Fellowship in Clinical Artificial Intelligence - Dr Ashiv Patel

Supervisor - Professor Declan O'Regan

Predicting Thoracic Aortic Aneurysm Progression with Artificial Intelligence

Background and Aim

Background: Thoracic aortic aneurysms (TAA) are life-threatening conditions with rising prevalence as the UK population ages. Current international guidelines for intervention rely on measuring aortic diameter by hand on surveillance imaging and applying a guideline-driven threshold for surgery even though 60% will rupture below this cut-off.

Aim: We aim to address this unmet clinical need for better prognostication by developing software that will analyse each patient's imaging to produce a 3D digital model of their aorta, predict the evolution of TAA growth over time, and provide an individualised assessment of risk of rupture. This virtual representation serves as a dynamic digital counterpart of aneurysm evolution and could be transformative in the evidence-based care of patients with TAA.

Data Procurement and Curation

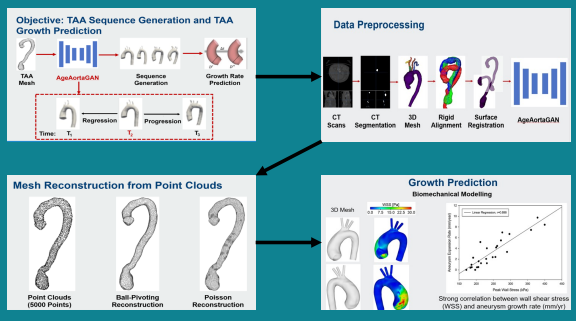
CT aorta whole/ CT aorta thoracic/ CT aorta abdominal performed at imperial College Healthcare NHS Trust between 01/01/2018 and 01/01/2023 (n=10,034)

Training data set (n=500)

Inclusion:
Diagnosed with a TAA
A minimum of two scans at different timepoints

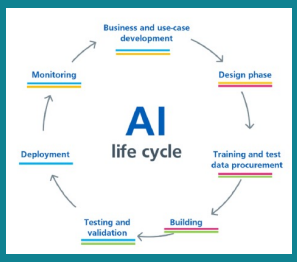
Exclusion:
Patients who have undergone any vascular procedures on the thoracic aorta or heart muscle
Patients with collagen-based disorders
Patients with dissections, aortic ulcers, intra-aortic thrombi, or hematomas

The Algorithm



Next Steps

- Data curation of scans performed between 01/01/2013 and 31/12/2017
- Data curation of scans performed at partner research centres
- Collection of biomechanical data for included subjects
- Algorithm refinement
- Deployment

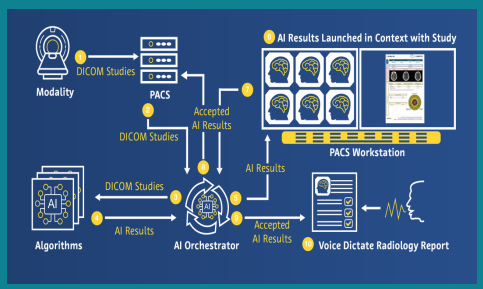


Implementation of Bayer Calantic Artificial Intelligence Applications

Aim

To develop, test and deploy the Bayer Calantic artificial intelligence apps across Charring Cross and Hammersmith Hospitals. Onboarding a selection of healthcare professionals working within the radiology department and considering feedback from teams involved in the apps use cases.

How it works



An orchestrated suite of AI radiology solutions that will focus on quality of care today and help transform radiology tomorrow. Our cloud-based marketplace, with service line AI apps, are integrated into the radiologist's workflow with the Calantic Viewer integrated in the PACS viewport.

Developed by radiologists for radiologists, Calantic takes previous fragmented and unrelated app solutions and coordinates them into a single convenient marketplace. Vetted with Bayer's expertise, to ensure the feasibility and reliability of third-party solutions.

Examples of Apps

Outcome

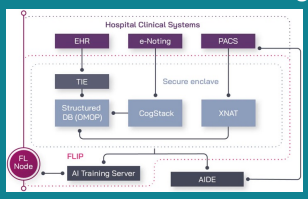
The Bayer Calantic suite of apps were successfully launched on test PACS and subsequently the trust live PACS and valuable feedback was gained from relevant clinicians.

Implementation of FLIP and AIDE at Imperial College Healthcare NHS Trust

Aim

To seamlessly integrate the FLIP and AIDE platforms into the clinical workflow at Imperial College Healthcare NHS trust.

FLIP - Federated Learning Interoperability Platform



Links data from multiple NHS Trusts to enable AI at scale.
It is comprised of three parts:

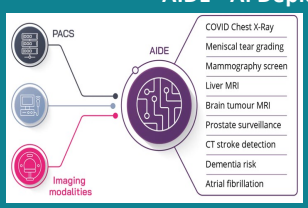
Secure Enclaves
Secure data storage that keeps sensitive patient data inside the Trust.

Federated learning
Brings algorithms to the data within each NHS Trust's secure enclave. The model is then applied within each secure enclave, where it learns from the data, is updated again, and the process repeated until an improved consensus model is created.

Interoperability and data harmonisation
Ontological and data interoperability standards are used to structure the data and make it actionable.

How FLIP adds value
Ensures a high level of fidelity in AI output models compared to traditional aggregative data strategies because the data it trains on does not need to be anonymized before use.
FLIP also allows adherence to each Trust's governance and data privacy regulations and ensures that models are scalable in full compliance with international laws and guidance.

AIDE - AI Deployment Engine



An intelligent tool that allows healthcare providers to deploy AI models safely, effectively, and efficiently by enabling the integration of AI models into clinical workflows.

AIDE connects any AI product to the entire patient record without requiring additional hardware or installation each time a new product is delivered into the clinical workflow.

Once clinical data has been analysed by an AI, the results are sent to the electronic patient record to support clinical decision making, such as prioritising reporting or diagnosis.

The platform can receive a live stream of clinical data, allowing clinicians to access near real-time AI analysis within seconds.

How AIDE adds value
AIDE allows multiple algorithms to run simultaneously through bespoke Application Programming Interfaces (APIs).
This provides NHS Trusts with the capability to run multiple AI solutions for day-to-day clinical care.
AIDE lowers the barrier to deploying clinical AI allowing individual Trusts to speed up the AI transformation of patient pathways.

Outcome

FLIP and AIDE are now operational across Imperial, and clinicians are being given access to the platform to augment healthcare provision.

If you would like to follow up on any of the information provided in this poster, please either email: ashiv.patel1@nhs.net or scan the QR code below: