Project title: Intelligent adaptive radiotherapy for pelvic malignancies

Project Summary: This project will leverage the installation of state-of-the-art tomotherapy with fully integrated adaptive software at the Royal Marsden Hospital Sutton to develop, design and deliver clinical trials of online adaptive radiotherapy in pelvic cancers.

In 2024, the Royal Marsden will one of the first institutions worldwide to receive 2 Radixact linear accelerators with enhanced extended field imaging, coupled with Raysearch Artemis online adaptive workflow software. This advance provides the opportunity to optimise and individualise each fraction of radiotherapy through adaptation of the treatment plan in real time. The aims of this project will be to develop systems and workflows for utilisation of this technology in gynaecological and urological cancers, with subsequent development of studies to test the downstream clinical benefits.

Specifically, the programme will include projects to:
1. Assess, optimise, and refine kV imaging acquisition for pelvis
2. Automate target and OAR delineation and radiotherapy treatment planning for gynaecological and urological radiotherapy treatment fields which include central and pelvic nodal targets
3. Operationalise workflows of online adaptive radiotherapy for pelvic cancers including education and training
4. Use dose accumulation strategies and NTCP modelling to study the dosimetric benefits of online adaptation
5. Use multivariate mathematical modelling of tumour, patient, and imaging characteristics to develop an algorithm to identify those most likely to benefit from online adaptive radiotherapy
6. Design and execute the first clinical trials using online adaptive workflows to implement dose escalation and hypofractionation in extended field pelvic cancer radiotherapy

Supervisory Team: Dr Susan Lalondrelle, Dr Julia Murray

Clinical Specialities: Clinical oncology