

# CT-based Amyloid PET SUVR Generation Using a Reproducible Flywheel Workflow

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## Introduction

Amyloid PET quantification typically relies on MRI for anatomical registration and spatial normalization. However, MRI availability is limited in clinical and multi-site research settings, constraining scalability, and MR-free techniques do not always perform reliably. Computed tomography (CT), routinely acquired during PET/CT, provides a practical alternative structural modality. We developed and validated a CT-based workflow for amyloid PET SUVR generation that eliminates MRI dependency.

## Hypothesis

Implementing a standardized Flywheel workflow that automatically converts PET/CT data into motion-corrected, smoothed, cerebellar-normalized SUVR images and presents them within a predefined viewer protocol will provide a consistent, efficient, and reproducible method of amyloid PET visual interpretation. This will provide a consistent method that can be accessed from a single platform from multiple sites providing a consistency set of tools available to multiple sites.

## Methods

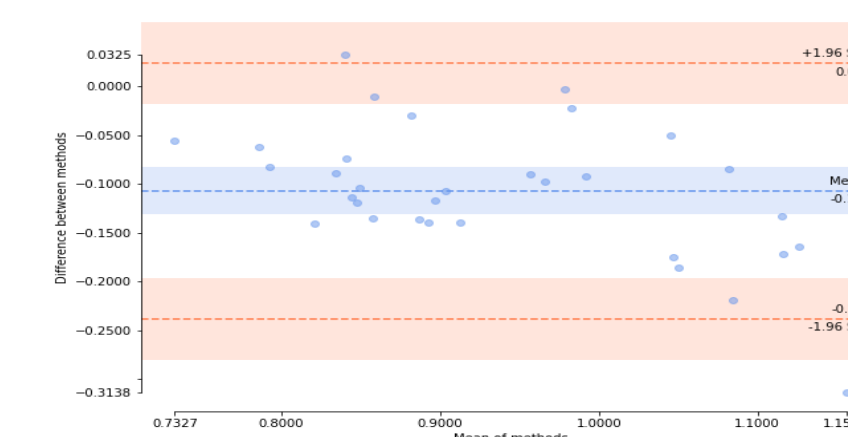
For this proof-of-concept study, n=35 amyloid PET exams acquired 50-70 minutes post-injection were analyzed. PET/CT studies were processed using an automated Flywheel workflow. CT images were converted from DICOM to NIfTI format and intensity normalized prior to registration to the MNI152 template using rigid, affine, and nonlinear (SyN) transformations implemented in ANTs. The cerebellar gray matter reference region was transformed from template space into native image space for subsequent quantification.

Dynamic PET data were converted to NIfTI format, decay-corrected using DICOM-derived frame-specific correction factors, and motion corrected using rigid-body registration. Frames were summed to generate a static PET image and smoothed with a 7-mm full-width-at-half-maximum Gaussian kernel.

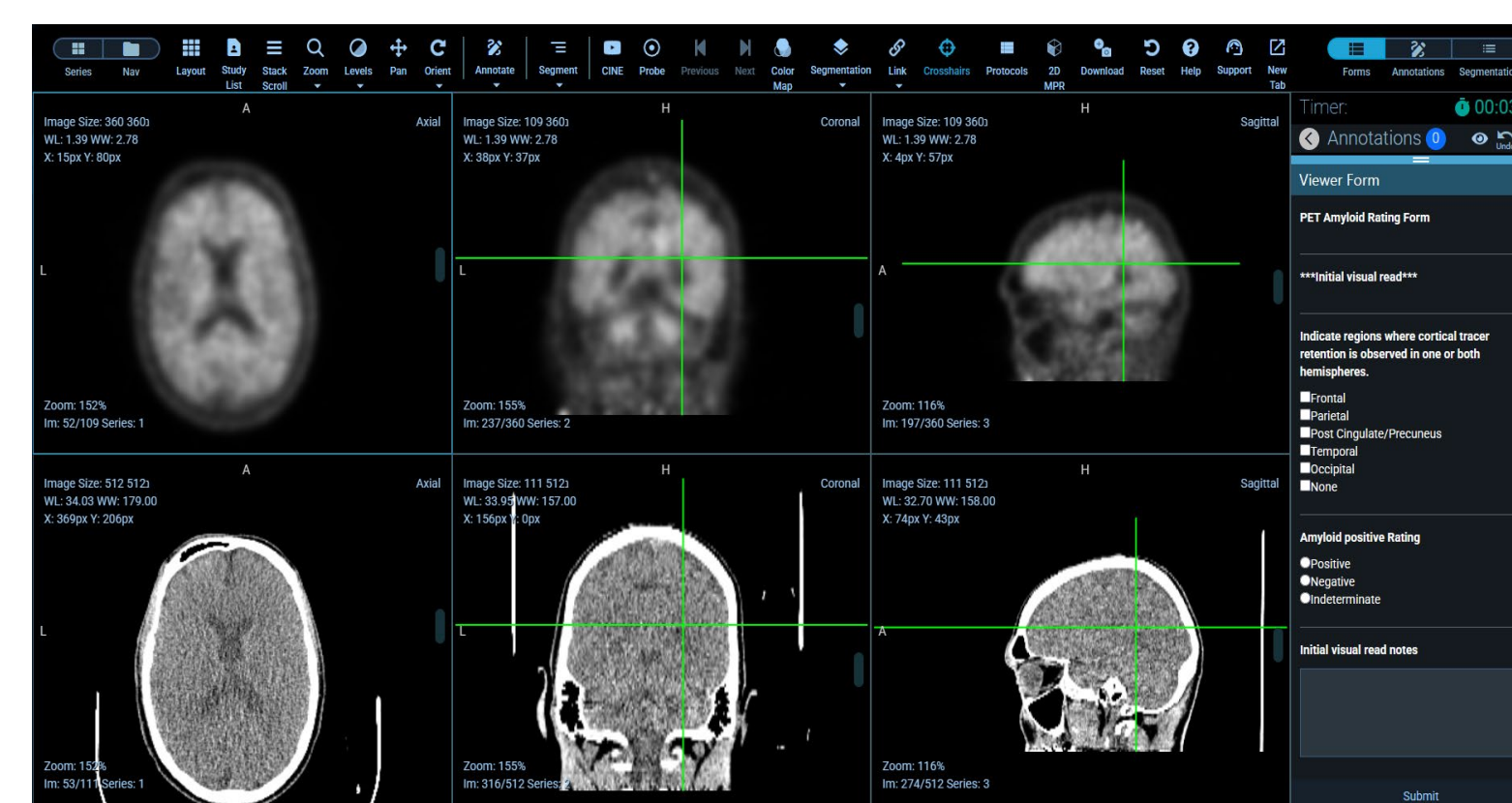
SUVR images were generated by normalizing voxel intensities to the mean uptake within a cerebellar gray matter reference region. Processed SUVR images automatically loaded into a Flywheel viewer protocol enabled amyloid visual assessment (amyloid positive or negative). This workflow provided an end-to-end pipeline from PET/CT acquisition through quantitative processing and visual interpretation.

## Results

CT-derived SUVR versus MR-based SUVR comparison: Processing was successful in all cases.



CT-derived global SUVRs demonstrated strong agreement with MRI-based measures ( $r > 0.82$ ) The workflow demonstrates reasonable consistency. However, there is a systematic underestimation ( $\sim 0.11$  SUVR) by the CT-based approach.



### Simultaneous PET and CT Review

- PET axial, coronal, and sagittal views (top row)
- CT axial, coronal, and sagittal views (bottom row)

### Configuration allows readers to:

- Localize areas of cortical tracer retention
- Confirm anatomic boundaries on CT
- Distinguish cortical uptake from white matter uptake
- Identify potential artifacts related to atrophy, motion, or attenuation correction

### Capture of read results in standardized form

- Consistent classification of visual read results
- Comparable across subject
- Free form field allows for subject specific details

## Conclusions

This proof-of-concept study demonstrates the feasibility of CT-based amyloid PET processing for SUVR generation without MRI. We will continue to optimize registration performance and validate this approach in larger, cohorts and across tracers to establish robustness and generalizability. The workflow is being prepared for deployment in platforms such as Flywheel.

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- Standardized Centralized Alzheimer's & Related Dementias Neuroimaging (SCAN)
- Laboratory of Neuro Imaging (LONI)
- National Centralized Repository for Alzheimer's Disease & Related Dementias (NCRAD)

This work utilized Advanced Normalization Tools (ANTs) ANTsX/ANTs for image processing and registration (Avants et al., 2009; Tustison et al., 2021)