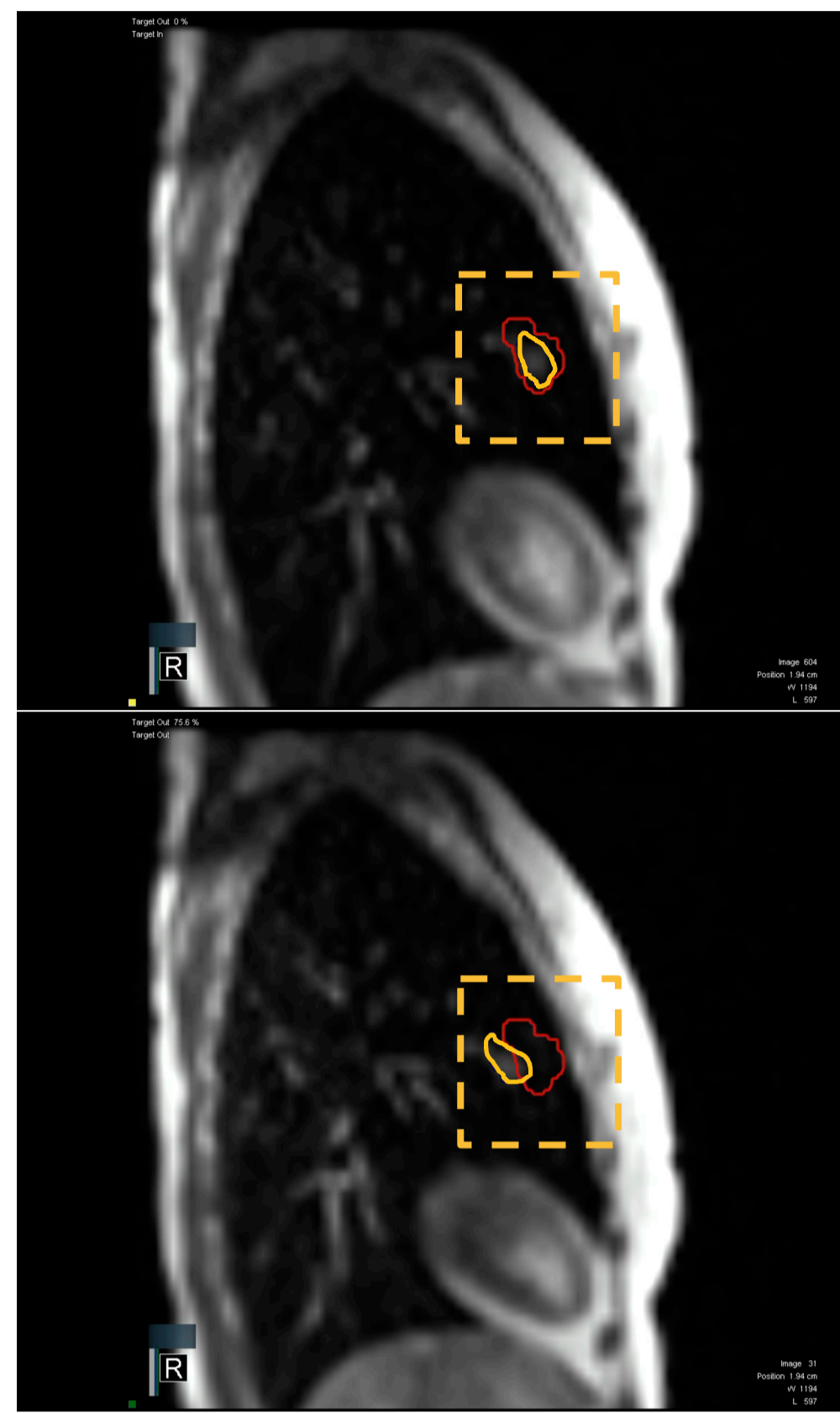


MRLINAC

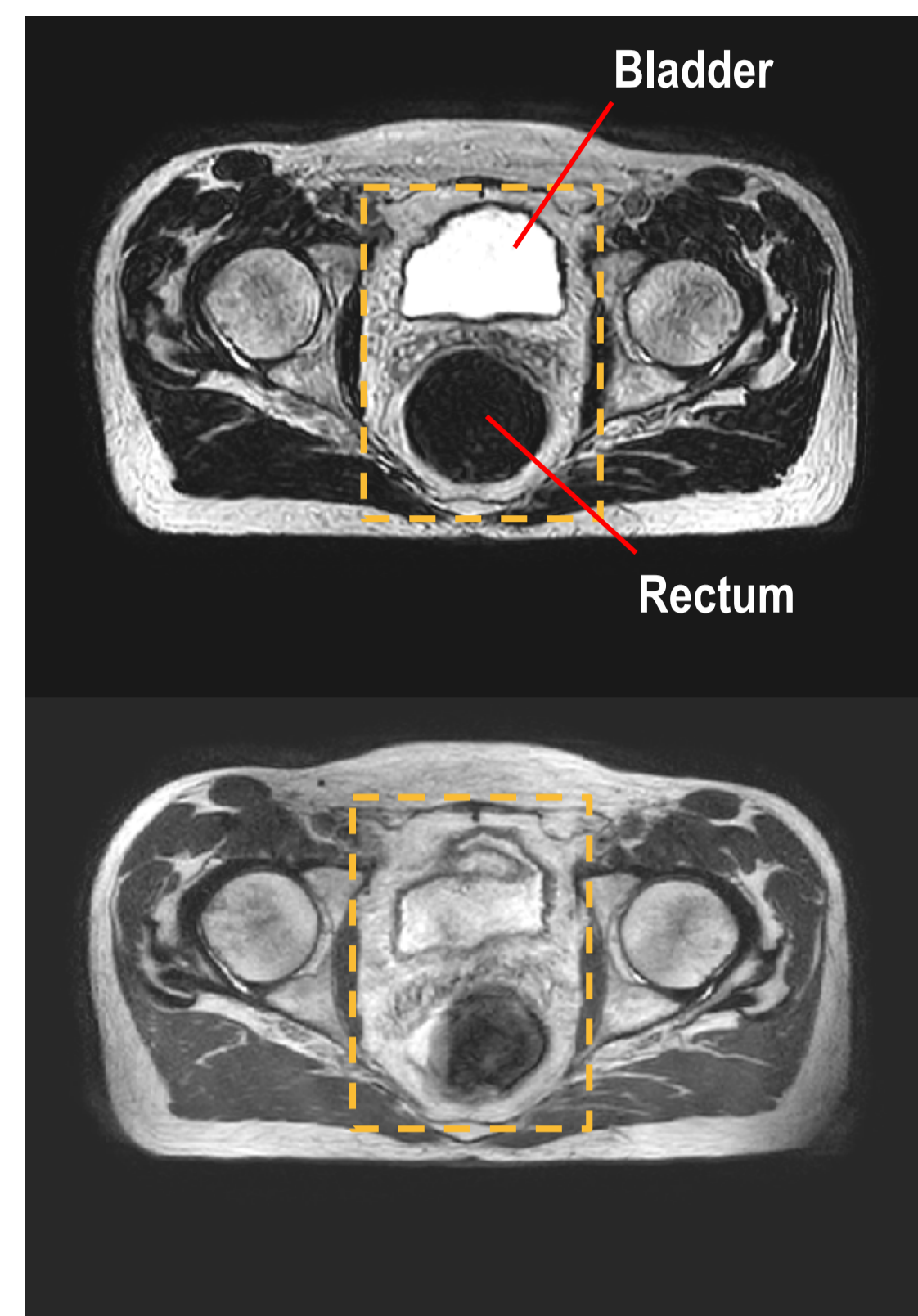
MRI Scanner + Linear Accelerator

Image Guided Radiotherapy for Cancer Treatment

Background



Real-Time 2D imaging
Monitor Respiratory Motion



Day-to-Day Organ Motion
Bladder Motion

The Magnetic Resonance Linear Accelerator (MR Linac) combines two technologies – a MR scanner and linear accelerator – to precisely locate tumours, tailor the shape of X-ray beams in real time and accurately deliver doses of radiation to moving tumours.

The location of tumours and organs within the body changes, for example a tumour in the lung will move up and down as a person breathes (respiratory motion), and a tumour in the prostate might move from day to day depending on what the person has eaten, or how full their bladder is - as seen in the scans, which shows how the bladder can change over the course of a 40-minute scan.

Constant monitoring of the patient during treatment will enable the most precise targeting of the tumour and help avoid healthy tissue.

MRLINAC

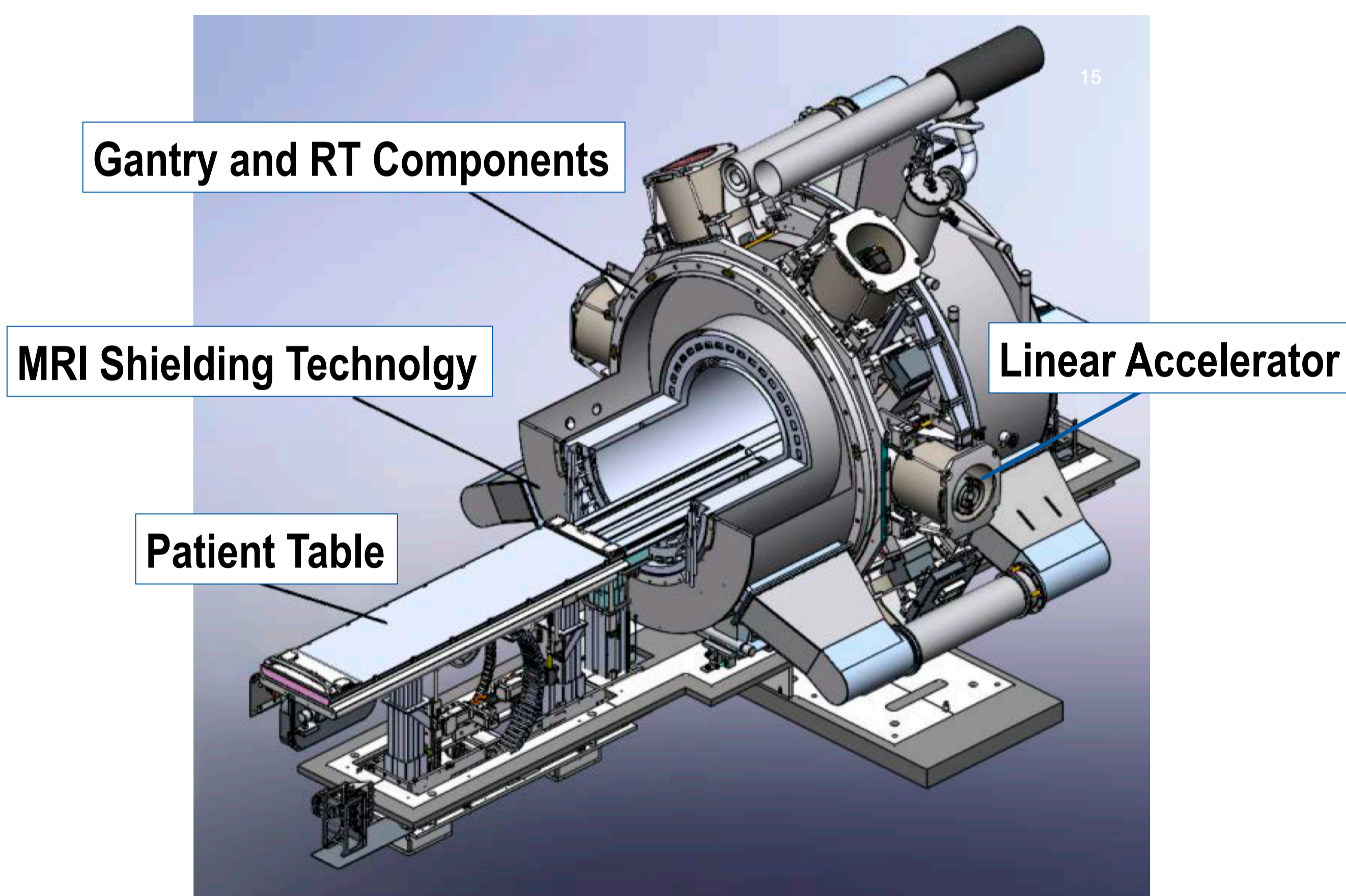
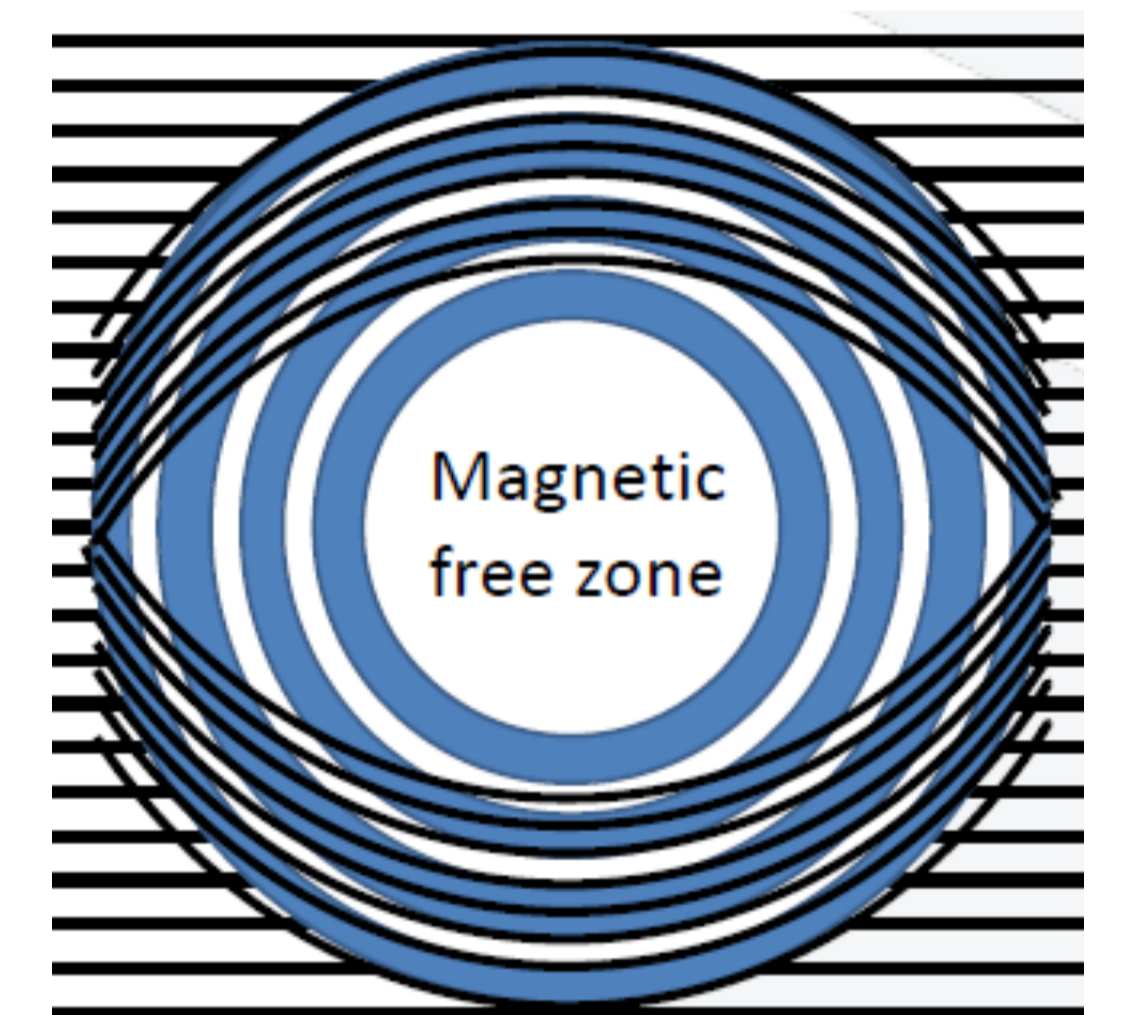
A typical MR-Linac has three main parts:

- Magnetic Resonance Imaging Subsystem(MRIS)
- Radiation Delivery Subsystem (RDS)
- Treatment Planning and Delivery Software (TPDS)

The main challenges for MR-Linacs:

- Delivering the ionized radiations with the presence of the strong magnetic field without deflection
- Acquiring the best image with minimum distortions in a homogenous field

With a specific gantry design, the linac has been shielded in a magnetic free zone, as seen in the image above, and also a uniform field is created to form images with the best quality possible (minimum noise), as in the bottom right picture.



Our Team

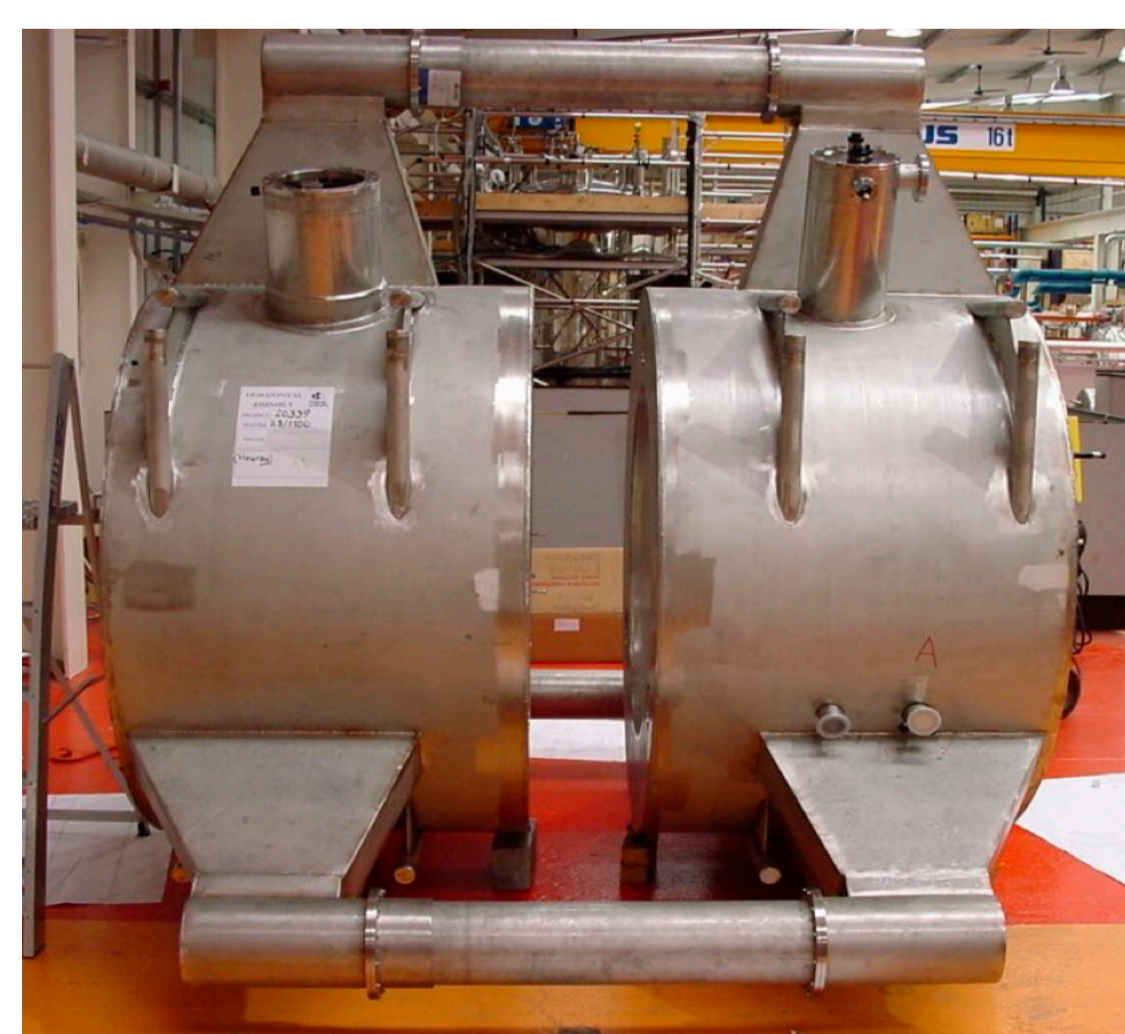
The Department of Radiation Oncology at the University Hospital Zurich(USZ) is the only department in Switzerland with an operating MR-Linac (MRIdian Linac from ViewRay) since April 2019. The MRIdian has a 0.345T split superconducting magnet with 6 MV linear accelerator.

At USZ, for every patient treatment with the MRIdian, there is a general workflow to follow, from positioning the patient to delivering the treatment, as seen in the graph.

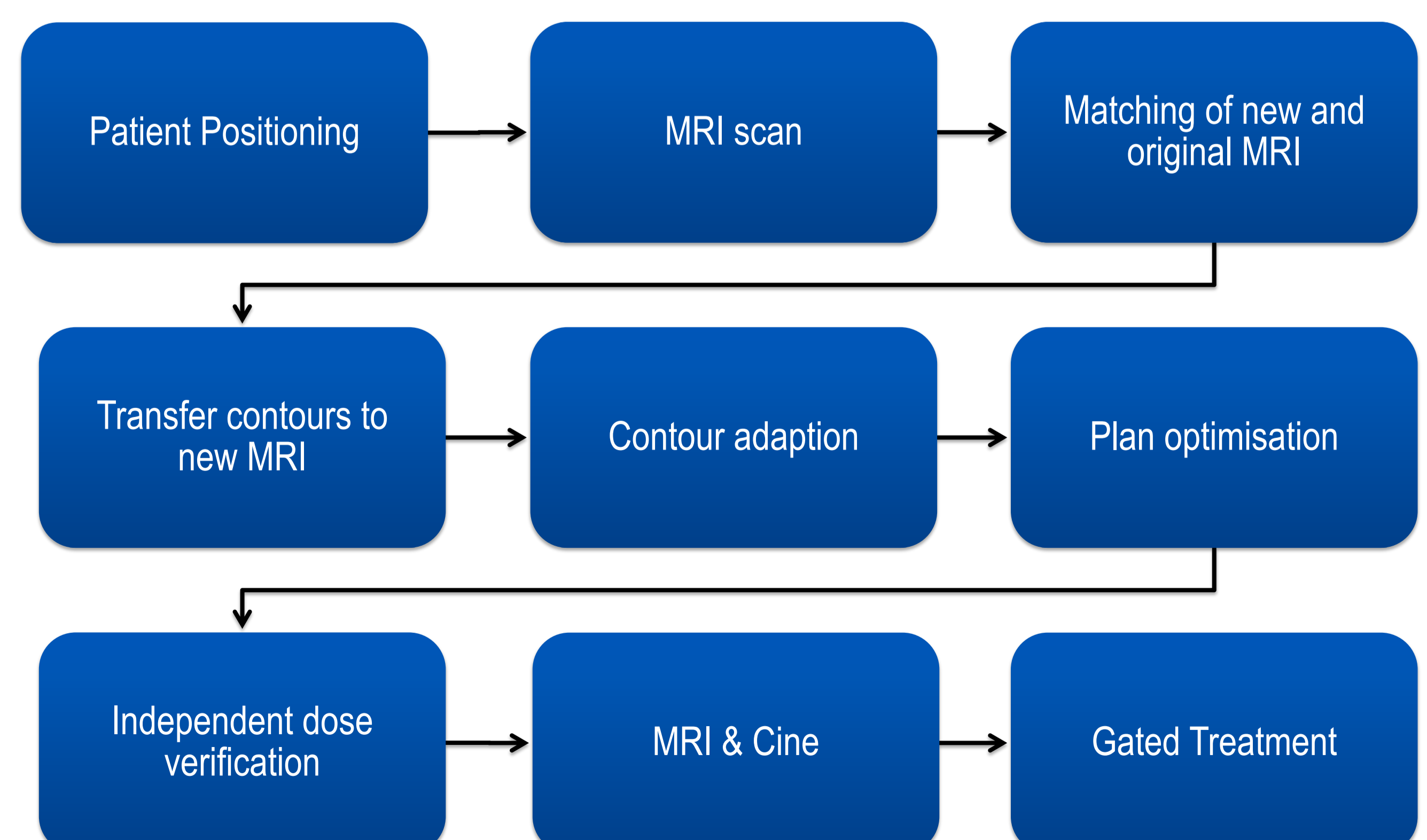
Already 65 patients have received their treatments with this machine with a very promising results. But there is always space for improvement for every step of the way to deliver the the treatments even better which some of the top research projects are about them in todays medical physics world.

Selection of ongoing Research Topics

- Motion Management
- Phantom Development
- Radiosurgery



split superconducting magnet



General Treatment Workflow with MRIdian