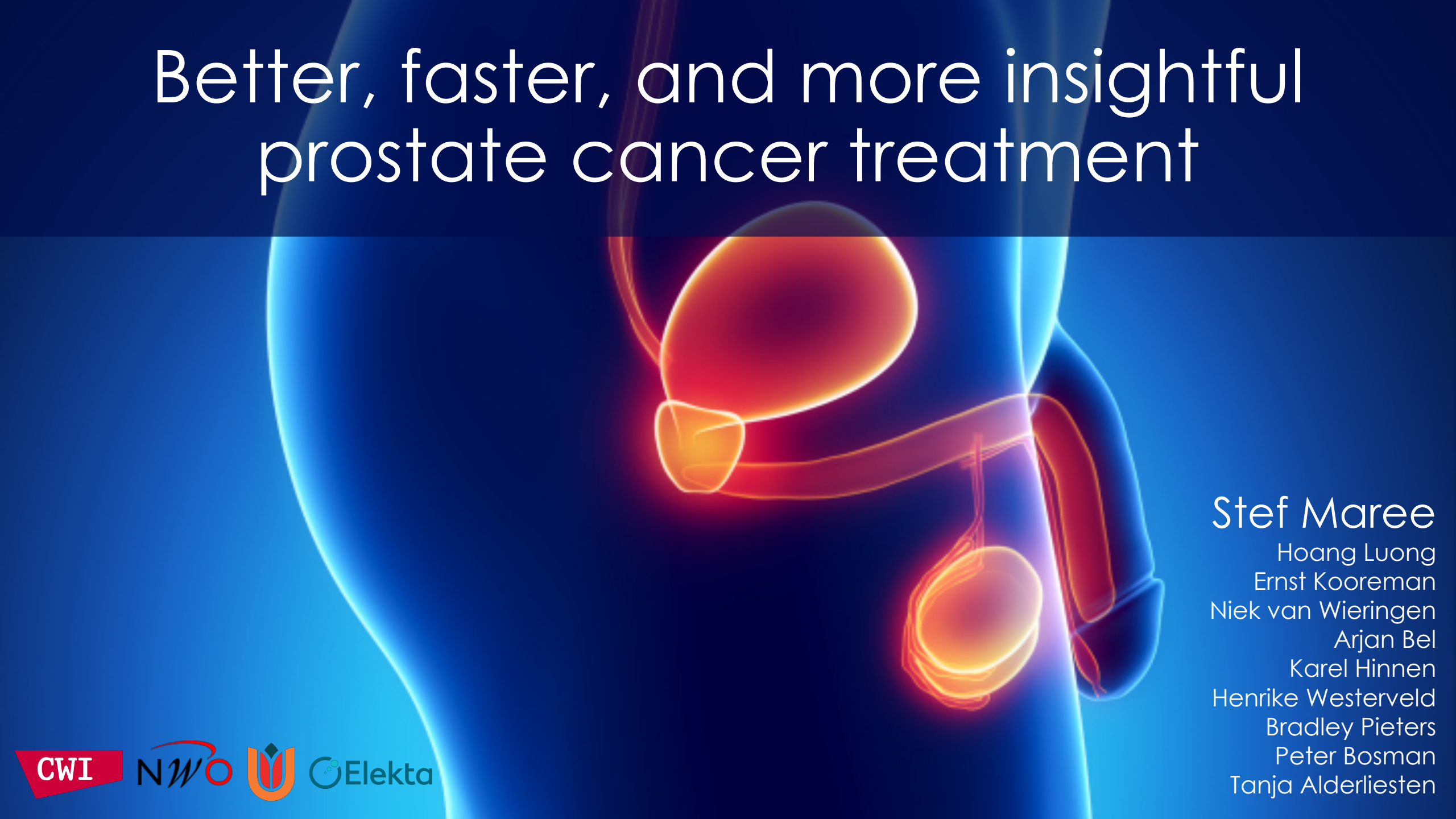
# Better, faster, and more insightful prostate cancer treatment

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MOVEMBER®
FOUNDATION

# Prostate Cancer By The Numbers

Many Men Can Not Only Survive Prostate Cancer, But Also Make More Informed Treatment Decisions By Better Understanding Its Aggressiveness

aris®

**1 in 6**

The American Cancer Society estimates about 1 in 6 American men will receive a diagnosis of prostate cancer in their lifetime.

**88,590**

nated # of American n diagnosed with state cancer in 2013.[4]

**2.5M**

More than 2 million men in the United States count themselves as prostate cancer survivors.[1]

**1/3**

The Amer Society near of

is the first prognostic test look inside the molecular ate cancer to help ne its aggressiveness her clinical n score and d

The National Institutes of Health (NIH) found only in 10 American men prostate cancer are eligible for conservative management choose this over aggressive therapy.[1]

» A more aggressive treatment regimen can started if the cancer rowing

men diagnosed ncer do

**4** There are stages of prostate cancer **BUT** tumor aggressiveness is different than tumor stage.

2017 STATS

**1 in 7** Canadian men will be diagnosed with prostate cancer in their lifetime

Prostate cancer is the most commonly diagnosed cancer among Canadian men

21% [of new male cases]

An estimated **21,300** Canadian men will be diagnosed with prostate cancer **2017**

**4,100** will die from the disease

The death rate has been declining significantly by an

3.3% [per year since

from improved testi nd better treat

EMORY WINSHIP CANCER INSTITUTE

# How common Prostate Cancer

A man is **35%** more likely to be **diagnosed** with prostate cancer than a woman with breast cancer

Nearly **3 million** American men currently live with prostate cancer

Prostate cancer is the **most common** men's cancer in America affecting **1 in 7** men

Source: American Cancer Society and Prostate Cancer Foundation

**1 in 5 men develop prostate cancer before they turn 85** (Australia)

2016 er **11.0**

men

THE BIG 5 CANCERS AFFECTING MEN IN SA

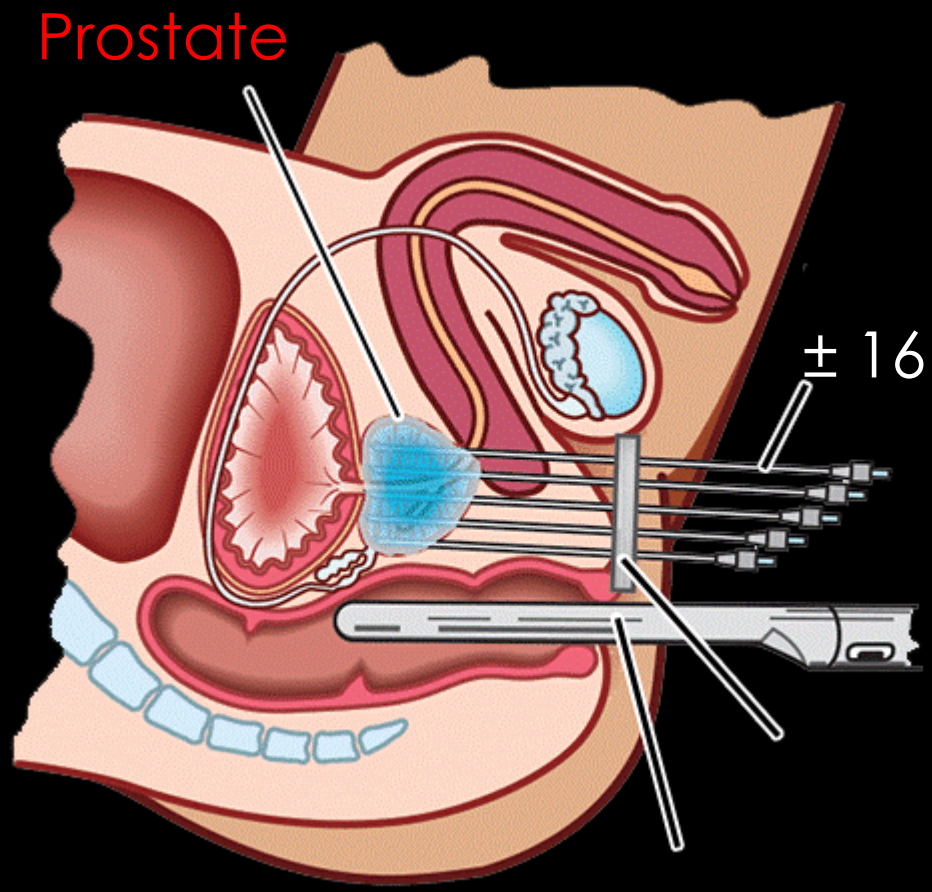
# #1 Prostate Cancer

IT IS ESTIMATED THAT **1 IN 19** SOUTH AFRICAN MEN WILL DEVELOP PROSTATE CANCER

# Brachytherapy

Treatment

# Brachytherapy



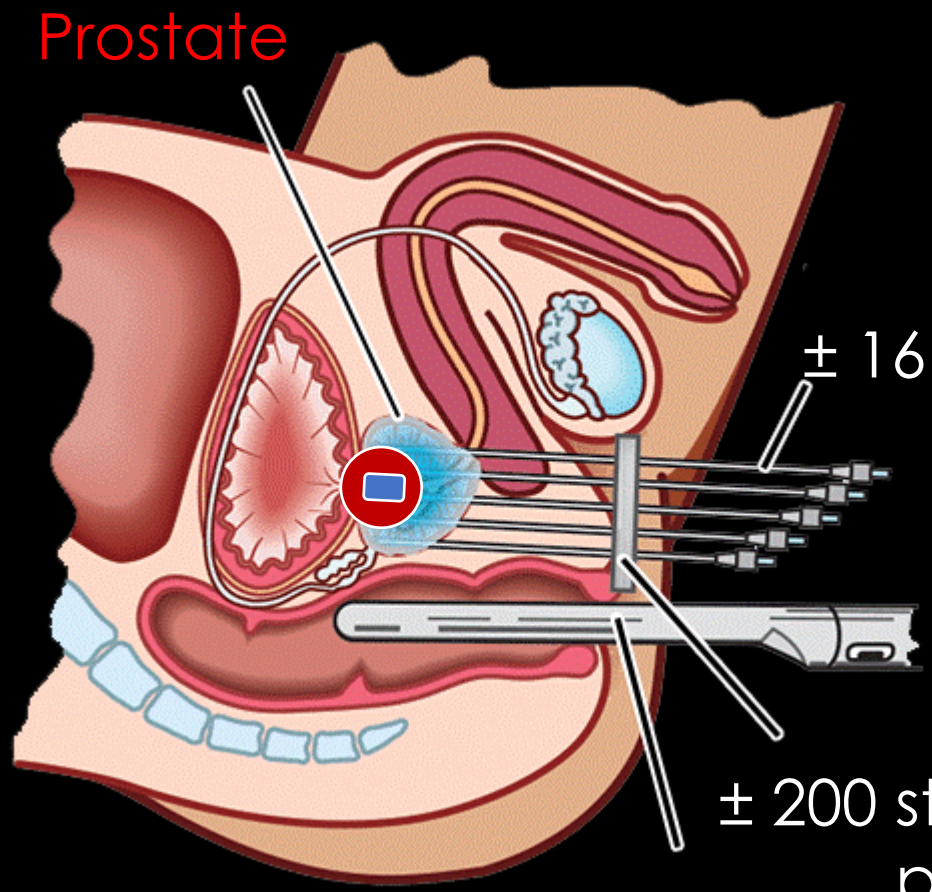

Operation theatre for catheter placement

+

Treatment

+

# Brachytherapy

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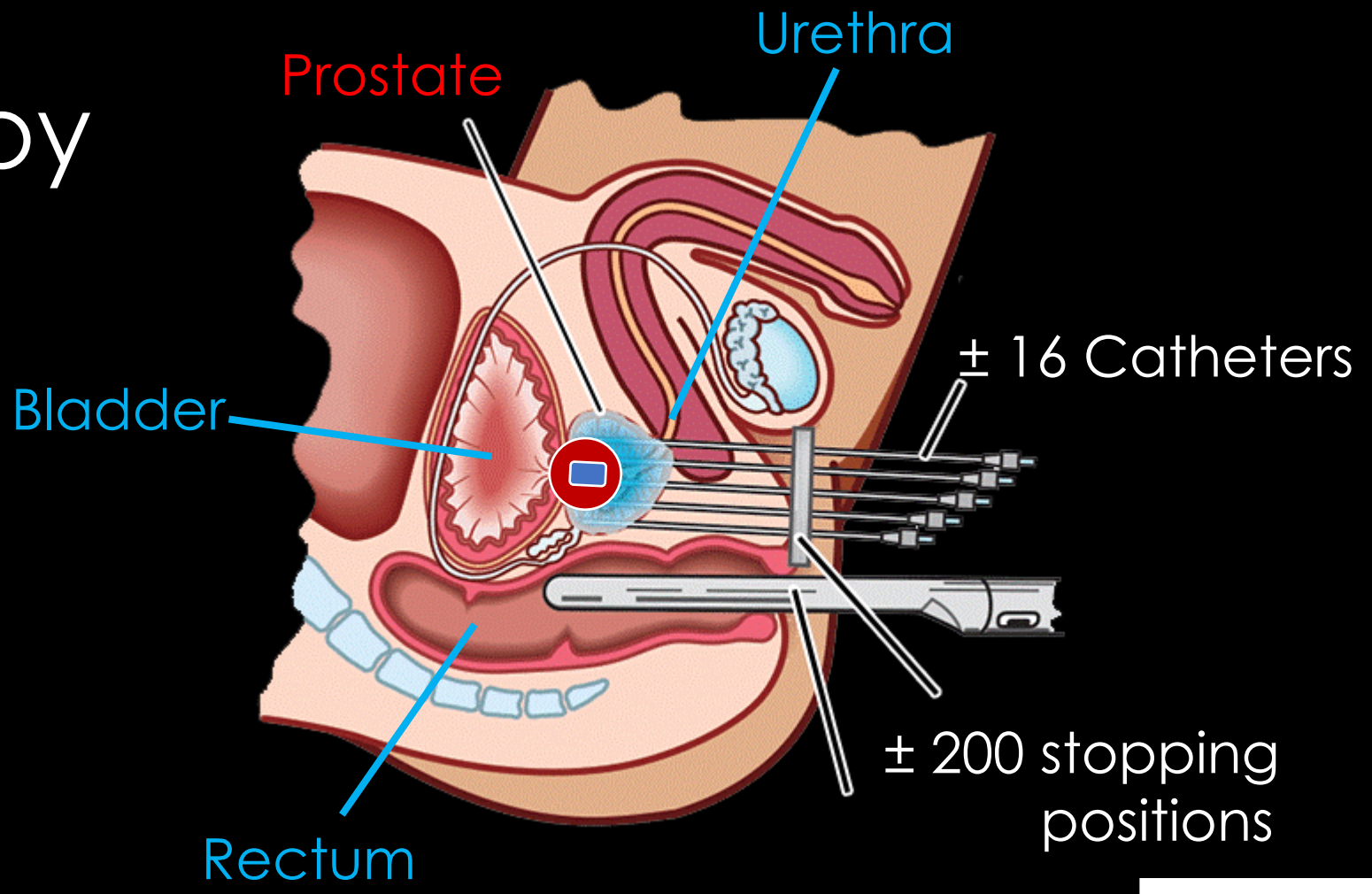


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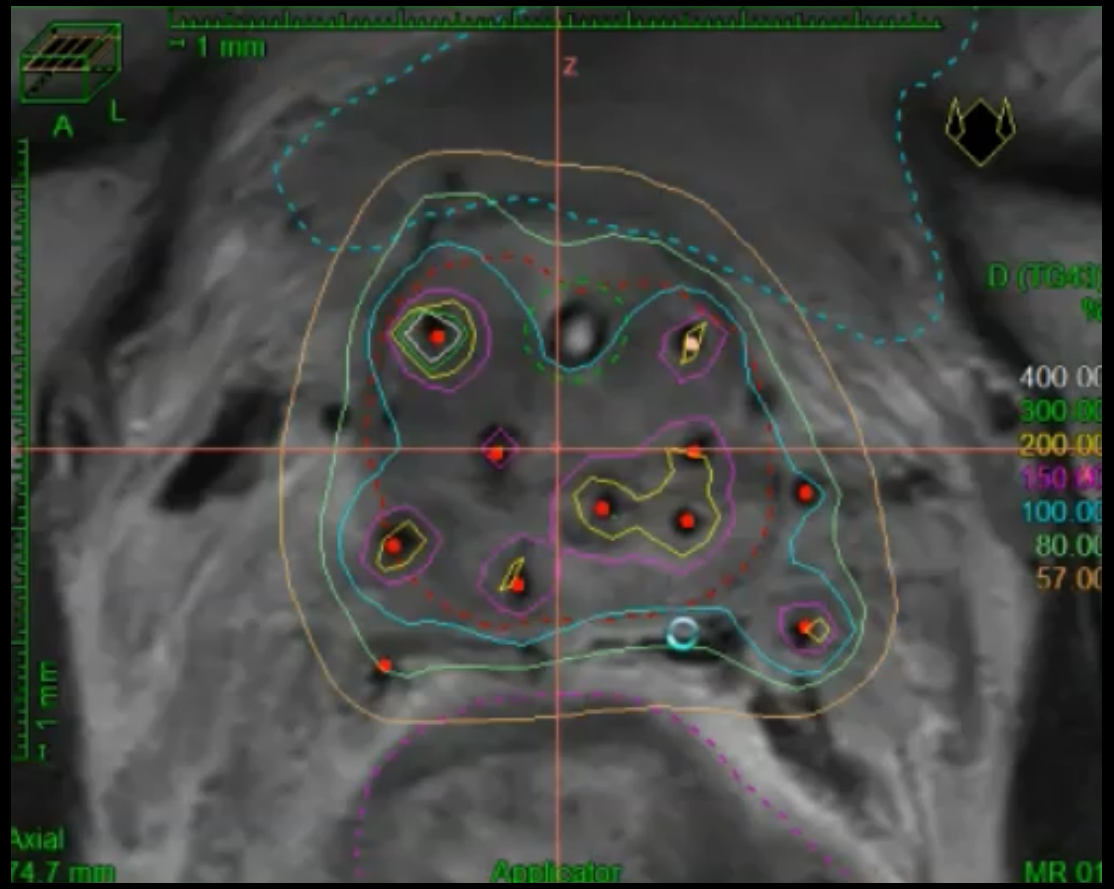
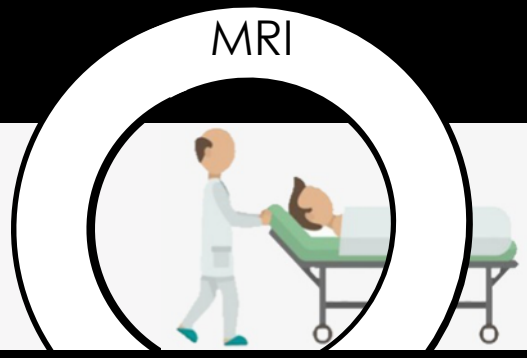
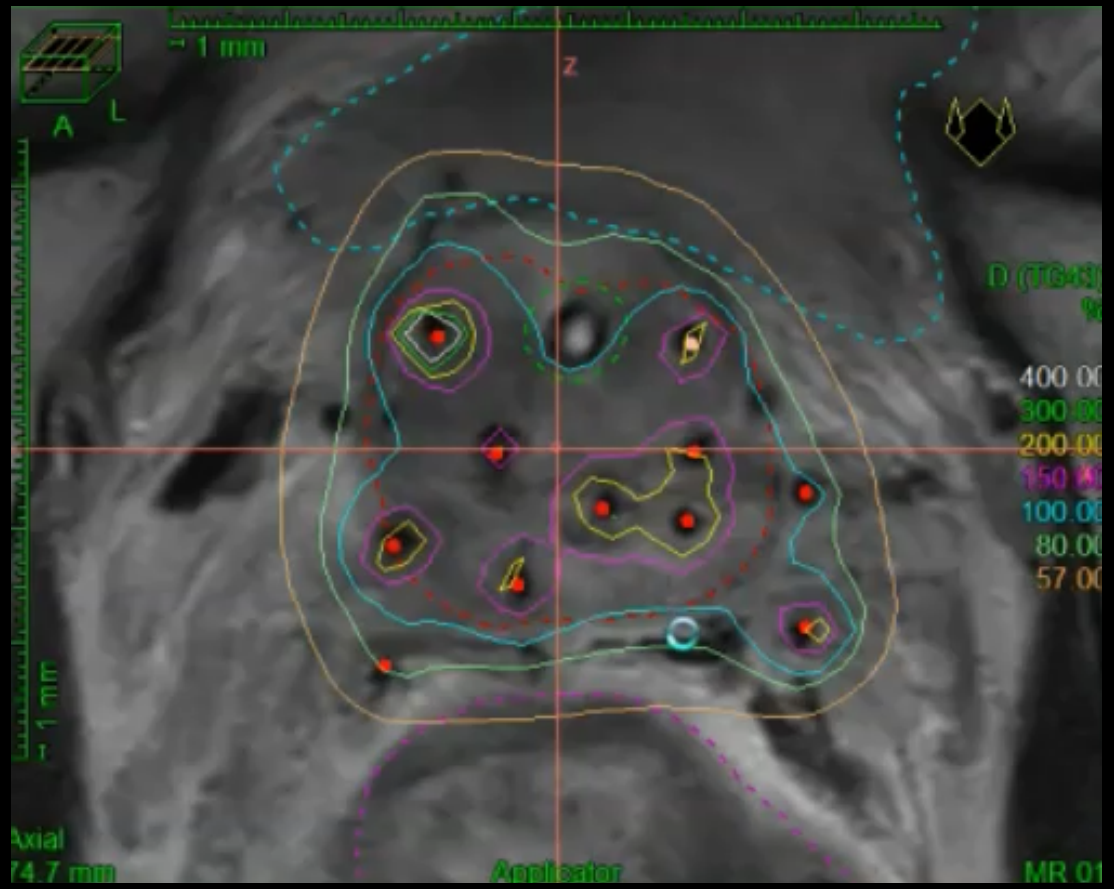



Operation theatre for catheter placement




Treatment

# Brachytherapy




Operation theatre for catheter placement

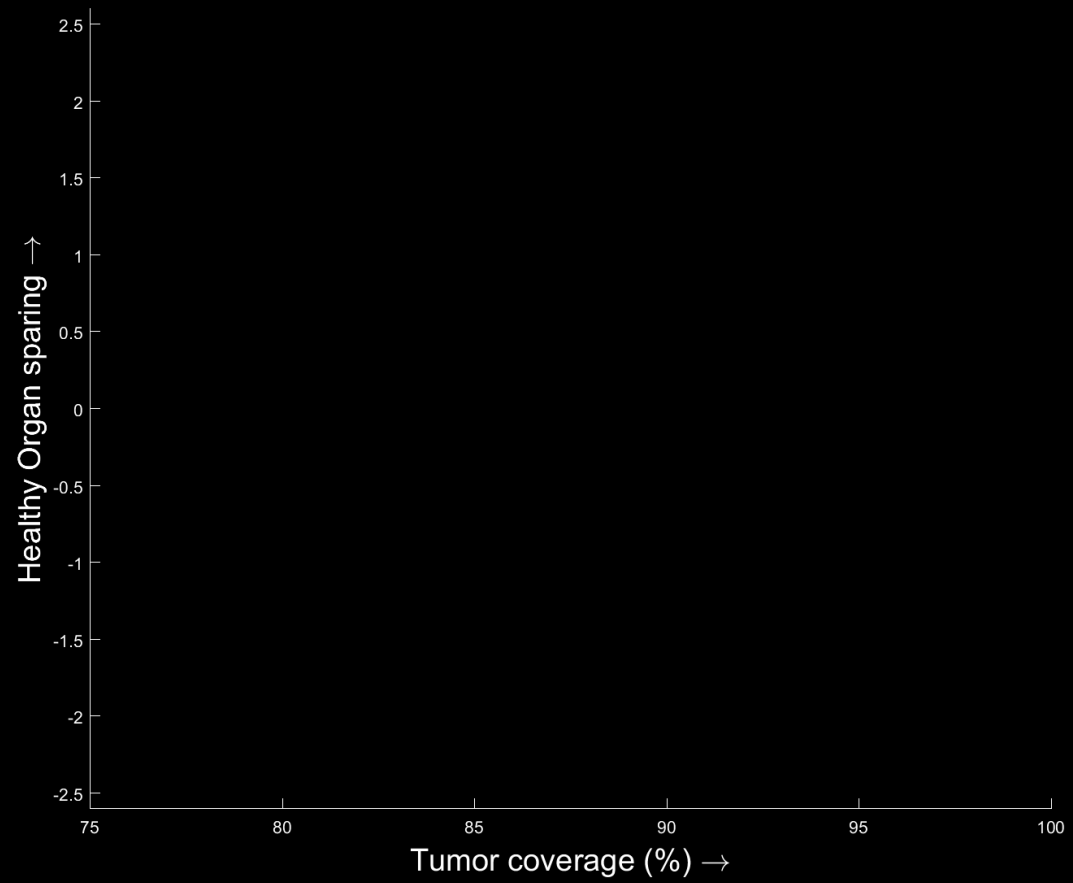
MRI

Treatment

# Treatment planning

The optimization problem:

- ±200 problem variables (stopping times)
- 2 objectives
- Directly based on clinical aims
- Non-linear, non-smooth, non-convex
- Limited time (patient is still waiting)

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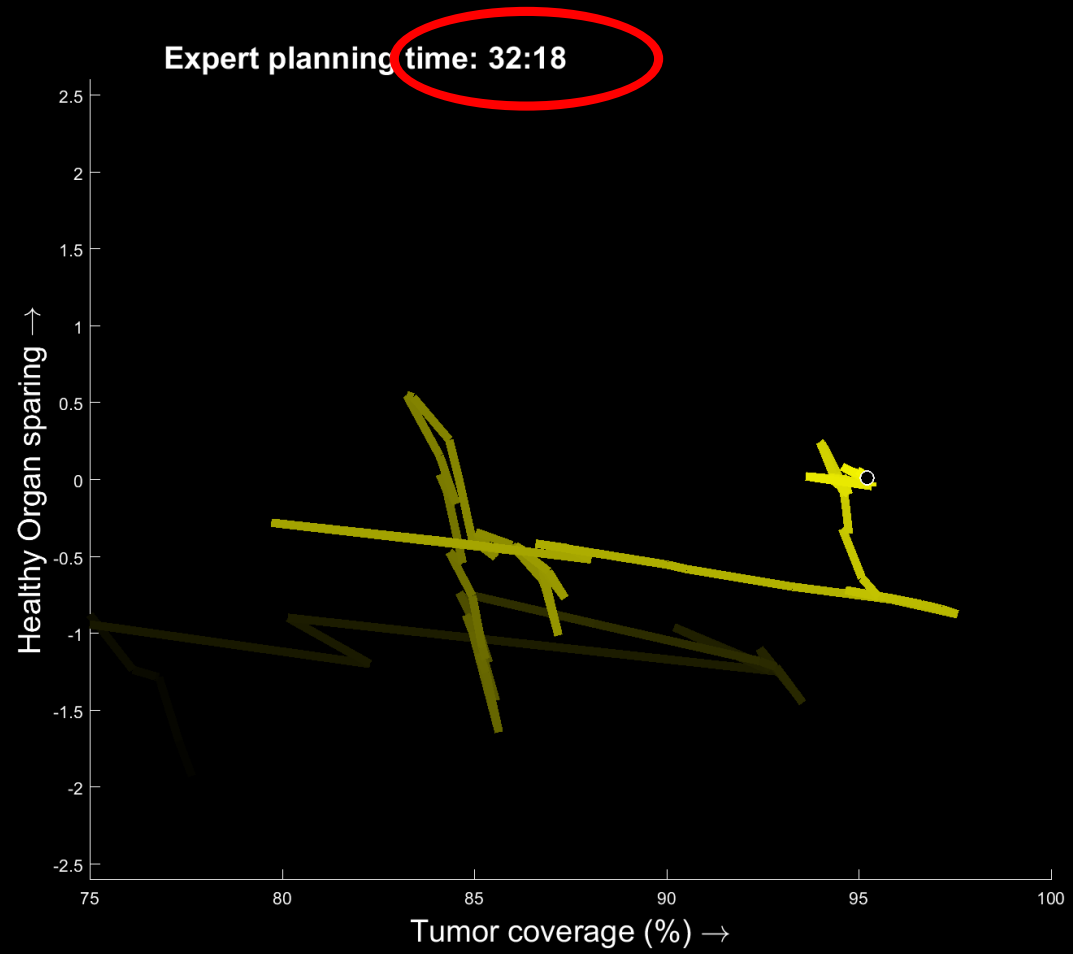


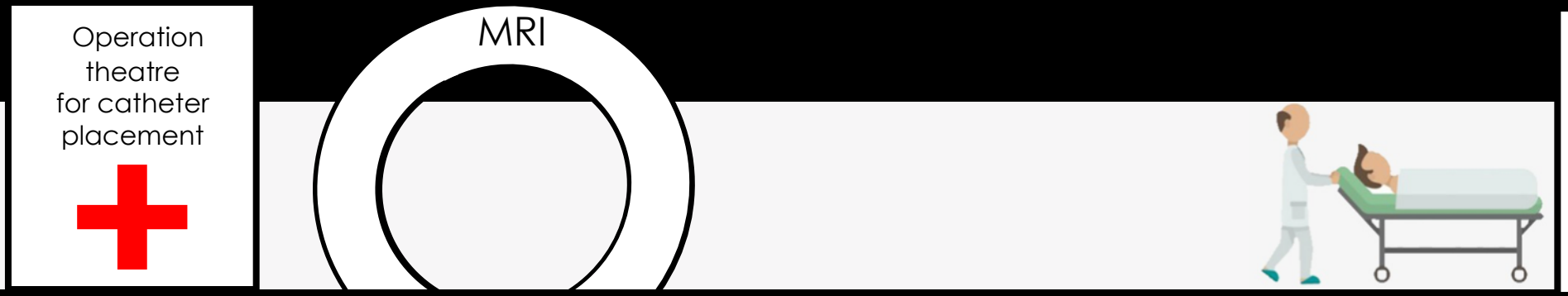

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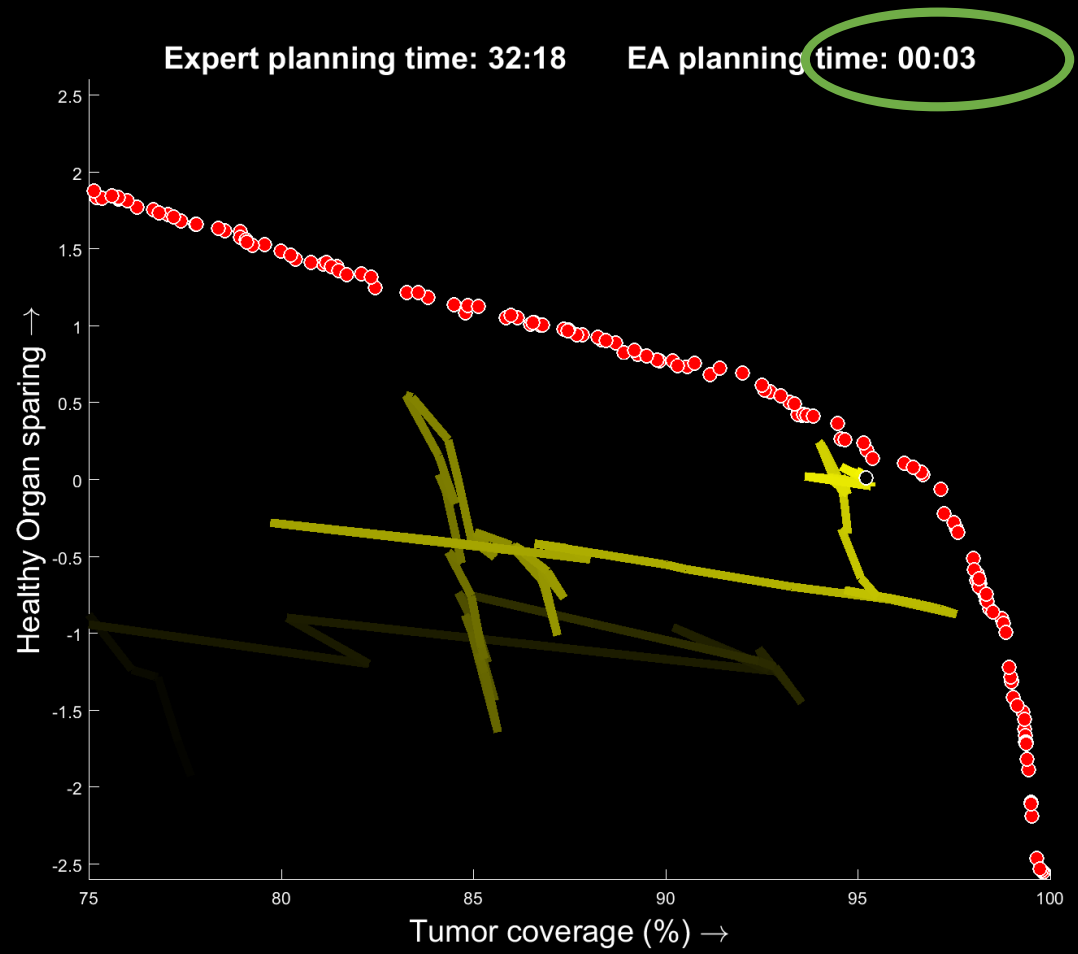


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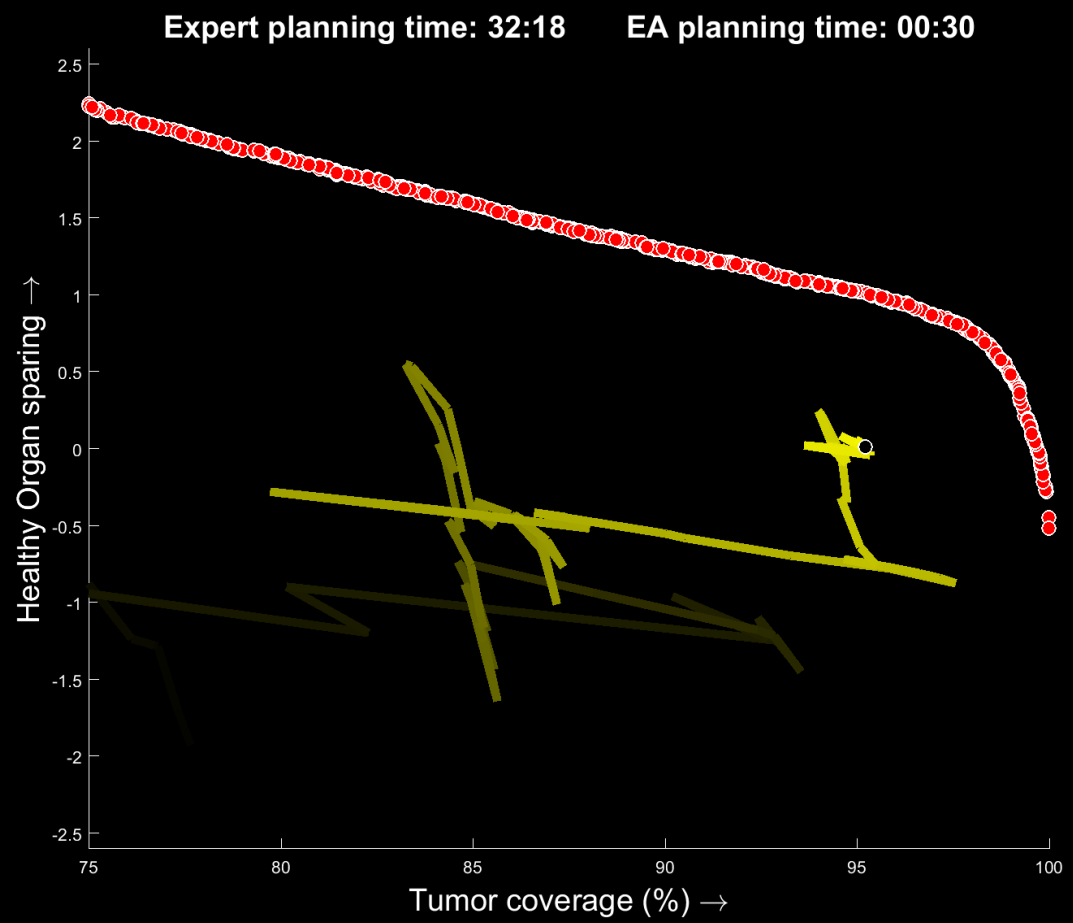
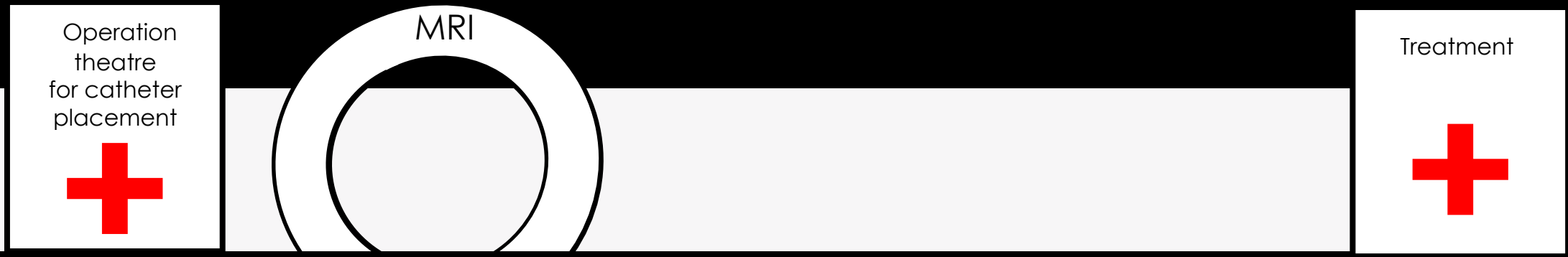
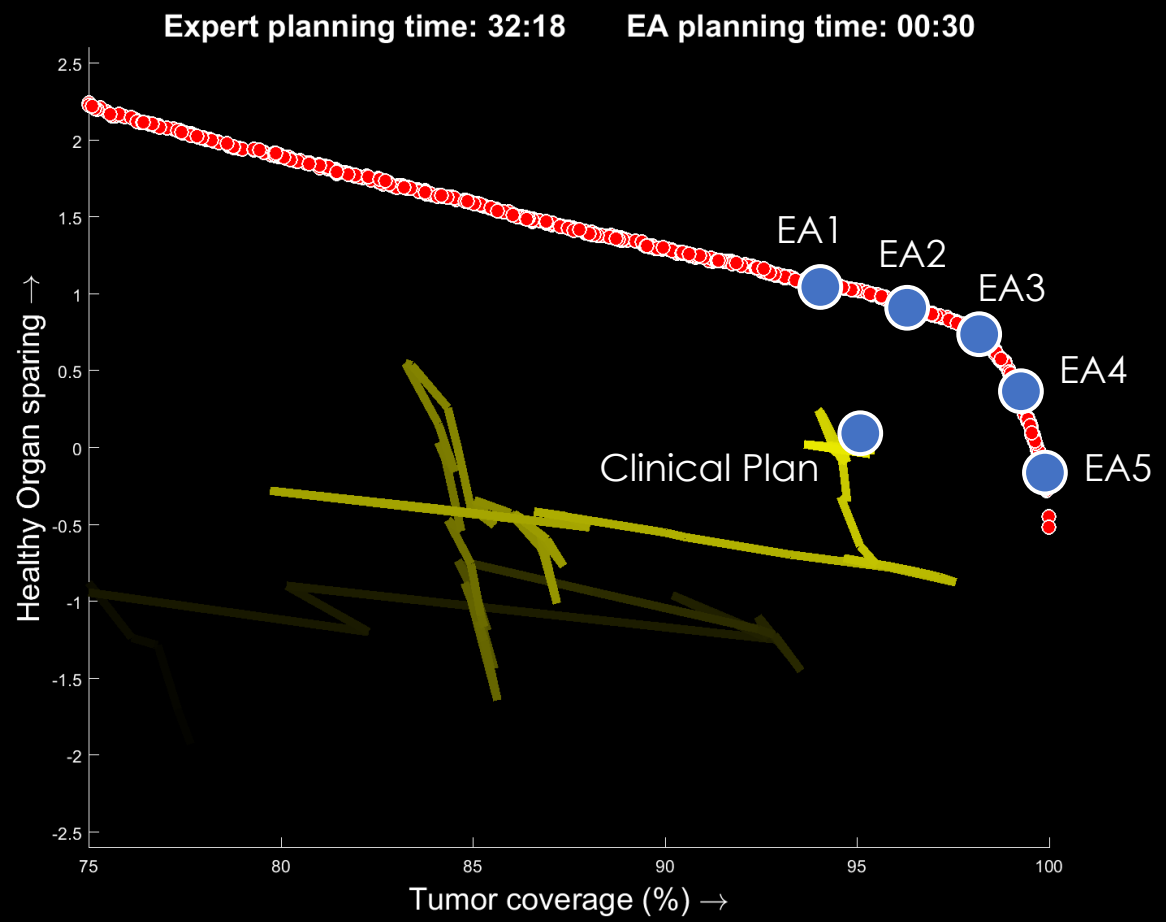


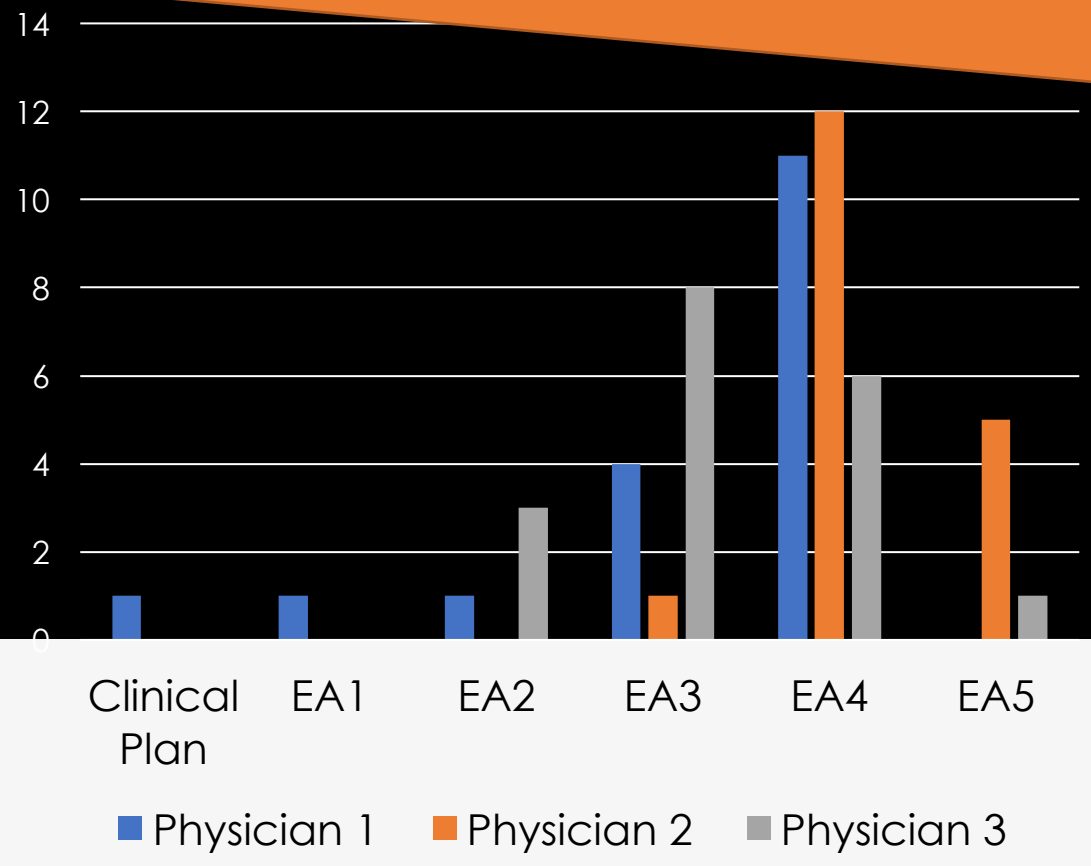



# Human competition

- 18 prostate cancer patients
- Blinded comparison between 6 plans
- 3 experienced radiation oncologists



# In 98% of the cases, an EA plan was preferred

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**First patients will be treated soon!**


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# Literature in this work


- S.C. Maree, N.H. Luong, E.S. Kooreman, N. van Wieringen, A. Bel, K.A. Hinnen, H. Westerveld, B.R. Pieters, P.A.N. Bosman, and T. Alderliesten. Evaluation of bi-objective treatment planning for high-dose-rate prostate brachytherapy -- A retrospective observer study. Brachytherapy, 2019. https://doi.org/10.1016/j.brachy.2018.12.010
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- N.H. Luong, T. Alderliesten, A. Bel, Y. Niatsetski, and P.A.N. Bosman. Application and Benchmarking of Multi-Objective Evolutionary Algorithms on High-Dose-Rate Brachytherapy Planning for Prostate Cancer Treatment. Swarm and Evolutionary Computation, 2018. https://doi.org/10.1016/j.swevo.2017.12.003