

**Project title:** Development of cancer triage pathways and multi-centre evaluation of Rapid Diagnostic centres

**Project Summary:** Rapid Diagnostic Centres (RDCs), recently implemented across all cancer alliances, enable earlier and faster diagnosis in patients with non-site specific cancer symptoms. Earlier diagnosis improves chances of cure or long-term survival, enhances patient experience and contributes to the effective utilisation of resources. However, implementation of diagnostic tests differs across RDCs and currently patients are exposed to a variety of biomarker tests, including innovative but single modality biomarkers such as ctDNA that will not deliver across all tumour types and are often limited in early stage disease.

Leveraging patient information from both pan-London and national RDC datasets, the project will apply state-of-the-art ML techniques to discern intricate patterns and relationships among various diagnostic tools, novel biomarker tests (e.g. ctDNA, exosomes, breath), and symptom profiles. Utilizing supervised learning algorithms, such as gradient-boosting ensemble models and deep neural networks, we aim for high predictive accuracy in determining the likelihood of a cancer diagnosis based on the specified feature set. Feature importance techniques will enhance our ability to pinpoint the most predictive diagnostic tools and symptom profiles, streamlining the journey towards optimal cancer triage pathways. Unsupervised causal ML techniques can assist in segmenting patients based on their diagnostic profiles and will be considered.

To mitigate the risk of the slow and variable adoption of our new ML-informed cancer triage pathways, we will leverage well-established "Implementation Science" methodologies, such as CFIR framework and Normalization Process Theory, to systematically inform our understanding of key contextual factors and mechanisms underlying the successful implementation of our innovation in RDS. We will develop tailored implementation strategies to overcome anticipated barriers to uptake and the scaling-up and sustainability of our new ML-informed cancer triage pathway.

By integrating these advanced methodologies, the ambition is to provide evidencedriven insight into the diagnostic processes within RDCs, with a focus on enhancing their efficiency.

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**Clinical Specialities: N/A**