET scanner). However, for some image types like DSC perfusion, the software used for computing the clinically used values is critical. There are only a few publications on software performance, but they have shown substantial and clinically significant differences between software packages. Because clinically used software is usually commercial product, the details of how the software works is usually proprietary and

not publicly available. This project could provide a way for researchers and vendors to begin to understand the magnitude of variability in measurements due to software, the impact of various acquisition parameters on measurements, and causes of variability between software analysis packages.