Efficient Imaging Data Management for Enhanced Research Collaboration

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Background/Problem Being Solved

Current workflows for managing research imaging data are error-prone, non-standard, and usually unsuitable for modern large-scale projects. These limitations impede data analysis, sharing, integrity, and reproducibility, crucial for advancing medical research.

Intervention(s)

The project introduces a two-phase workflow designed to optimize the operational processes for research imaging data management:

1. Data Capture and Anonymization:
Imaging data in RAW and DICOM formats are directly captured from MRI scanners, guided by user-specified parameters. Anonymization tools ensure compliance with privacy regulations at the scanner level before secure transfer to a staging area. Opting in by specifying individual exams rather than bulk captures reduces bandwidth strain and aligns with system limitations, making the process scalable and efficient.

2. Ingestion to Data Warehouse:
Data in the staging area is efficiently organized and pre-processed before entering the data warehouse. A single-command workflow allows users to initiate ingestion with just the exam number on MRI scanners, simplifying adoption for MR technologists. The containerized pipeline categorizes and ingests data securely into the centralized warehouse, ensuring streamlined access to organized datasets while minimizing redundancy.

Barriers/Challenges

Managing vast imaging datasets, such as tens of gigabytes of data per study and hundreds of thousands of images, places significant strain on systems. These challenges are further compounded by network bandwidth limitations and outdated infrastructure, which hinder secure, efficient data transfer, and storage.

Outcome

Initial findings indicate expedited workflows and enhanced data accessibility for downstream processing and analysis. This automated workflow improves operational efficiency, reduces data handling errors, standardizes processing, and supports collaboration and reproducibility.

Scientific Research & Applied Informatics Posters and Demonstrations

Conclusion/Statement of Impact/Lessons Learned

This approach addresses key challenges in imaging data management, enhancing security, accessibility, and operational efficiency. By enabling easy exam-specific data capture and efficient staging processes for ingestion to data warehouse, it makes large-scale imaging research feasible and adaptable to other modalities like PET/MRI and CT.

Keywords

Administration & Operations; Clinical Workflow & Productivity; Enterprise Imaging; Imaging Research; Security; Storage