



MedAustron: Medical part

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Non-clinical research

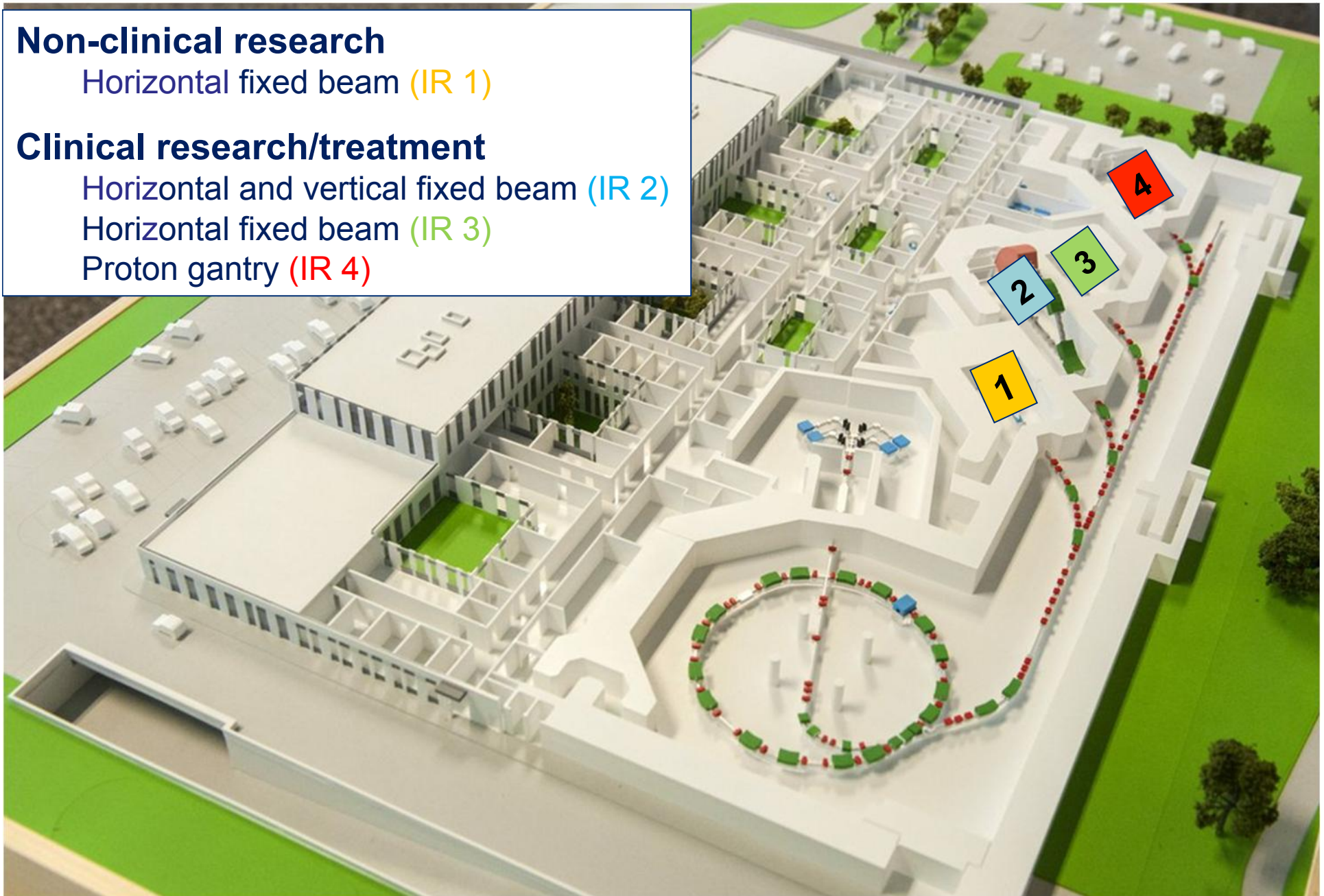
Horizontal fixed beam (IR 1)

Clinical research/treatment

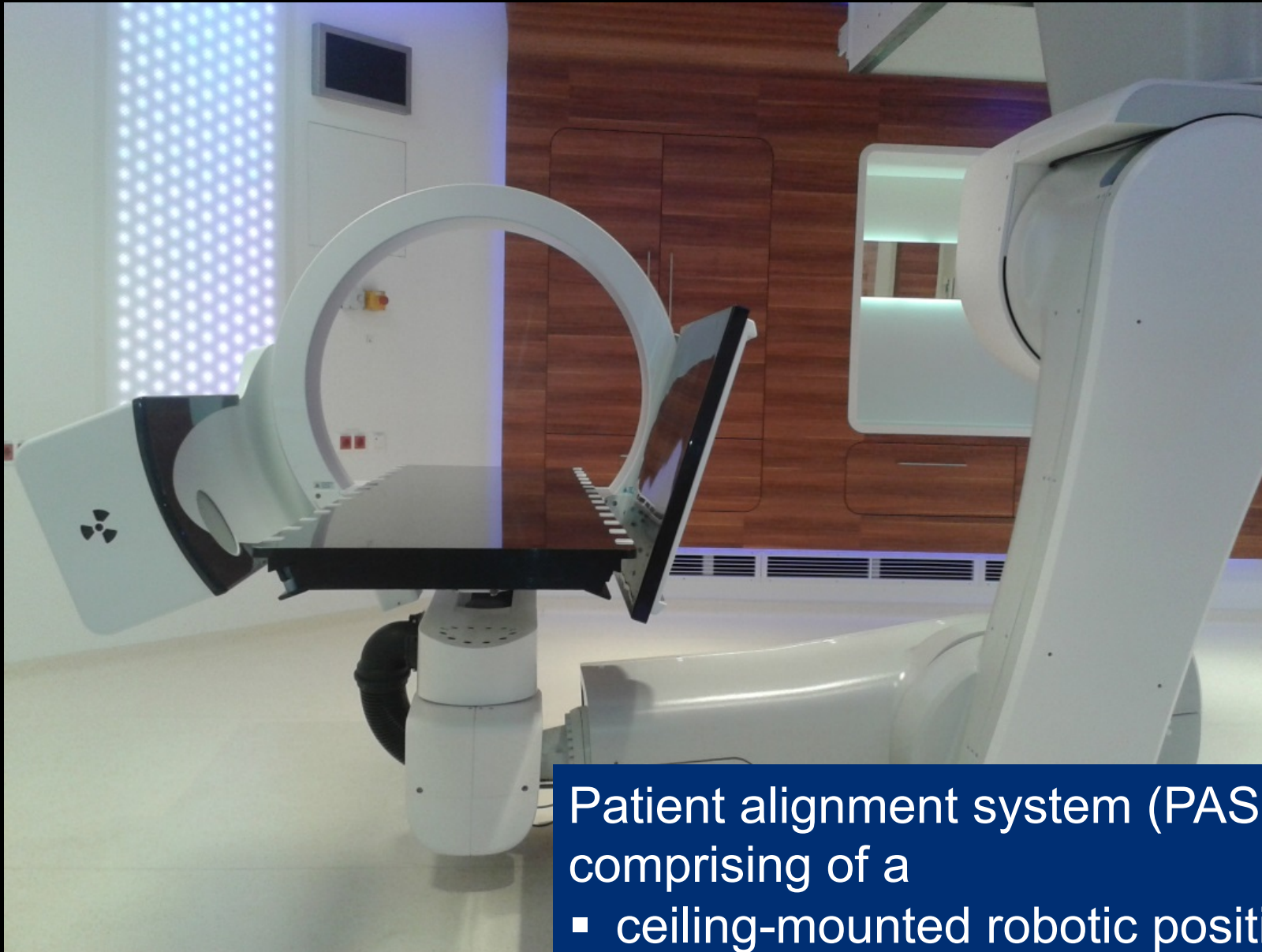
Horizontal and vertical fixed beam (IR 2)

Horizontal fixed beam (IR 3)

Proton gantry (IR 4)

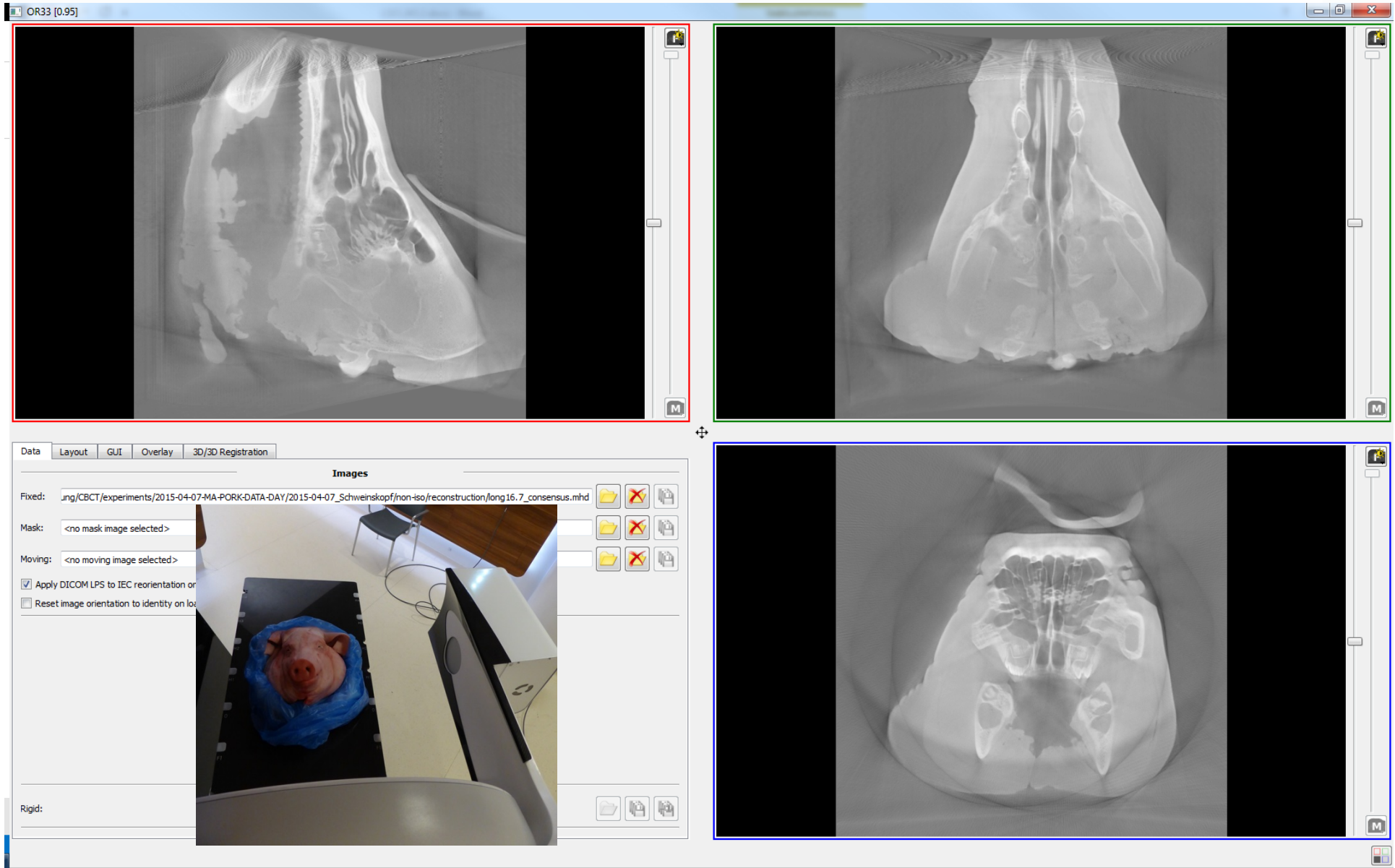






- Patient alignment system (PAS)
comprising of a
- ceiling-mounted robotic positioner
 - imaging ring device
 - collision avoidance system

CBCT Herbert



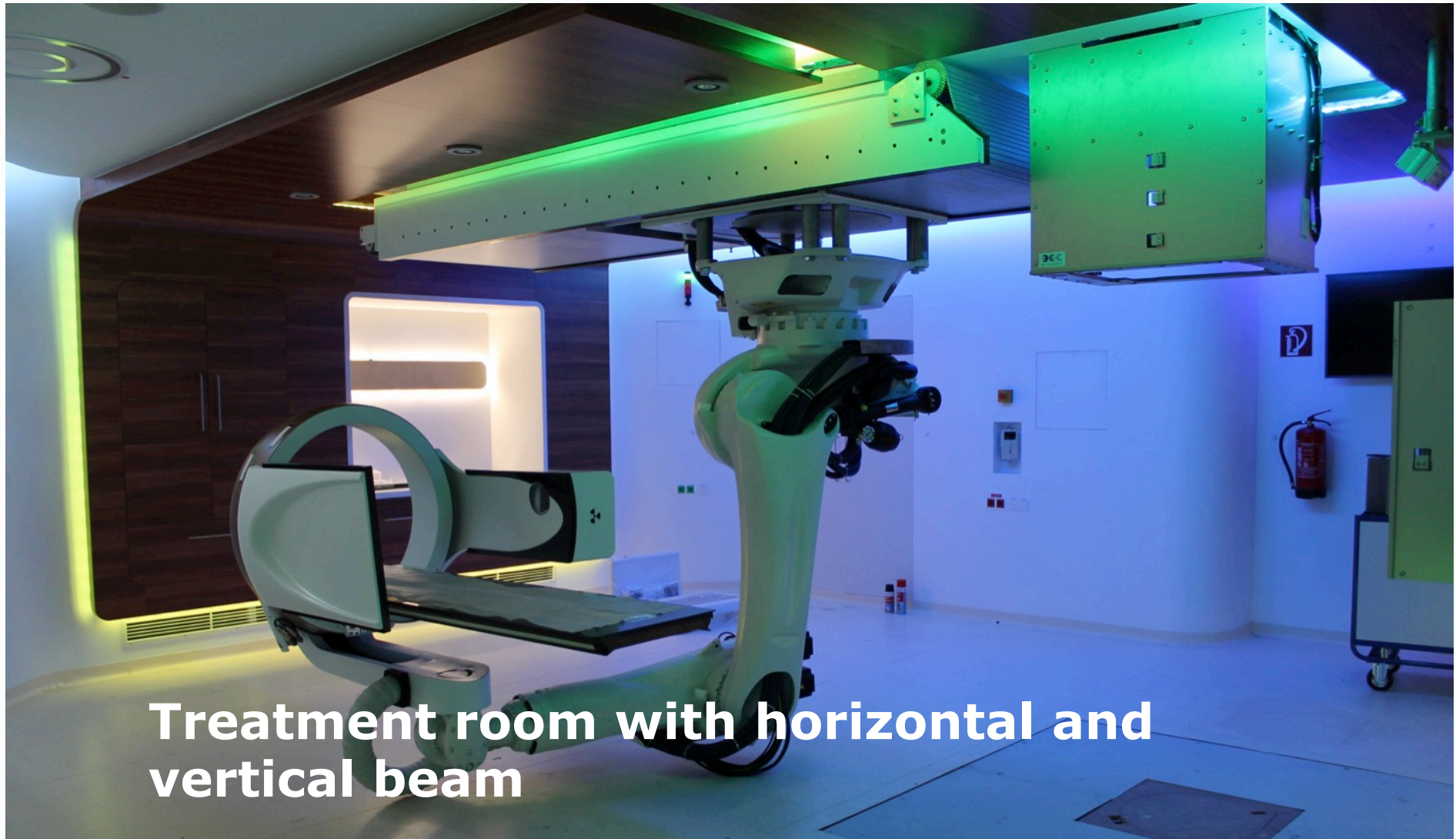
The screenshot displays the MedAustron software interface for CBCT imaging. It features three main viewing windows and a control panel:

- Top Left Window (OR33 [0.95]):** Shows a sagittal view of the pig's head CBCT scan.
- Top Right Window:** Shows an anterior view of the pig's head CBCT scan.
- Bottom Right Window:** Shows a posterior view of the pig's head CBCT scan.
- Bottom Left Panel:** Contains the 'Images' section with the following controls:
 - Fixed:** `ung/CBCT/experiments/2015-04-07-MA-PORK-DATA-DAY/2015-04-07_Schweinskopf/non-iso/reconstruction/long16.7_consensus.mhd`
 - Mask:** `<no mask image selected>`
 - Moving:** `<no moving image selected>`
 - Apply DICOM LPS to IEC reorientation on load
 - Reset image orientation to identity on load
 - Rigid:** (empty field)
- Bottom Left Image:** A live camera feed showing the pig's head in a treatment room, positioned on a table.

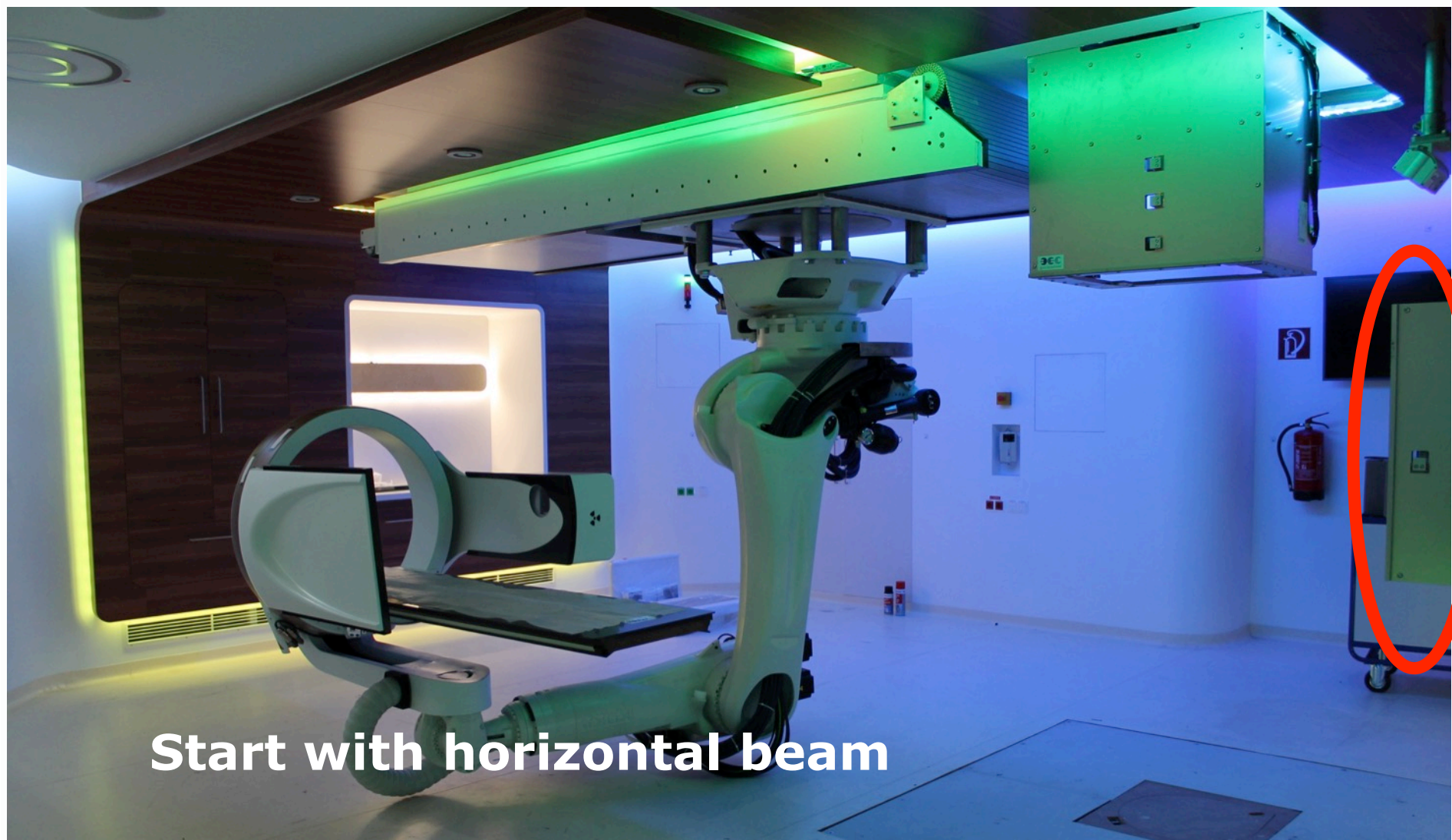
Patient treatment at MedAustron

Clinical indications during the start up phase

- ❑ „Well established“ clinical indications to proton therapy
- ❑ „Well established“ clinical treatment strategies
- ❑ Conventional fractionated
(exemption: prostate cancer)
- ❑ Treatment of „non moving“ targets



Treatment room with horizontal and vertical beam



Start with horizontal beam

Start of patient`s treatment in 2016

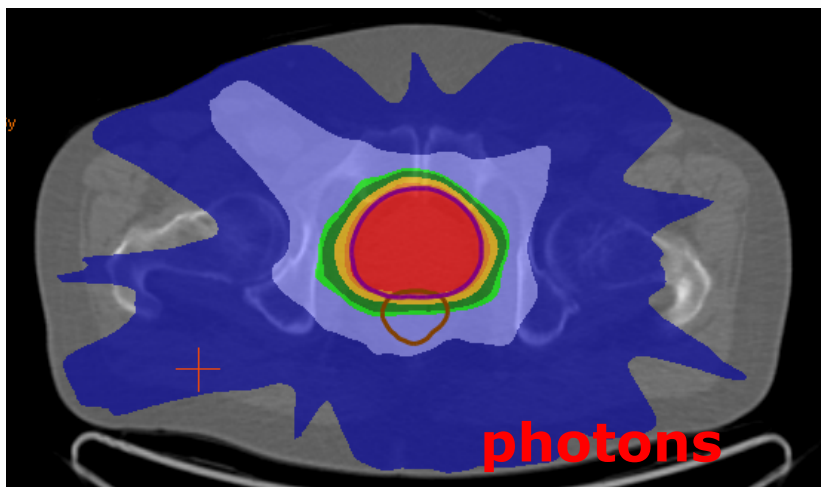
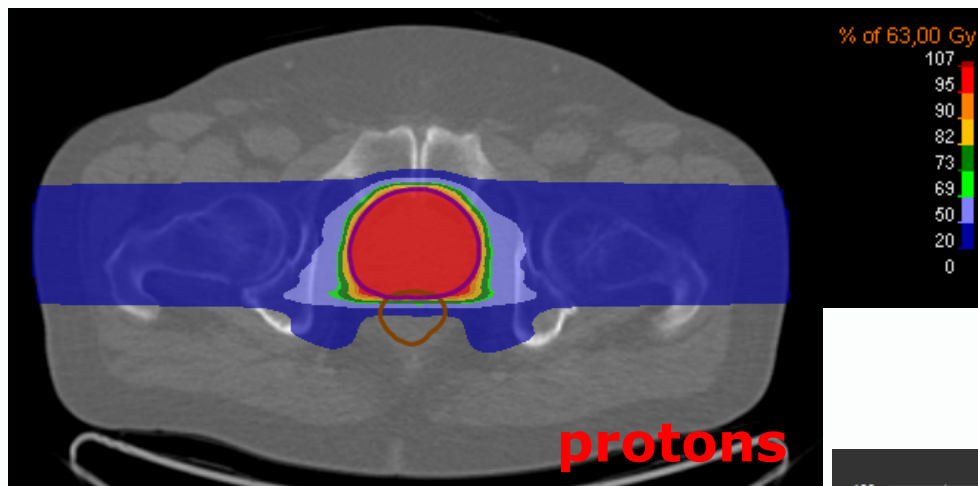
- ❑ Start in one treatment room =
Horizontal fix beam line with protons
- ❑ Parallel commissioning of the other treatment rooms
- ❑ Carbon ion treatment starting 2017
- ❑ Gantry availability by 2019/2020
- ❑ Continuous increase of patient numbers

- ❑ All patients included in prospective study protocols
- ❑ **Focus on quality of life assessment**

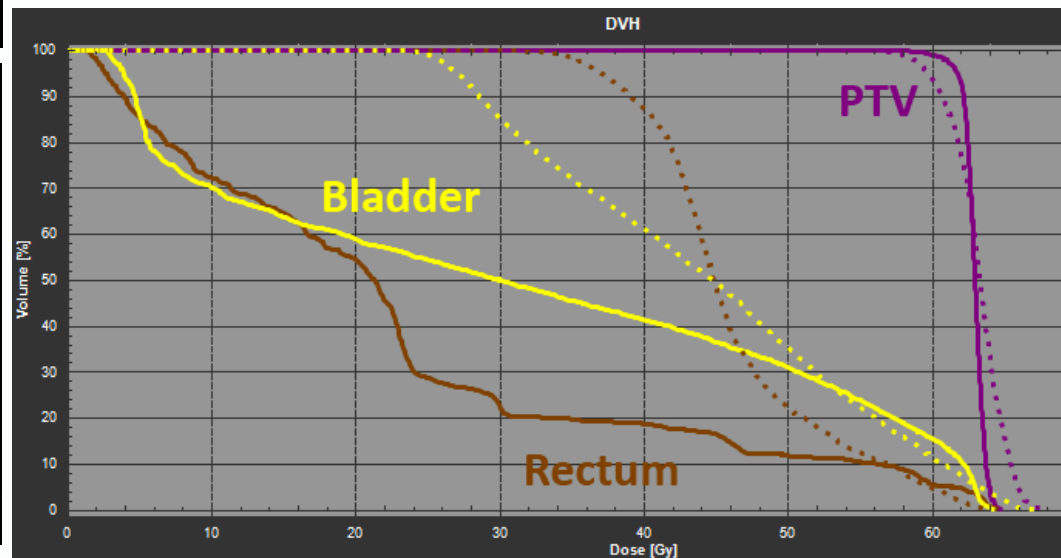
Clinical indications during start up phase

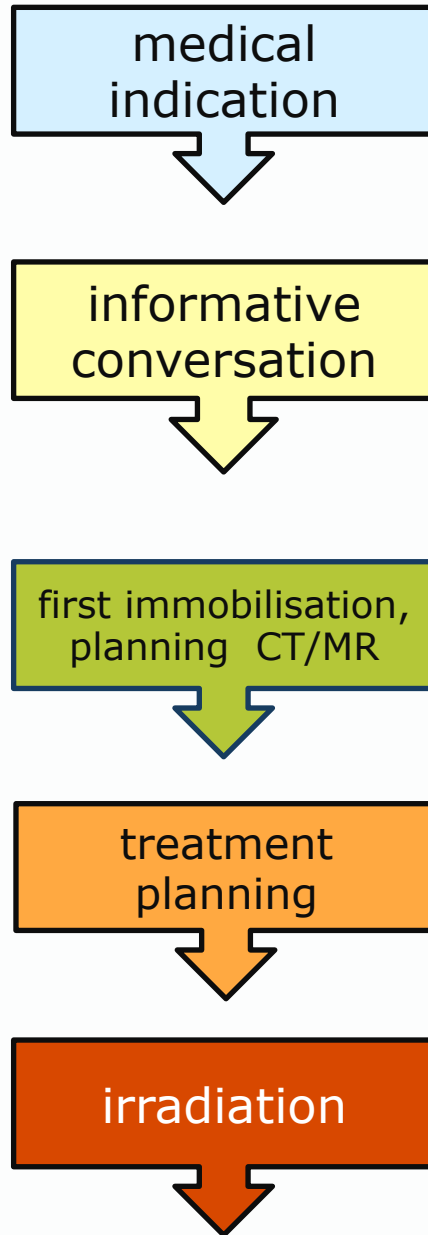
- Sarcomas of the extremities
- Prostate cancer
- Tumors of the skull base
- CNS tumors
- Pediatric malignancies (without sedation), if beam arrangement is adequate

Prostate

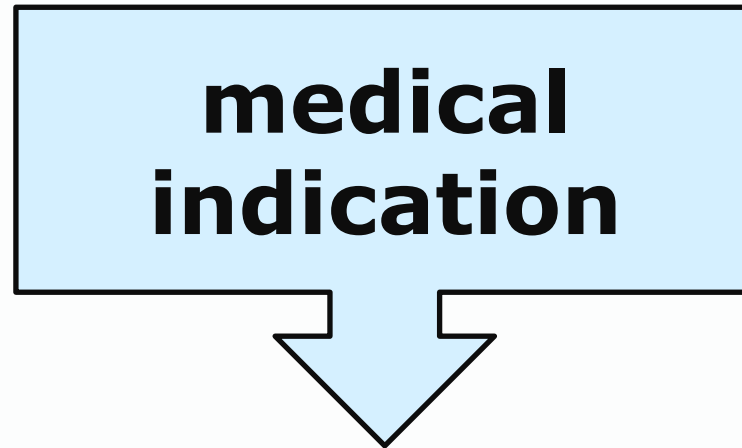


Solid: protons (IMPT)
Dotted: photons (VMAT)





Course of an irradiation procedure

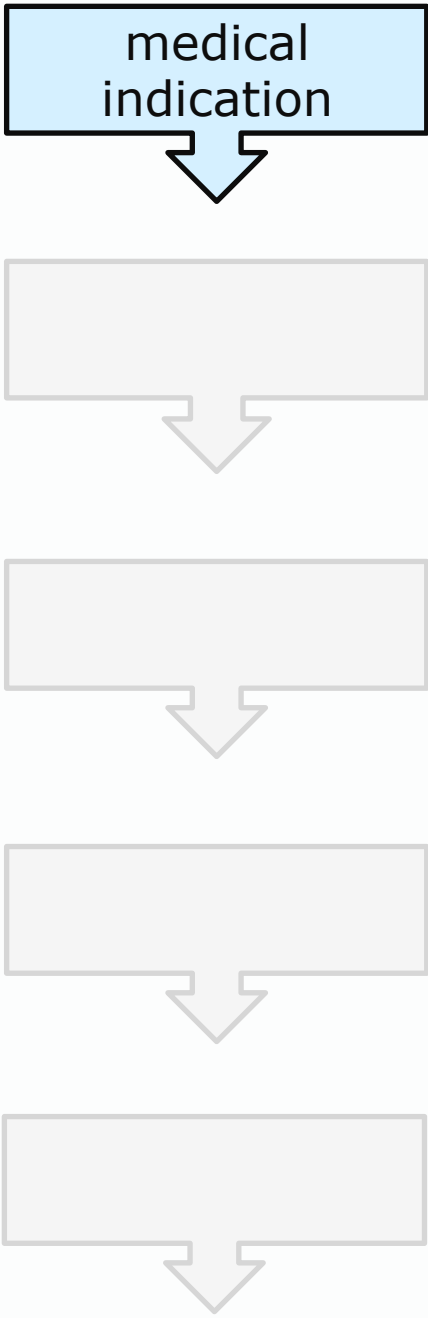


medical
indication

Tumour diagnosis (biopsy, surgery...)



medical
indication



Tumour diagnosis (biopsy, surgery...)

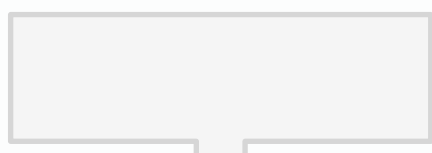
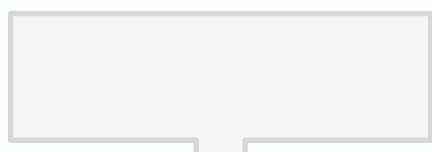
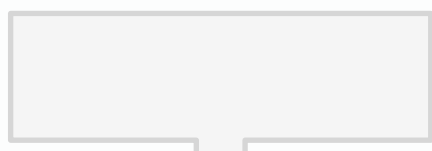
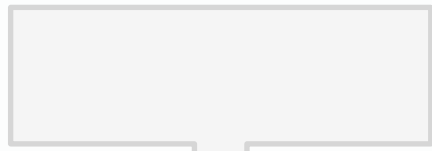
Tumor staging

General health conditions

Discussion within the local tumor board

Referral for ion beam therapy

medical indication



MedAustron ^N

conventional RT

ion beam therapy

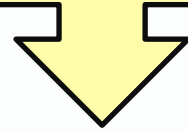
more work intensive



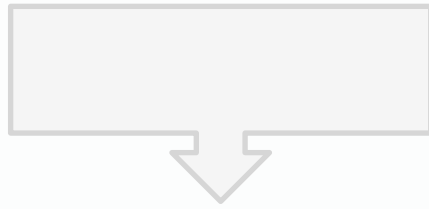
selected indications

authorisation of a reimbursement by social insurances more difficult

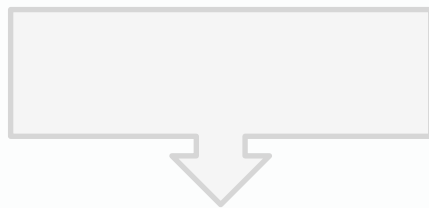
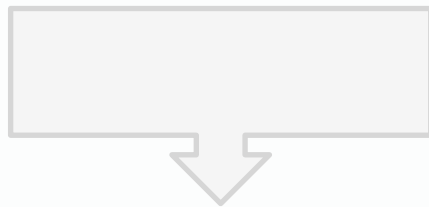
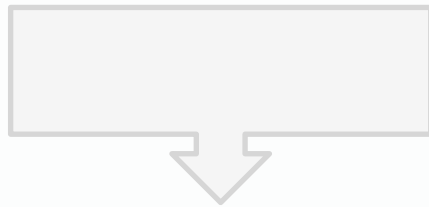
Informative conversation



initial visit at MedAustron



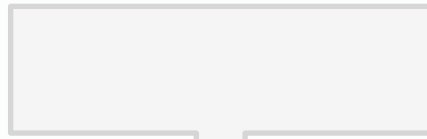
informative
conversation



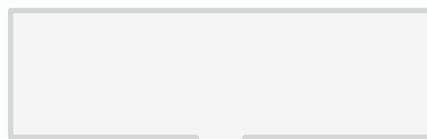
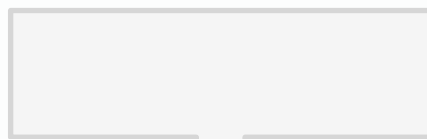
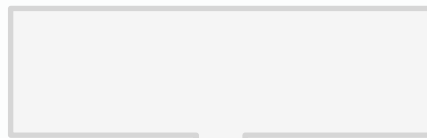
physical examination

- tumour
- general condition
- comorbidities

- problems previously not mentioned (claustrophobia...)



informative
conversation

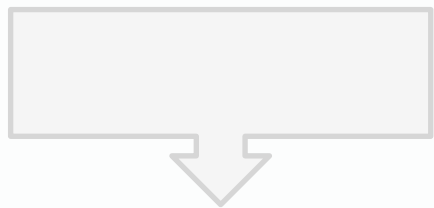
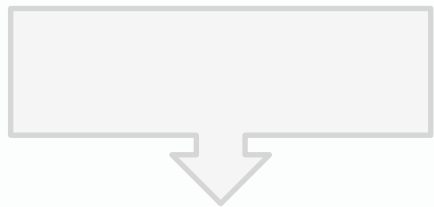
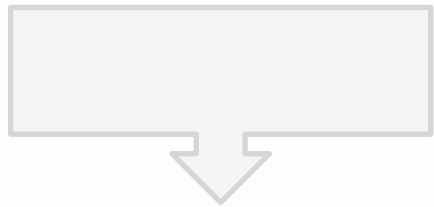
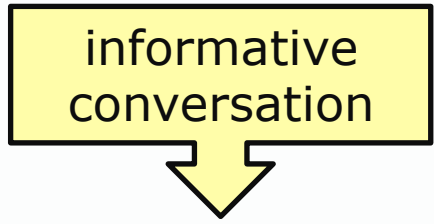
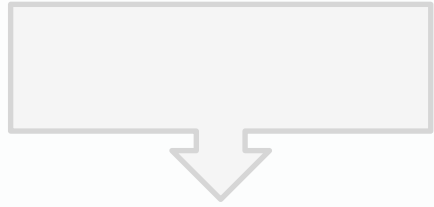


informative conversation

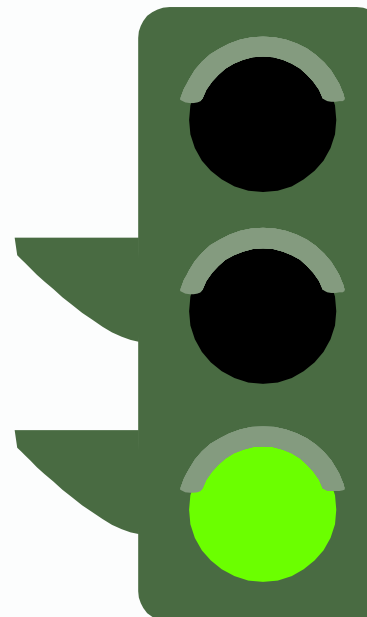
- advantages of the therapy
 - acute und chronic side effects
 - therapeutic procedure
 - patient's consent
- or:
- patient's refusal

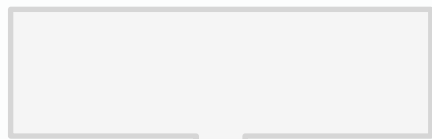
consent to participate in studies

treatment contract

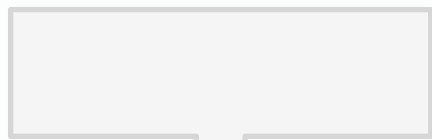
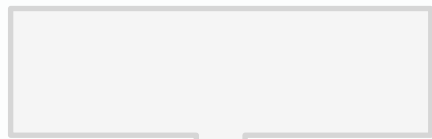
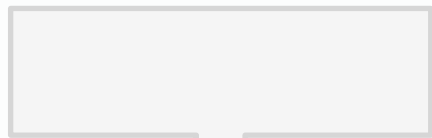


final indication

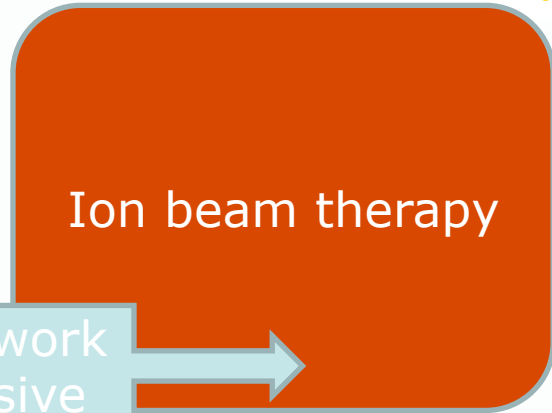
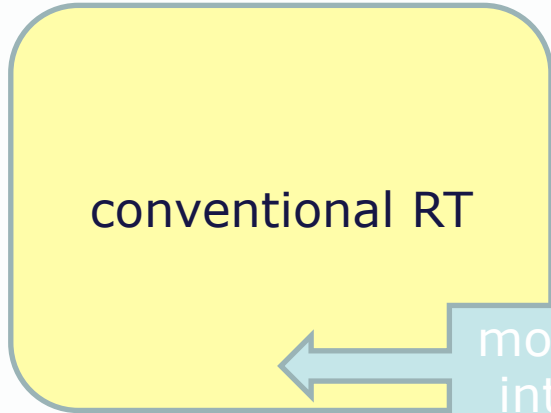




informative conversation



MedAustron ^N



more work intensive



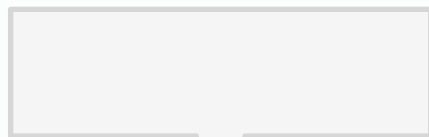
almost all patients at MedAustron will be treated in the scope of study protocols

assessment of quality of life, side effects, local and distal control

first immobilisation,
planning CT/MR



second visit at MedAustron



Patient admission

first immobilisation, planning CT/MR

Treatment process

Follow up

= second visit of the patient to the ion beam center

second informative discussion – about the procedure of making immobilisation devices



= second visit of the patient to the ion beam center

Choosing the appropriate position and immobilisation device

making the immobilisation device

first immobilisation,
planning CT/MR



= second visit of the patient to the ion beam center

Choosing the appropriate position and positioning device
making the immobilisation device

first immobilisation,
planning CT/MR



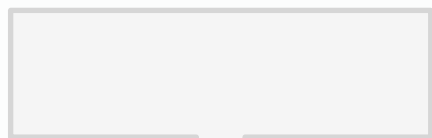
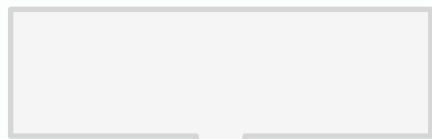


= second visit of the patient to the ion beam center

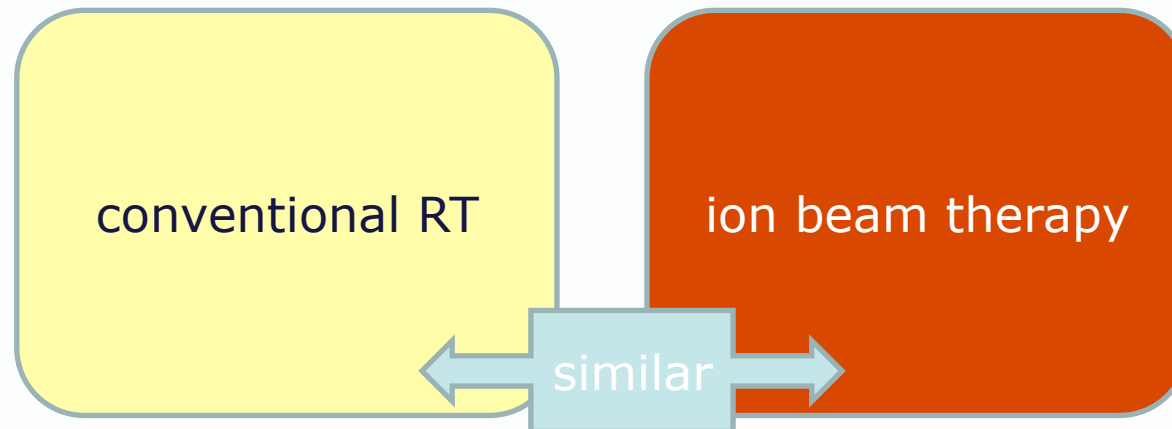
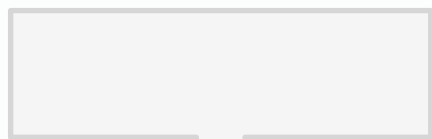
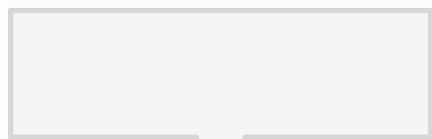
Planning-CT – with positioning device (+ MR)

first immobilisation,
planning CT/MR





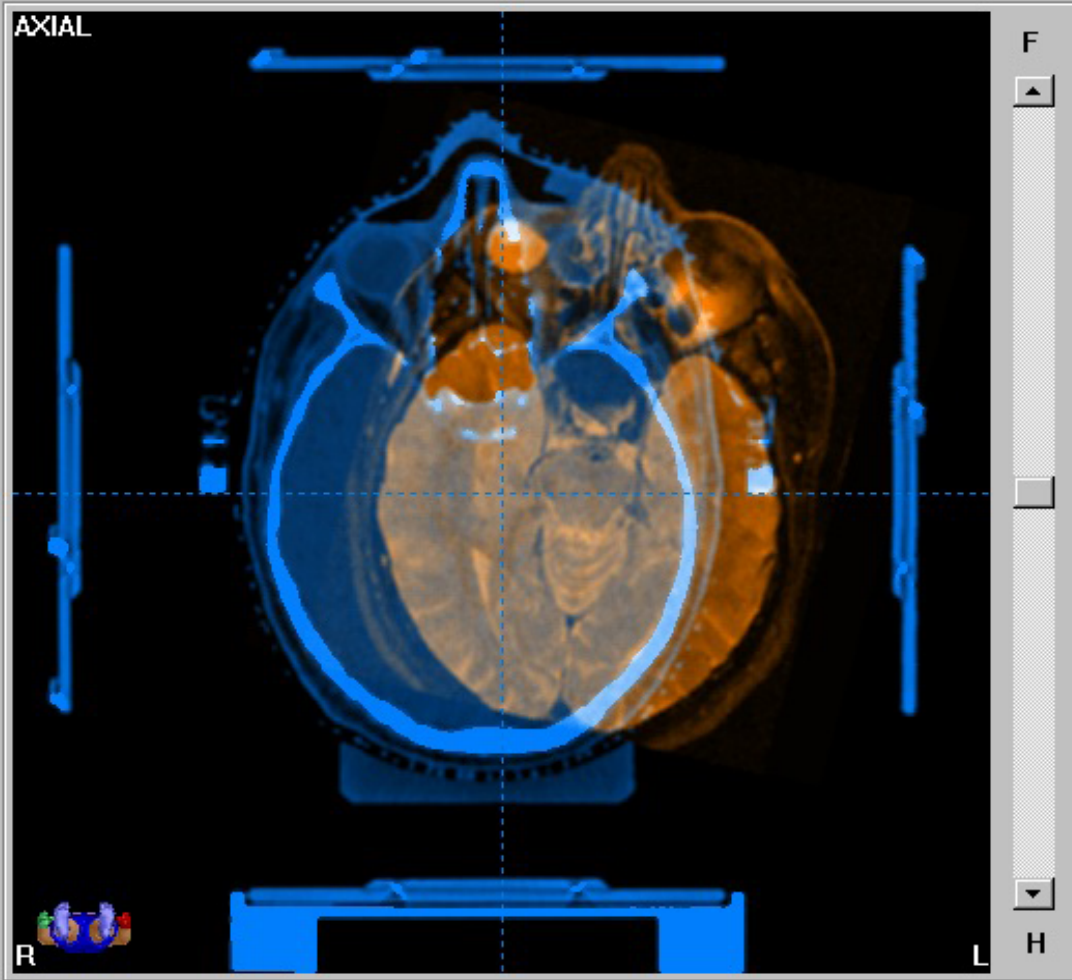
first immobilisation,
planning CT/MR



**treatment
planning**



Fuse image sets



View

Axial
 Sagittal
 Coronal

In Out

Mix

Mode
Amber/Blue

Grid Size

MR axial set #1
 Objects
 Edges

CT set #1
 Objects
 Edges

CT and MR
fusion
= Image fusion

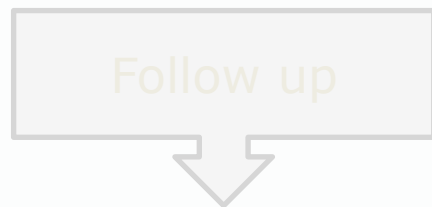
Scale Move Control

4.234 mm
3.06°
6.13%

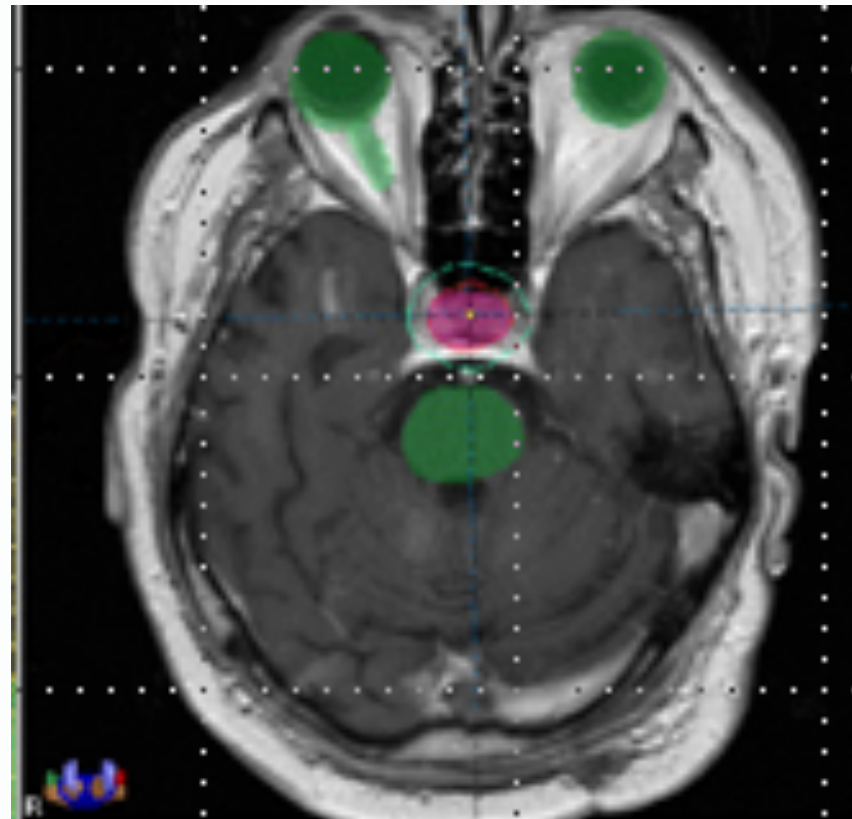
Coarse Fine

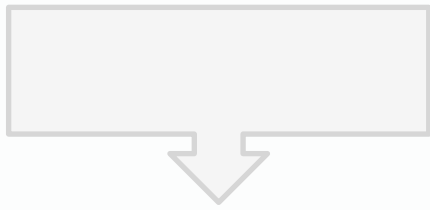
AutoFUSE Object Pairs Reset

Ok Cancel

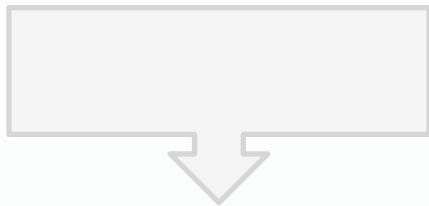


- delineation of target volume and organs at risk on the planning CT by the physician

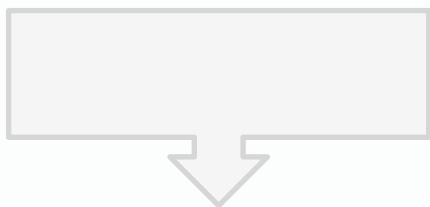




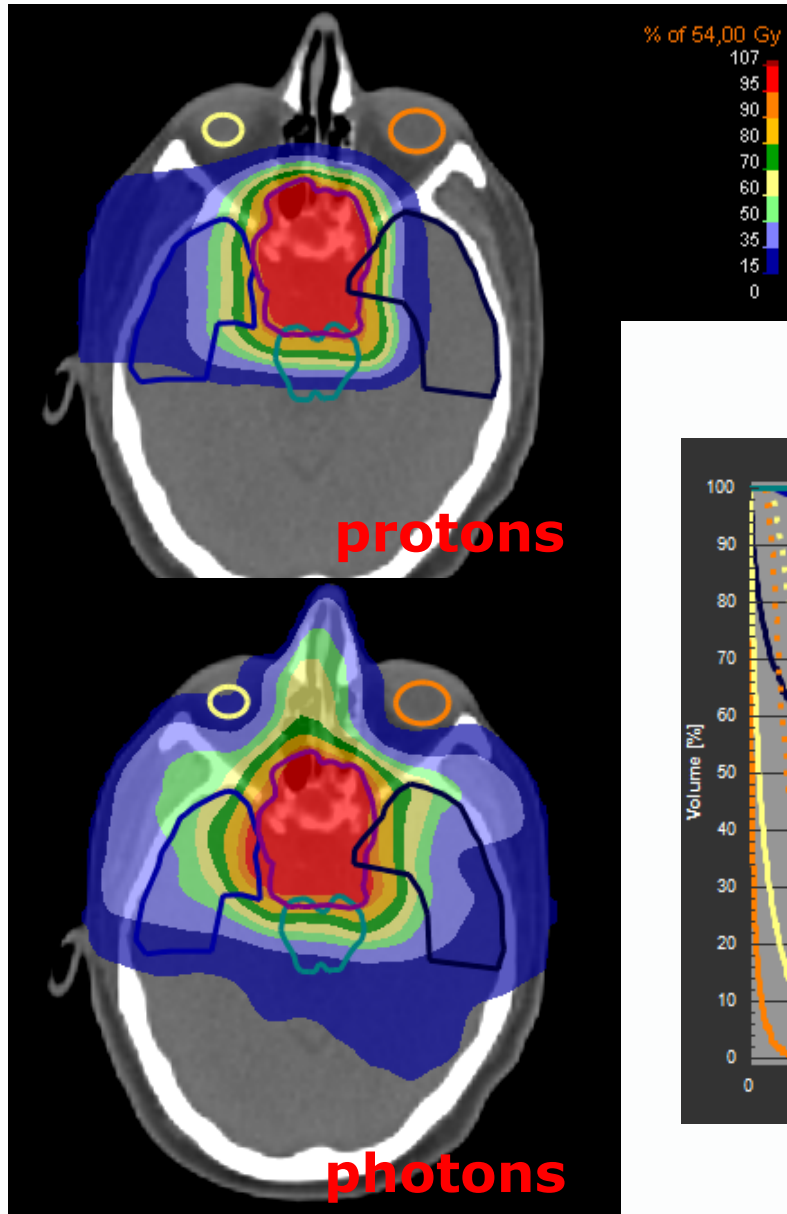
- treatment planning by medical physicist
- discussion with the physician
- selecting a suitable plan and finalisation



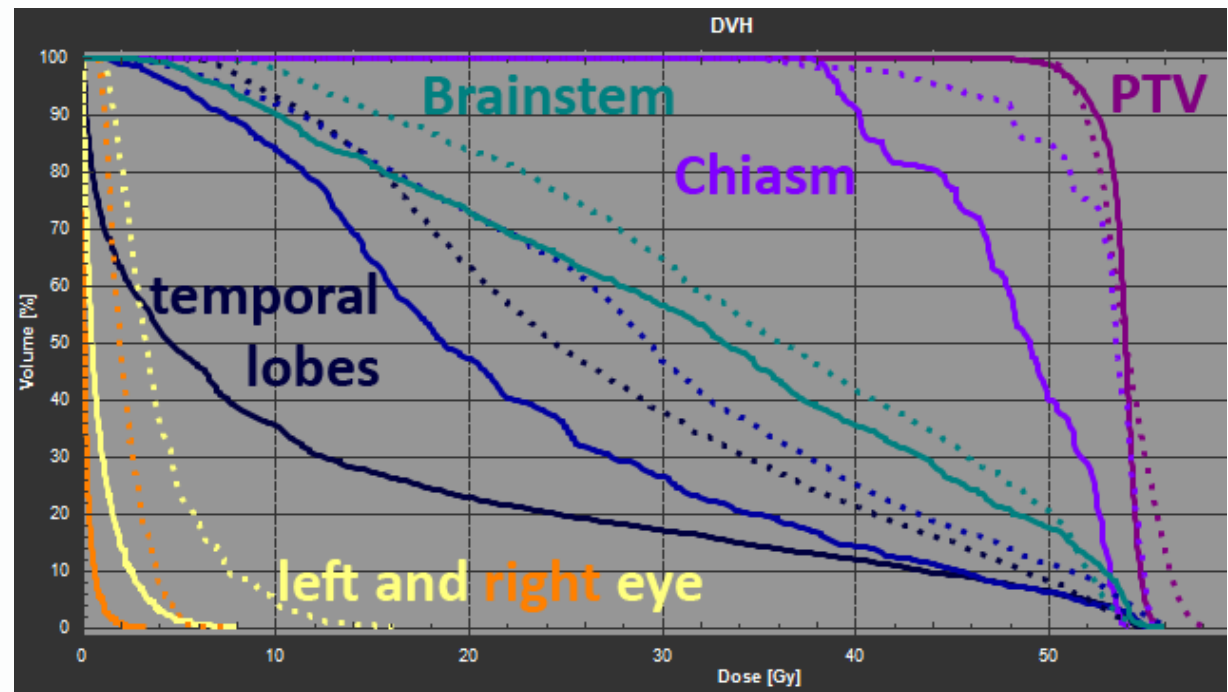
- Simulation of the plan and **quality assurance by the medical physicist**

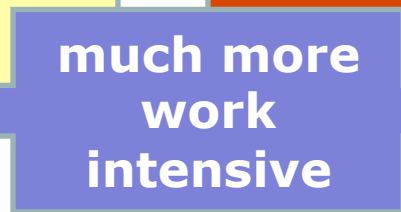
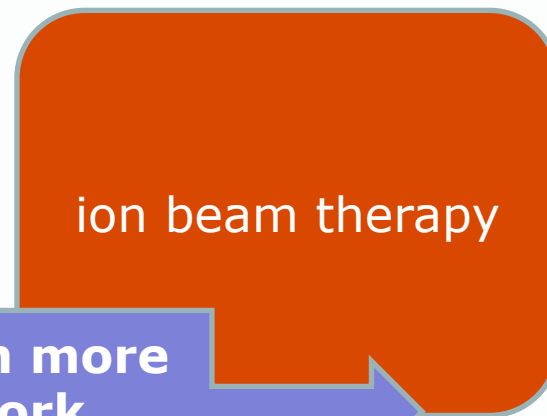
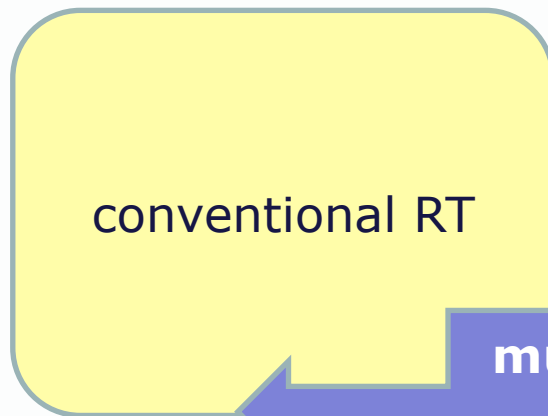
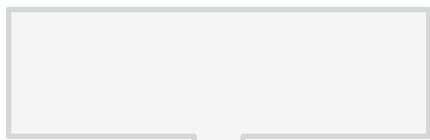
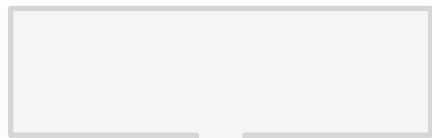
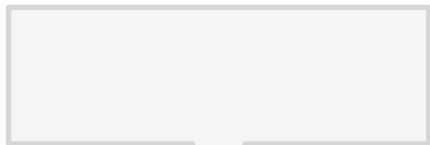
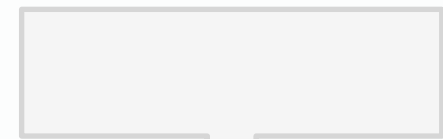


Skull base chordoma



Solid: protons (IMPT)
Dotted: photons (VMAT)





treatment planning is much more work- and time consuming

irradiation





irradiation

Patient is brought to the irradiation room

Patient selection



Patient admission



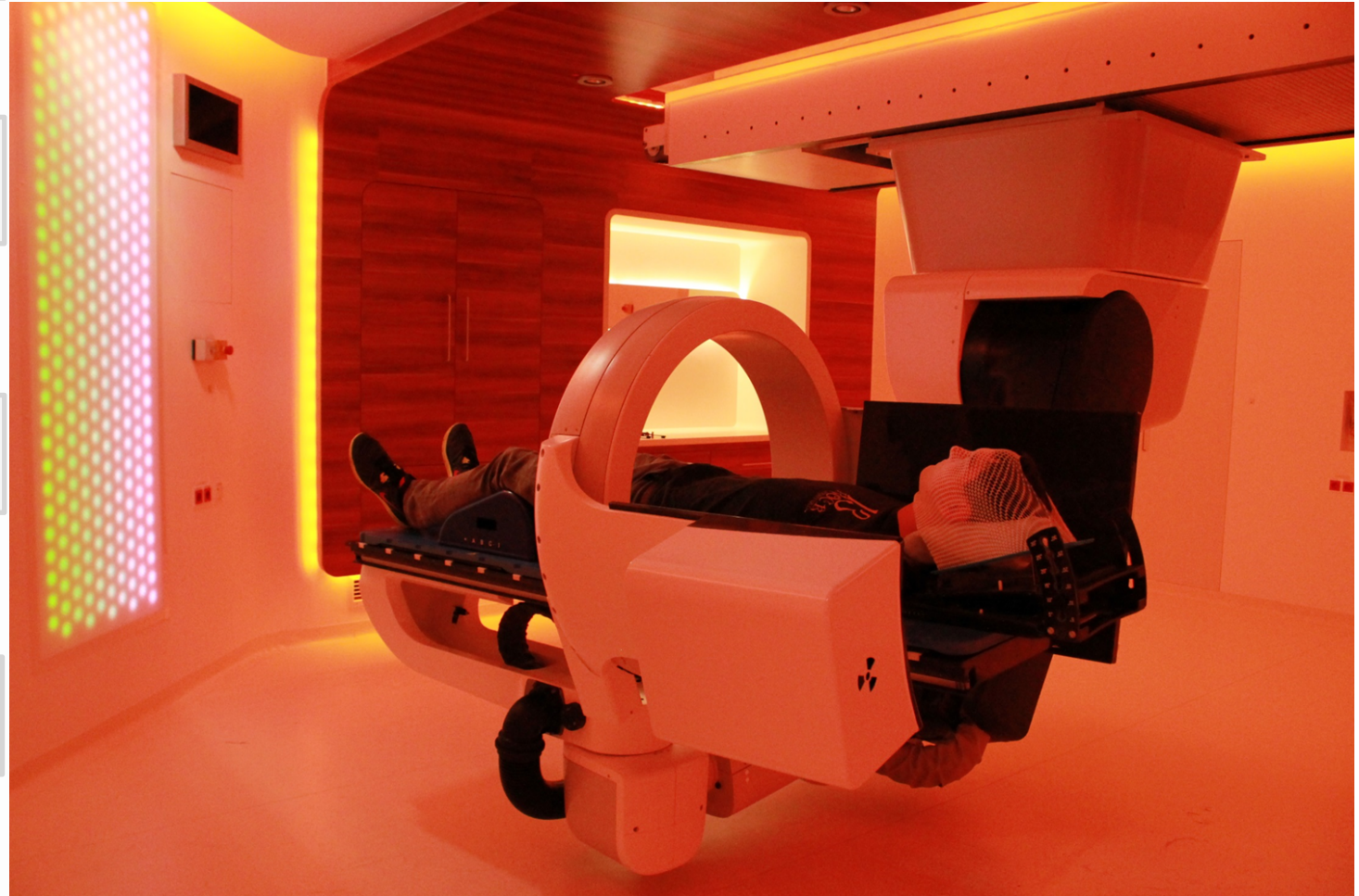
Treatment planning



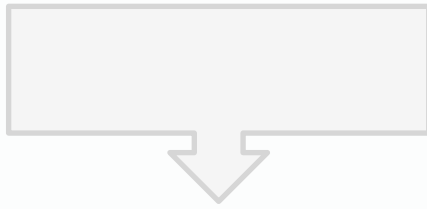
Follow up



irradiation

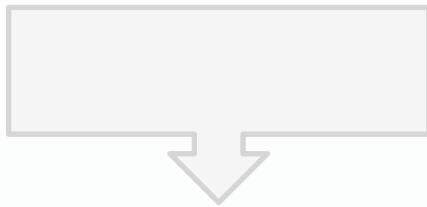


X-ray/CBT for position verification



During the irradiation series at least once a week:

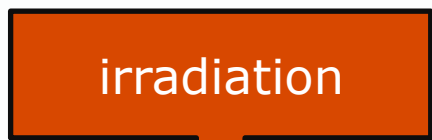
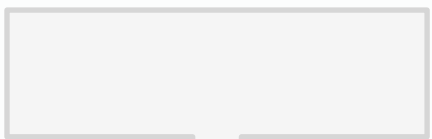
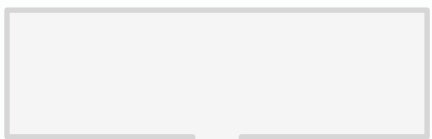
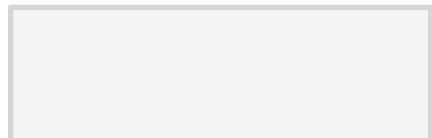
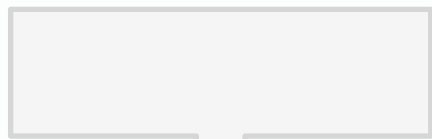
- examination of the patient
- assessment of quality of life



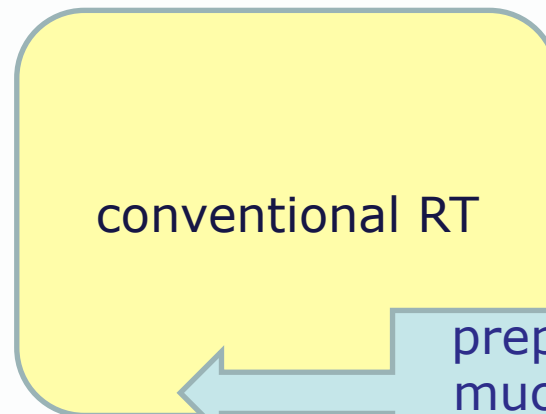
▪ informative conversation at the end of the irradiation series



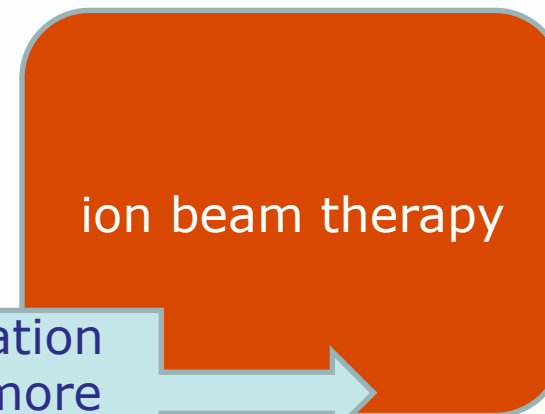
▪ doctor's letter



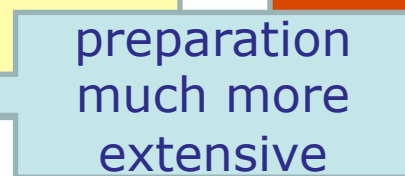
irradiation



conventional RT



ion beam therapy



preparation
much more
extensive



daily radiological check of the position

QA for medical physicists much more challenging!

medical indication



informative conversation



first immobilisation, planning CT/MR



treatment planning



irradiation



conventional RT

ion beam therapy

More work consuming

more work consuming

(similar)

much more extensive

preparation more extensive

Goal

- long-time tumour control
- with good quality of life