HollandPTC
Particle Therapy Centre

Holland Particle Therapy Center
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Marco van Vulpen
(Medical Director
from Nov, 2016)

HollandPTC, Delft

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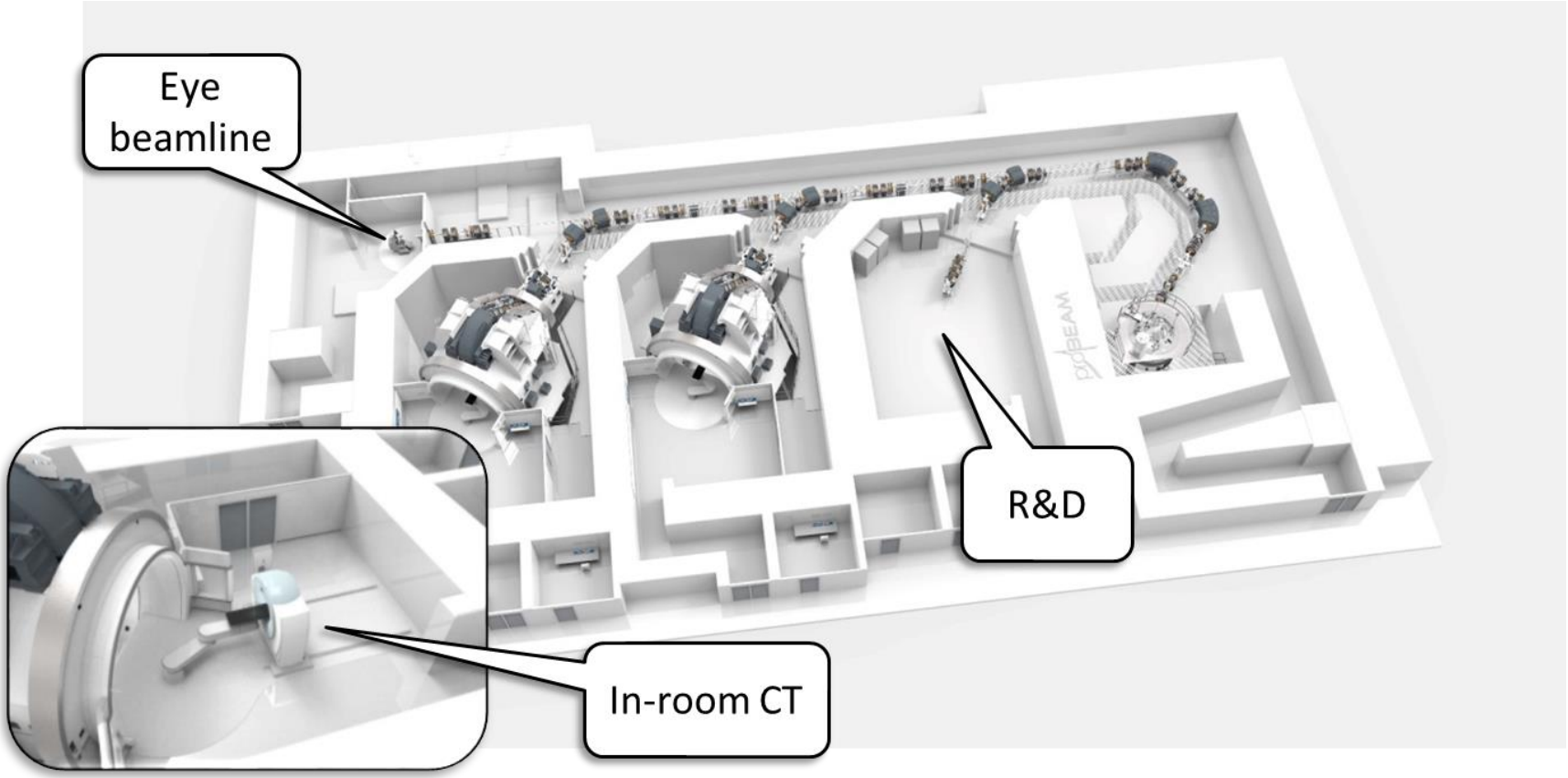
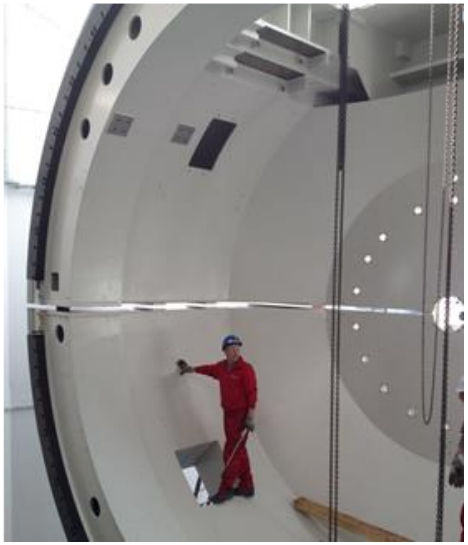


Imaging platform: 3.0T MRI, PET-CT, Dual energy CT, in-room CT's

Installation of cyclotron and gantries,

May 2016



Scheduled first patient treatment August 2017

HollandPTC mission

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The overarching mission of HollandPTC is to apply research-driven proton therapy for those patients that have sufficient benefit from it, enabling access to proton therapy for at least 600 eligible patients a year, and to contribute to the development of next generation of particle therapy. This means that patients should as much as possible be included into clinical trials, and that when a patient is receiving proton therapy everything should be done to ensure a perfect quality of care and a seamless radiation treatment.

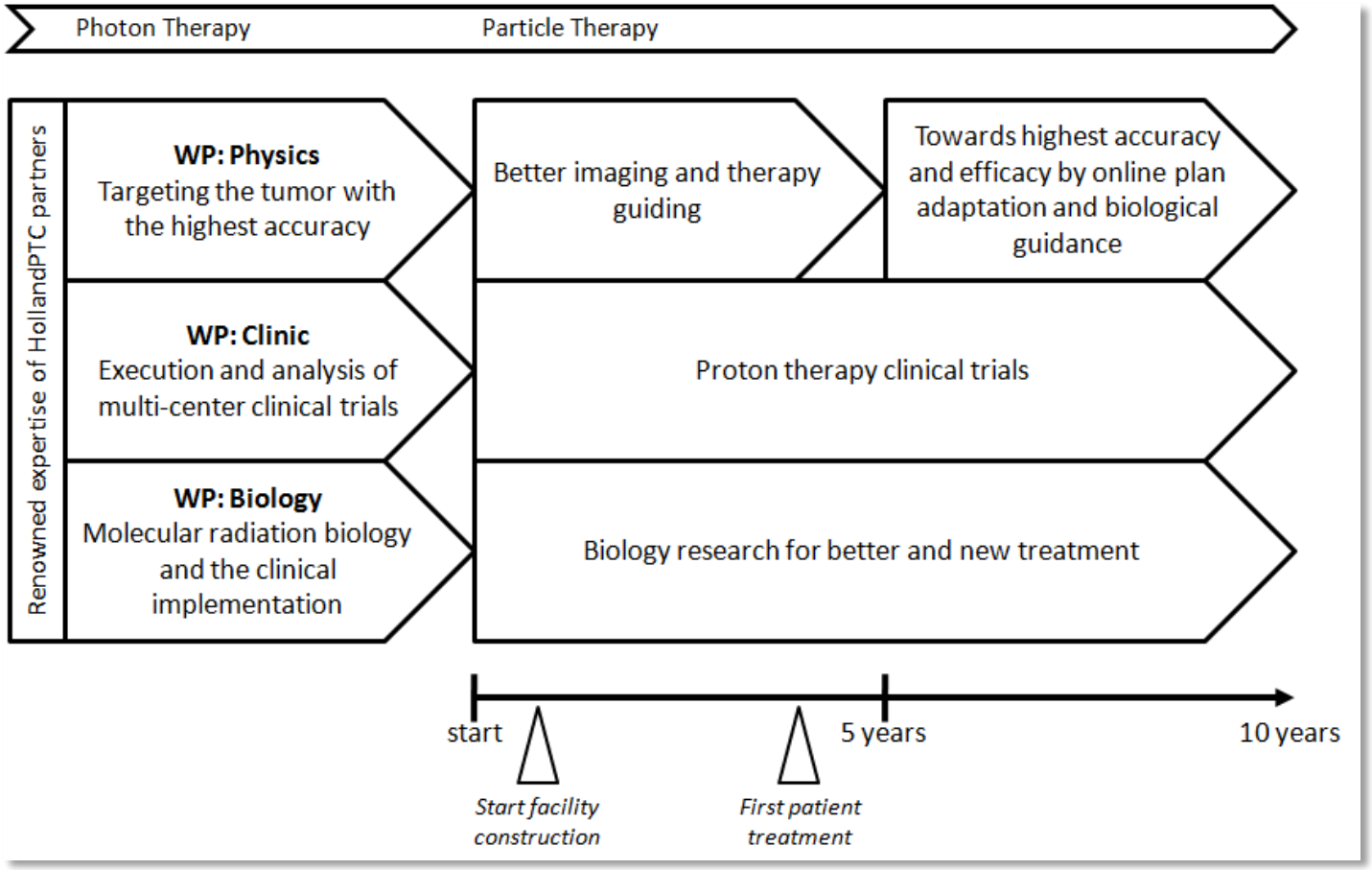
HollandPTC consortium

- HollandPTC, Delft
- Erasmus MC, Rotterdam
- LUMC, Leiden
- TU Delft, Delft
- VUMC, Amsterdam
- AMC, Amsterdam

Holland PTC network

- All prospective **Dutch proton therapy centers**, joined in the DUPROTON network
- **University of Leuven, Belgium**
- **University of Aarhus, Denmark**
- Various **international research groups** (Dresden, Munich, Heidelberg, Bergen a.o.)
- **Medical Delta** a network of life sciences, health and technology partners
- **Varian Medical Systems Particle Therapy**
- **Siemens**
- **Philips**
- **RaySearch**

Research Goals



HollandPTC R&D pillars

Pillar 1: Technology

To increase the geometric, dosimetric and biologic precision of proton therapy by developing technology for high-precision image-guided and biology-guided online adaptive proton therapy.

Pillar 2: Imaging

To develop and clinically and pre-clinically validate quantitative imaging biomarkers for pre-treatment characterization and response assessment of the tumor and healthy tissues.

Pillar 3: Implementation

To implement and evaluate innovations in clinical practice in HollandPTC realizing the next generation of proton therapy.

Pillar 4: Radiobiology

To improve mechanistic understanding of DNA damage repair and to exploit this understanding to enhance the effectiveness proton irradiation.

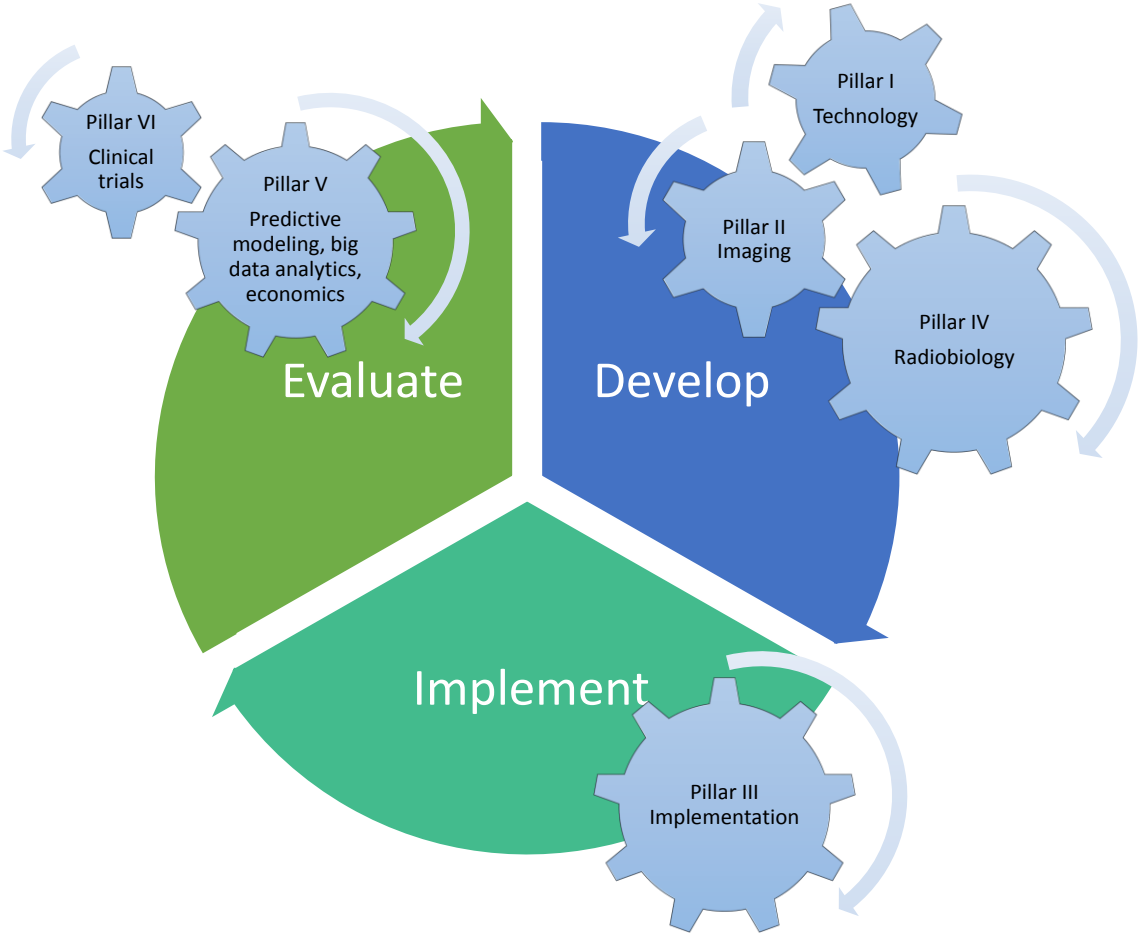
Pillar 5: Predictive modeling, big data analytics, economics

To develop knowledge on the optimal clinical indication of proton therapy, integrating patient's characteristics and preferences, cost-effectiveness analysis and predictive modeling of complications for photon and proton therapy.

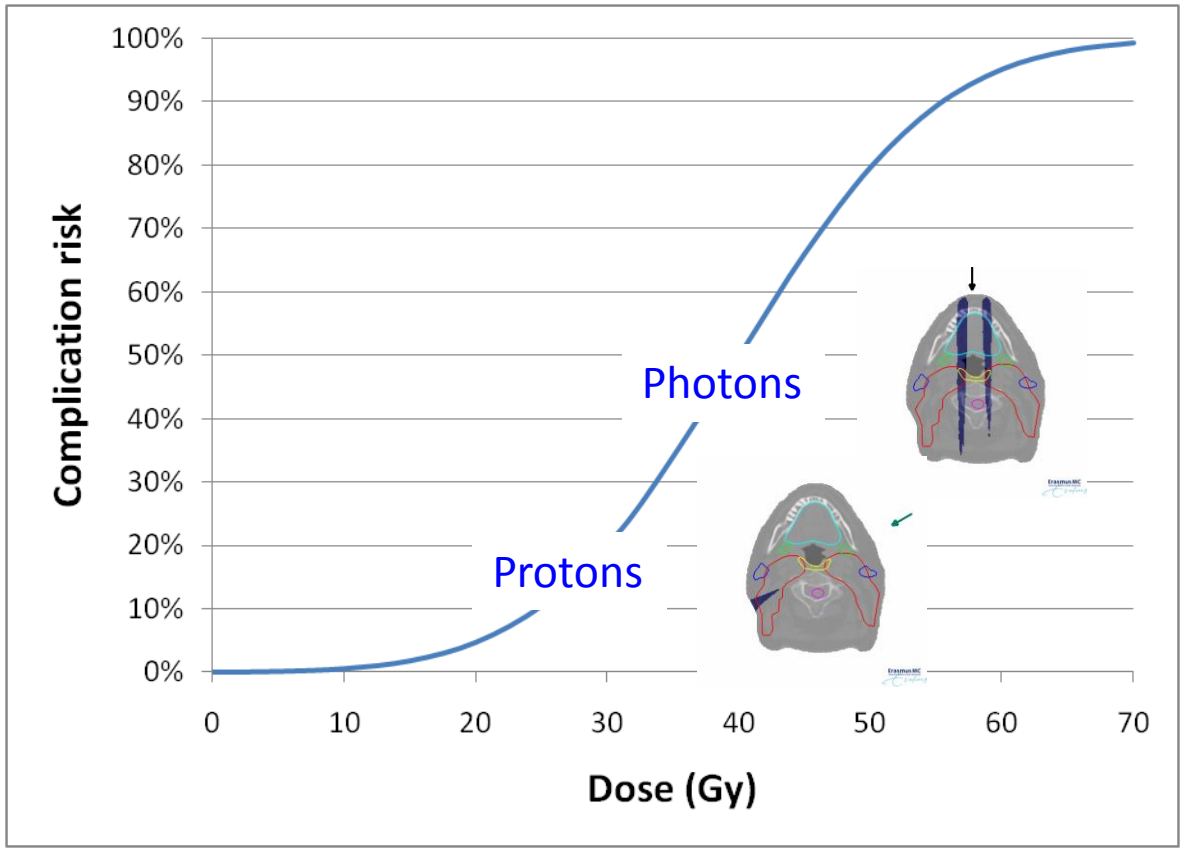
Pillar 6: Clinical trials

To provide level-1 clinical evidence of the currently theoretical benefit of proton therapy compared to the best possible photon treatment currently available (IMRT/VMAT and/or adaptive radiotherapy and/or stereotactic radiotherapy).

Continuous improvement cycle

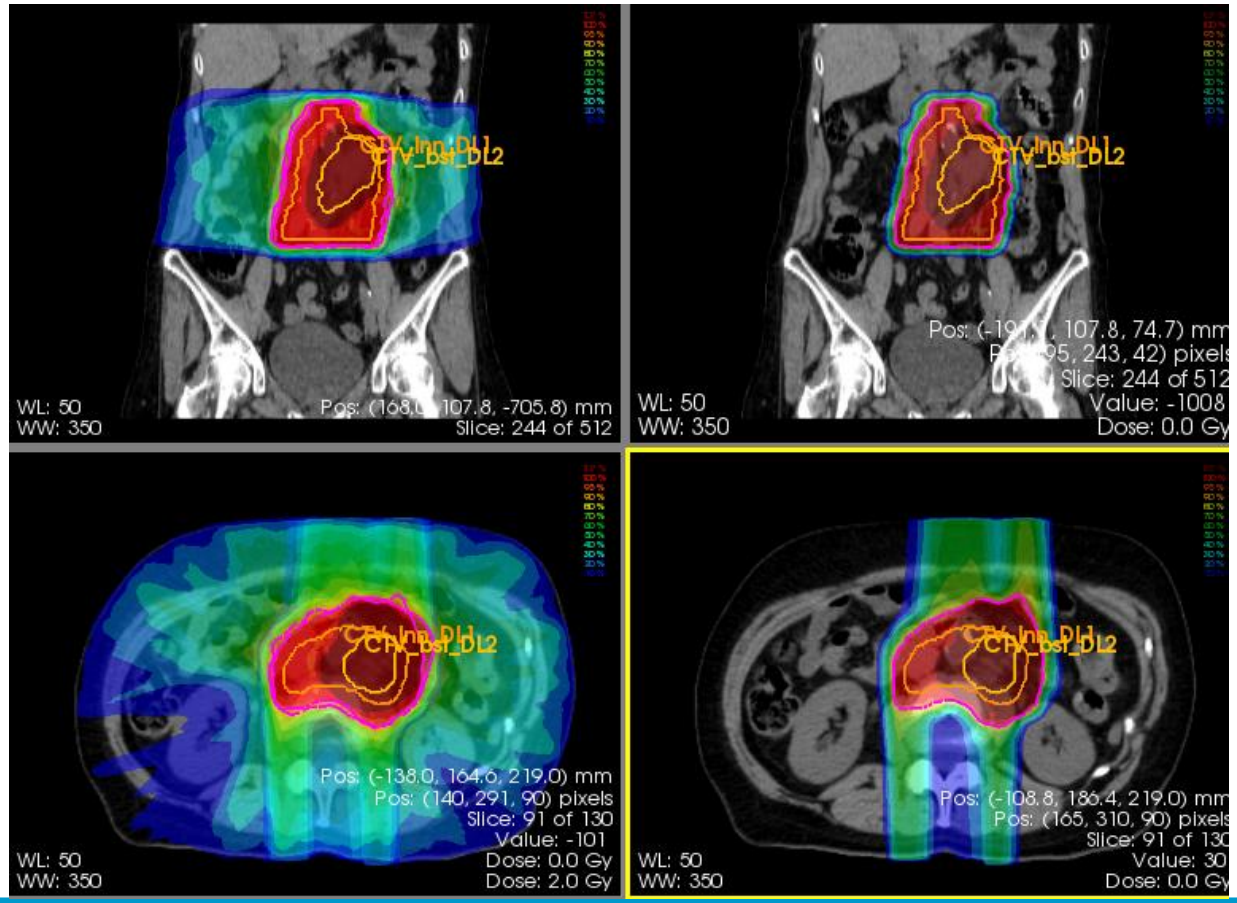


ΔNTCP Based Patient Selection



Horizon Scanning Report; Hans Langendijk

Photon vs. Proton Radiation Tx



M van de Sande, C Creutzberg, M Hoogeman et al.

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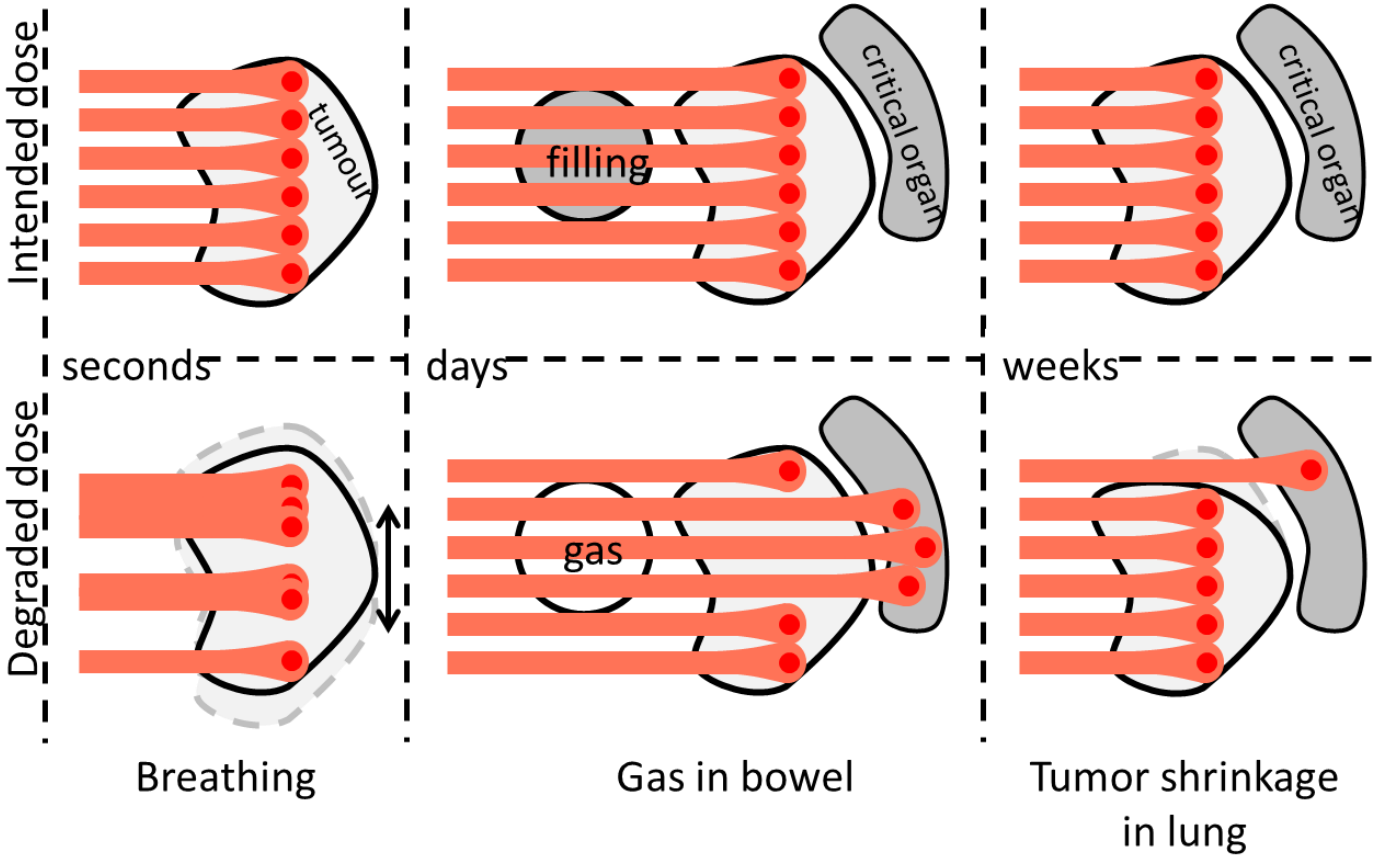
LUMC Leids Universitair Medisch Centrum
TU Delft

Dose Degradation in Proton Therapy



Courtesy M Hoogeman

Anatomic Changes

E Vasquez-Osorio et al. IJROBP 2008; dx.doi.org/1016/j.ijrobp.2007.10.063

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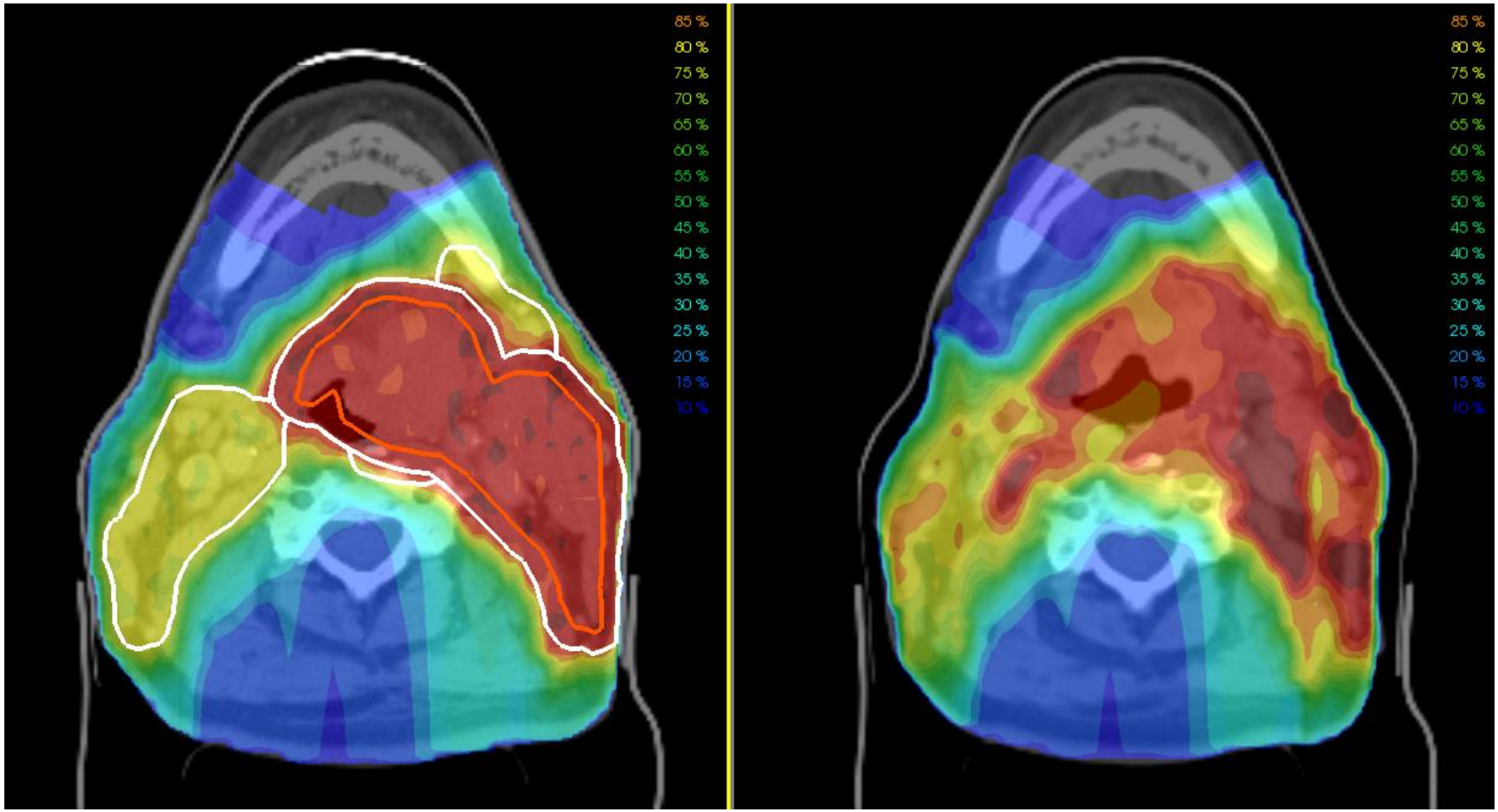
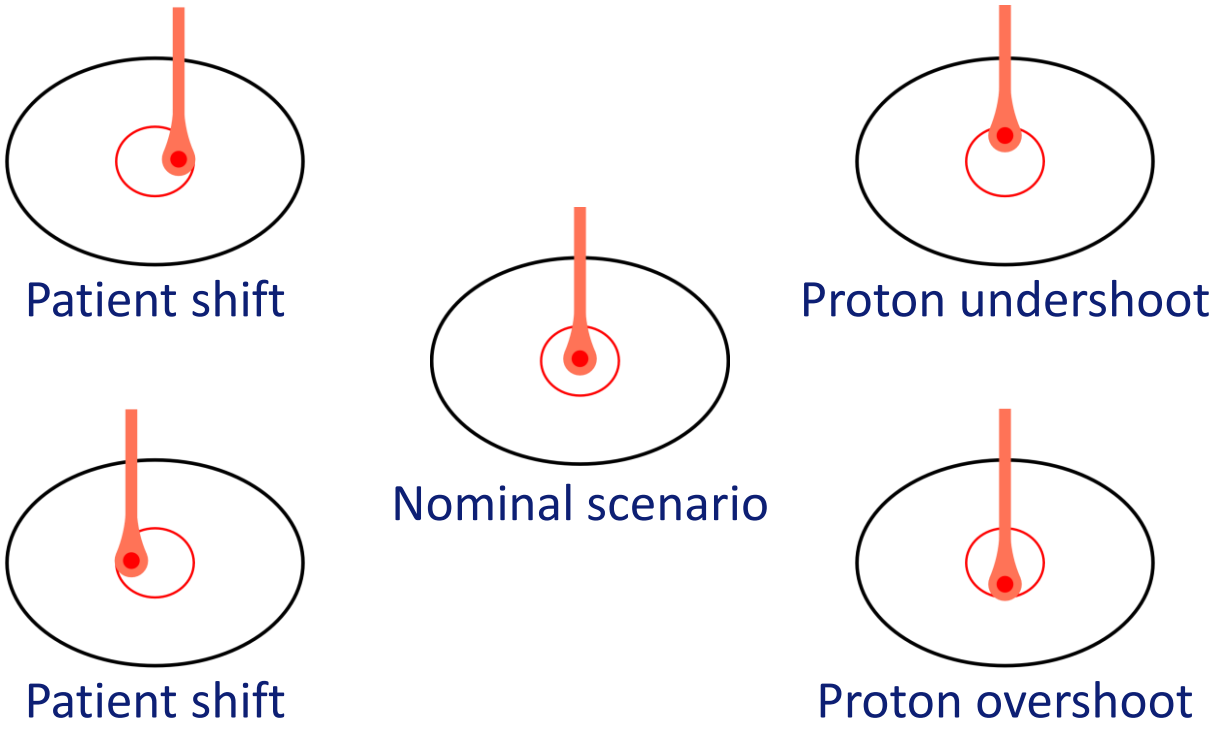
Dosimetric Changes

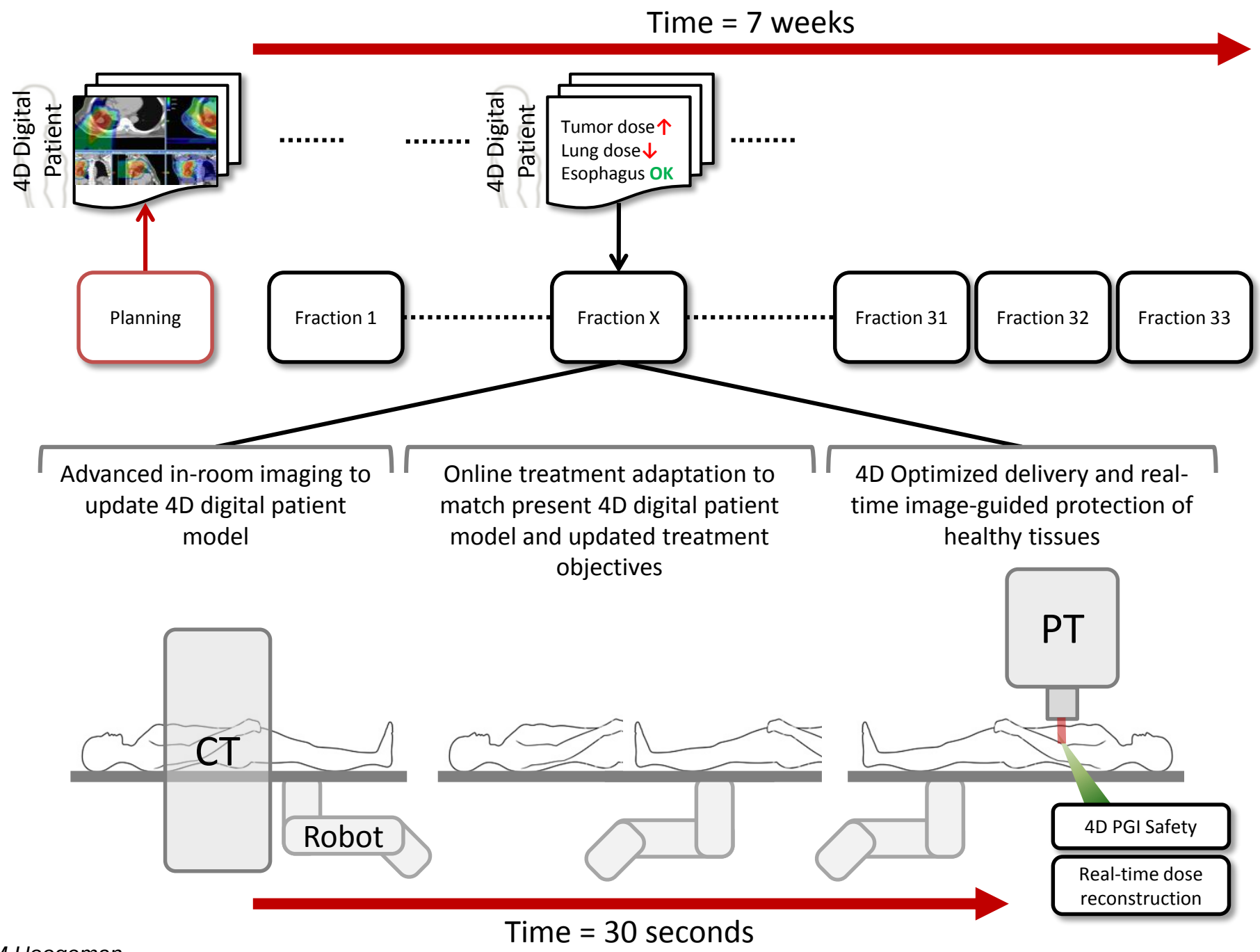


A Kraan et al. IJROBP 2013; dx.doi.org/10.1016/j.ijrobp.2013.09.014

Robust Against Errors



Courtesy S van de Water


Time = 7 weeks
4D Digital Patient
4D Digital Patient
Tumor dose ↑
Lung dose ↓
Esophagus OK
Planning
Fraction 1
Fraction X
Fraction 31
Fraction 32
Fraction 33
Advanced in-room imaging to update 4D digital patient model
Online treatment adaptation to match present 4D digital patient model and updated treatment objectives
4D Optimized delivery and real-time image-guided protection of healthy tissues
CT
Robot
PT
4D PGI Safety
Real-time dose reconstruction
Time = 30 seconds

M Hoogeman

Conclusion

HollandPTC looks forward to collaborate and jointly determine the added clinical value of proton therapy

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