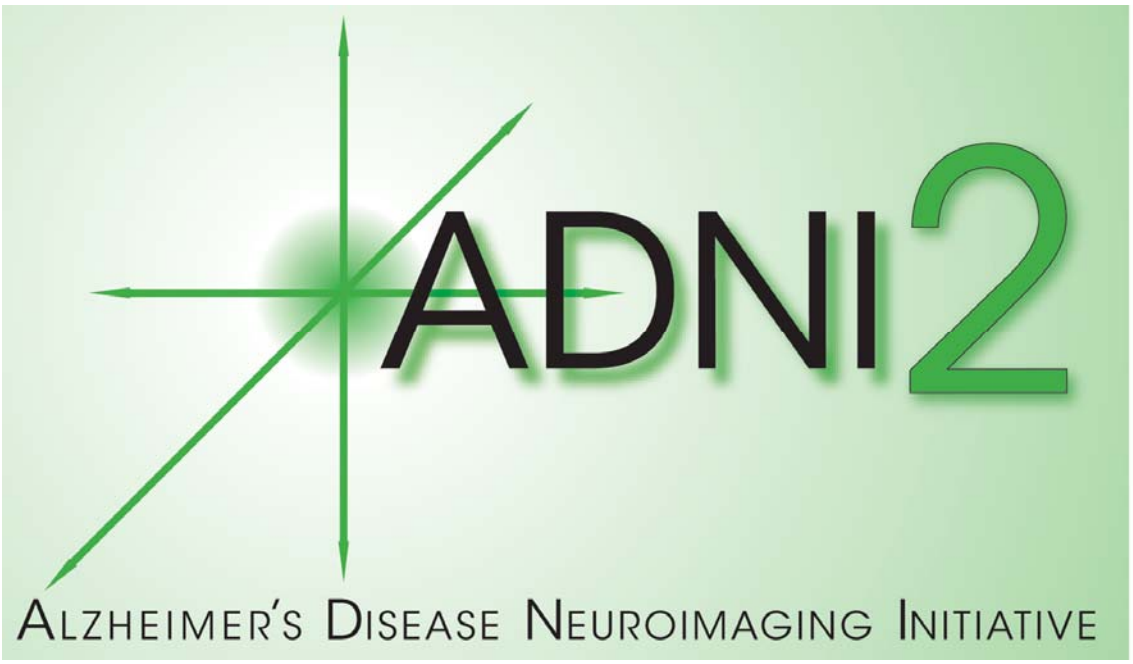
ADNI2
ALZHEIMER'S DISEASE NEUROIMAGING INITIATIVE

ADNI 2

Alzheimer's Disease Neuroimaging Initiative
3T MRI Technical Procedures Manual

Version 4 February 2014

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I. Contact Information

- If you have any questions regarding the acquisition aspects of this protocol please contact:

adnimri@mayo.edu

- If you have any questions or problems regarding the data transfer to LONI for this protocol please contact:

adni@loni.usc.edu

- If you have any questions regarding individual subjects please contact the study coordinator at your referral site.

II. ADNI2 3T Study Overview

Background

MRI measurements of brain structure have been shown to demonstrate brain atrophy (which correlates with neuron loss) in MCI and AD and increasing rates of brain atrophy as subjects become more impaired. Therefore, structural MRI is used as a measure of the rate of disease progression, and possibly as a measure of treatment effect, in AD treatment trials. Structural MRI (MPRAGE/IRSPGR) will continue in ADNI2 and the data will be used both as a measure of the rate of change as well as a predictor of future change, in all subjects. Cerebro-vascular disease, especially white matter lesions (WMLs) will be assessed with FLAIR. Recently, iron imaging especially micro bleeds (T2* GRE); has been used in anti-amyloid clinical trials, because of the association of microbleeds with anti-amyloid therapy; this will be measured with T2* GRE.

The Core MRI protocol consists of 3 types of sequences that are acquired in every subject and on every MRI vendor system these are: (1) structural MRI, (2) FLAIR, and (3) T2* GRE.

The experimental sub studies consist of three different types of sequences: (1) DTI, (2) ASL, (3) resting state functional connectivity. Each of these will be acquired on only one MRI vendor system – i.e. the experimental sequences will be vendor specific.

Goals

The overall goal of this project is to determine the relationships among the clinical, cognitive, imaging, genetic and biochemical biomarker characteristics of the entire spectrum of Alzheimer's disease (AD), as the pathology evolves from normal aging through very mild symptoms, to mild cognitive impairment (MCI), to dementia. ADNI2 continues the currently funded AD Neuroimaging Initiative (ADNI1), a public/private collaboration between academia and industry to study biomarkers of AD as well as a recently funded Grand Opportunities (GO) grant which supplements ADNI goals and activities. ADNI will inform the neuroscience of AD, identify diagnostic and prognostic markers, identify outcome measures that can be used in clinical trials, and help develop the most effective clinical trial scenarios.

The specific objectives of the MRI core include: 1) Obtaining high quality multi-site data that is consistent over time, and across different MRI systems. 2) Perform appropriate image quality control throughout the study. 3) Qualify (and re-qualify after upgrades) each scanner on the ADNI-GO/2 MRI protocol. 4) Correct specific classes of image artifacts in each image acquired; imaging intensity nonuniformity, image warping due to gradient nonlinearity, and scaling changes over time. 5) Monitor each scanner longitudinally in the study using the ADNI phantom. Unlike ADNI1, measurements from the phantom will not be used to modify accompanying human images. 6) Perform quantitative measurements of all images.

Study design for ADNI2

All subjects newly enrolled into ADNI2 will be scanned using the ADNI-GO 3T scanning protocol. These subjects will be scanned at Screening, 3 months from the Screening MRI, and then within 2 weeks before or after the Month 6 and subsequent annual visits. *Update: October 2013 all 3 and 6 month scans have been discontinued.*

EMCI subjects carried forward from ADNI-GO will continue with the more modern and expanded 3T scanning protocol initiated in ADNI-GO. Imaging for this group will occur annually, within 2 weeks before or 2 weeks after the in-clinic assessments.

CN and MCI subjects carried forward from ADNI1 are scanned with the original ADNI protocol on the existing ADNI 1.5T scanner at that site in order to maintain optimum longitudinal consistency unless and until a decision is made by the MRI Core that the site should perform 3T MRI scans on all subjects. Imaging for this group will occur annually, within 2 weeks before or 2 weeks after the in-clinic assessments.

Please refer to the original MRI Tech Manual from ADNI1 for CN and MCI subjects carried forward from ADNI1 to ADNI 2. These subjects are scanned with the original ADNI protocol sequence on the existing ADNI 1.5T scanner unless informed otherwise by the MRI Core.

III. Site Qualification

A. Site Qualification Overview:

Each site must have one MRI scanner qualified for the ANDI2 MRI Study. If the machine being used has already been certified by the ADNI MRI Core under ADNI1, ADNI-GO or ADNI2 studies and has not experienced any software upgrades, re-qualification may not be required. However, please note that there may be instances where the ADNI MRI Core may deem it necessary to change, upgrade or add on to the MRI sequences used in ADNI, in which case your site may need to re-certify the MRI scanner with a phantom and/or a volunteer scan.

Site qualification includes two different exams. The first, being a scan on the specially designed ADNI phantom with the ADNI-GO Phantom QC sequences loaded by your local service engineer. Secondly, your site will be asked to scan a human volunteer with the approved ADNI-GO Human sequences loaded by your local service engineer. Mayo QC will review the phantom and human scans for the protocol compliance and image quality.

Please note: All new enrollees in ADNI2 will be scanned using the ADNI-GO 3T scanning protocol, as well as any EMCI subject carried forward from ADNI–GO to ADNI2.

Only CN and MCI subjects carried forward from ADNI1 are scanned with the original ADNI protocol sequence on the existing ADNI 1.5T scanner.

QC Phantom Scan Protocol:

1) Localizer
    1a) Calibration/Reference Scan (if applicable)
2) QC Phantom MP-RAGE/IR-SPGR (Accelerated)
3) QC Phantom fMRI (Philips Systems)

Human Protocol:

(All scans are performed in straight orthogonal planes -- Sagittal or Axial)
(No manual adjustments should be made to this protocol)

1) Localizer
    1a) Calibration/Reference Scan (if applicable)
2) Sagittal MP-RAGE/IR-SPGR
3) Accelerated Sagittal MP-RAGE/IR-SPGR
4) Extended Resting State fMRI (Philips Systems Only) - Eyes OPEN.
4) Axial T2-FLAIR
5) Axial T2-Star
6) Axial ASL Perfusion (Siemens Systems Only) - Subjects should have eyes OPEN.
6) Axial DTI Scan (GE Systems)
7) Axial T2 FSE/TSE with Fat Sat
8) Field Mapping Sequences (Philips and Siemens Only)
9) High Resolution Hippocampal Scan (Siemens Systems Only)
10) Extended Axial Resting State fMRI (GE 15 and 16x only)
11) Enhanced Axial DTI (GE 20x+ systems only)

****Please note that your scanner will not have all these sequences loaded after installing the ADNI2 protocol. Only the sequences applicable to your system type and that you have the manufacturer's license for will be loaded.**

After each scan protocol, please upload images to LONI (see Appendix 6) using the ADNI naming conventions detailed later in this section.

Any questions concerning site qualification scans please contact:
adnimri@mayo.edu

B. Phantom Scan Instructions:

For site qualification, each site must scan the ADNI phantom using the electronically loaded ADNI2 QC Phantom Sequences.

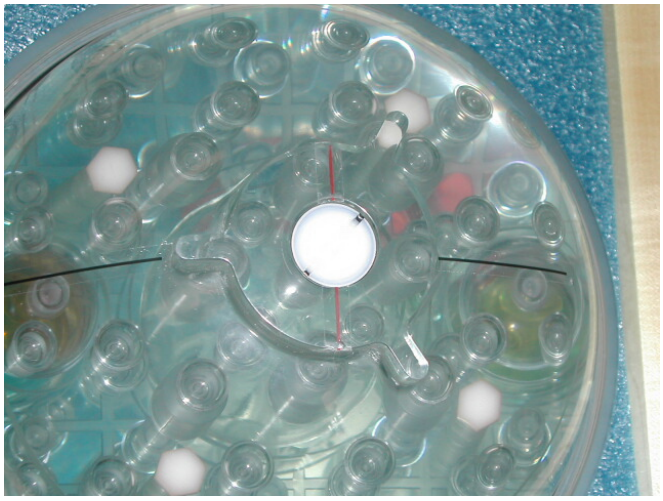
Note: This can be done prior to IRB approval

Please Note: Mayo QC will be supplying electronic protocols (WIPs) for installation by your local service engineer. This will ensure that you have the correct protocol for your MRI scanner. If you have any questions about this procedure please contact:
adnimri@mayo.edu
Use only the imported ADNI GO sequences.

Phantom Positioning:
The following image shows the phantom placed in the appropriate position within the 8-channel coil. Achieving a reproducible position is a key element to the system performance analysis that will be conducted each day an ADNI subject(s) are imaged. The phantom should be placed in the coil with the alignment markers facing upward and the serial number SN XXXX positioned out of the bore as shown, along with alignment guides, will facilitate the reproducible positioning of your phantom.

ADNI phantom shown positioned inside of an 8-channel head coil.

Please note that your phantom has a base and positioning markers (in black and red, see image below). The phantom should be placed inside the head coil with the indicated "top" facing upwards. This orientation is due to space constraints within some coils and we would like to maintain a consistent orientation for all scanners across the ADNI2 study. Please inspect the phantom and note the additional marks added to help you position your phantom. We have indicated the top of the phantom with red and black marks to aid with placement in the coil.



The top of the phantom and the alignment lines are indicated above. These markings should be used with the alignment lights on your scanner to position the phantom.

Please place the phantom in your head coil with the alignment marks facing up, and the phantom SN number (e.g. 9996) facing you, out of the bore (see the following picture). Furthermore, try to align the center of the phantom with the center of the coil. Use the alignment lights on your scanner to position the phantom into the center of the magnet.

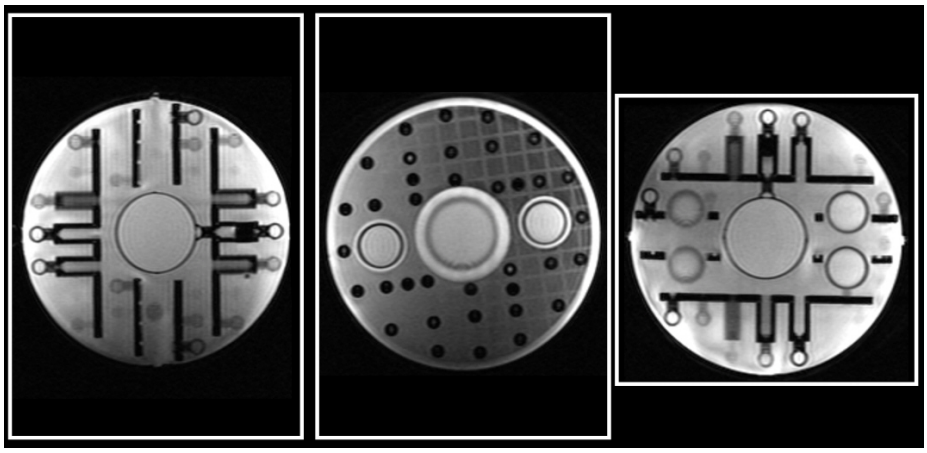
The phantom is shown in the correct position, with the Serial Number (SN 9999) positioned forward and reading correctly from right to left. This will be the typical scanning position for your phantom

Phantom Scan Protocol:
Scan the phantom using the entire electronically loaded ADNI-GO QC Phantom protocol.

Phantom Scan Protocol:
1) Localizer
    1a) Calibration/Reference Scan (if applicable))
2) QC Phantom MP-RAGE/IR-SPGR (Accelerated)
3) QC Phantom fMRI (Philips Systems)

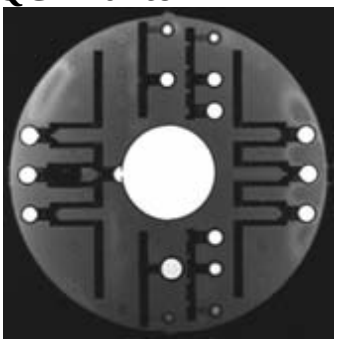
1. Localizer

3 Plane Localizer.



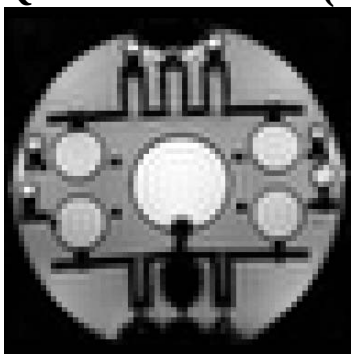
Example – Place FOV to cover entire phantom.

2. QC Phantom MP-RAGE/IR-SPGR (Accelerated)



Example

3. QC Phantom fMRI (Philips Systems)



Data Transfer:
Please upload all the sequences acquired for the phantom scan to the LONI website as detailed in Appendix 6.

Phantom Naming:

1. **ADNI Phantom Naming Convention *(entered during LONI upload*):**

For the upload to LONI, phantom scans should follow the naming convention:

XXX_P_YYYY

X=Site#/P=Phantom/Y=Phantom#

For example, each phantom scan from site 007 should be coded:

007_P_9999

2. **De-identification**

As part of the upload process to LONI, all the information entered into the scanner will be removed and replaced with the information entered during the LONI upload procedure. For this reason, you are encouraged to enter the phantom scan information into the scanner following standard local practice.

Phantom Scan Results:
Mayo QC will examine the phantom data and determine if the correct parameters have been met and assure there are no other underlying problems with the scanning session. When finished, an email will be sent to your site notifying you of the results.

C. Human Volunteer Scan Instructions

1. ***After*** your site has received institutional IRB approval for the ADNI2 protocol, A human volunteer must be scanned using the electronically loaded ADNI-GO protocol at 3T.

2. The volunteer should be consented by the study coordinator.

3. Since the data will be de-identified during the upload process to LONI, please enter the volunteer's information into the scanner following standard local practice.
4. Please scan the volunteer using the instructions outlined in "MRI Pre-Scan Procedures" addressed on page 14 of this manual. It is crucial to follow the appropriate pre-scan procedures, subject positioning guidelines, and ADNI-GO sequences.

Human Scan Protocol:
(All scans are performed in straight orthogonal planes -- Sagittal or Axial)
(No manual adjustments should be made to this protocol)

1) Localizer
    1a) Calibration/Reference Scan (if applicable)
2) Sagittal MP-RAGE/IR-SPGR
3) Accelerated Sagittal MP-RAGE/IR-SPGR
4) Extended Resting State fMRI (Philips Systems Only) - Eyes OPEN.
4) Axial T2-FLAIR
5) Axial T2-Star
6) Axial ASL Perfusion (Siemens Systems Only)
6) Axial DTI Scan (GE Systems)
7) Axial T2 FSE/TSE with Fat Sat
8) Field Mapping Sequences (Philips and Siemens Only)
9) High Resolution Hippocampal Scan (Siemens Systems Only)
10) Extended Axial Resting State fMRI (GE 15 and 16x only) - Eyes OPEN.
11) Enhanced Axial DTI (GE 20x+ systems only)

Data Transfer:
Please upload all the sequences acquired for the volunteer scan to the LONI website as detailed in Appendix 6.

Volunteer Naming:

1. **ADNI Volunteer Naming Convention:** ***(entered during LONI upload):***

    Volunteer scans should follow the naming convention:
    XXX_V_1000 (X=Site#/V=Volunteer#/Y=Vol#

    For example, each phantom scan from site 007 should be coded:
    007_V_1000

2. **De-identification** - As part of the upload process to LONI, all the information entered into the scanner will be removed and replaced with the information entered during the LONI upload procedure. For this reason, you are encouraged to enter the volunteer scan information into the scanner following standard local practice.

Human Volunteer Scan Results:
The Mayo QC team will perform a quality control check on the volunteer scan data. Mayo QC will determine if the correct parameters have been met and assure there are no other underlying problems seen during the scanning of this session. When finished, an email will be sent to your site notifying you of the results. In addition, a email will be sent to the selected contact list for your site notifying them your site has been approved and is ready to scan subjects.

Anticipation of Hardware Upgrades:
The Mayo QC team requires notification prior to any software and/or hardware upgrades for any scanner involved in the ADNI imaging study.

ADNIMRI@Mayo.edu

Depending on the impact of the upgrade the site may be required to scan a phantom and/or volunteer prior to continued scanning.

IV. MRI Subject Pre-Scan Procedures

A. Subject Pre-screening

1. All subjects should have been screened by the study coordinator for standard MRI contraindications. (A copy of the pre-screen form is available in Appendix 1) However, subjects must be screened for MRI contraindications immediately before the MRI scan using your local standard protocol. Contraindications include, but are not limited to:
    - The presence of non-removable ferrous metal objects
    - Aneurysm clips
    - Pacemakers
    - Other contraindications such as defibrillators, etc.

2. Sedation during the Screening MRI scan is not offered for this protocol. Subjects that are uncomfortable with MRI scans should not be included in this study. If you have a subject who is uncomfortable with MRI and refuses to complete the scan without sedation, please contact the referring center and notify the study coordinator. Exceptions may be granted on a case-by-case basis to allow the use of sedatives for MR scans at visits **after** screening.

B. Subject Safety and Monitoring

1. All sites should follow the standard subject consent protocols as approved by your local IRB. Explain the scan procedure to the subject so that they know what to expect during the MRI.

2. Provide the subject with the opportunity to use the restroom before the scan begins.

3. Please use universal MRI safety precautions. Make sure that subject does not have any large ferrous metal on or inside of him/her such as shrapnel, a metal fragment in the eye, aneurysm clips, ear implants, spinal nerve stimulators, permanent makeup, or a pacemaker. Make sure that all loose metal objects are removed (Please refer to Appendix 1 Pre-Screening Form).

4. Please use standard local practice for monitoring the subject during the scan. These may include devices to monitor pulse and O_2 levels.

C. Subject Positioning

1. Proper subject positioning is crucial for successful reproduction of serial MRI exams. Therefore, it is important that each subject is positioned in the same manner for each and every MRI exam.

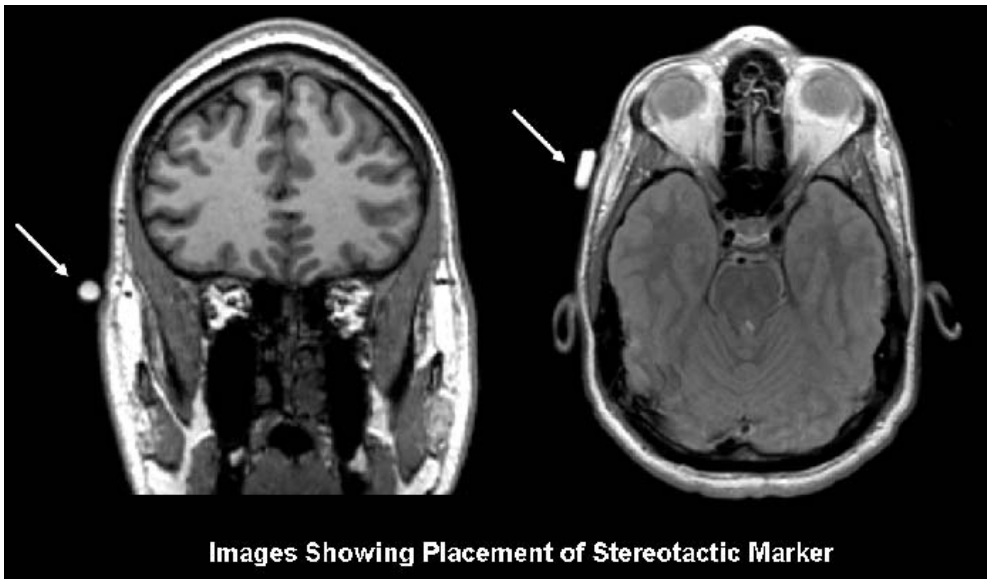
2. Please follow the procedures below for positioning the subject in the head coil:

    - Place clean sheet on scanner table and coil cradle.

    - Besides standard room exclusions ensure the subject has removed their dentures as well as any hair clips, combs, earrings, necklaces, etc.

    - Remove all upper body clothing with metallic trim, such as zippers, buttons or embroideries that may cause artifacts in the MRI images.

    - **Tape stereotactic marker (vitamin E or fish oil capsule) on the subjects' right temple (RT).**



Images Showing Placement of Stereotactic Marker

    - Provide each subject with ear protection.

    - Position the subject so their head and neck are relaxed, but without rotation in either plane. Proper placement in the head coil is crucial because scans are acquired straight, not in an oblique orientation. The subject should also be well supported in the head coil to minimize movement. Motion artifacts may result in data rejection and request for a re-scan in many cases.

- Support under the back and/or legs can help to decrease strain on the knees and back as well as assisting in the stabilization of motion in the lower body.

- Once subject has been positioned, place sponges along the sides of head and a Velcro strap across forehead (if available) for stabilizing support and reduction of motion.

- **Align the centering crosshairs on the subject's nasion *(directly between the eyebrows)* at every scanning session.**

Please Note:

- It is extremely important that the subject is positioned in the same manner, at the nasion, for the Screening MRI exam and for all the subsequent MRI visits.

- It is imperative that the subject positioning procedures are followed exactly for all follow-up exams for a particular subject to ensure consistent imaging of the brain.

- If a deviation from these instructions is required to accommodate a subject, the MRI technologist must note this on the MRI Scan Form and refer to these notes during the follow-up exam.

- Center the head coil over the subject's head, making sure the subject is high enough in the coil to prevent signal loss at the inferior aspect of the brain.

- Offer each subject a panic button in case of emergencies or claustrophobia if common local practice at your facility (for example, a squeeze ball alarm.)

- Remind subject to hold as still as possible and advance subject to the iso-center of the scanning bore.

V. MRI Subject Scan Protocol

ADNI Subject Scanning Session Includes:

1) Localizer
    1a) Calibration/Reference Scan (if applicable)
2) Sagittal MPRAGE/IR-SPGR
3) Accelerated Sagittal MP-RAGE/IR-SPGR
4) Extended Resting State fMRI (Philips Systems Only) - Eyes OPEN.
4) Axial T2-FLAIR
5) Axial T2-Star
6) Axial ASL Perfusion (Siemens Systems Only) - Subjects should have eyes OPEN
6) Axial DTI Scan (GE Systems)
7) Axial T2 FSE/TSE with Fat Sat
8) Field Mapping Sequences (Philips and Siemens Only)
9) High Resolution Hippocampal Scan (Siemens Systems Only)
10) Extended Axial Resting State fMRI (GE 15 and 16x only) - - Eyes OPEN.
11) Enhanced Axial DTI (GE 20x+ systems only)

Update – There is no longer phantom scanning with each subject scan, only done at certification and scanner update, artifact or significant maintenance.

The Mayo QC team will check all imaging parameters to assure the correct sequence was used. If the electronically loaded ADNI-GO sequence is not used to scan a subject, the scan will be excluded and the subject must be re-scanned with the correct ADNI sequences.

A. MRI Scan Information Form

1. The "MRI Scan Information Form" should be completed at the time of acquisition for every ADNI2 subject. A copy of the MRI worksheet is included in Appendix 2.

2. The study coordinator at the referral site should complete the top section of the MRI Scan Worksheet. If this section is incomplete, please contact the study coordinator for the information.

3. The MRI technologist should complete the remainder of the form during the scan. Please be sure to indicate if each sequence has been completed and note any problems or modifications to the protocol in the appropriate sections. Also, note if data transfer, archive, and local copy for clinical reads have been completed.

4. Please complete the form in full and transfer to the study coordinator at the referral site. The study coordinator will upload the information into the ADNI2 database and this will be linked with the subjects' MRI data. Please keep a copy on site for your records.

5. To report an incident regarding the MRI sequences please email: ADNIMRI@mayo.edu

6. To report an incident about a specific subject please contact your study coordinator.

B. Entering Subject Information

1. Please enter the subject's information into the scanner following your standard local practice. This will assure the scan is formatted for your local archival system. When data are uploaded to LONI the scan header will be de-identified and rendered HIPAA compliant. Data will be identified at the LONI site by subject code only. The subject code will be entered manually at the time of data transmission to LONI.

C. Scanning Sequences:

#1: 3 Plane Localizer:

1. A quick acquisition in 3 orthogonal planes for anatomical orientation. Multiple slices acquired in the middle of each plane (sagittal, coronal, transverse). The head should be centered laterally along the inter-hemispheric fissure and centered on the thalamus for the anterior/posterior and superior/inferior planes. Please use the images below as reference when determining if the subject is positioned properly.

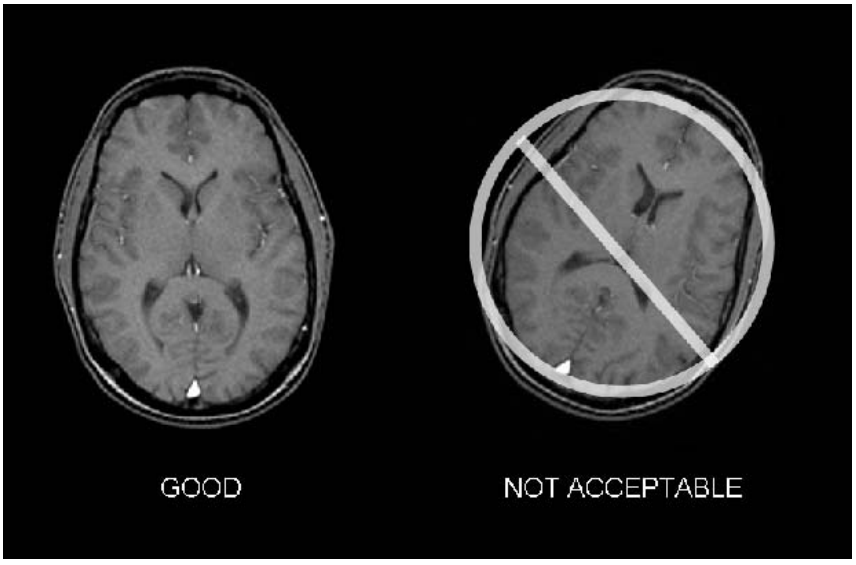
2. Proper placement in the head coil is crucial because scans are acquired in straight orthogonal planes. (Oblique scans are not allowed).

3. If the subject is not positioned properly please adjust the subject in the head coil and re-scout. Continue repositioning and scouting until the subject is correctly centered in the head coil.

Example:

Box A – Axial image. FOV placed in center to avoid side-to-side wrap.
Box B – Sagittal image. FOV placed anterior to avoid nose wrap.
Box C – Coronal image. FOV placed to assure top of the brain is covered.

Make sure subject is aligned correctly in the head coil and is not rotated. Their head should be as straight as possible in the coil. Please adjust the subject if necessary.



The head should be centered laterally along the inter-hemispheric fissure.
Proper placement in the head coil is crucial because scans are acquired straight, <u>not in an oblique orientation</u>.

Please Note:

- It is mandatory that the ADNI-GO acquisition protocols electronically imported to your MRI be used for all sequences at the Screening MRI exam and for all the subsequent MRI visits unless otherwise directed by the coordinating center.
- Failure to use the same sequence at the time of Screening and all subsequent visits will result in the request for a rescan of the subject.
- It is mandatory that the ADNI2 qualified scanner be used for all **new subjects** in the ADNI2 study.
- Failure to use the ADNI2 qualified scanner for all **new subjects** in the ADNI2 Study will result in the request for a rescan of the subject.
- CN and MCI subjects carried forward from ADNI1 are scanned with the **original ADNI protocol on the existing ADNI 1.5T scanner** at that site in order to maintain optimum longitudinal consistency unless and until a decision is made by the MRI Core that the site should perform 3T MRI scans on all subjects.

#1a: Calibration/Reference Scan (If applicable)

MRI scanners provide automated adjustment procedures Calibration/RF coil tuning and frequency adjustments after the subject is positioned in the magnet. Follow the adjustment procedures provided by your manufacturer.

#2: 3D MP-RAGE/IR-SPGR

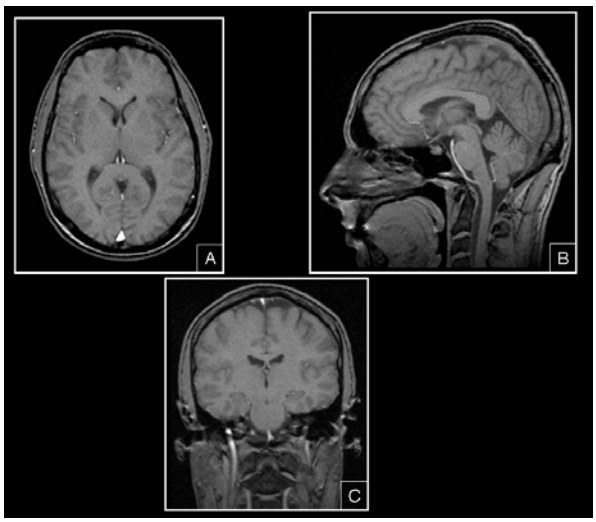
MP-RAGE = Siemens/Philips – IR-SPGR=GE

Example:

1. Orientation. **<u>Straight</u>** sagittal. Slices will be prescribed from left to right. ***<u>DO NOT</u>*** oblique the scanning FOV to compensate for subject held tilt.

2. Positioning:
   Use the tri-planar scout to position the acquisition box. Make sure to get full head coverage**. Studies that do not contain the whole brain and skull cannot be processed.** The skull must be fully included superiorly and laterally. The entire cerebellum should be included inferiorly. **In the anterior/posterior plane the nose should also be included otherwise image folding into the back of the brain will result and the exam may not be usable for the study**. Please see the images below and use as a guide to correctly position the acquisition box.

Example of 3 Plane Localizer for MP-RAGE FOV Placements



A – Axial image. FOV placed in center to avoid side-to-side wrap.

B – Sagittal image. FOV placed anterior to avoid nose wrap.

C – Coronal image. FOV placed to assure top of the brain is covered.

#3: Accelerated 3D MP-RAGE/IR-SPGR

For every ADNI2 3T exam, the sagittal MP-RAGE/IR-SPGR sequence is acquired a second time with an acceleration factor. The FOV is purposely a little larger for the accelerated scan; however the prescription should be nearly identical to the un-accelerated scan.
Sites using GE scanners (Do not use Copy Protocol RX as this will change the FOV to match the un-accelerated scan – which is not to protocol)

Positioning for all Axial Scans:

1. Orientation: **Straight** Axial. Prescribe slices inferior to superior. DO NOT Oblique Scans.

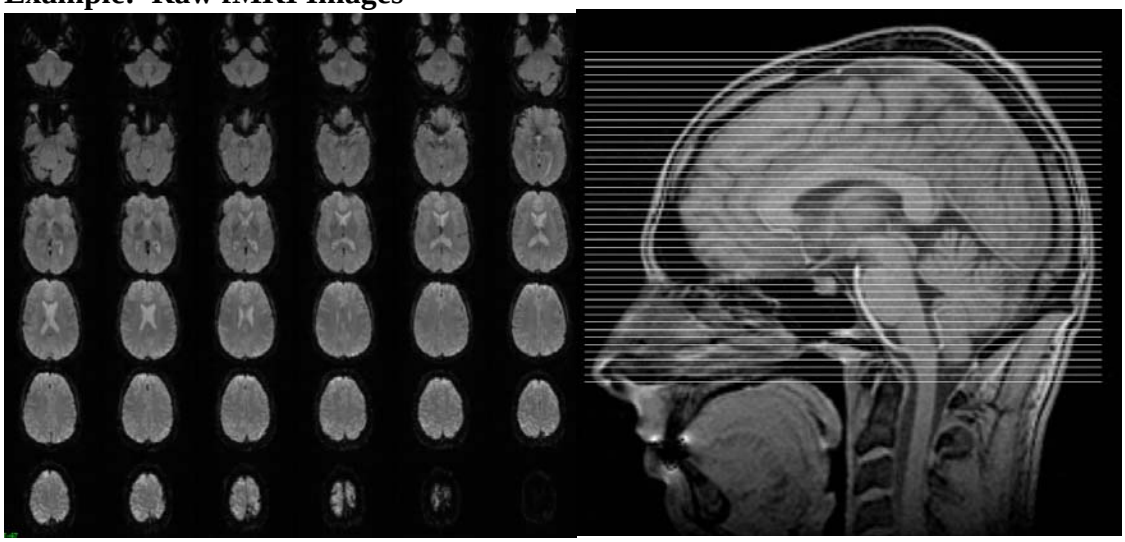
2. Positioning: Position on mid-sagittal slice from tri-planar scout. Make sure to get full BRAIN coverage whenever possible. The acquisition stack should be placed just above the most superior point in the brain and should fully cover the cerebellum as well as all brain in the lateral and the anterior to posterior planes. If extra transverse slices are required to achieve this coverage please acquire those slices.

**** ***DO NOT*** oblique the scanning slices to compensate for subject held tilt. Scan as straight Axials.

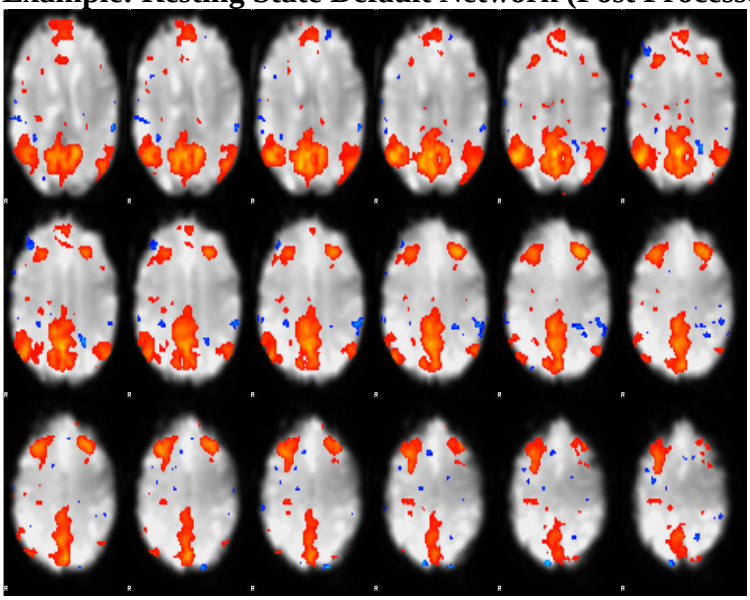
#4: Extended Axial Resting State fMRI – Philips Systems Only

(Subject should have eyes OPEN)

Example: Raw fMRI Images



Example: Resting State Default Network (Post Processed Image)



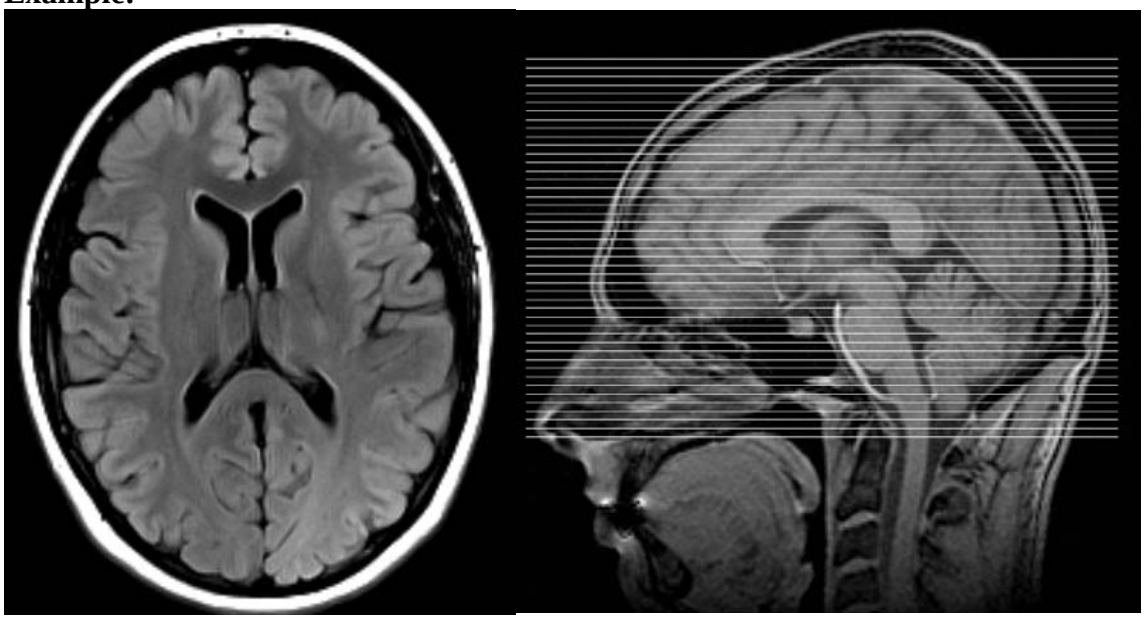
1. Orientation: Straight Axial -- DO NOT Oblique Scans.

2. Subject Instruction: **Please instruct the subject to keep their eyes open during the entire scan.** You can instruct them to focus on a point on the mirror or scanner. Also remind the subjects of the importance of holding their head still for the entire scan.

3. Positioning: Position on mid-sagittal slice from tri-planar scout. **The acquisition stack should be placed just above the most superior point in the brain and should cover the cerebellum.**

#4: Axial T2-FLAIR

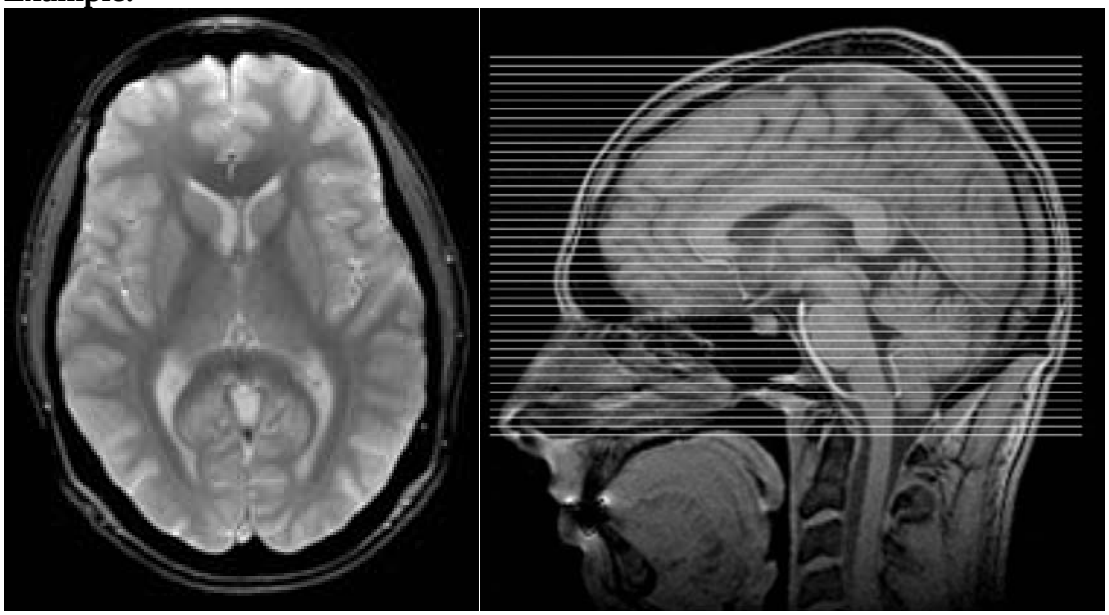
Example:



Orientation: Straight Axial. Prescribe slices inferior to superior. ** *DO NOT* oblique the scanning slices to compensate for subject held tilt. Scan as straight Axials. If extra transverse slices are required to achieve this coverage please acquire those slices.

#5: Axial T2-Star

Example:

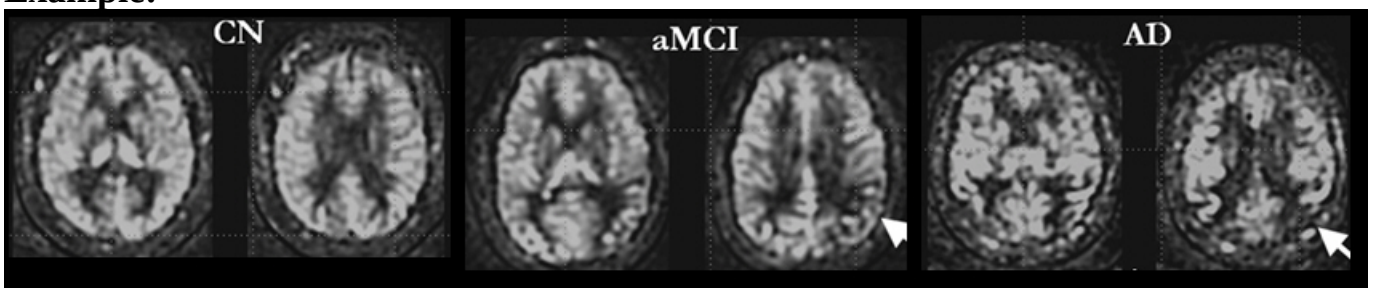


Orientation: Straight Axial. Prescribe slices inferior to superior. ** *DO NOT* oblique the scanning slices to compensate for subject held tilt. Scan as straight Axials. If extra transverse slices are required to achieve this coverage please acquire those slices.

#6: Axial ASL (Arterial Spin Label) – Siemens Systems Only --

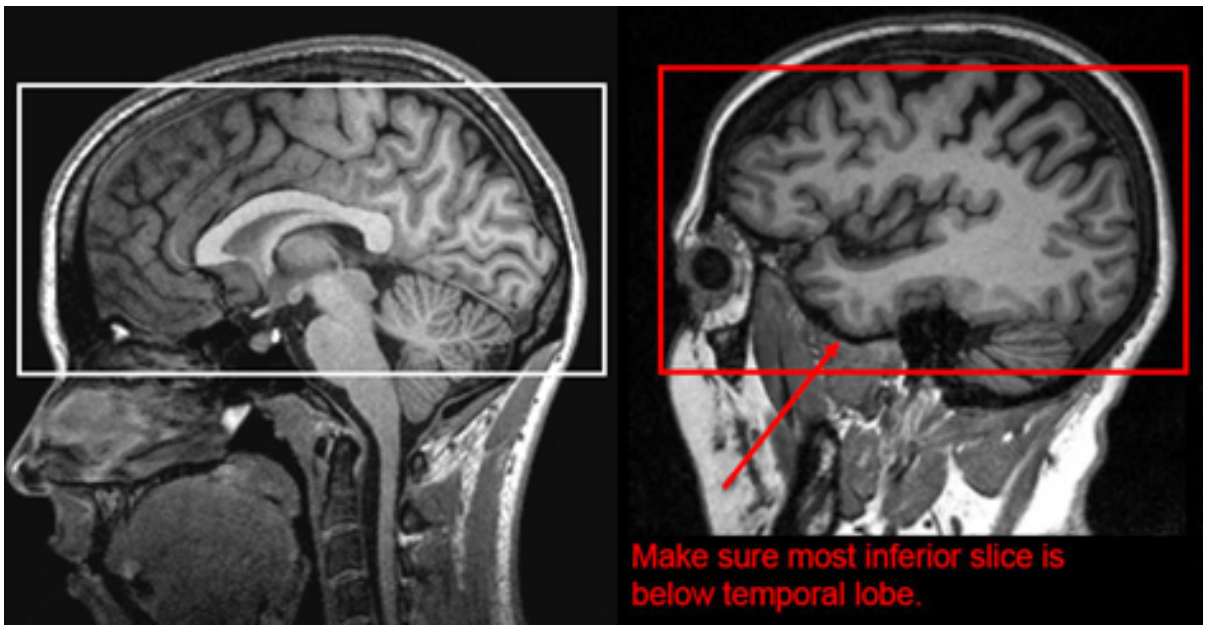
Subjects should have eyes OPEN.

Example:



From Vemuri et al, submitted

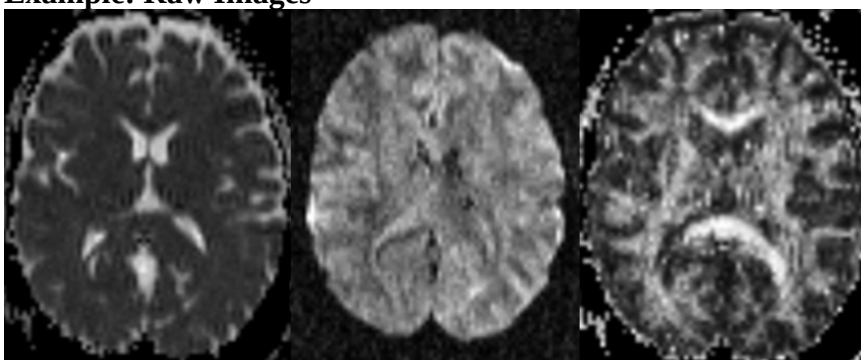
Orientation: Straight Axial. Prescribe the 3D Slab inferior to superior. ** *DO NOT* oblique the slab to compensate for subject held tilt. Scan as straight axial.



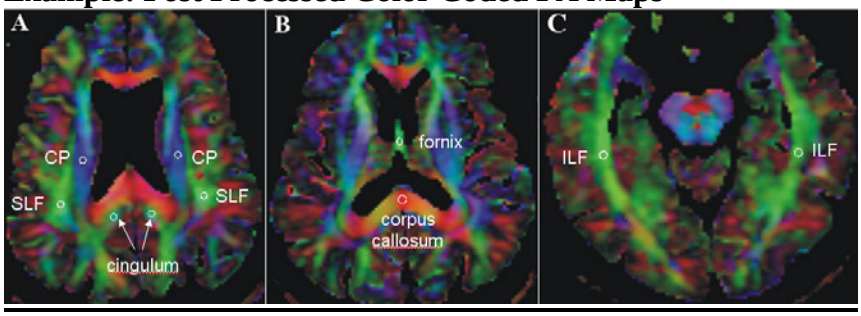
****For many subjects the ASL volume is not adequate to cover the entire brain. With this in mind, please make sure that the most inferior slice is below the temporal lobe. It is preferred to cut slices from the cerebellum rather than the top of head.**

#6: Axial DTI (Diffusion Tensor Imaging) – GE Systems Only

Example: Raw Images



Example: Post Processed Color Coded FA Maps

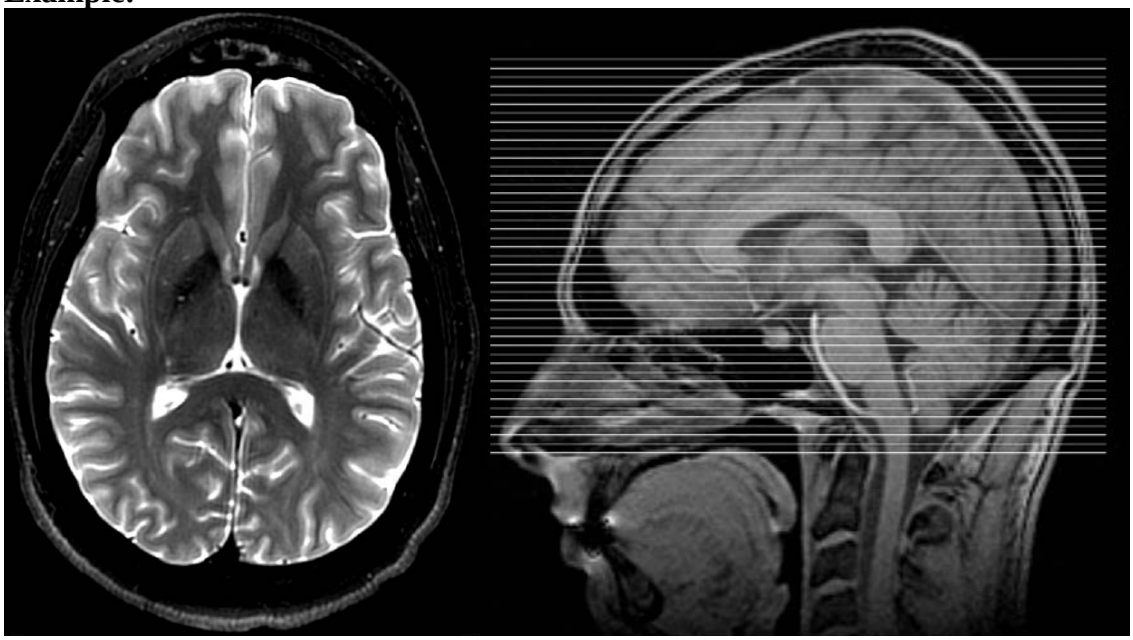


From Kantarci et al, submitted

Orientation: Straight Axial. Prescribe the 3D Slab inferior to superior. ** *DO NOT* oblique the slab to compensate for subject held tilt. Scan as straight axial.

7) Axial T2 FSE/TSE with Fat Sat

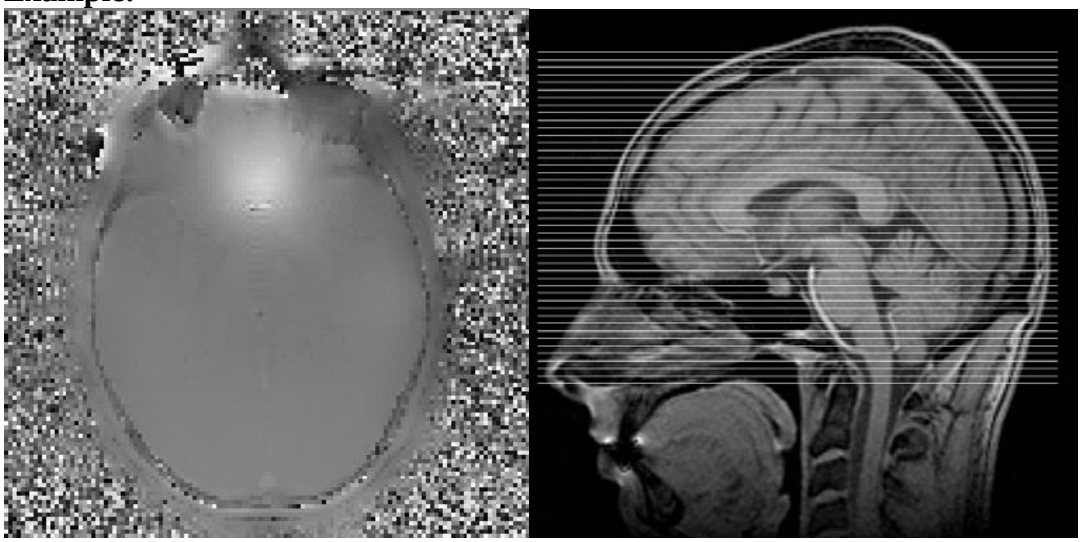
Example:



Orientation: Straight Axial. Prescribe slices inferior to superior. ** *DO NOT* oblique the scanning slices to compensate for subject held tilt. Scan as straight Axials. If extra transverse slices are required to achieve this coverage please acquire those slices.

8) Field Mapping Sequences (Philips and Siemens Only)

Example:

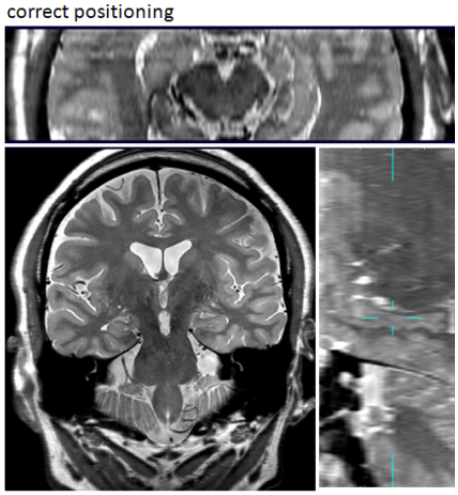


Orientation: Straight Axial or Sagittal. ** *DO NOT* oblique the scanning slices to compensate for subject held tilt. Scan as straight. If extra transverse slices are required to achieve this coverage please acquire those slices.

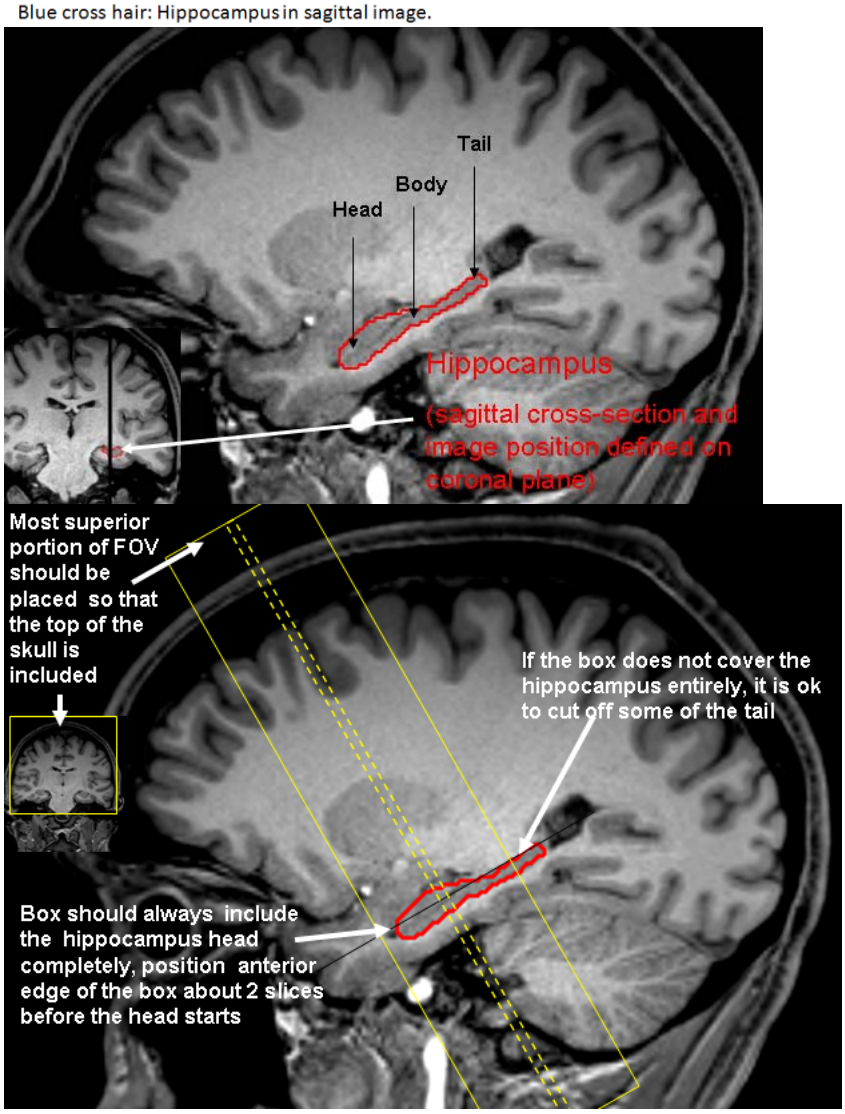
9) High Resolution Hippocampal Scan (Siemens Systems Only)

Example

Example of High Res Hippo Image using the correct positioning



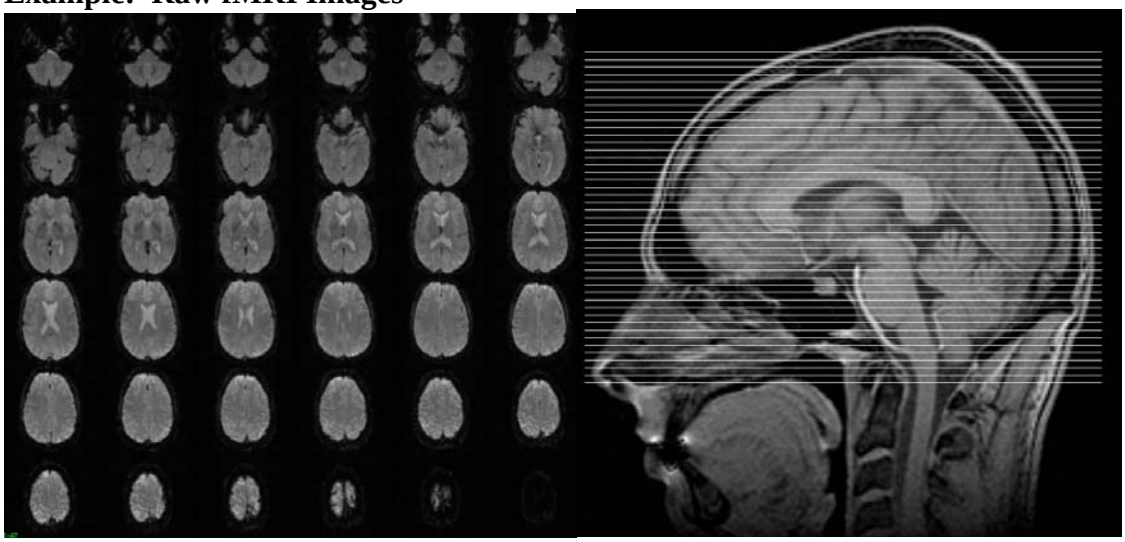
Blue cross hair: Hippocampus in sagittal image.



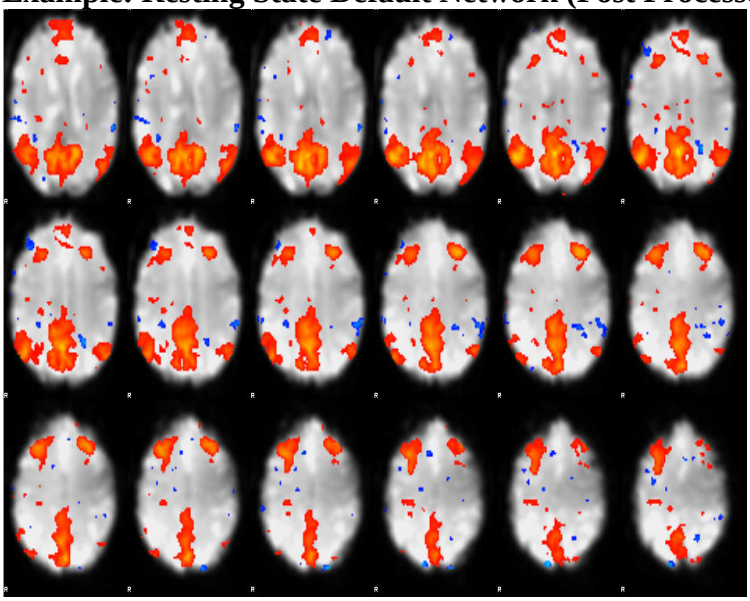
#10: Extended Axial Resting State fMRI – GE 15 and 16x Systems Only

(Subject should have eyes OPEN)

Example: Raw fMRI Images



Example: Resting State Default Network (Post Processed Image)



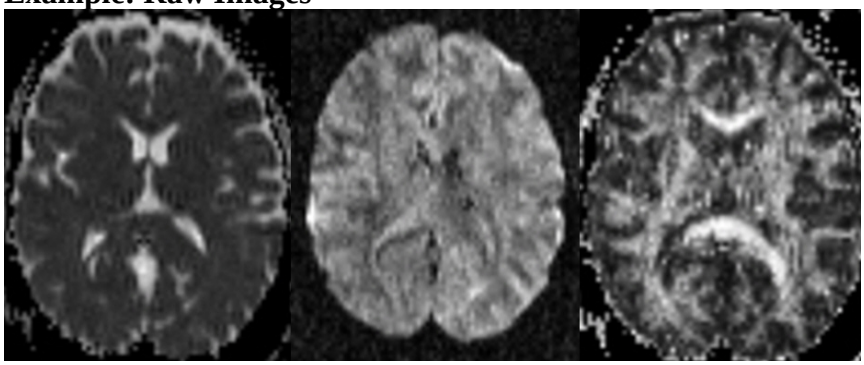
1. Orientation: Straight Axial -- DO NOT Oblique Scans.

2. Subject Instruction: **Please instruct the subject to keep their eyes open during the entire scan.** You can instruct them to focus on a point on the mirror or scanner. Also remind the subjects of the importance of holding their head still for the entire scan.

3. Positioning: Position on mid-sagittal slice from tri-planar scout. **The acquisition stack should be placed just above the most superior point in the brain and should cover the cerebellum.**

#11: Enhanced Axial DTI (Diffusion Tensor Imaging) – GE 20x and higher Systems Only. *(More directions different B-value)*

Example: Raw Images



Example: Post Processed Color Coded FA Maps

Orientation: Straight Axial. Prescribe the 3D Slab inferior to superior. ** *DO NOT* oblique the slab to compensate for subject held tilt. Scan as straight axial.

VI. MRI Subject Scan Procedures

A. Scan Discontinuation

1. If the subject elects to discontinue the MRI because of discomfort every effort should be made to adjust the table, head coil, etc. and finish acquiring the scan. However, if the subject still does not want to complete the scan, then the MRI should be abandoned and noted as incomplete on the ADNI2 3T MRI Scan Worksheet. The comments sections should include the reason the subject was unable to complete the MRI.

B. Clinical Reads

1. **Every subject in the ADNI2 Study *must* receive a clinical read by an on-site radiologist at each MRI facility.** The clinical read should follow standard local practice and a clinical dictation of the read should be transferred to the study coordinator at the referral site.

2. Clinical reads will **NOT** be provided by Mayo QC or LONI.

C. Archive Procedures

1. Every MRI (both human and phantom) for the ADNI2 Study must be archived at the MRI facility following standard local practice in addition to the data transfer to LONI immediately after the MRI scan. Additional data transfers or copies will be requested by the coordinating center in the event that a data transfer is interrupted or incomplete. Possible MRI archive mediums include:
    - Optical Disk
    - PACS
    - CD or DVD

D. Request for Repeat MRI Scans

1. Reasons for MRI Repeats:
    a. A request for a repeat MRI may be required in the event that the scans are found to be unacceptable due to subject motion or an incomplete MRI acquisition. Your site will be asked to schedule a repeat study.

    b. Mayo QC will check all ADNI 2 scans for protocol compliance. Repeat exams may also be required if the incorrect scan sequence, orientation, or angulations are used. It is imperative to use the ADNI-GO approved acquisition sequence with every ADNI2 subject (unless continuing CN or MCI from ADNI1, such subjects continue with the original ADNI sequence on the 1.5T). Scans with image degradation due to the incorrect scan sequence, orientation, or angulations will **NOT** be reimbursed. Re-

scans will be reimbursed if the correct scan sequence, orientation, and angulations were used.

2. Procedures for MRI Repeats:
    a. Repeat MRI scans should be performed as quickly as possible. The coordinating center for the ADNI2 Study will contact the referral site as well as the MRI facility requesting a repeat MRI. Detailed information regarding the reason for the repeat as well as suggestions for improvement will be communicated to both sites.

VII. On Going Quality Control Scanning Instructions

UPDATE – There is no longer phantom scanning with each subject scan, only done at certification and scanner update, artifact or significant maintenance. (Feb2014)

To ensure scanner stability and scan quality throughout the ADNI2 Study, each site is **required** to perform *on going* quality control scans on the ADNI phantom using the ADNI-GO QC Phantom protocol each time the certified MRI scanner undergoes a hardware or software upgrade.

> **IMPORTANT:** If a site fails to perform these phantom scans. ADNI may not reimburse the subject scans until received.

A. On Going Quality Control (QC) Phantom Scanning Instructions

For on-going quality control and post processing image analysis, each site must scan the specially designed ADNI phantom using the electronically loaded ADNI2 QC protocols **after every software or hardware upgrade.**

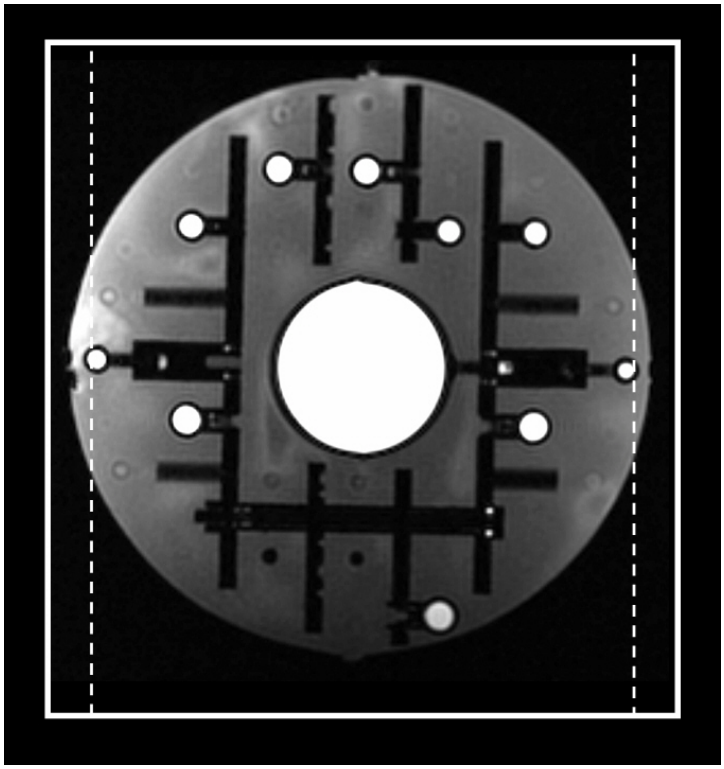
On Going QC Phantom Scan Protocol:

Phantom Scan Protocol:
1) Localizer
    1a) Calibration/Reference Scan (if applicable))
2) QC Phantom MP-RAGE/IR-SPGR (Accelerated)
3) QC Phantom fMRI (Philips Systems)

1. Post upgrade: Register the phantom as a new exam. (Start a new exam)

2. **3 Plane Localizer** - Please run a localizer to be sure the phantom is positioned correctly in the head coil.

3. **QC Phantom Sagittal MP-RAGE/IR-SPGR** - The on-going quality control scans are identical to the subject 3D scans except the slice thickness has been increase to ensure that the phantom has been covered completely. Please refer to the following figure.



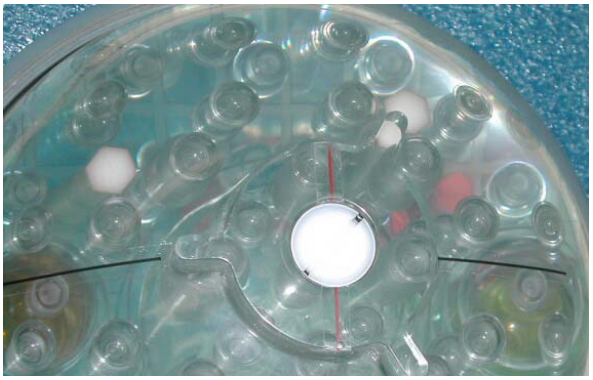
Note that the dotted line shows original slice thickness of 1.2 and solid line represents thickness of 1.3, which is adequate for covering entire phantom.

Phantom Positioning:

The following image shows the phantom placed in the appropriate position within the 8-channel coil. Achieving a reproducible position is a key element to the system performance analysis that will be conducted each day an ADNI2 subject(s) is imaged. Positioning with the alignment lines upward and the serial number SN XXXX positioned out of the bore as shown, will facilitate the reproducible positioning of your phantom.

ADNI phantom shown positioned inside of an 8-channel head coil.

Please note that your phantom has a base and positioning markers (in black and red, see image below). The phantom should be placed inside the head coil with the alignment markers facing upwards. This orientation is due to space constraints within some coils and we would like to maintain a consistent orientation for all scanners across the ADNI2 study.



The top of the phantom and the alignment lines are indicated above. These markings should be used with the alignment lights on your scanner to position the phantom.

Please place the phantom in your head coil with the alignment markers up, and the phantom SN number (e.g. 9999) facing you, out of the bore (see the following picture). Furthermore, try to align the center of the phantom with the center of the coil. Use the alignment lights on your scanner to position the phantom into the center of the magnet.

The phantom is shown in the correct position, with the Serial Number (SN 9999) positioned forward and reading correctly from right to left. This will be the typical scanning position for your phantom

Phantom Storage:

Due to its small base, please store your phantom in the wooden box that it came in. This will ensure that the phantom does not roll of its base and fall when it is not being used.

B. Phantom Naming:

1. **ADNI Phantom Naming Convention *(entered during LONI upload*):**

   For the upload to LONI, phantom scans should follow the naming convention:
   XXX_P_YYYY
   X=Site#/P=Phantom/Y=Phantom#

   For example, each phantom scan from site 007 should be coded:
   007_P_9999

2. **De-identification** - As part of the upload process to LONI, all the information entered into the scanner will be removed and replaced with the information entered during the LONI upload procedure. For this reason, you are encouraged to enter the phantom scan information into the scanner following standard local practice.

C. Data Transfer:

Each site will send the phantom data (along with the subject data) to LONI within 24 hours after the completion of the scan as detailed in Appendix 6.

D. Measurements:

The Mayo QC team will perform the following measurements on the phantom data: Gradient Linearity Measurements, Signal to Noise measurements, Image contrast, Inhomogeneity, and RF Power measurements.

E. Phantom Results and Site Notification:

Mayo QC will examine each phantom data set to ensure that there are no underlying problems with the scanning session, and that the scanner has not drifted out of specification. When finished, if there is an issue that needs to be addressed, an email will be sent to your site notifying you of the problem.

VIII. Appendices

Appendix 1: MRI Pre-Screening Form

The following is an example of the form subjects complete with the study coordinator prior to their MRI scans. The study coordinator should notify the MRI site if the subject has indicated yes for any items that may pose a risk to the subject (i.e. internal metal) during the MRI. This form should not be a substitute for your standard pre-screening form.

Date _____/_____/___

Subject ID _____

Please check Yes/No for each of the following:

☐ Yes ☐ No Previous MRI scan

Exclusionary Items:

☐ Yes ☐ No Cardiac pacemaker / defibrillator
☐ Yes ☐ No Aneurysm or aortic clip(s)
☐ Yes ☐ No Neurostimulator
☐ Yes ☐ No Cochlear, otologic, or ear implant

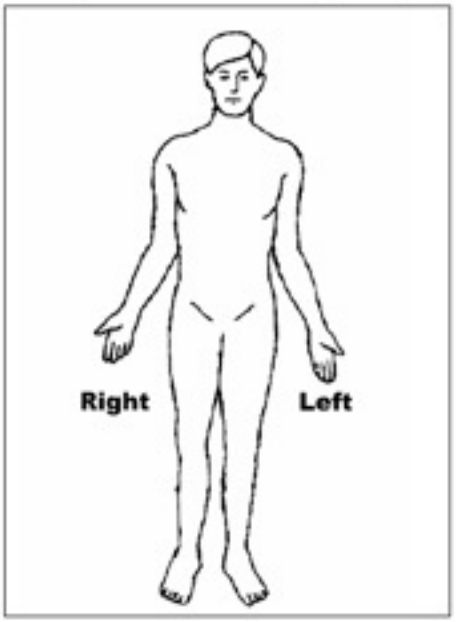
Please Inform MRI Center:

☐ Yes ☐ No Prosthesis or implant
☐ Yes ☐ No Artificial limb or joint
☐ Yes ☐ No Insulin or infusion pump
☐ Yes ☐ No Bone growth / fusion stimulator
☐ Yes ☐ No Carotid artery vascular clamp
☐ Yes ☐ No Electrodes (on body, head, or brain)
☐ Yes ☐ No Stents, filters, or coils (intravascular)
☐ Yes ☐ No Shunt (spinal or intraventricular)
☐ Yes ☐ No Vascular access port and / or catheter
☐ Yes ☐ No Tattooed makeup (eyeliner, lips, etc.)
☐ Yes ☐ No Body piercing(s)
☐ Yes ☐ No Any metal fragments or shrapnel (current or removed)
☐ Yes ☐ No Internal pacing wires
☐ Yes ☐ No Metal or wire mesh implants
☐ Yes ☐ No Bone / joint pin, screw nail, wire, plate
☐ Yes ☐ No Breathing disorder
☐ Yes ☐ No Claustrophobia
☐ Yes ☐ No Hearing aid (***Remove before MRI***)
☐ Yes ☐ No Dentures (***Remove before MRI***)

If answers below are yes, please explain below

☐ Yes ☐ No Worked extensively with metal (grinding, etc.)
☐ Yes ☐ No A history of seizures continuing to present

Please mark on the figure below the location of any implant or metal inside or on your body



Remove all metallic objects prior to your MRI examination

Explanation _____

_____ _____
Signature of subject or subject's representative *Name of Representative*

_____ Date _____/_____/_____
Signature of person administering screening form

Date _____/_____/_____

Appendix 2: MRI Scan Information Form

- The “MRI Scan Information Form” should be completed at the time of acquisition for every ADNI2 subject. A copy of the MRI worksheet follows.

- The study coordinator at the referral site should complete the top section of the form. If this section is incomplete, please contact the study coordinator for the information.

- The MRI technologist should complete the remainder of the form during the scan. Please be sure to indicate if each sequence has been completed and note any problems or modifications to the protocol in the appropriate sections. Also, note if data transfer, archive, and local copy for clinical reads have also been completed.

- Please complete the form in full and transfer to the study coordinator at the referral site. Please keep a copy on site for your records.

ADNI 2 – 3T MRI - Scan information sheet. (EXAMPLE)

Participant:

		/ /
Participant ID	Session ID	Date of Scan

Visit: Baseline

Site Code:

Study Coordinator Name:

ADNI GO Participant Initials:

MRI Technologist Initials:

**Important: It is mandatory that the ADNI2 site qualified scanner be used for ALL participants in the ADNI2 study. **It is also mandatory that the same ADNI2 approved sequences are used for all ADNI2 subject scans. Do NOT adjust protocol values.

Was the scan conducted?

- ☐ Yes
- ☐ No

Reason why the scan was not conducted:

- ☐ Illness
- ☐ Participant unavailable
- ☐ Participant unwilling
- ☐ Administrative problems
- ☐ Withdrawn consent
- ☐ Other (specify)

If Other, specify:

Placed Marker on the subjects Right (RT) temple. ☐ Yes ☐ No

(Please note that the series numbers below may not match your protocol)

Scan #1: 3 Plane/Tri-Planar Scout: **Check the subject positioning in the head coil; Re-position and re-scout if necessary.

Completed?
☐ Yes
☐ No

NOTES:

Scan #2: Sagittal 3D MP-RAGE/IR-SPGR: ** **Straight** sagittal. ***DO NOT*** oblique the scanning FOV to compensate for subject held tilt. Position FOV to avoid nose wrapping into the back of the brain.

Completed?
☐ Yes
☐ No

NOTES:

Scan #3: Sagittal 3D Accelerated MP-RAGE/IR-SPGR: Please scan in the exact same position as the non-accelerated scan unless repositioning is necessary

Completed?
☐ Yes
☐ No

NOTES:

Scan #4: Extended Axial Resting State fMRI *(Subject should have eyes OPEN)*:

--Philips Systems Only

The acquisition stack should be placed just above the most superior point in the brain and should cover inferior as much as possible, if the cerebellum is not covered fully, that is acceptable. Instruct the subject prior to this scan that they should have their eyes open and to hold very still. **DO NOT oblique the scanning slices.

Was the subject instructed to open their eyes?

☐ Yes

☐ No

Did the subject keep their eyes open? (MRI Tech: ask the subject right after the scan)

☐ Yes

☐ No

Completed?

☐ Yes

☐ No

NOTES:

Scan #4: Axial FLAIR: Position Slices to cover below cerebellum through the top of the head. ***DO NOT*** oblique the scanning slices.

Completed?

☐ Yes

☐ No

NOTES:

Scan #5: Axial T2 Star: Position Slices to cover below cerebellum through the top of the head. ***DO NOT*** oblique the scanning slices.

Completed?

☐ Yes

☐ No

NOTES:

Scan #6: Axial ASL Perfusion Scan *(Subject should have eyes OPEN)*:

-- Siemens Systems Only (**with license agreement):**

Position Slices to cover below cerebellum through the top of the head. ***DO NOT*** oblique the scanning slices.

Was the subject instructed to open their eyes?

☐ Yes

☐ No

Did the subject keep their eyes open? (MRI Tech: ask the subject right after the scan)

☐ Yes

☐ No

Completed?

☐ Yes

☐ No

NOTES:

Scan #6: Axial DTI Scan

-- GE Systems Only (**with license agreement):**

Position Slices to cover below cerebellum through the top of the head. ***DO NOT*** oblique the scanning slices.

Completed?

☐ Yes

☐ No

NOTES:

Scan #7: Axial T2 FSE/TSE with Fat Sat

-- All Systems

Position Slices to cover below cerebellum through the top of the head. ***DO NOT*** oblique the scanning slices.

Completed?

☐ Yes

☐ No

NOTES:

Scan #8: Field Mapping Sequences

-- Philips and Siemens Systems Only

Cover the entire brain. ***DO NOT*** oblique the scanning slices.

Completed?

☐ Yes

☐ No

NOTES:

Scan #9: High Resolution Hippocampal Scan

-- Siemens Systems Only

From the MPRAGE, position FOV perpendicular to the long axis of the hippocampus. First slice should be just anterior to the heads of the hippocampus.

Completed?

☐ Yes

☐ No

NOTES:

Scan #10: Extended Axial Resting State fMRI *(Subject should have eyes OPEN)*:

--GE 15x and 16x Systems Only

The acquisition stack should be placed just above the most superior point in the brain and should cover inferior as much as possible, if the cerebellum is not covered fully, that is acceptable. Instruct the subject prior to this scan that they should have their eyes open and to hold very still. **DO NOT oblique the scanning slices.

Was the subject instructed to open their eyes?

☐ Yes

☐ No

Did the subject keep their eyes open? (MRI Tech: ask the subject right after the scan)

☐ Yes

☐ No

Completed?

☐ Yes

☐ No

NOTES:

Scan #11: Enhanced Axial DTI Scan

-- GE 20x and higher Systems Only (**with license agreement):**

Position Slices to cover below cerebellum through the top of the head. ***DO NOT*** oblique the scanning slices.

Completed?

☐ Yes

☐ No

NOTES:

Phantom QC Scans:

Your site is no longer required to do phantom scans along with ADNI2 MRI subject scans. Phantoms scans will only be required at site certification and software/hardware upgrades or significant scanner maintenance.

Patient Motion Problems:

☐ Yes

☐ No

If yes, describe:

Scanner malfunction:

☐ Yes

☐ No

If yes, describe:

Other protocol variations:

☐ Yes

☐ No

If yes, describe:

Was data transferred to LONI within 24 hours of scan?

☐ Yes
☐ No

Comments

Date:
Month/Day/Year_____

Data Archived Locally?

If No, please explain under comments.

☐ Yes
☐ No

Archive Medium (circle): PACS CD/DVD MOD

Comments

Other:

Was a lumbar puncture completed prior to the MRI scan? (Completed by the study coordinator)

☐ Yes
☐ No

If Yes, What was the interval between LP and MRI?

Appendix 3: MRI Acquisition Summary

Please Note: Your MRI scanner vendor (GE, Siemens, or Phillips) will be supplying electronic protocols (WIPs) for installation to your local service engineer for your specific MRI system(s). This will ensure that you have the correct protocol for your MRI scanner. If you have any questions about this procedure please contact: **ADNIMRI@Mayo.edu**
Use only the imported ADNI sequences

ADNI2 3T QC Phantom Scan Protocol:
(Performed at site certification and post software /hardware upgrade)
1) Localizer
1a) Calibration/Reference Scan (if applicable)
2) QC Phantom MP-RAGE/IR-SPGR (Accelerated)
3) QC Phantom fMRI (Philips Systems)

ADNI2 3T Human Protocol:
(All scans are performed in straight orthogonal planes -- Sagittal or Axial)
(No manual adjustments should be made to this protocol)

1) Localizer
1a) Calibration/Reference Scan (if applicable)
2) Sagittal MP-RAGE/IR-SPGR
3) Accelerated Sagittal MP-RAGE/IR-SPGR
4) Extended Resting State fMRI (Philips Systems Only) - Eyes OPEN.
4) Axial T2-FLAIR
5) Axial T2-Star
6) Axial ASL Perfusion (Siemens Systems) - Subjects should have eyes OPEN.
6) Axial DTI Scan (GE Systems)
7) Axial T2 FSE/TSE with Fat Sat
8) Field Mapping Sequences (Philips and Siemens Only)
9) High Resolution Hippocampal Scan (Siemens Systems Only)
10) Extended Axial Resting State fMRI (GE 15 and 16x only) - Eyes OPEN.
11) Enhanced Axial DTI (GE 20x+ systems only)

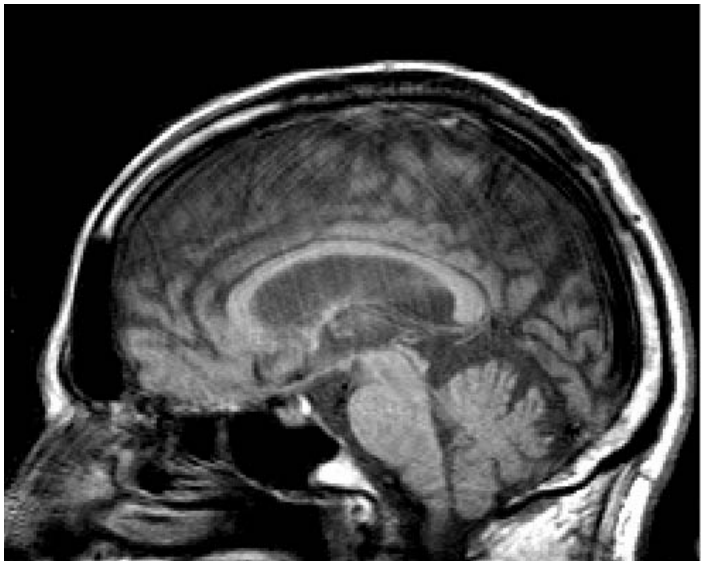
Appendix 4: ADNI Acquisition Troubleshooting Guide

Superior image quality is imperative to the success of the ADNI2 Study. Every effort should be made to acquire excellent scans on ADNI2 subjects at their first MRI appointment and at all subsequent visits. This prevents the clinical centers from rescheduling additional repeat MRI's for study subjects.

It should also be noted that the 3D T1 acquisition sequence is the most important sequence in ADNI2. This sequence should always be acquired immediately after the tri-planar scout. Please note the image quality of this scan and re-acquire if necessary before running the rest of the sequences.

Please use the following reference as a guide for identifying and remedying inferior image quality, image artifacts, and subject issues that may degrade image quality. Also, please contact ADNIMRI@Mayo.edu for specific technical questions or concerns outside the scope of this manual.

Example 1: Image Degradation due to Movement Artifact

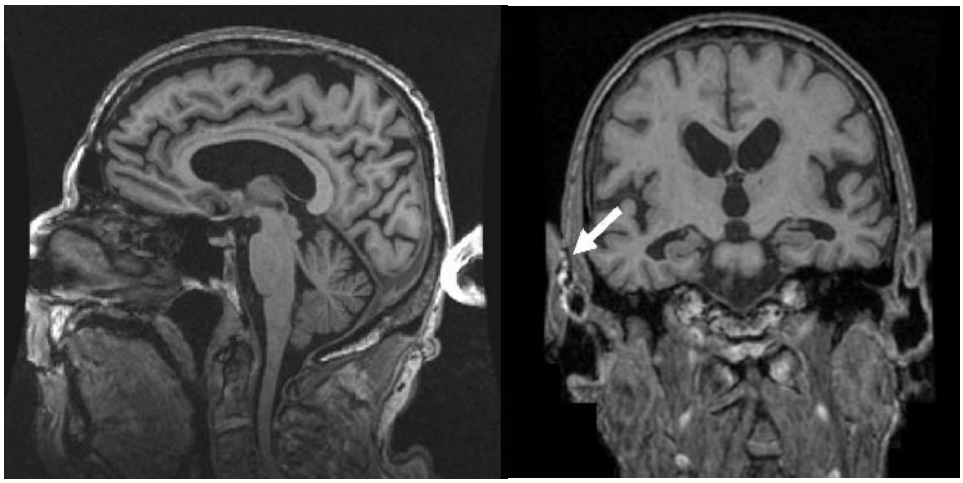


Problem:
In this example movement has caused motion artifacts. Acquisitions with major motion artifacts will not be accepted and a repeat scan may be requested.

Possible Remedies:
If movement is due to the subject's head moving, reacquire MP-RAGE after tightly securing the subject's head with additional restraints and discussions with subject to hold their head still**.**

If the subject is not moving it is possible the artifact is the result of mechanical problems. Please discuss with your service engineer.

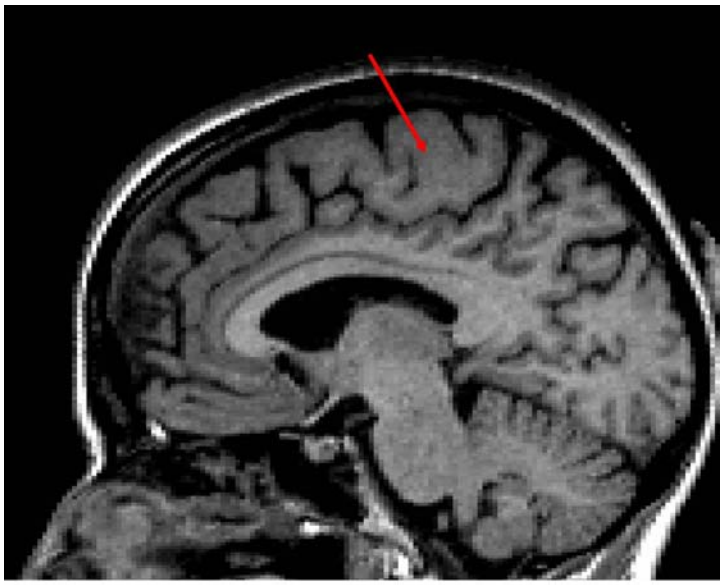
Example 2: Wrap Around



Problem:
In this example, wrap around occurs in the MP-RAGE image above. In the figure on the left, the nose folds into the back of the skull. In the figure on the right, the ear wraps into the side of the skull. Acquisitions with wrap around artifacts will not be accepted and a repeat scan will be requested.

Possible Remedy:
Wrap around generally occurs when the subject's head size is larger than the acquisition box. Please try to position the acquisition box so that the wrap can be avoided.

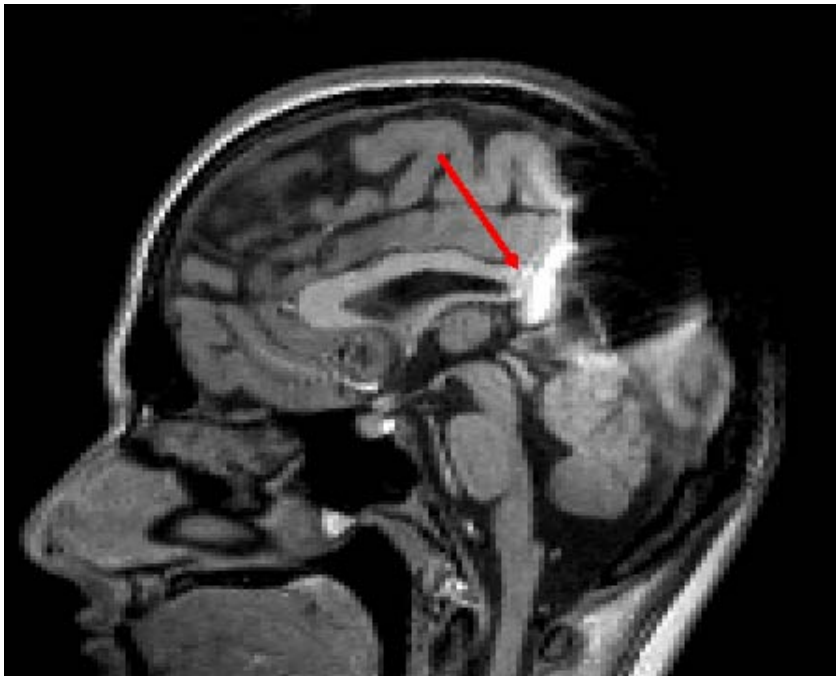
Example 3: Signal Loss at the Top of the Brain



Problem:
In this example, the image has a loss of signal at the top of the brain due to incorrect positioning in the head coil. The subject was placed too high in the coil. Please note the lack of contrast between gray and white matter at the top of the brain only. Acquisitions with signal loss, especially due to incorrect positioning, will not be accepted and a repeat scan will be requested.

Possible Remedies:
1. Check to be sure subject is positioned correctly in the head coil. Please see "Subject Positioning" for information on positioning.
2. Make sure head coil is properly secured.

Example 4: Metal Artifact



Problem:
Magnetic field distortions: In this example there is a signal void due to the presence of metal near the subject's head. Acquisitions with metal artifact will not be accepted any circumstances and a repeat scan will be requested.

Possible Remedy:
1. Make sure the subject is not wearing any metal. Refer to Appendix 1. Check for hair clips, metallic makeup (i.e. permanent eyeliner), necklace, safety pins, removable dentures, and facial jewelry. Remove metal and rescan.

Appendix 5: FAQ's -- Frequently Asked Questions:

Q – My subjects head is tilted quite a bit. Can I oblique the scans then?
A – No, do not oblique the scans, we can deal with the subjects head being tilted more easily than we can with scans that were acquired obliquely.

Q – I forgot to put the marker on the subject. Do we need to rescan?
A – No, that will not be a reason for a re-scan, please just try to remember next time.

Q – What is the phantom filled with?
A – Mostly distilled water and some anti-mold ingredients. If you notice your water level is getting low, please top off with distilled water. Distilled water acts differently when imaged than tap water, so please make sure you are using distilled water.

Q – I noticed some wrap on my image. Should I increase the FOV to compensate?
A – No, unless the wrap is affecting brain tissue you do not need to re-scan. If the wrap is affecting brain tissue please try to place the FOV to avoid wrap if possible.

Q – Should I append this scan to the previous scan in the PACs system.
N – Please do not append the sessions, it causes the exams all to have the same UID.

Q – Do I need to have the subject remove their dentures?
A – Yes, please have all your subjects remove their dentures to avoid artifact.

Q – I am having trouble with upload data to LONI, who do I contact?
A - adni@loni.usc.edu

Q – The exam was already sent to LONI, do we need to keep a copy of it?
A – Yes, please keep a copy of all human AND QC phantom scans your site performs.

Q – Our scanner was upgraded, do I need to re-certify?
A – If it was a major upgrade (both software and hardware) the answer is yes. However, many minor upgrades do not need a full re-certification scan, just a phantom scan. In that case, we may just ask you run the QC phantom scans to make sure the pulse sequences are working.

Q – What are some common reasons for a rescan.
A- Assuming the site followed the ADNI2 protocol; Most rescans are required due to subject motion. Please try to repeat the core sequences if they contain significant motion (3D T1/FLAIR/T2 Star). If those sequences are not useable a rescan will be requested.

Appendix 6: Data Transfer to LONI

LONI Image & Data Archive

INTRODUCTION

The LONI Image & Data Archive (IDA) is a user-friendly environment to archive, search, share, track and disseminate neuro-imaging data. It accommodates MRI, fMRI, PET, MRA, DTI and other imaging modalities. A flexible data de-identification engine and encrypted file transmission help ensure compliance with patient-privacy regulations. All data are stored on redundant servers with daily and weekly on- and off-site backups. Archiving data in the IDA is simple, secure and requires no specialized hardware or software. The IDA automatically extracts relevant metadata from de-identified image files, and allows data to be searched within moments of archival. Once archived, data can be downloaded and/or streamed into the LONI Pipeline workflow environment for processing and analysis. Integration of the LONI Debabeler file format translation engine allows users to download image data in a number of common file formats.

IMAGE & DATA ARCHIVE (IDA)
Laboratory of Neuro Imaging
Institution of Neuroimaging and Informatics
Keck School of Medicine
University of Southern California
2001 North Soto Street, Room 102,
Los Angeles, CA 90033-9232
Phone: 323-442-7246
Fax: 323-442-0137
https://ida.loni.usc.edu

For questions or problems with the IDA, please e-mail dba@loni.usc.edu

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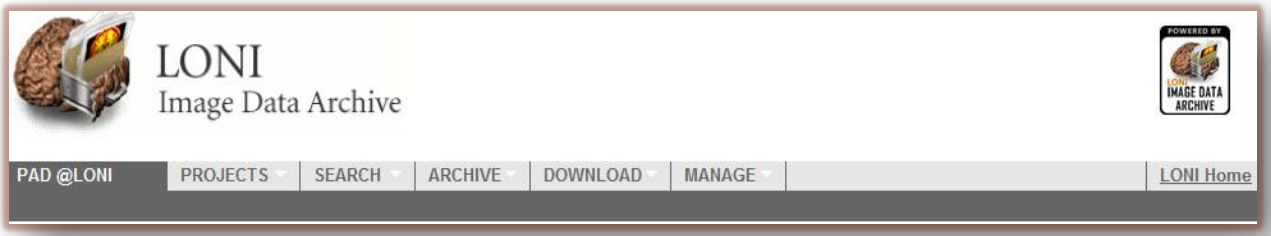
A – IMAGE & DATA ARCHIVE OVERVIEW

The LONI Image & Data Archive (IDA) provides an integrated and safe environment to archive neuro-imaging data. The archive protects data from unauthorized access and allows investigators to share data. For questions or problems with the IDA, please e-mail dba@loni.usc.edu

System Requirements:

The IDA system requires a computer with internet access, newer web browser software (IE, Netscape, Mozilla, Safari, Chrome), Java plug-in (version 1.5 or higher), and a valid user account.

IDA MENU OVERVIEW



Projects:

- *All:* View participant gender and research group distribution on public projects and other private projects you are permitted to access. Public projects such as PAD are available to all users.
- *Individual Projects:* View project information and participant gender distribution from your project.

Search:

- *Simple Image Search:* Database queries based on a limited set of subject and image parameters.
- *Advanced Image Search*: Database queries using a more extensive list of parameters. Limited to authorized users on a project-by-project basis.

Archive:

- *Archive Files:* De-identify images to remove potentially identifying subject information, and securely transmit files to be stored in the LONI Image & Data Archive.

Download:

- *Image Collections:* Download individual images or entire collections.
- *Study Data:* Download study data for selected projects.

Manage:

- *Edit metadata:* Provide or modify subject-related information such as sex, age and weight.
- *Delete data:* Remove images from the LONI Image and Data Archive. Available to users with higher access levels.
- *Image QC*: Quality-control of imaging data. Available to users with higher access levels.
- *Project Summary:* View project upload and download summary information. Available to users with higher access levels.
- *Manage user access:* Grant or modify user's privileges. Available to project leaders.

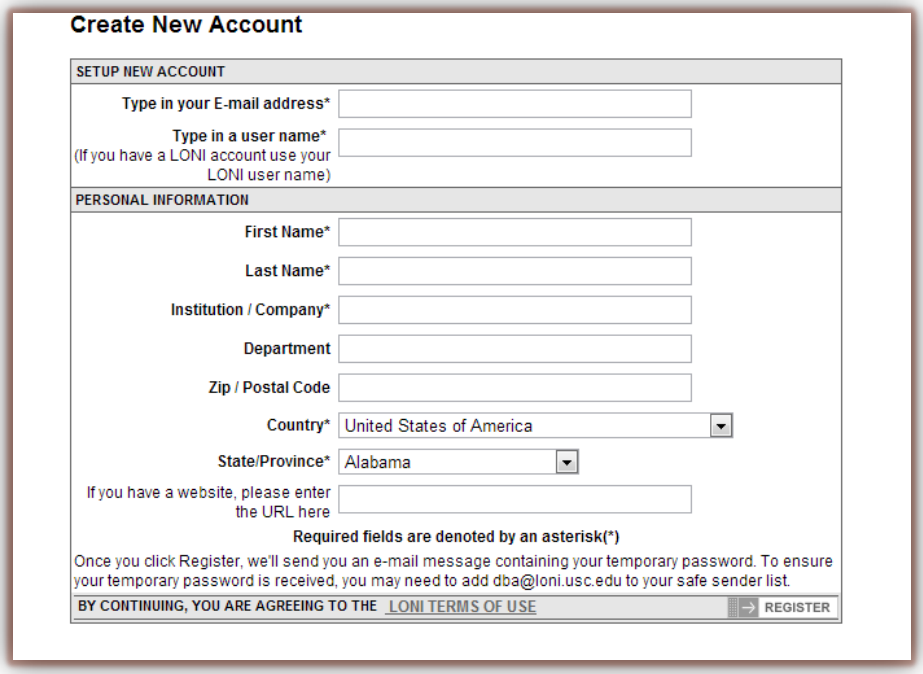
Note:

Available submenus vary depending on project and user access level.

USER REGISTRATION

1. If you do not have a user account, click REGISTER on the Image & Data Archive Log-In page at https://ida.loni.usc.edu

2. Complete the form below to create a new account. To submit, click the REGISTER button.



3. Once the registration process is complete, a confirmation email will be sent with a temporary password and login instructions. However, you will be unable to upload data until completion of step 4.

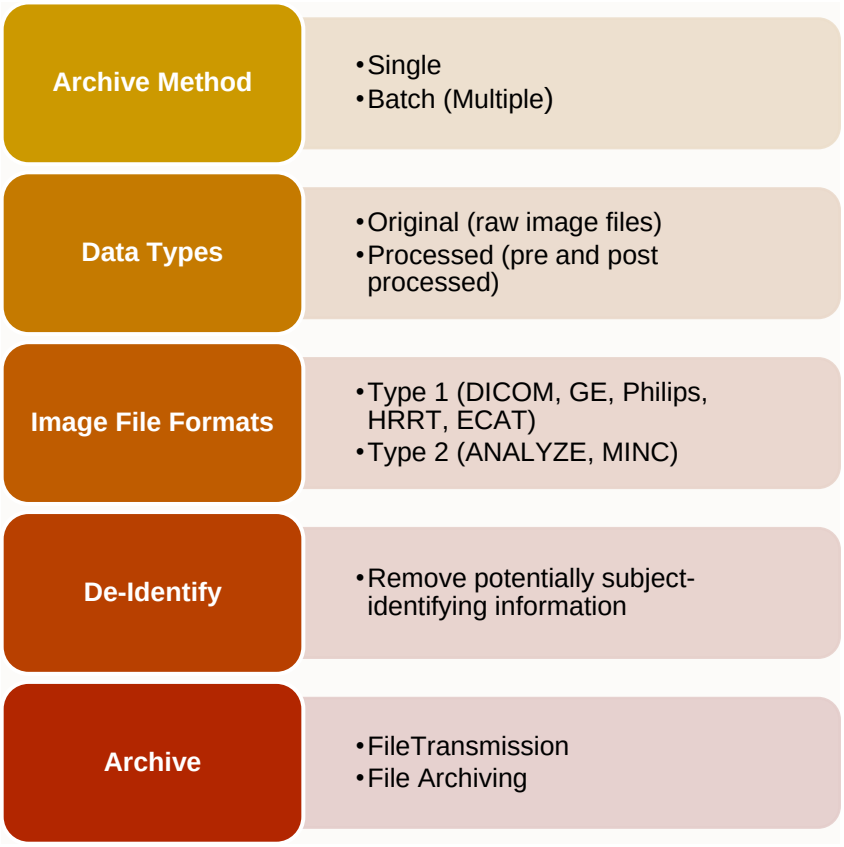
4. Email dba@loni.usc.edu to request upload access. Be sure to include your site number in the email request.

D – ARCHIVE

There are two steps in the archive process: de-identification and file transmission. The de-identification step removes or replaces potentially identifying subject information from the image headers.

During the file transmission step, the de-identified files are securely transmitted to LONI and stored in the data archive. The data archive accepts DICOM, GE, Philips, HRRT and ECAT files (Type 1 headers), and files with limited header information, such as Analyze and MINC (Type 2 files). Archiving Type 2 files requires some user input to provide image metadata.

ARCHIVE PROCESS GRAPHIC INTERVIEW



SINGLE ARCHIVE INSTRUCTIONS

Use the Single Archive process to upload one or more files from a single subject.

TYPE 1 FILES ARCHIVING INSTRUCTIONS (e.g. DICOM, GE, Philips, HRRT, ECAT)

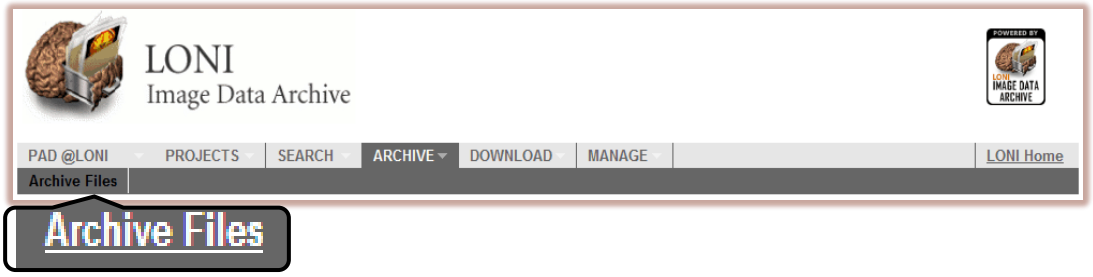
PREREQUISITES

- Place all image files for each subject within a single directory (**source directory**) which may contain subdirectories. The source directory must not contain multiple image formats.
- Create an empty directory where the de-identified files will be written (**target directory**)

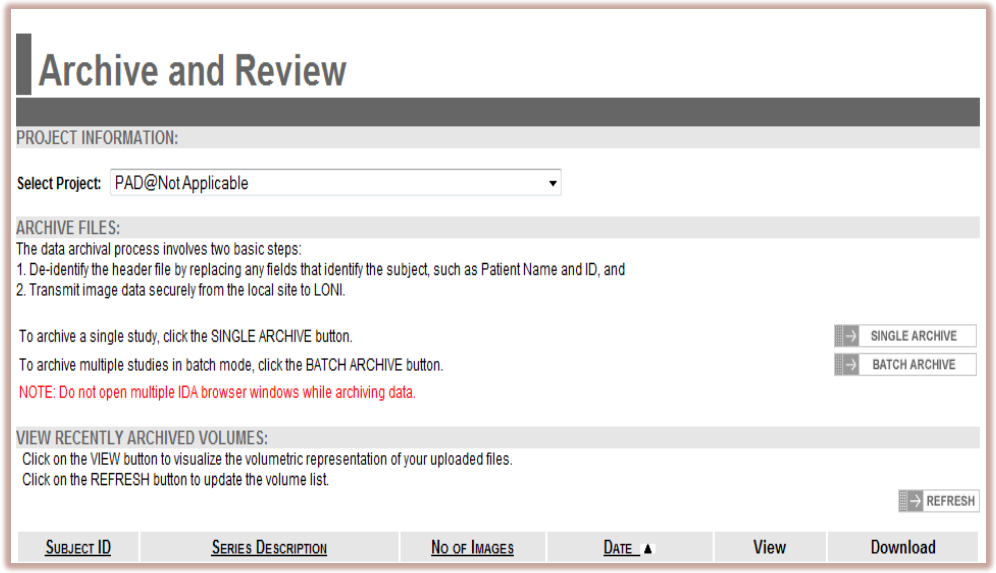
NOTE

- The browser window must remain open during the entire upload process. Closing the browser window cancels the upload. You may minimize the window.

Choose ARCHIVE FILES from the Archive Menu:

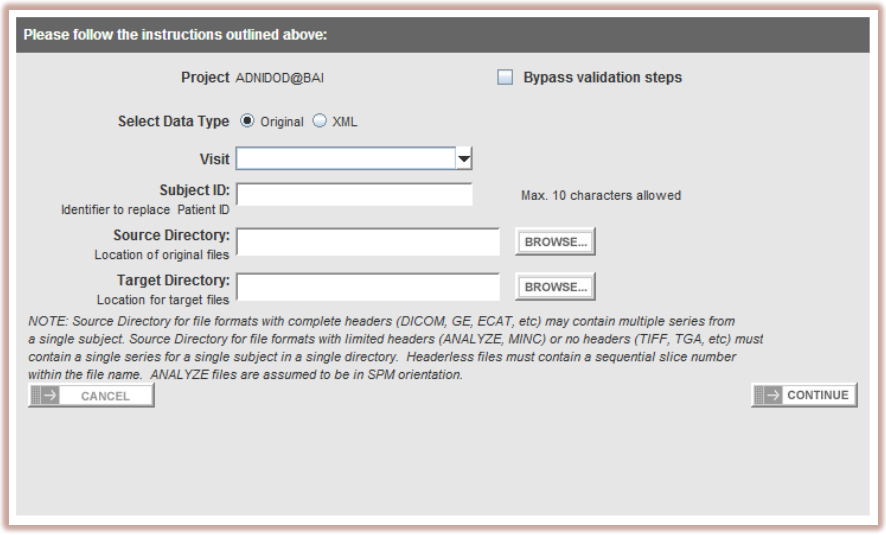


Select your Project/ Site from the drop down menu, and then select SINGLE ARCHIVE.



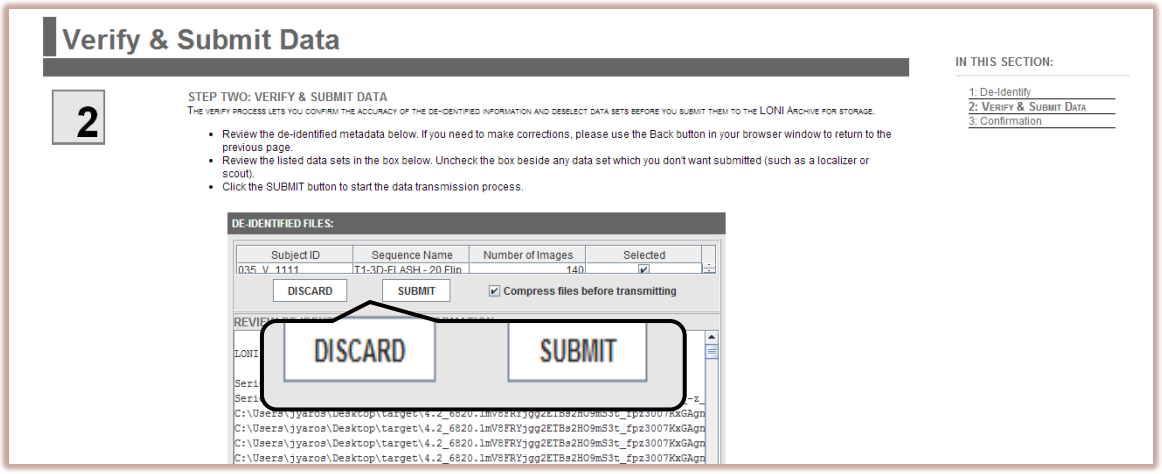
Step 1: De-identification

-Select the type of data to be uploaded (Original/Processed) then complete the form entries.
-The Subject ID you provide replaces the existing Patient ID in the image file(s). It is recommended that a separate cross reference of original and replacement subject identifiers are kept externally.
-Source directory is the directory in which the original files are located (contains image files only).
-Target directory is an empty directory which will contain the new, de-identified files.
-Click the CONTINUE button to begin the de-identification process.



Step 2: Verify and Submit

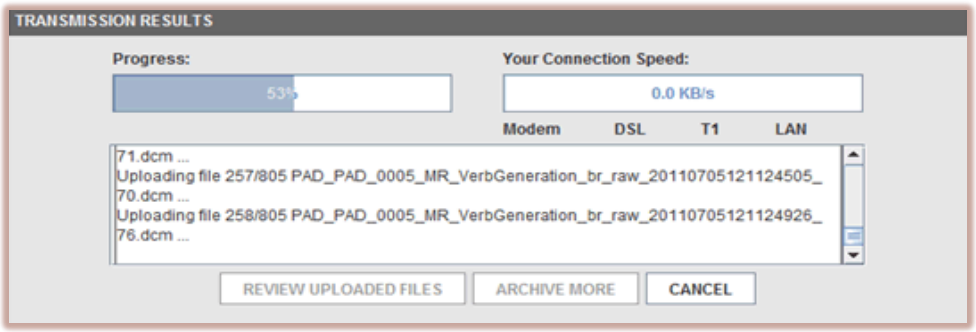
-To remove any images, uncheck the 'Selected' box beside the image.
Note: This feature is not an option with Batch Archive.
-Click SUBMIT to transmit the de-identified images. Choosing DISCARD cancels the upload.



The transmission process will begin. The progress bar will show the status of the upload.

Once the file transmission is complete, click REVIEW UPLOADED FILES to view a list of the archived

images, or click ARCHIVE MORE to upload more files. If you continue to upload files you may want to consider using the Batch Archive function instead.



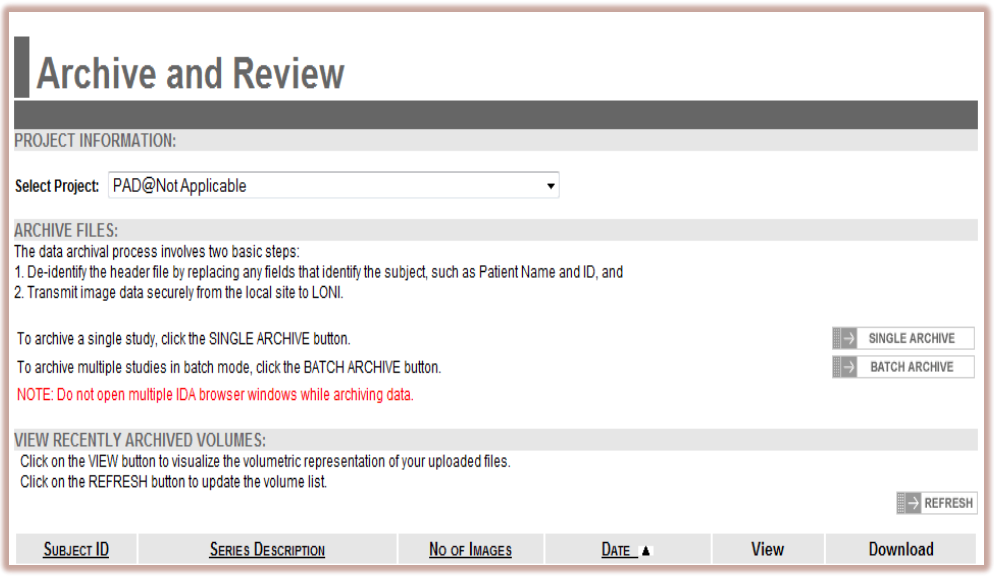
Type 2 Files Archiving Instructions (ANALYZE, MINC)

Available to users with higher access levels.
Refer to the **Appendix** for information about how to Archive Analyze and Minc files.
Please contact dba@loni.usc.edu for other file formats.

BATCH ARCHIVE INSTRUCTIONS

The Batch Archive process is similar to Single Archive, except that multiple subjects and image series can be submitted in a batch. Batches can be of the same or different file formats and modalities. However, users cannot review the results of the de-identification process prior to the batch upload.

First, select BATCH ARCHIVE.



Proceed to follow Step 1: De-identification in the **SINGLE ARCHIVE INSTRUCTIONS** (page 6).

Step 2: **Image Database Batch Queue**
-Click ADD MORE to add more studies/subjects. Repeat this process until you have added all subject images you intend to archive
-Click SUBMIT to de-identify and upload all files.