Background:

- Lung cancer is the most frequently diagnosed cancer worldwide.
- Survival remains poor for those with inoperable disease (median 28 weeks).
- Whilst the role of curative-intent radiotherapy (RT) is widely accepted, the thorax remains a challenging anatomical site to irradiate.
- New advanced radiotherapy technologies; stereotactic ablative radiotherapy (SABR), magnetic resonance image-guided radiotherapy (MR-Linac) and proton-beam therapy (PBT) have potential to yield substantial clinical benefits.
- However there are significant challenges for development, assessment and rational implementation within the NHS.
- ART-NET is a CRUK funded initiative comprising 7 workstreams across 5 UK centres (The Institute of Cancer Research/Royal Marsden Hospital (ICR), Leeds, Manchester Cancer Research Centre (MCRC), Oxford and University College London (UCL)).

ART-NET Goals:

- Accelerate clinical translation of SABR, MR-Linac and PBT around the theme of hypofractionated RT to provide an evidence based rationale across a range of tumour types.
- Develop/disseminate expertise in medical physics to lead development of planning/image guided solutions for these technologies.
- Implement methodologies for reliable treatment plan optimization on MR-images, acquired directly prior to or during treatment, enabling the clinical benefit of MR-guided SABR and MR-Linac to be fully exploited.
- Co-ordinate methodological developments in design and conduct of clinical trials to streamline assessments of new health technologies in specific tumours.
- Recommendations for development pathways for new RT technologies into practice-changing clinical trials.
- Assess feasibility/delivery of PBT and MR-Linac clinical trials including assessment of logistics and equipopule.
- Development of core outcome set; treatment, dosimetry, safety, efficacy, effectiveness, including electronic platforms for patient-reported outcomes.
- Support for clinical trial grant applications in core TSGs.

Workstreams:

1. MOTION MANAGEMENT
   - A key aim of ART-NET is to develop national treatment protocols and disseminate them across the UK, improving and harmonising practice.
   - Additionally, involvement of medical physicists, research radiographers and clinical research fellows in ART-NET will develop a skilled workforce that will be a huge asset for future radiotherapy research in the UK.
   - Ultimately this will improve patient access to state-of-the-art radiotherapy and increase recruitment into clinical trials.

Conclusion:

Traffic light Protocol:

- This is a project being undertaken within the motion management workstream 3 and is based on the traffic light system developed at the NKI (see fig 1).
- The aim is to develop a protocol to facilitate online radiographer review of cone beam computerised tomography (CBCTs) in patients undergoing lung SABR to assess organ motion and anatomical changes.
- This will assess the impact of these changes on PTV coverage and advise when to seek physics/clinical review.
- This will inform the need for plan adaptation nationally.

Figure 1 Examples of the Traffic Light Protocols developed at the NKI. a) CBCTs acquired prior to planning (green). b) Small changes (yellow). c) Planned alterations with PTV changes (orange).

Traffic light colors: Green, yellow, orange.

1. Frank Van den Heuvel, Carlo dose algorithms for photon and proton based (3D-10D) treatment planning CT. 