Clinical implementation of intraoperative radiotherapy

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Disclosures

The authors have no financial interests or relationships with any of the manufacturers or vendors of equipment described in this presentation, nor with any of the commercial supporters of the EPSM Conference.

Aspects of this project have previously been presented at the June 2023 ACPSEM QLD Branch PRIMPS Meeting.

Intraoperative breast radiotherapy

Intraoperative radiotherapy is the delivery of a dose of radiation during a surgical intervention – e.g. the resection of a breast tumour.

Assuming surgical margins are negative, the patient does not have external beam radiation therapy.

The Xoft Axxent system achieves this using a small 50 kVp x-ray source, which can be loaded into a variety of applicators.

For breast IORT, a balloon inflated to a diameter of 3 to 5 cm is inserted into the surgical cavity. 20 Gy is delivered to the surface, over a period of 5-15 minutes.

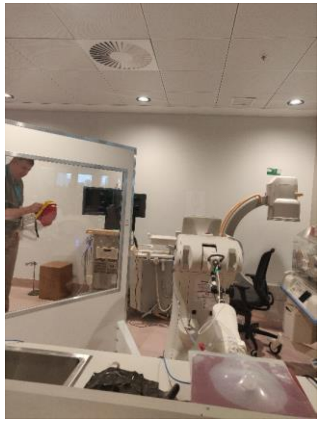
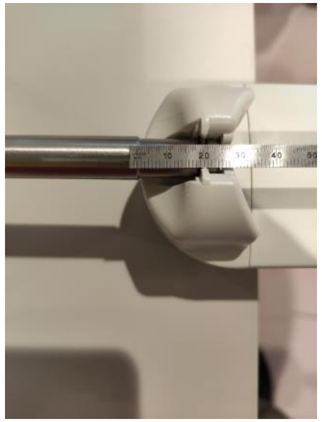
Intraoperative breast radiotherapy at Herston

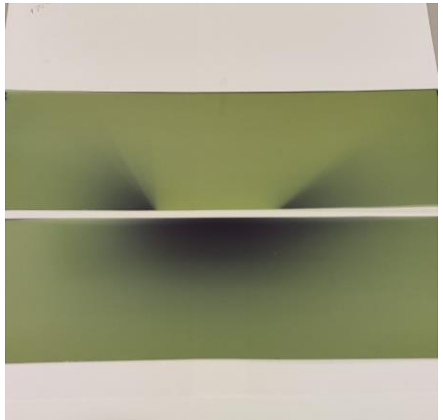
Our medical physics group (RBWH) were requested to support IORT at another facility on our campus, Surgical, Treatment and Rehabilitation Service (STARS), considered a separate hospital. This was done as part of a prospective 12 month trial of the system. This followed earlier discussions, technology assessments, applications for funding, etc. dating back to May 2018.

- **Feb 2021**: Breast surgeon interest in IORT
- **Jun 2021**: Organisational approval for IORT
- **Mar 2022**: Radiation plan submitted
- **Jul 2022**: Procurement approval for Xoft
- **Aug 2022**: Visit to Monash PMCC site
- **Oct 2022**: Xoft system delivered
- **10 Jan 2023**: Acceptance testing
- **11 Jan 2023**: Commissioning begins
- **18 Jan 2023**: Simulated treatment
- **19 Jan 2023**: First patient treatment

Commissioning process

Physics commissioning involved various radiation safety, mechanical and dosimetric tests, including the unit itself, the replaceable x-ray sources, shielding, and template plans.



Multidisciplinary team responsibilities

Royal Brisbane & Women's Hospital

- Radiation Oncologist: eligibility assessment, consenting, image approval, plan approval.
- Physicists: commissioning, QA, treatment planning and delivery, OIS documentation, source management, radiation safety.

Surgical, Treatment and Rehabilitation Service

- Surgeons: eligibility assessment, applicator placement, ultrasound imaging.
- Anaesthetists: attending, in room during Tx.
- Nurses: attending treatment, consumables, sterilisations, EMR documentation.

Challenges in implementation

- Cross-institution services are complicated.
- Delays with determining who was responsible for what, raised *after* purchase.
- Multiple versions of workflows and procedures by RBWH, STARS and MNHHS Safety & Quality teams.

Governance

- The funding of physics time needed to be solved by the HHS Executive.
- FTE estimates were produced from workforce survey, past experience, and discussions with PMCC staff.
- We were funded 0.4 FTE for 6 months to treat 20 patients.

Physics staffing

Challenges in implementation

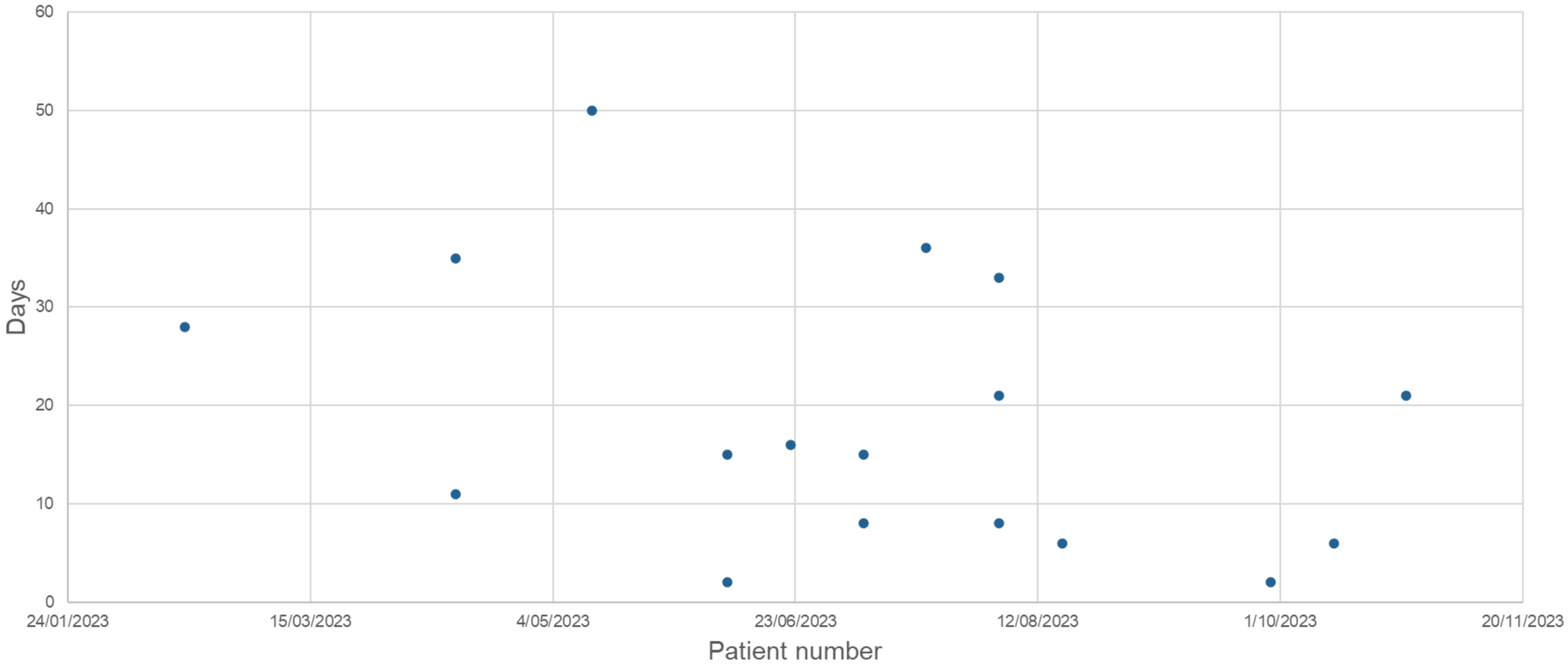
- Theatres and store rooms are in use during clinical hours, and daily QA time is limited to late afternoon to avoid disruption.
- Needed to arrange times to testing compliance of premises.
- Some minor delays with swipe card access for staff, meaning team had to arrive concurrently.

Access

- Advanced notice of upcoming procedures isn't polished. We have been told only a few days before surgery was scheduled.
- Procedures not at the start of a list, and multiple procedures in a day (particularly in different theatres) can result in ROMPs waiting in scrubs at STARS.

Scheduling

Notice of procedures



Challenges in treatment

- Physicists don’t have much to do at the start of the procedure: observation & documentation.
- Once the balloon is in and imaged, everyone is waiting on them. Planning, approval, calibration and insertion of the source, and shielding all happen quickly at that point.

Xoft system

- Alignment of balloon and the adjustable arm can require couch adjustment and repeated movement of the Xoft system.
- Nice placement of the flexible shielding on the patient is dependent on sterile field set-up, angle of applicator and curvature of surface.

Positioning

Successes in implementation

- The surgeon most involved in getting the service up and running was very passionate, and leveraged relationships to make things happen.
- We obtained a low energy chamber for independent dosimetry more easily than we could within our department.

Stakeholders

- Despite the infrequency, and changes in involved staff (esp. anaesthetists!), everyone feels comfortable asking questions and talking during procedures.
- Everyone is attentive, and offer help when they see the need – e.g. moving equipment or saving ultrasound images.

Communication

Successes in implementation

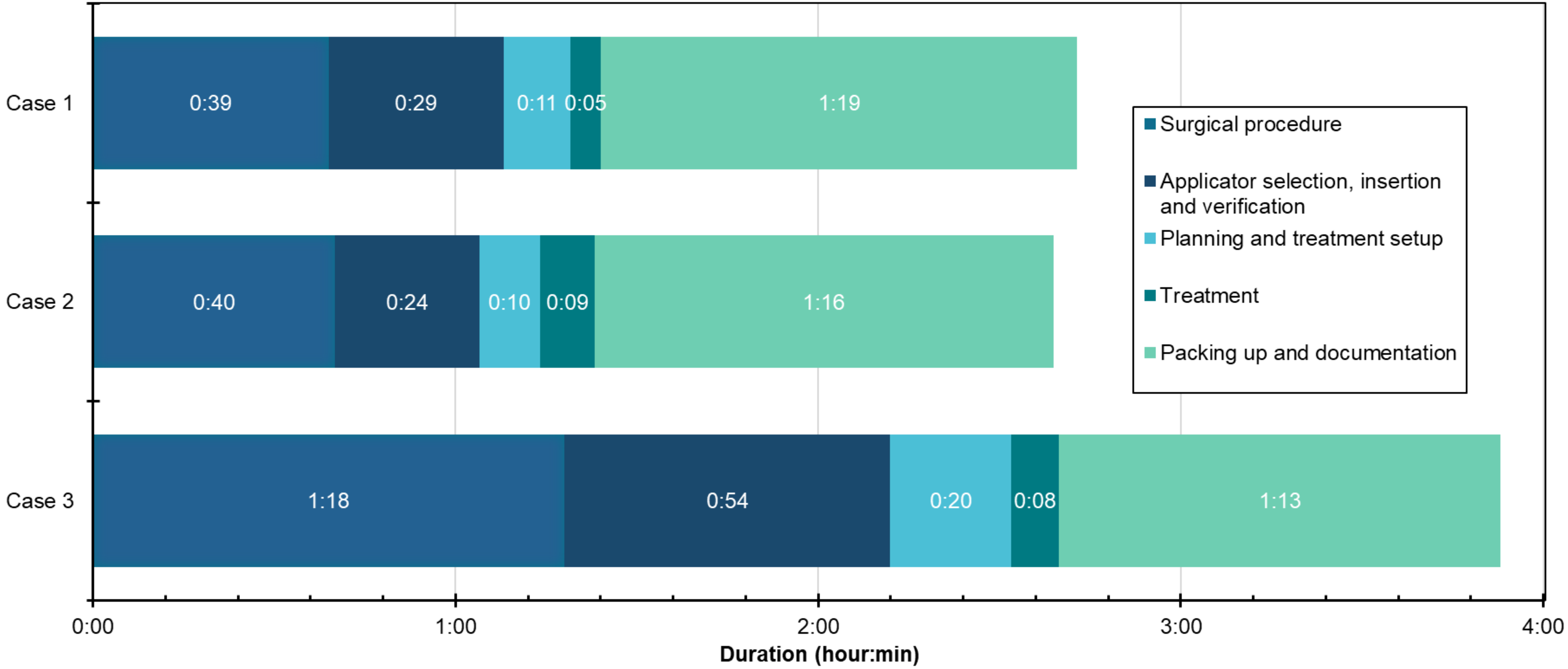
- The inclusion criteria have led to small treatment volumes, and reasonably consistent treatment volumes and times.
- This has meant relatively consistent "added times" due to the use of IORT – around 30 minutes. It may allow more streamlined planning in future.

Consistency

- The system itself is easy-to-use, with good safety features and user documentation. It is difficult to get wrong.
- Physicists felt comfortable with the system after a few uses.
- Peculiarities (e.g. using mm Hg, source calibration process) were not serious issues.

Simplicity

IORT procedure times



Conclusions

- Observing a procedure at another site and discussing what they had learnt from clinical implementation was incredibly valuable. Thanks to Tomas and Derrick for answering questions, and hosting a visit to the Monash department. Thanks to Prabhakar for the paper describing implementation at Monash.
- Despite challenges in governance, the introduction of IORT across hospital boundaries was successful, due to commitment of the different disciplines.
- Open lines of communication are critical to this. Be humble, ask questions, and raise concerns when you have them.