

ADNI MR Group (Core?) – Cliff Jack

- MR Acquisition and Scanner QC →
M Bernstein, J Felmlee, N Schuff, M Weiner, A Dale,
N Fox, C DeCarli, J Gunter, P Britson
- Image Analysis → N Fox, A Dale, M Weiner, N
Schuff, G Alexander, P Thompson, C Studholme

NI MR Core Aims

- Acquire a high quality longitudinal MR data set at ~ 50 sites
- Consistency vertically (across sites/platforms) and horizontally (across time)
- 1.5T in all subjects at all time points, and 3T in 25%
- Analyze year 1 data using established measures in the field - state of the art image analysis methods
- Measure CVD at all time points – Charlie D

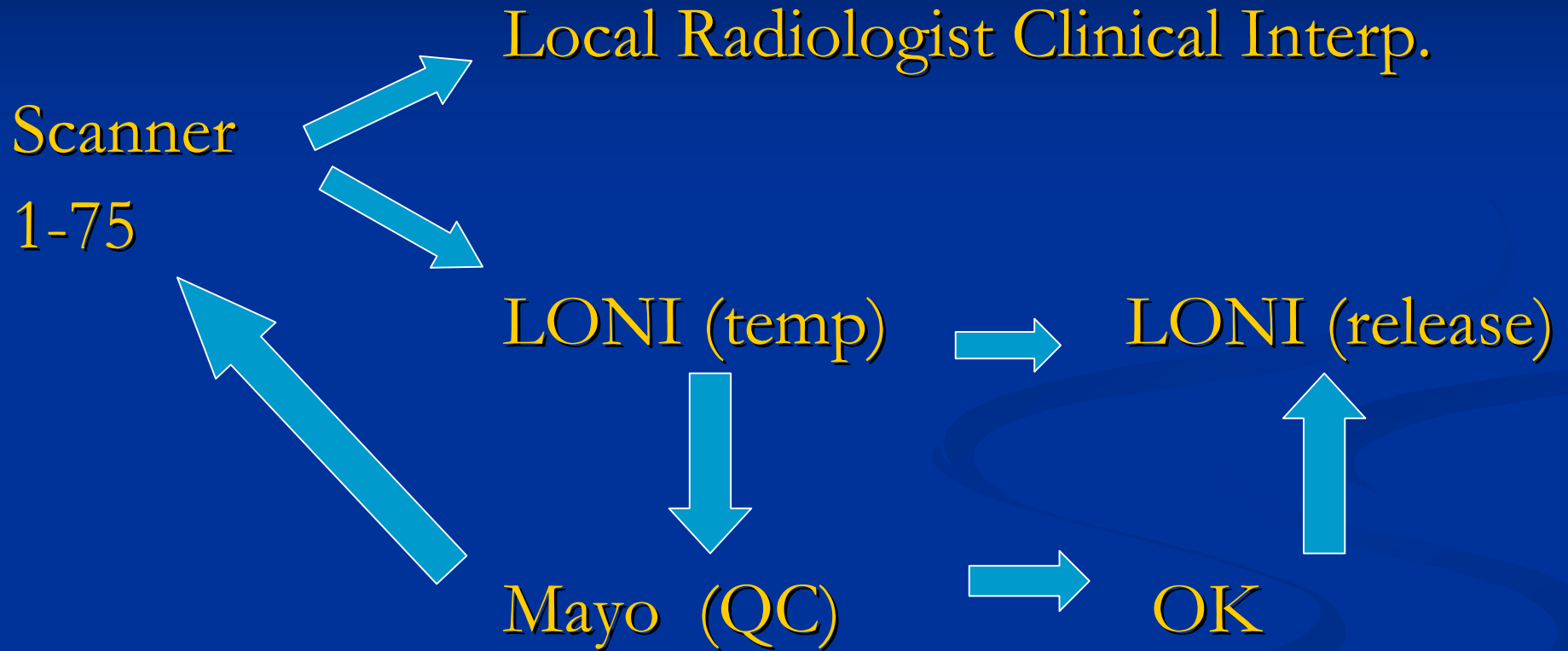
Overview

- Preparatory Phase: Oct 04 – April 05
- Execution Phase: April 05
- Discuss Backwards

Execution Phase – Acquisition Functions

- Image QA –
 1. visual inspection of each sequence – artifacts? Pathology? Scanning error?
 2. Protocol adherence – DICOM program
 3. After baseline – BSI as QC check
 4. at Mayo, rapid turn around – “released” to open pool at LONI when OKed
- Phantom scan with each session – calibration metrics – notify site if deviation from spec
 1. SNR
 2. X,Y,Z gradient calibration
 3. RF Power
 4. T1 CNR
 5. Uniformity
- Archive magnitude and K-space data
- Select modifications in anticipation of upgrade

MR Flow Diagram



First - Preparation Phase

- Select calibration method and establish specs.
- Select Phantom → ACR-NEMA vs custom phantom
- Assemble and meet with Ext Advisory Committee
- Identify and work with MR industry collaborators
- Develop and install applications for secure transmit and archive of magnitude and K-space data
- Develop and install DICOM header parsing (Mayo)
- Develop and install PACs (Mayo)
- Establish plan for hardware/software upgrades
- Establish plan multi- array acquisitions
- Select sites for 3 T participation
- Site qualification – protocol and scanner calibration
- Establish acquisition protocol

Acquisition Protocol Specs

- Similar image qualities (CNR, spatial resolution, resistance to artifact, reliability, speed, etc) across sites/platforms and time
- Maximize scientific value while minimizing patient burden (ie scan time) → phantom with each patient scan, save k space
- Must work with major image analysis methods → manual ROI, BSI, VBM, TBM, atlas construction

Approach to Protocol Development

- Major questions:
 1. IR –Prepped SPGR vs MP RAGE
 2. Inversion family vs SPGR/FLASH
 3. Single flip SPGR/FLASH vs dual flip
 4. Multi array coil vs birdcage
 5. MEDIC vs FLASH
- 3D volume sequences) must work with major image analyses methods → acquisition – processing interaction

Approach Preparatory Phase

- Preparation Phase
 1. Part 1
 2. Part 2 = mini clinical trial
- Platforms: Siemens, GE, Phillips 1.5 and 3T
- 4 test sites – Mayo, UCSF, Boston U, MGH

Preparatory Phase Part 1

- Optimize and standardize across vendor platforms the following → FLASH/SPGR, IR-Prepped SPGR, MP-RAGE, MEDIC, Dual FSE, T2 FSE, FLAIR, birdcage and multi array receiver coil.
 1. Web site with optimized examples from various sources (incl. MR vendors)
 2. Scan 2-4 normal elderly subjects up to 5X at each of the 3 test sites.
 3. Deliverable = protocol for phase 2

Preparatory Phase Part 2 – mini clinical trial

- Scan 60 normal and 60 ADs once for X-sectional comparisons. Scan controls again (2 wk) for precision comp. Scan 1/2 controls 2X at each visit for multi array vs. birdcage coil comp.
- Measure hipp vol, BSI, cortical thickness. Compare inter-group separation and test re-test stability.
- Evaluate different sequence performance in SNT, BSI, TBM, VBM applications
- Decisions: IR-Prepped SPGR vs MP RAGE, SPGR vs MP-RAGE; MEDIC; hi/low flip SPGR.
- Final decisions will be data driven
- Deliverable = protocol (in native language) for each vendor and platform for execution phase

Preparation Phase- time line

- Establish site contacts - done
- MR survey – 29/50 returned
- Identify and contact industry collaborators - done
- Assemble Ext Adv Com – done
- Meet with Ext Adv Com –Oct 8
- Write protocol for phase 2 - done
- Web site for phase 1 comparisons – close
- Complete Phase 1 - Nov 1, 04
- IRB consent for phase 2 at 3 test sites - Nov 1,04
- Complete Phase 2 - Feb 1, 05
- Select scanner calibration method/phantom– Dec 04
- Site qualification Feb 1 - April 1, 05
- Execution phase – start April 1, 05

MRI Scanner Questionnaire Submitted

Albany Medical College

Baylor College of Medicine

Boston University

Brigham and Women's Hospital

Brown University

Case Western Reserve University

Dartmouth-Hitchcock Medical Center

Emory University

Georgetown University

Good Samaritan

Indiana University

Jewish Hospital Memory Clinic, Quebec

Johns Hopkins University

Mayo Clinic, Rochester

Mount Sinai School of Medicine

New York University Medical Center

Ohio State University

Parkwood Hospital

Saint Joseph's Hospital

Sunnybrook Health Sciences, Ontario

University of British Columbia, Canada

University of California, Davis

University of California, San Diego

University of California, San Francisco

University of Nevada School of Medicine

University of Rochester Medical Center

University of Texas, Southwestern MC

University of Wisconsin

Washington University

Massachusetts General - Harvard

ADNI Site MRI Scanner Questionnaire Not Submitted

Columbia University

Duke University Medical Center

Mayo Clinic, Jacksonville

Medical University of South Carolina

Oregon Health and Science University

Premiere Neurological Group

Rush-Presbyterian - St. Lukes Med. Center

Southwestern Vermont Medical Center

Stanford University

Sun Health/Arizona Consortium

University of Alabama

University of California, Irvine - 1

University of California, Irvine - 2

University of California, Los Angeles

University of Michigan

University of Pennsylvania

University of Pittsburgh

University of Southern California

University of Washington

Wein Center

Yale University School of Medicine

MR Manufacturer Contacts

- Joe Debbins – GE
- Kathy Scott – Siemens
- Greg Metzger - Philips

External Advisors

- Gary Glover – Stanford
- John Gore – Vanderbilt
- John Mugler – U Virginia

ADNI MR Group

- Thank you – NIA, NIH Foundation, Industry, Clinical Collaborators