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Bridging the gap: integrating Deep Brain Stimulation imaging and clinical data in a unified data management system

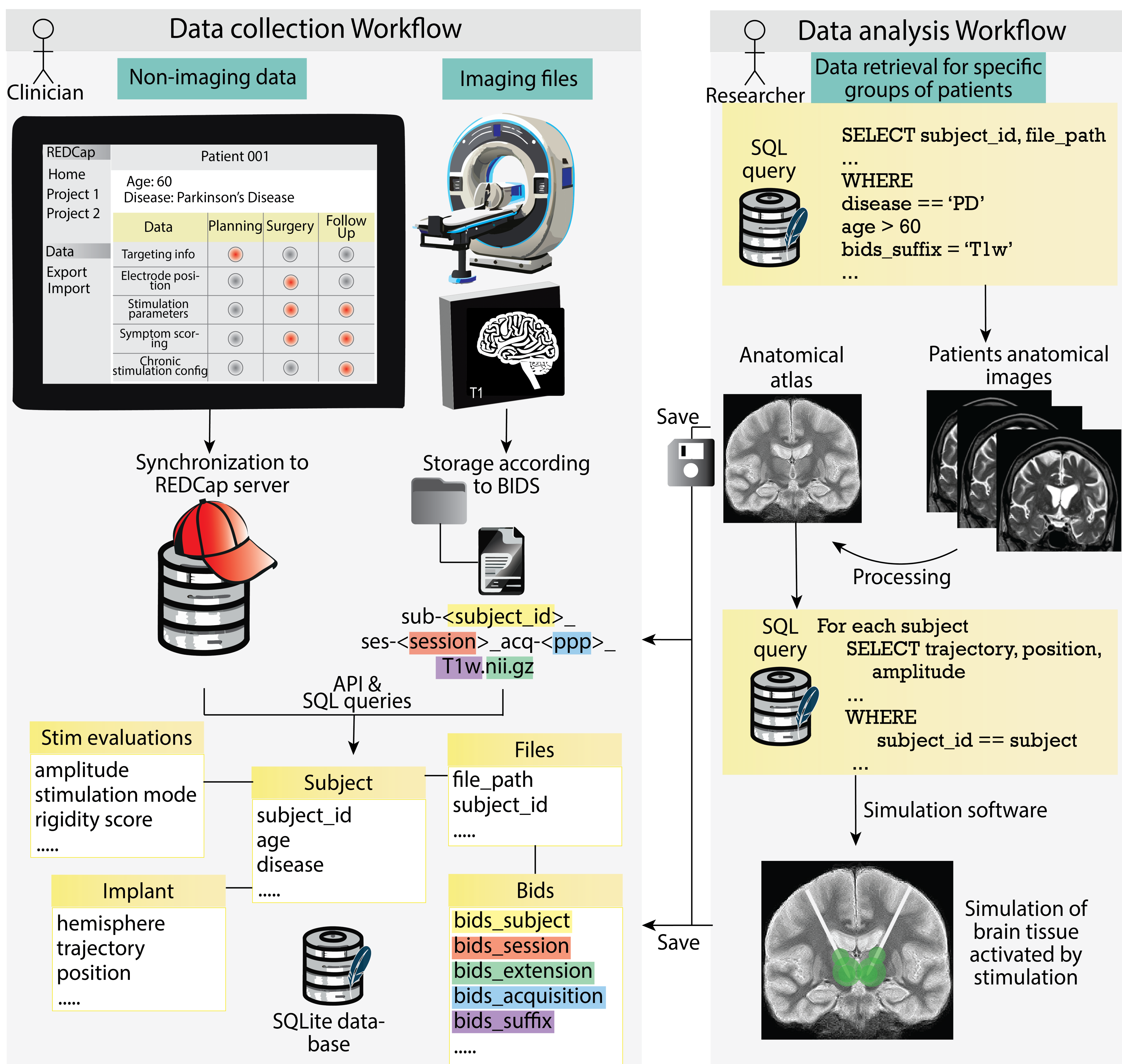
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Introduction

- ❖ Deep Brain Stimulation (DBS) research faces challenges in managing the heterogeneous data types generated during the patient's journey (e.g. clinical evaluations, medical images).
- ❖ This work proposes a framework for enhanced metadata capture leveraging Brain Imaging Data Structure (BIDS)[1] as standardized file structure and Research Electronic Data Capture (REDCap)[2] for validated data collection in hospital settings.
- ❖ BIDS and REDCap limitations are overcome through their integration with SQLite, a lightweight relational database management system.

Data type	REDCap	BIDS
Clinical	✓	✗
Image	✗	✓

Materials and Methods



The system caters to two primary user groups: clinicians and researchers.

Clinical (non-imaging) data management

- ❖ Collection via structured forms within REDCap.
- ❖ Transfer into SQLite database

Imaging data management

- ❖ Storage and transfer in the anonymized DICOMDIR format.
- ❖ Conversion into the Neuroimaging Informatics Technology Initiative (NIFTI) format
- ❖ Storage in a BIDS-compliant directory structure
- ❖ Establishment of image references within the SQLite database

Results

Data collected by 2 medical institutions with the proposed system was successfully fed to DBS processing pipelines.

Captured data	Database structure
University Hospital Basel	28 tables
University Hospital Clermont-Ferrand	230 data fields
107 patients	33 relationships
~35 imaging files per patient	

Discussion and Conclusions

The presented framework enables:

- ❖ Data collection and streamlining from clinics to research centers
- ❖ Heterogeneous data management and detailed metadata capture
- ❖ Data retrieval through a unique interface

It facilitates deeper and more efficient DBS research, potentially leading to improved clinical decision-making and patient outcomes.

Acknowledgments

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