

# **SCAN: Standardized Centralized Alzheimer's and Related Dementias Neuroimaging**

## **Overall Goals:**

**To standardize image acquisition, QC, processing, and analysis across all ADRCs**

**Improve imaging expertise across the ADRC program**

**Facilitate data sharing and collaborative research**

**Applies to prospectively collected data from MRI, amyloid-PET, tau-PET, FDG-PET**

# Specific Aims 1

**Advise the National Alzheimer's Coordinating Center (NACC) on methods to optimize their procedures for de-identifying and secure uploading of MRI and PET data to the NACC image repository**

**Develop and promote standards for collection of prospective MRI and PET data across centers that includes evaluation of neuroimaging equipment and standardization of acquisition protocols**

**Develop and apply methods for quality control (QC) of all uploaded PET and MRI images.**

**Develop and apply methods for harmonization (i.e. pre-processing) of MRI and PET images to permit cross-center data merging and merging with ADNI datasets**

**Work with NACC to ensure that all images in the repository are appropriately curated and labeled with QC and pre-processing status so that they are available for download to qualified investigators.**

**Develop and apply methods for the analysis of MRI and PET images to yield numerical summary data of variables including regional brain volumes/cortical thickness, cerebrovascular lesions, white matter hyperintensities and integrity, cerebral microbleeds, regional cerebral perfusion and glucose metabolism, brain  $\beta$ -amyloid deposition, and brain tau deposition.**

## **Specific Aims 2**

**Incorporate new MRI and PET technical innovations as they develop, and promote standards in prospective data collection**

**Advise NACC as necessary in linking imaging data with other data (clinical, biomarker, -omics, neuropathology, etc) from ADC research participants**

**Provide a user-help function for ADC investigators less familiar with imaging methods including online documentation of methods and data**

**Work with NACC to establish a website for help, image search and upload/download functions**

**Convene an executive committee composed of SCAN leadership with representation from NACC, the NIA, and ADC investigators for decision making and development/approval of procedures and protocols. Report at regular intervals to the NIA and ADCs**

# Key Personnel

## PET – Berkeley

Bill Jagust

Susan Landau

Suzanne Baker

## PET – Michigan

Bob Koeppe

## MRI – Mayo

Cliff Jack

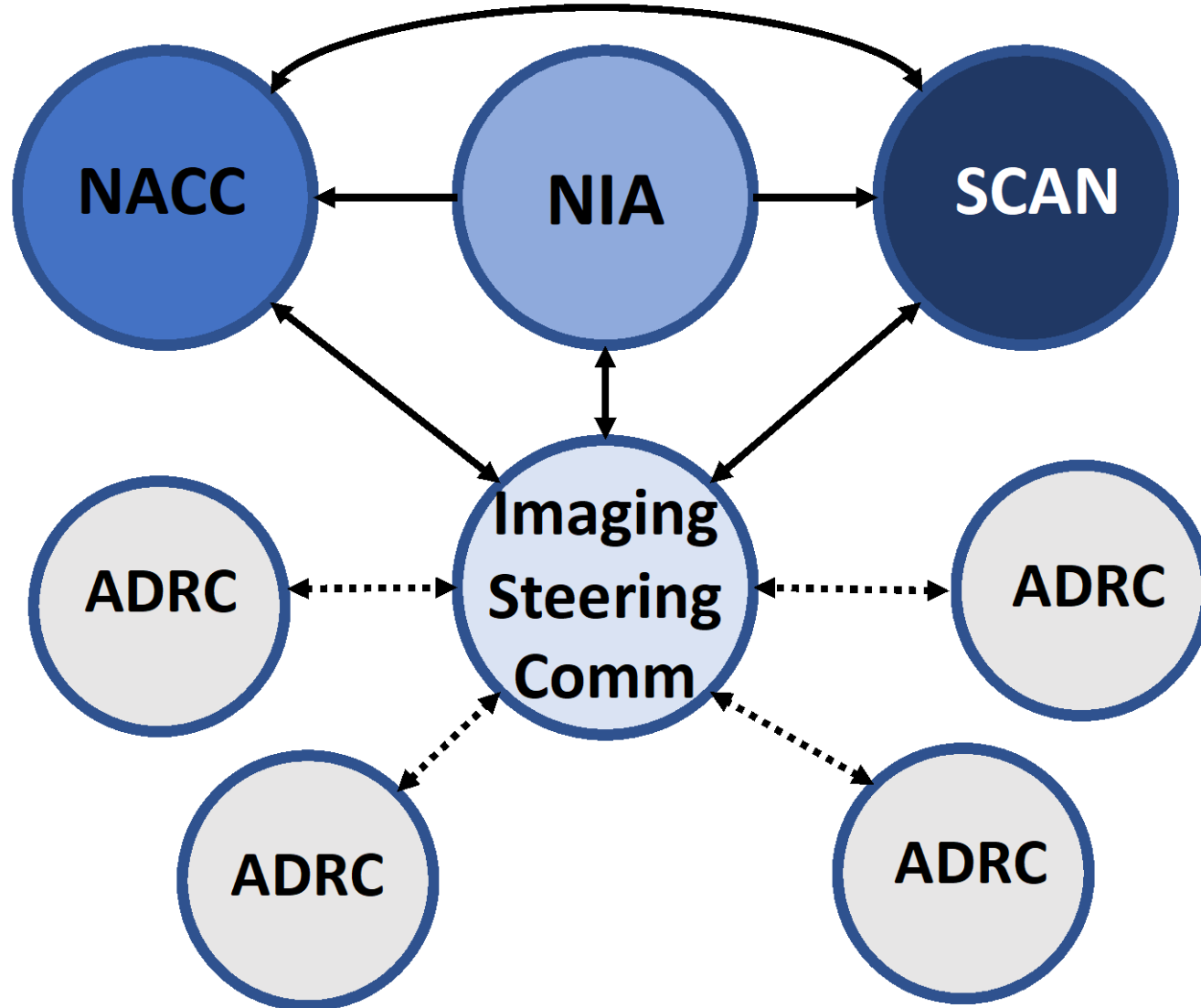
Kejal Kantarci

## MRI – UC Davis

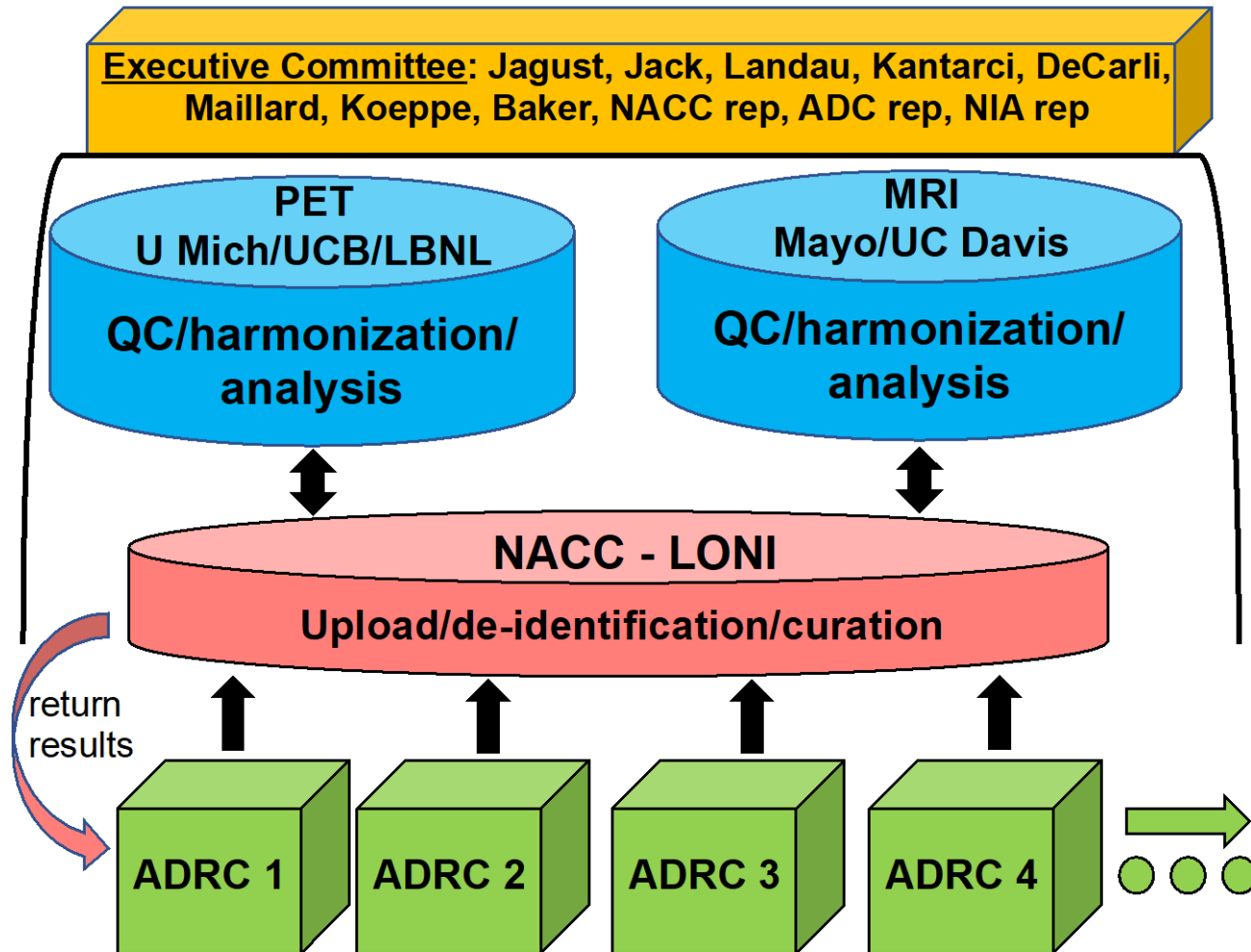
Charlie DeCarli

Pauline Maillard

# SCAN Administrative Interactions



# Organization and Roles, and Data Flow



**Data uploads from Centers to NACC**

**Michigan: PET QC/pre-processing**

**Mayo: MRI QC/pre-processing**

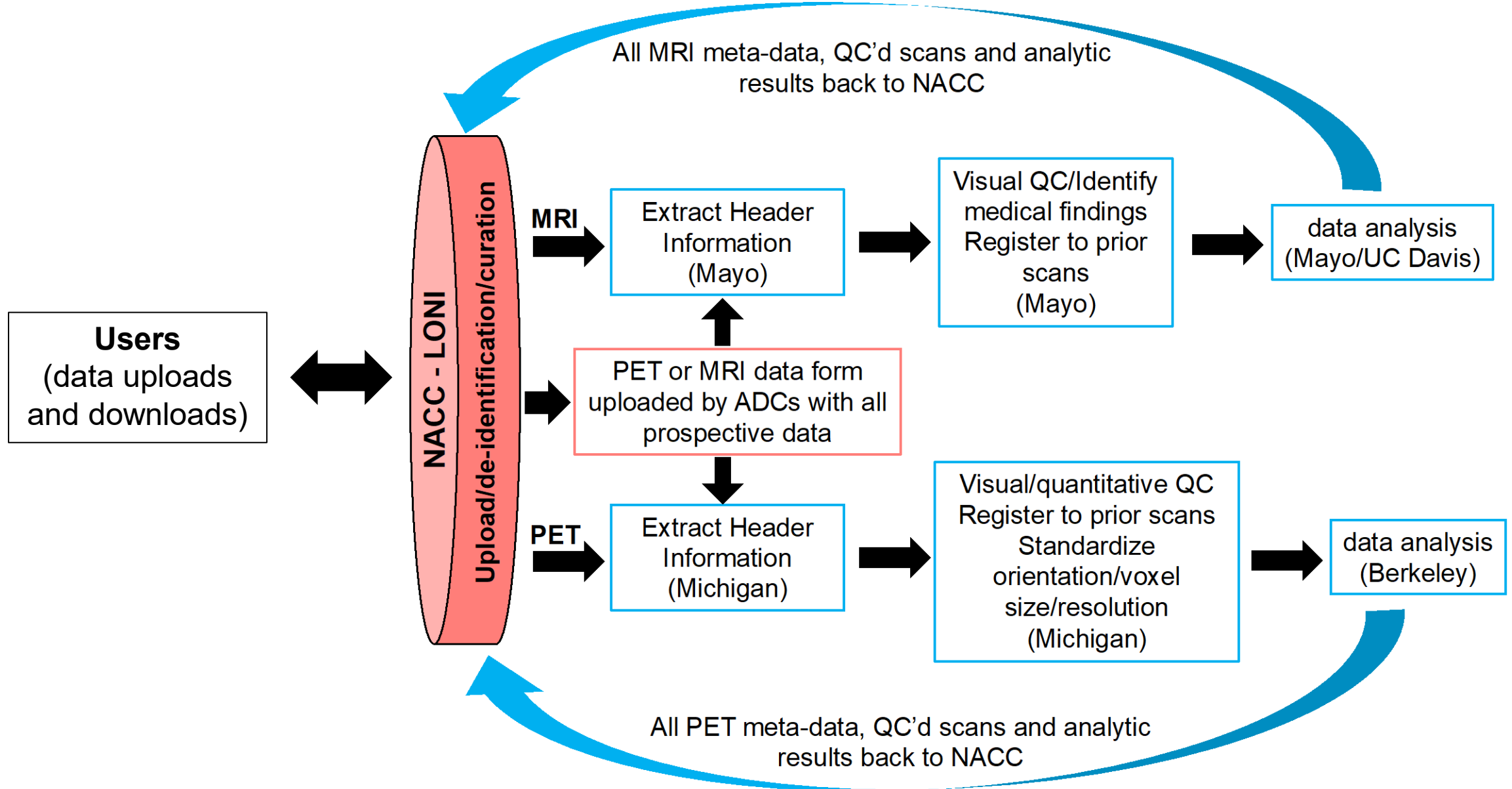
**UCB/LBNL: PET analysis**

**Mayo/UCD: MRI analysis**

**Results return to ADRCs via NACC**

**Oversight:** Executive Committee comprised of investigators, NACC, ADC representatives (Imaging Steering Committee), NIA representative (John Hsiao/Cerise Elliott)

# Data Flow



# **Standardization vs Innovation**

**SCAN investigators recognize the necessity for ADRCs to conduct single-center, investigator-driven, novel imaging research**

**For characterization of research participants in the A/T/N framework, widely accepted methods are available**

**In the immediate future, SCAN will focus on data acquisition and analysis for phenotyping participants in the A/T/N framework, using accepted best practices**

**As novel approaches become available, they will be incorporated into SCAN based upon the interests and needs of the ADRCs**



# **MR and PET Protocols**

**To be reviewed in PET and MR sessions**

**MR: Basic required acquisition (10 min)**

**Optional additions**

**PET: Amyloid, Tau, FDG standardized frames**

# Data Analysis: MRI

## UCD (basic)

FreeSurfer analysis of cortical thickness, regional volumes

White matter hyperintensity volumes

## Mayo (optional)

Cerebrovascular lesions (infarction/cerebral microbleeds)

DTI measures of FA and MD

CBF maps from ASL data

Resting state fMRI analyses pending

# Data Analysis: PET

## Amyloid PET

Regional (FreeSurfer based) SUVRs

Centiloid Conversion of all data

Amyloid positivity based on accepted thresholds

## Tau PET

Regional FreeSurfer based SUVRs

Aggregate summary ROIs (Braak stages, meta-ROI)

## FDG-PET (Depending on need)

FreeSurfer based SUVRs

Atlas-based spatial normalization with calculation of SUVRs in meta-ROI

# **Data Curation**

**All data to be available at NACC, linked to subject IDs**

**Images available via NACC/LONI**

# Support Functions

**One goal of SCAN is to enable high quality imaging across all ADRCs including those with limited experience to date**

**Web-based documentation of protocols and procedures/FAQs**

**”Help desk” with online (not real-time) responses to questions**

# Work Schedule

**Finalize Acquisition Protocols**

**Work with ADCs to establish data collection**

**Finalize data flow process (ADCs → NACC, NACC → analysis groups)**

**Data uploads in a limited number of test ADCs**

**Develop website/help functions**

# **For Discussion: NIA Administrative Supplements**

**SCAN will circulate a document outlining substantive requirements:**

**Acquisition protocols**

**Single scanner for all images**

**Upload requirements**

**Data availability**

**Acknowledgement of adherence to these standards can be documented in one of several different approaches**