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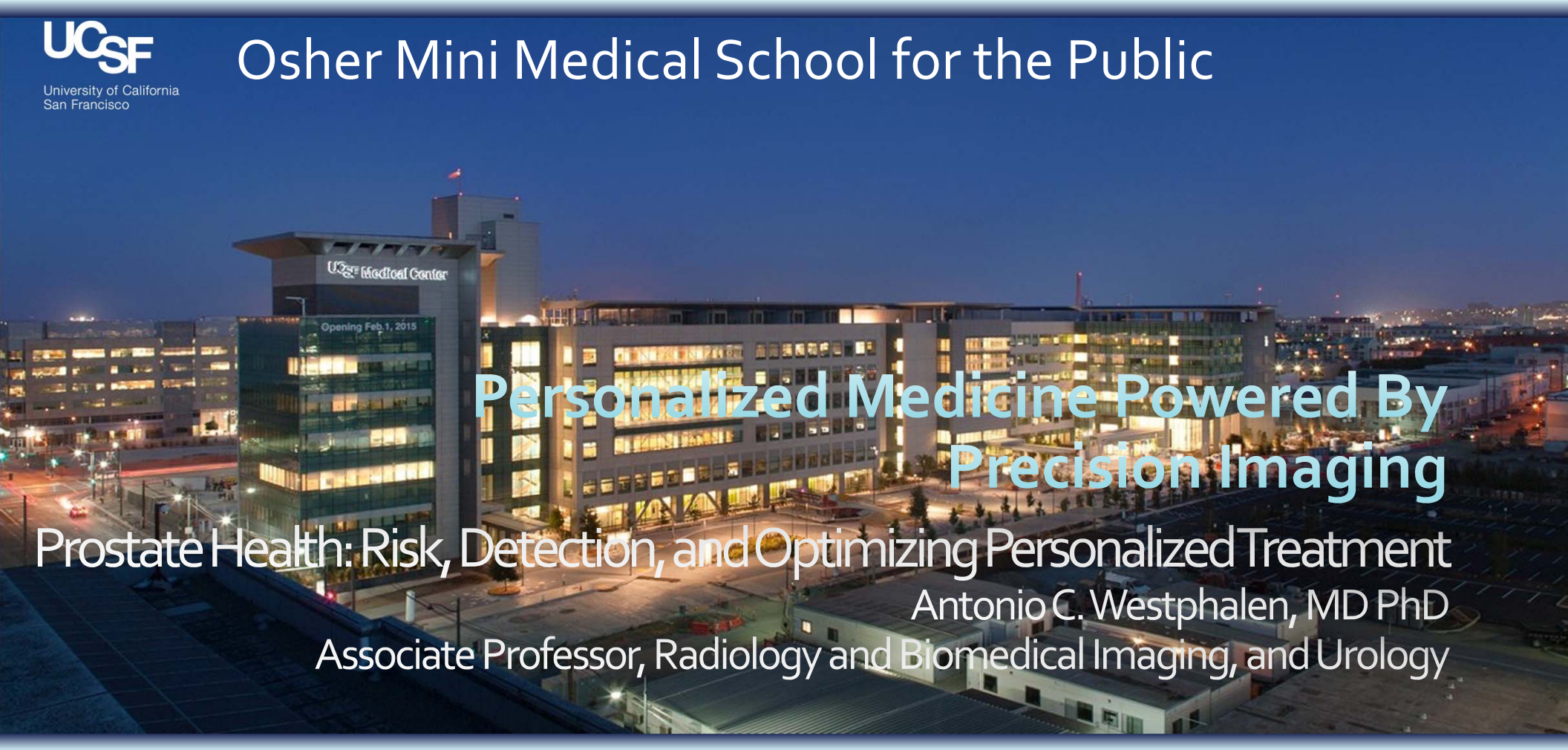
Osher Mini Medical School for the Public



Personalized Medicine Powered By Precision Imaging

Prostate Health: Risk, Detection, and Optimizing Personalized Treatment

Antonio C. Westphalen, MD PhD
Associate Professor, Radiology and Biomedical Imaging, and Urology

Outline

- What are we doing at UCSF? How? Why?
- What is the role of radiologists in this process?

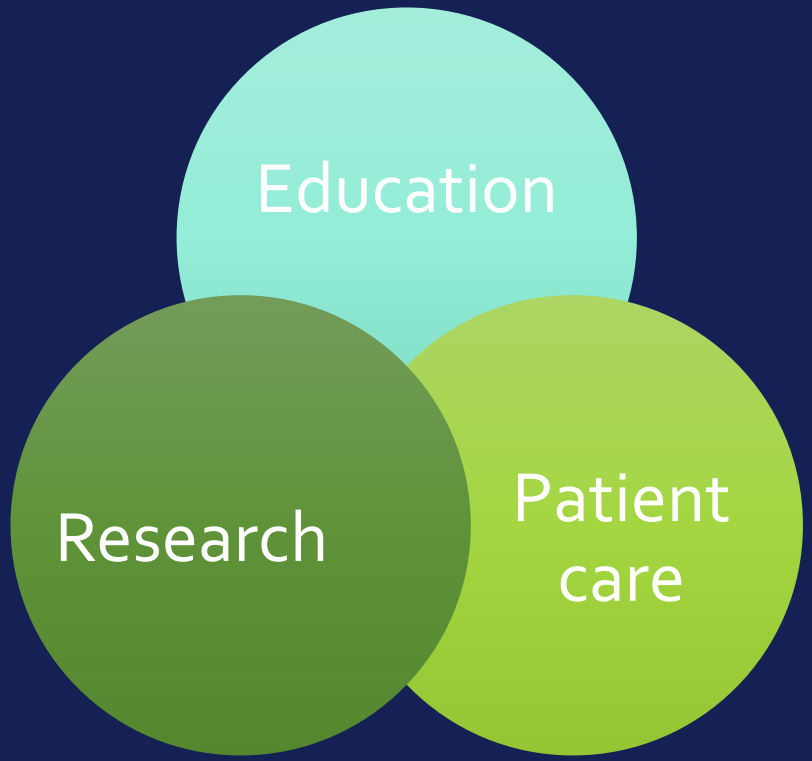
- Matthew Cooperberg
- John Kurhanewicz

- Questions and Answers

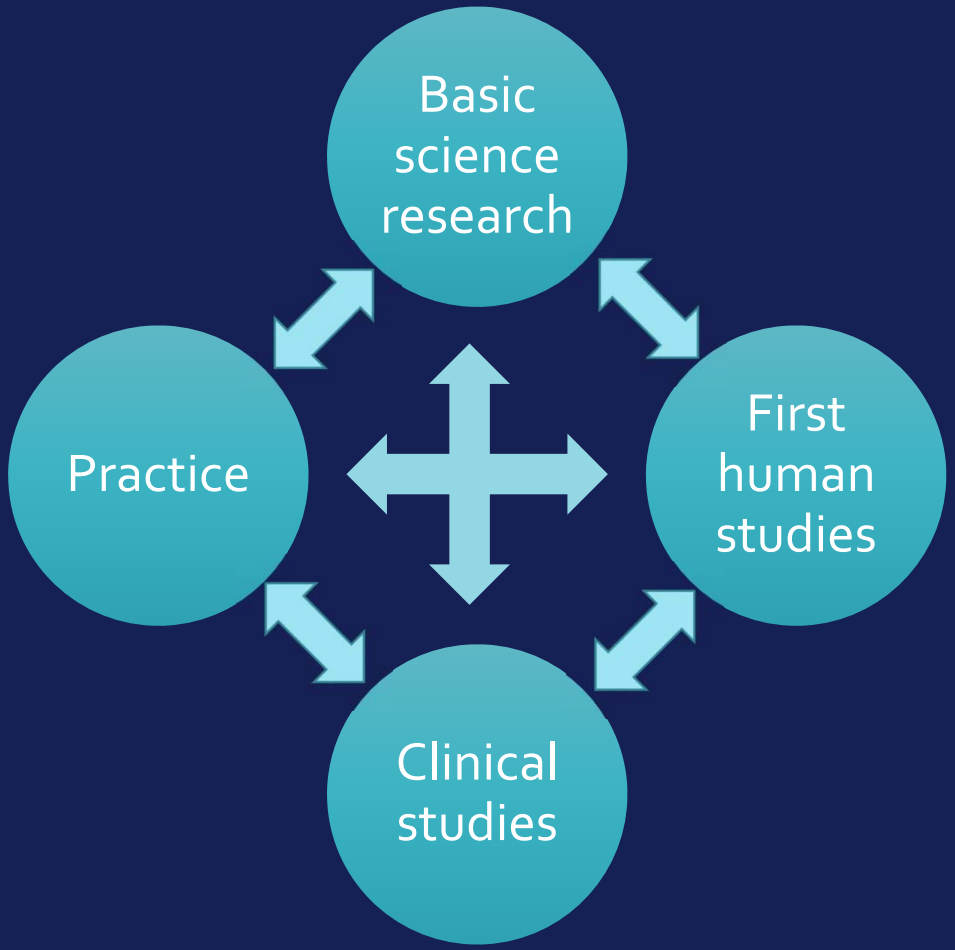
UCSF Mission

- *"advancing health worldwide* through preeminent biomedical research, graduate-level education in the life sciences and health professions, and excellence in patient care."

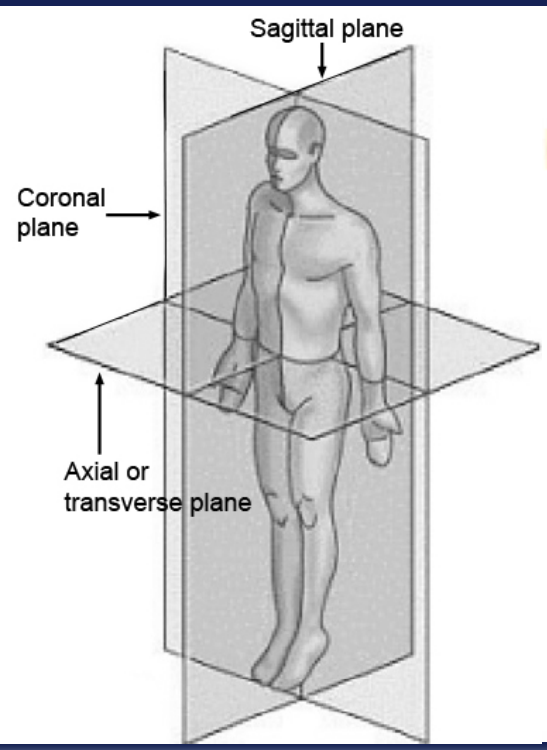
UCSF Mission

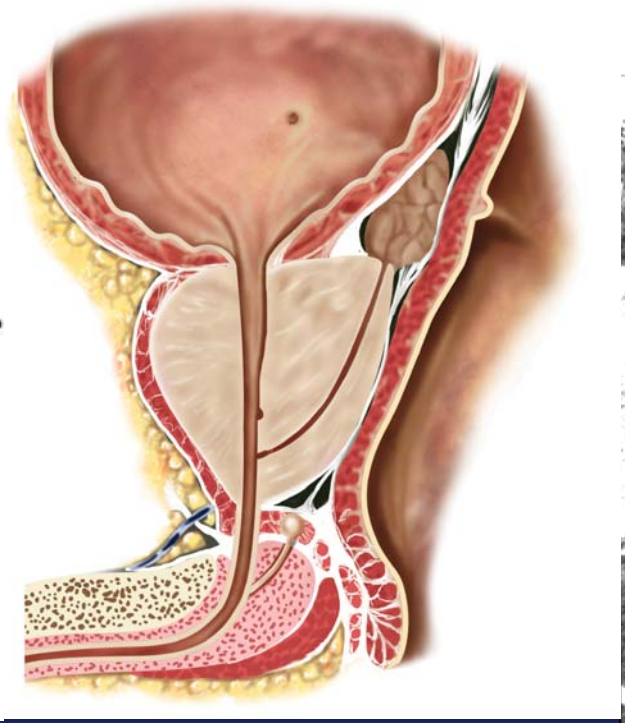


UCSF Mission

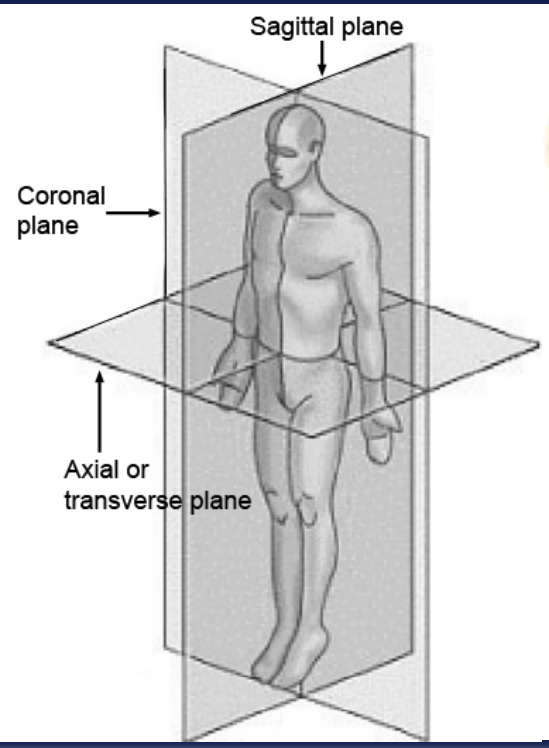


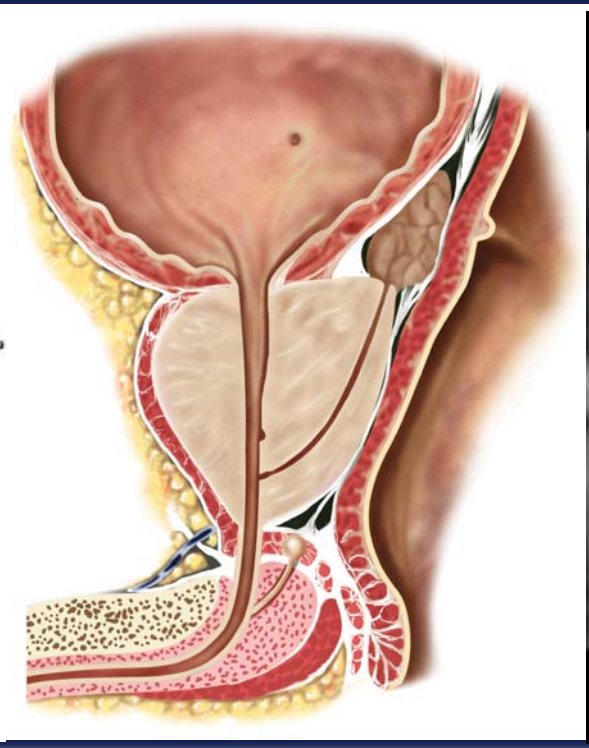
Prostate and Prostate Cancer!

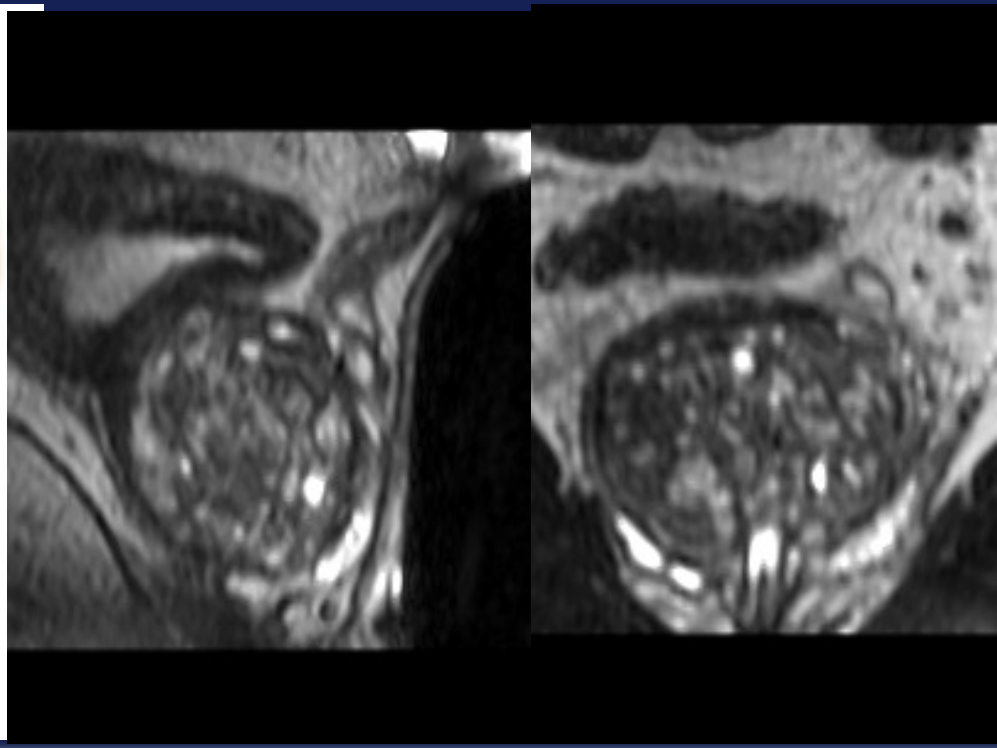


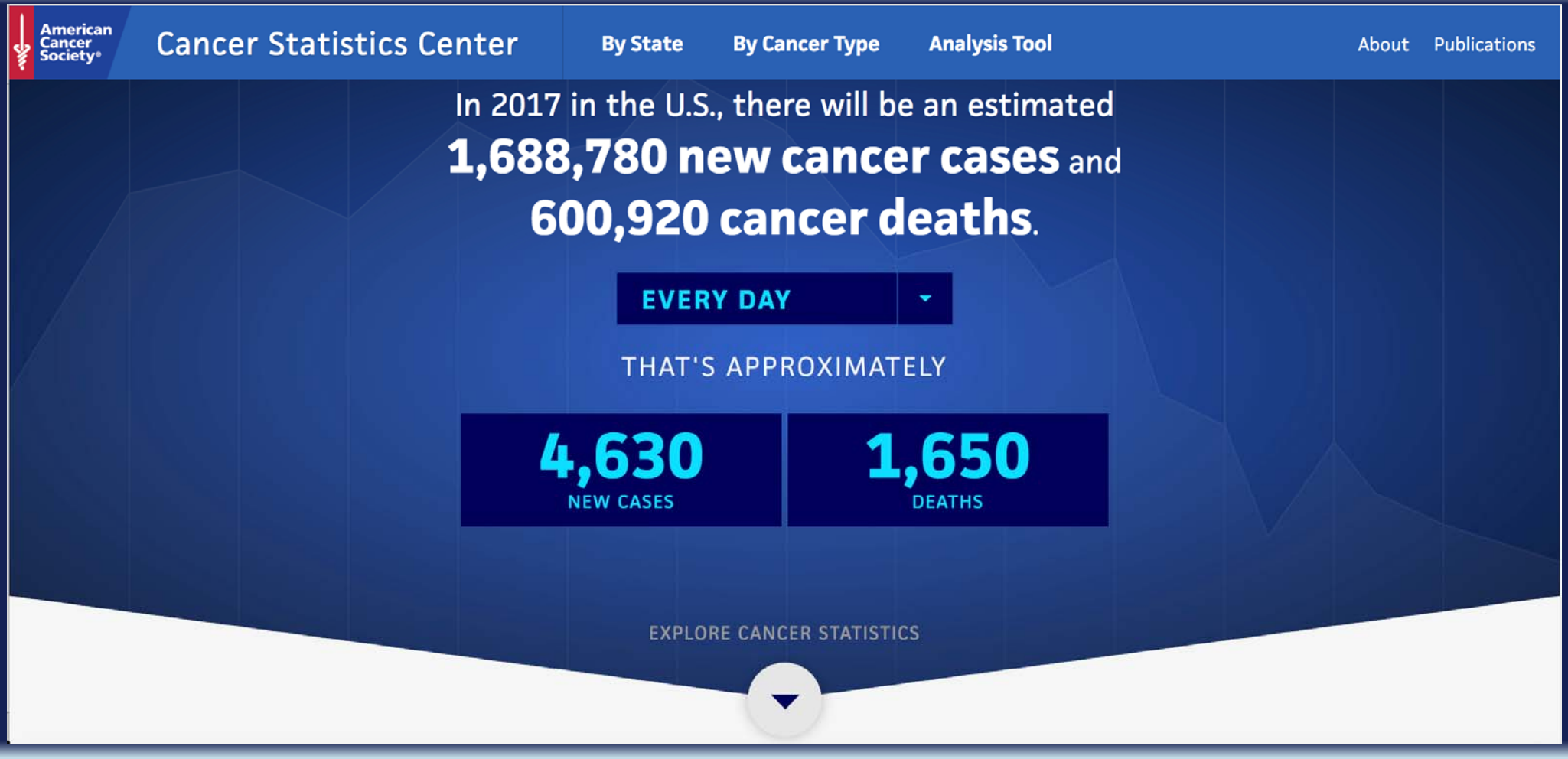


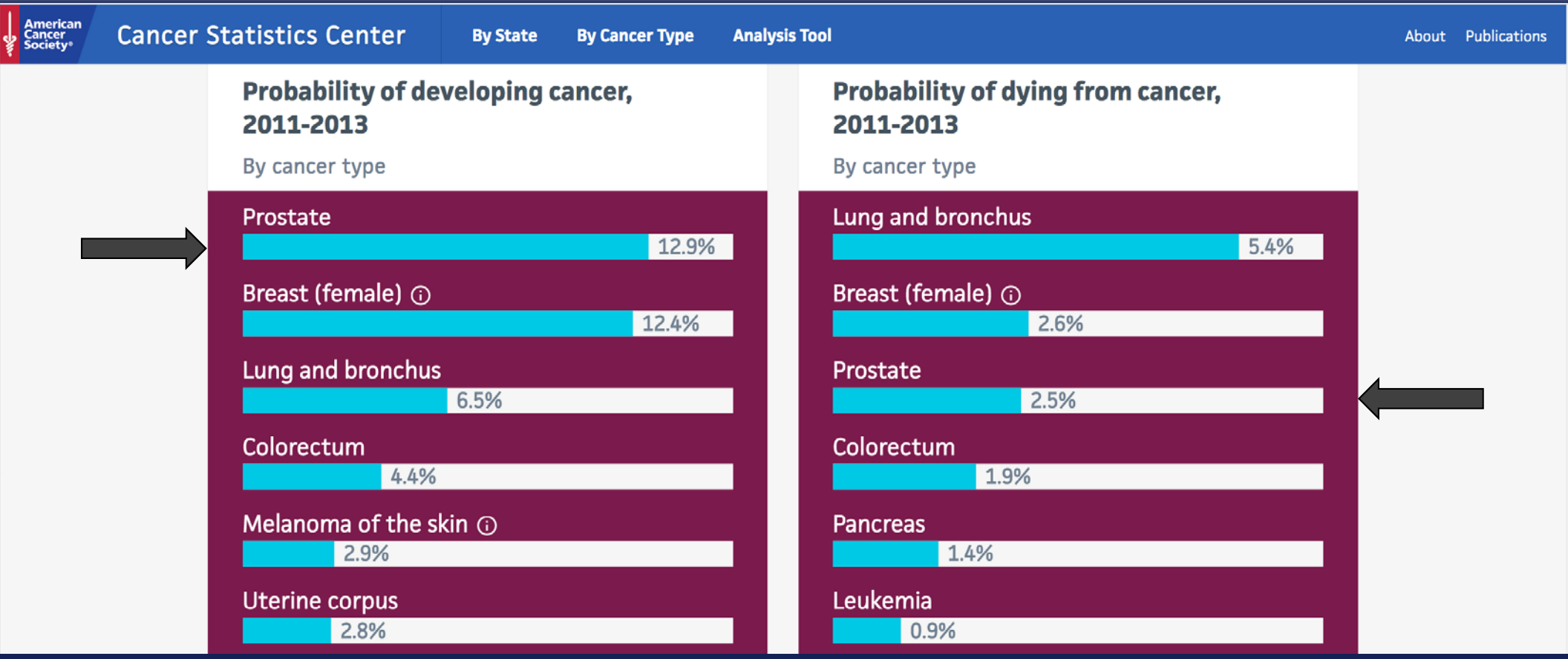
Prostate and Prostate Cancer!





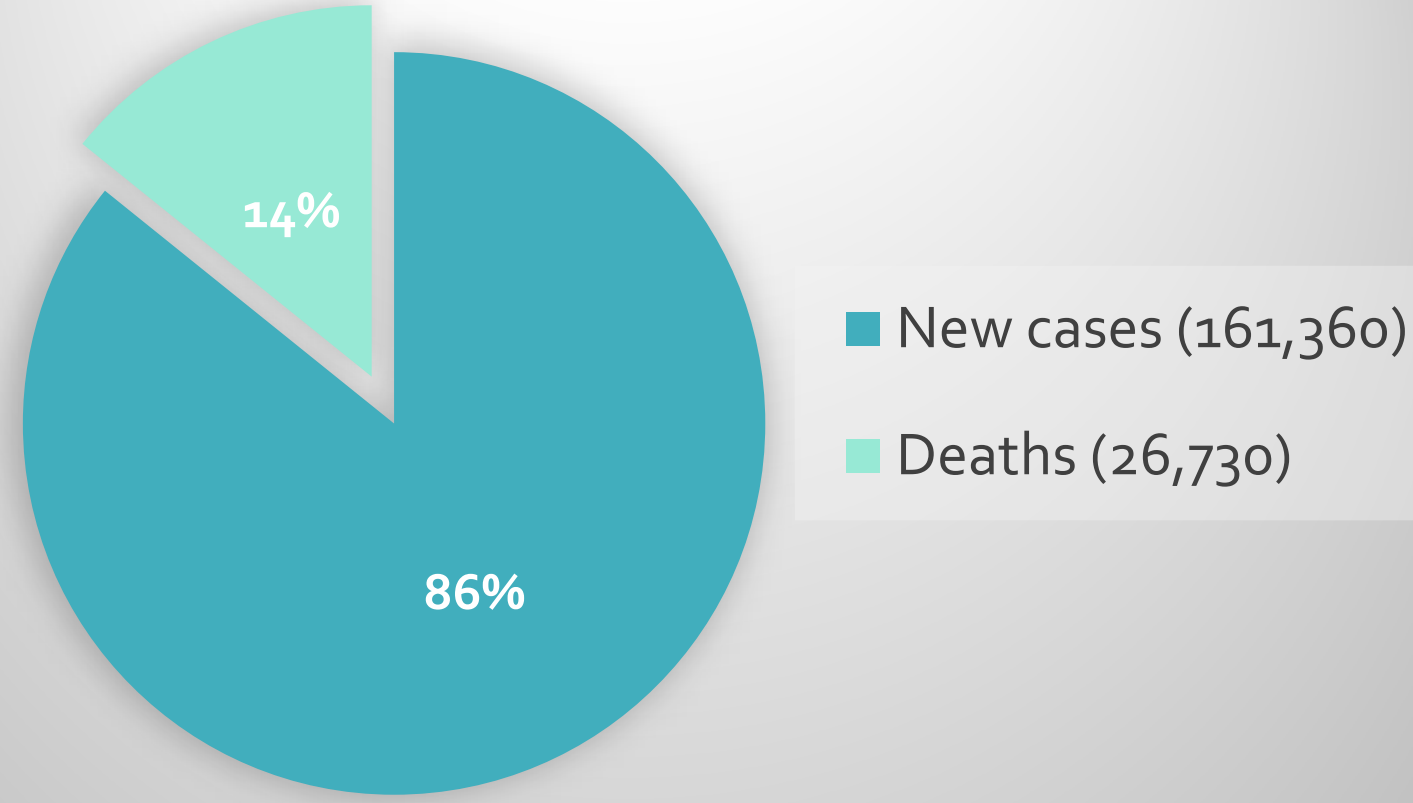



American Cancer Society
Cancer Statistics Center
By State
By Cancer Type
Analysis Tool
About
Publications
In 2017 in the U.S., there will be an estimated
1,688,780 new cancer cases and
600,920 cancer deaths.
EVERY DAY
THAT'S APPROXIMATELY
4,630
NEW CASES
1,650
DEATHS
EXPLORE CANCER STATISTICS



Lifetime risk

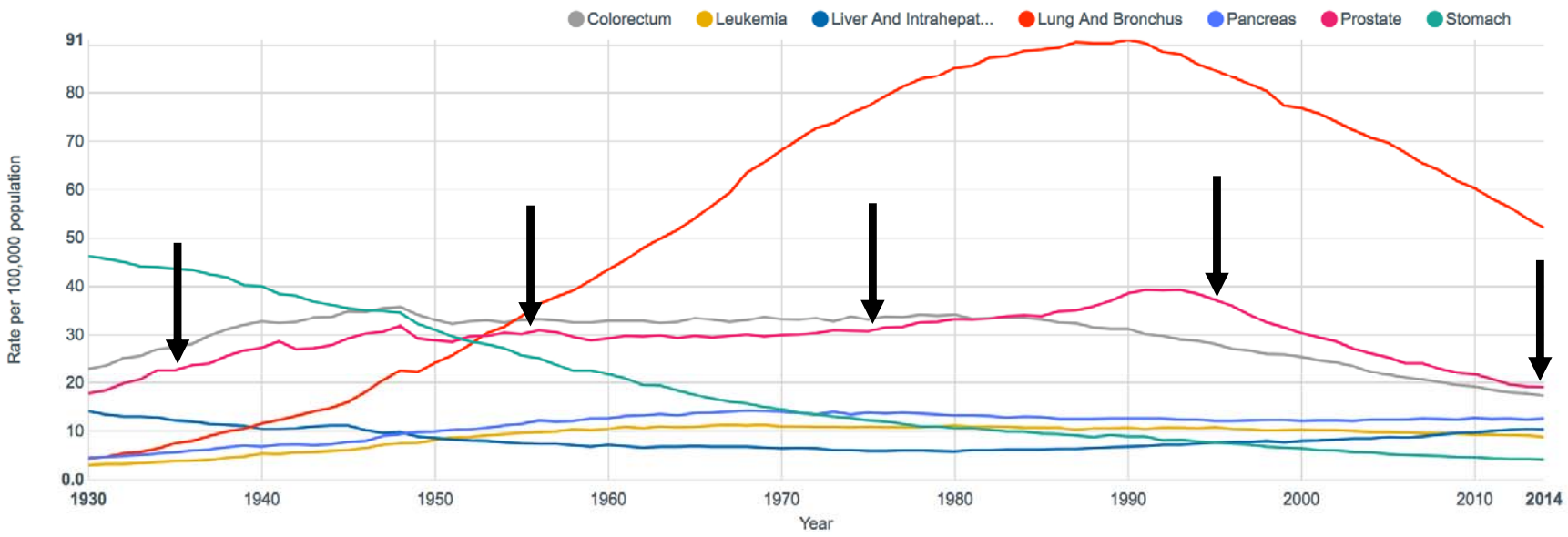
Prostate Cancer (2017)



American Cancer Society® Cancer Statistics Center | By State | By Cancer Type | Analysis Tool | About | Publications

Trends in death rates, 1930-2014

Males



Per 100,000, age adjusted to the 2000 US standard population.

Data sources: National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, 2016

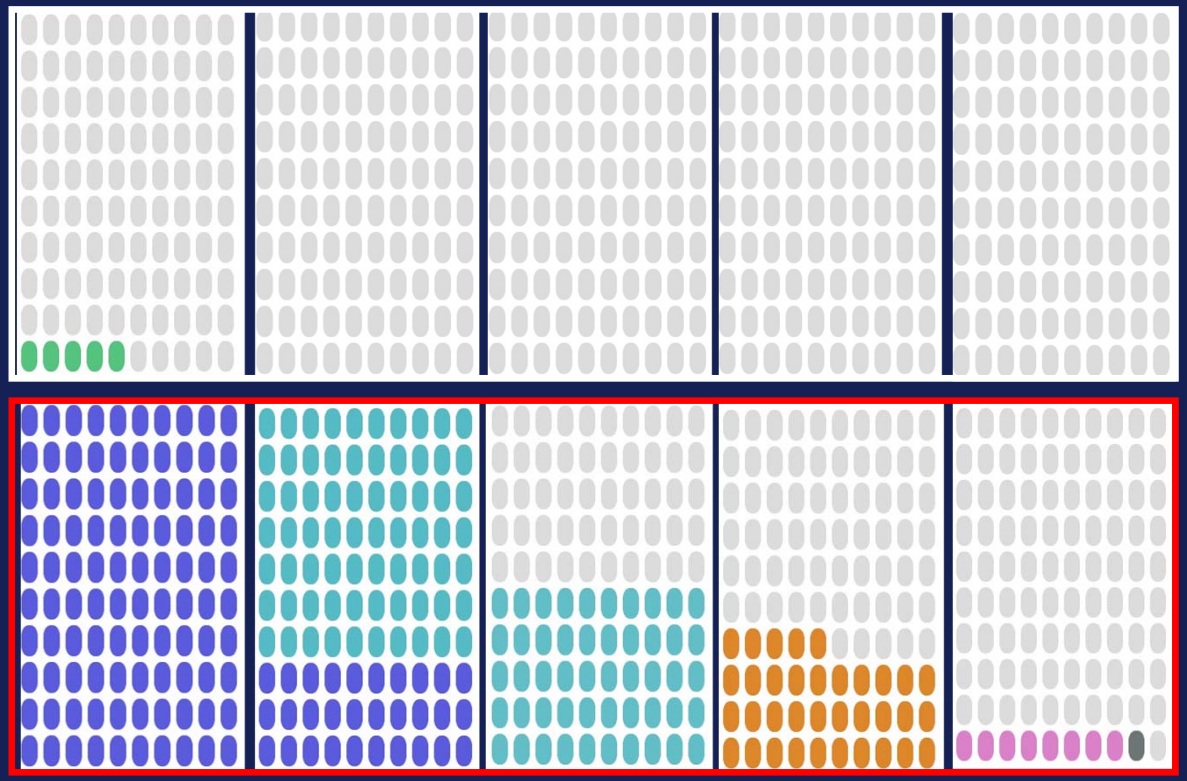
American Cancer Society

Cancer Statistics Center | By State | By Cancer Type | Analysis Tool | About | Publications

5-year relative survival, 2006-2012

By cancer type

PSA Screening in 1000 US men



Benefits

5 fewer Pca deaths

Harms

130 negative biopsies

120 positive biopsies

35 develop bladder, bowel or sexual side effects

8 complications of biopsy or treatment (i.e. sepsis, wound infection, DVT, MI, etc.)

<1 death due to treatment

Slide courtesy of Dr. Peter Carroll

We *overdiagnose* prostate cancer, i.e. we diagnose tumors that will not have an impact on patients life.

We *overtreat* prostate cancer, i.e. we treat tumors tumors that will not have an impact on patients life.


Do I have cancer?
Is my cancer bad?

What do we want?

- *We want …*

… to diagnose only prostate cancers that do need treatment because they will impact the patient's life

… to improve treatment/management decisions

… to minimize the risks, i.e. complications, of treatments

And when cure is not possible

- *We want …*

… to detect spreading of disease early to maximize the control of cancer and maintain life expectancy

Radiologists play a key role!

After abnormal PSA
Before diagnosis, i.e. biopsy

After diagnosis, i.e. biopsy
Before treatment

Treatment

After treatment

After abnormal PSA
Before diagnosis, i.e. biopsy
MRI

After diagnosis, i.e. biopsy
Before treatment
MRI / CT / bone scan / PET

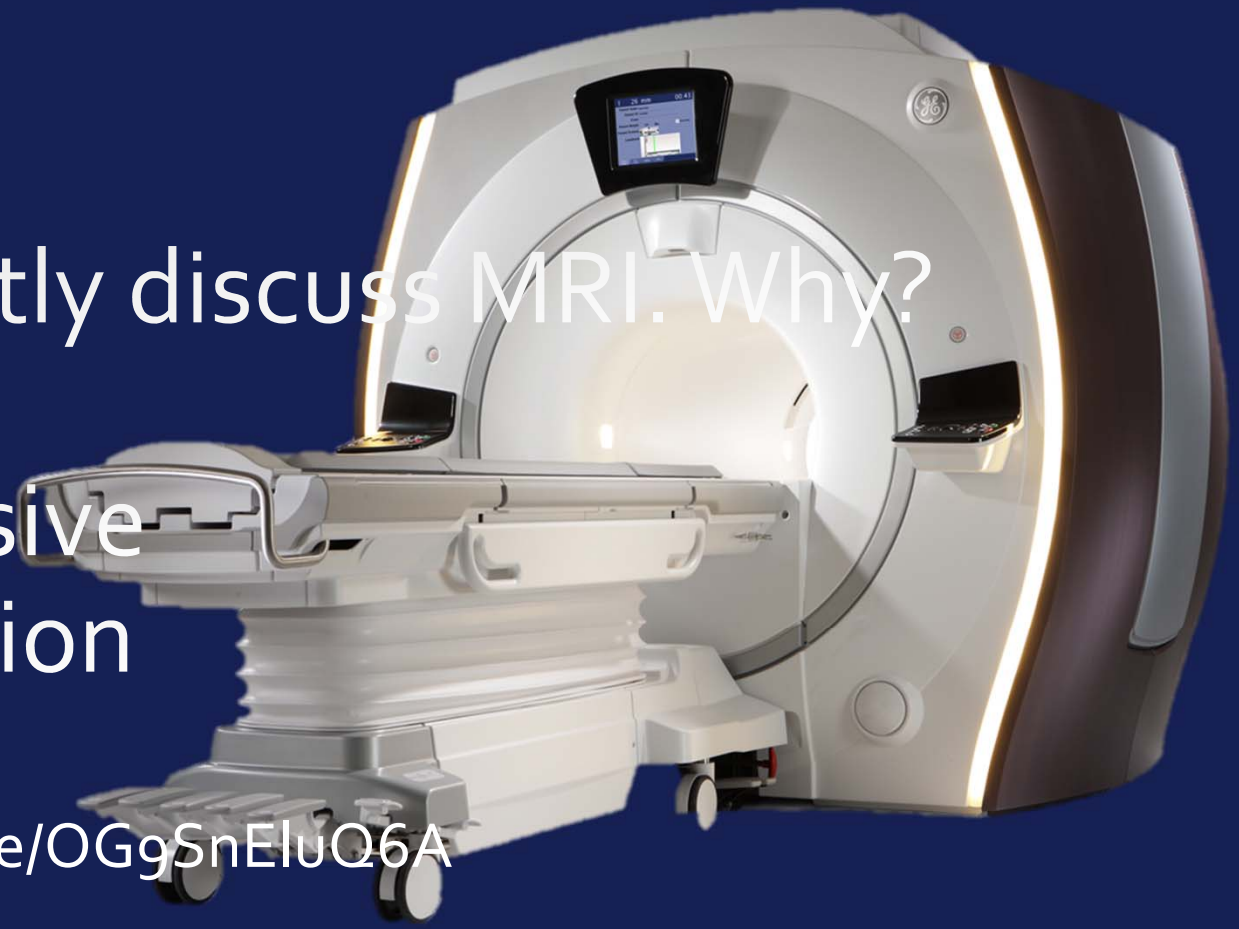
We play a role at all stages of patient care!

After treatment
PET

Treatment
CT / bone scan / PET

I will mostly discuss MRI.

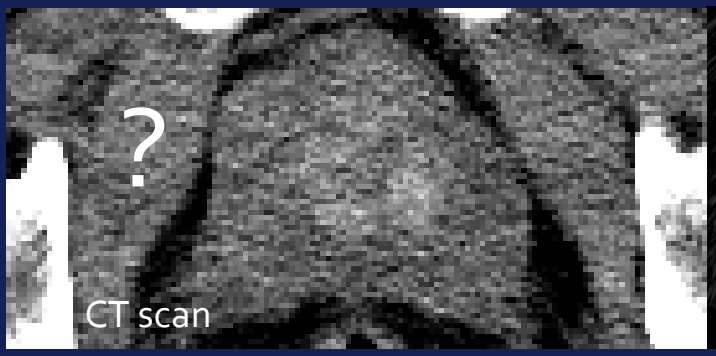
I will mostly discuss MRI. Why?

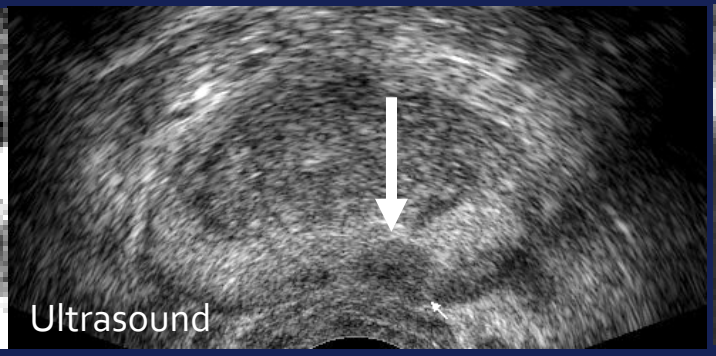


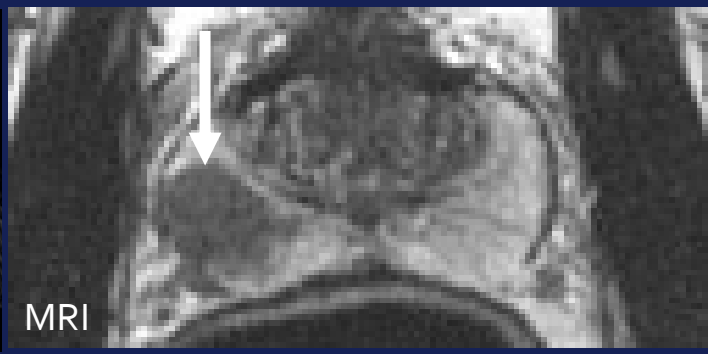
Non invasive
No radiation

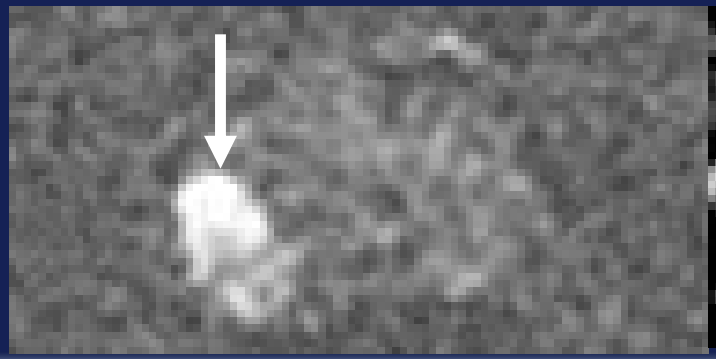
https://youtu.be/OG9SnEluQ6A

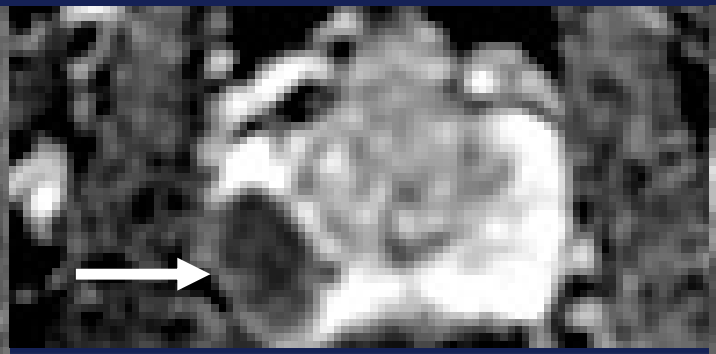
I will mostly discuss MRI

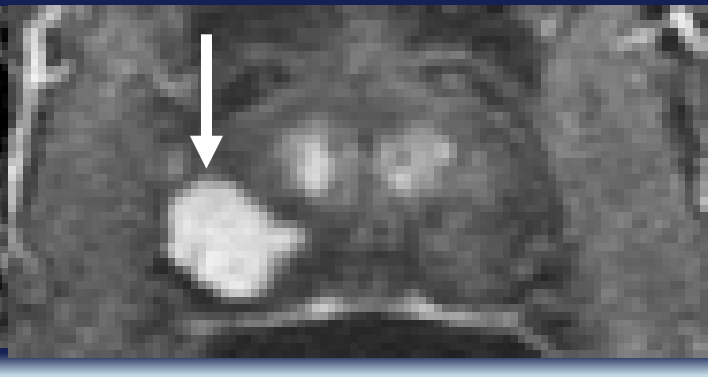




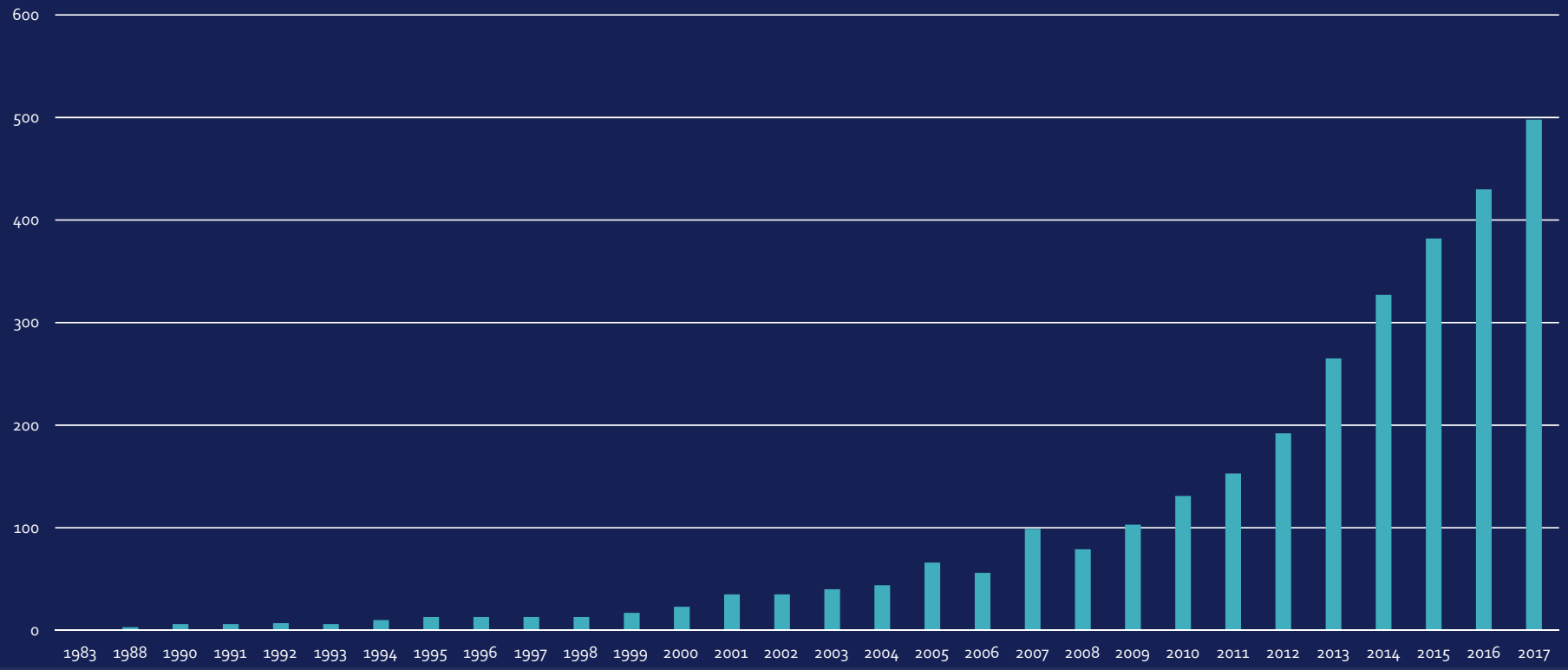


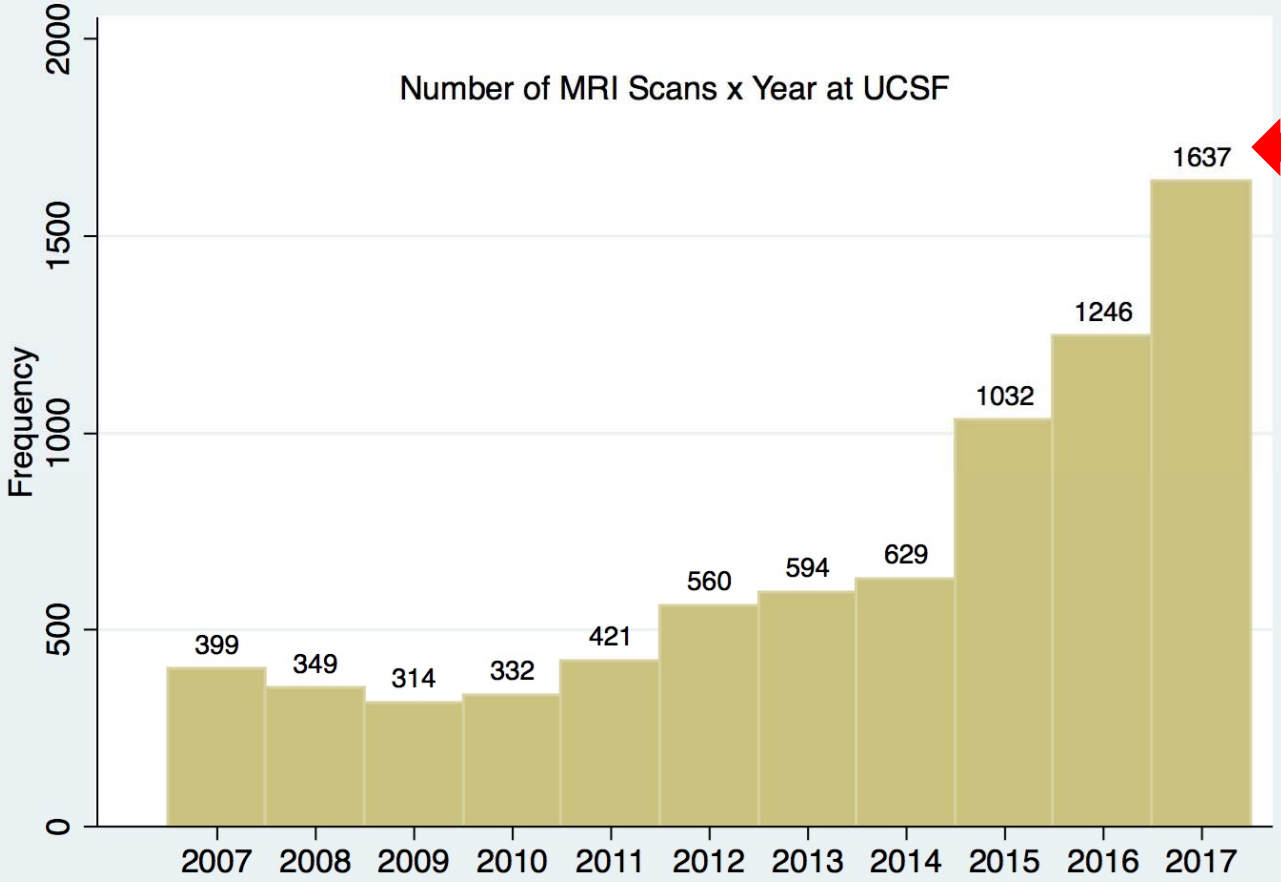




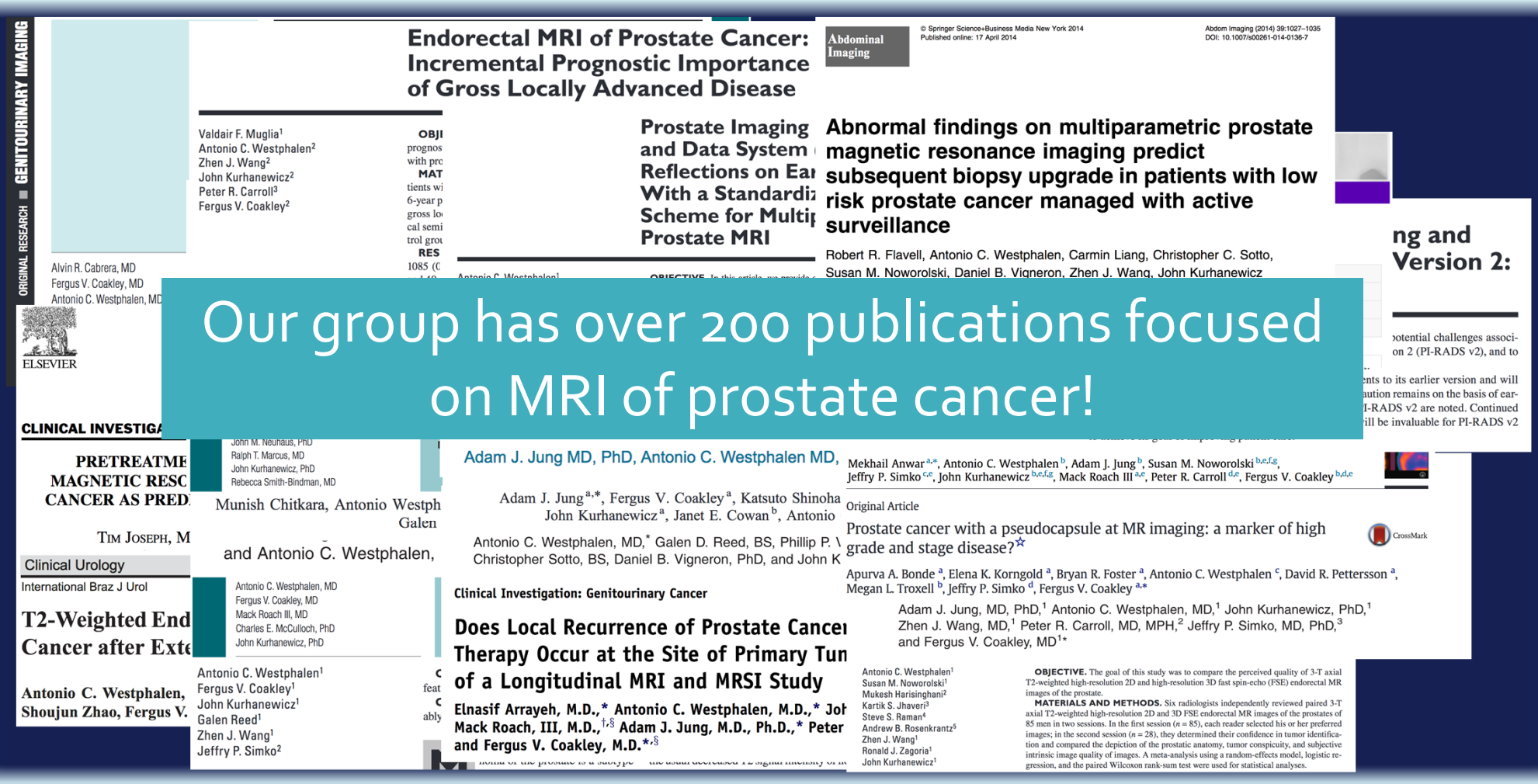


Prostate MRI PubMed publications




Number of MRI Scans x Year at UCSF
Frequency
0
500
1000
1500
2000
399
349
314
332
421
560
594
629
1032
1246
1637
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

09/31/2017



Our group has over 200 publications focused on MRI of prostate cancer!

We want …

… to diagnose only prostate cancers that do need treatment because they will impact the patient's life

When the MRI is negative it is unlikely the patient has a bad/aggressive prostate cancer, i.e. tumor with Gleason pattern 4

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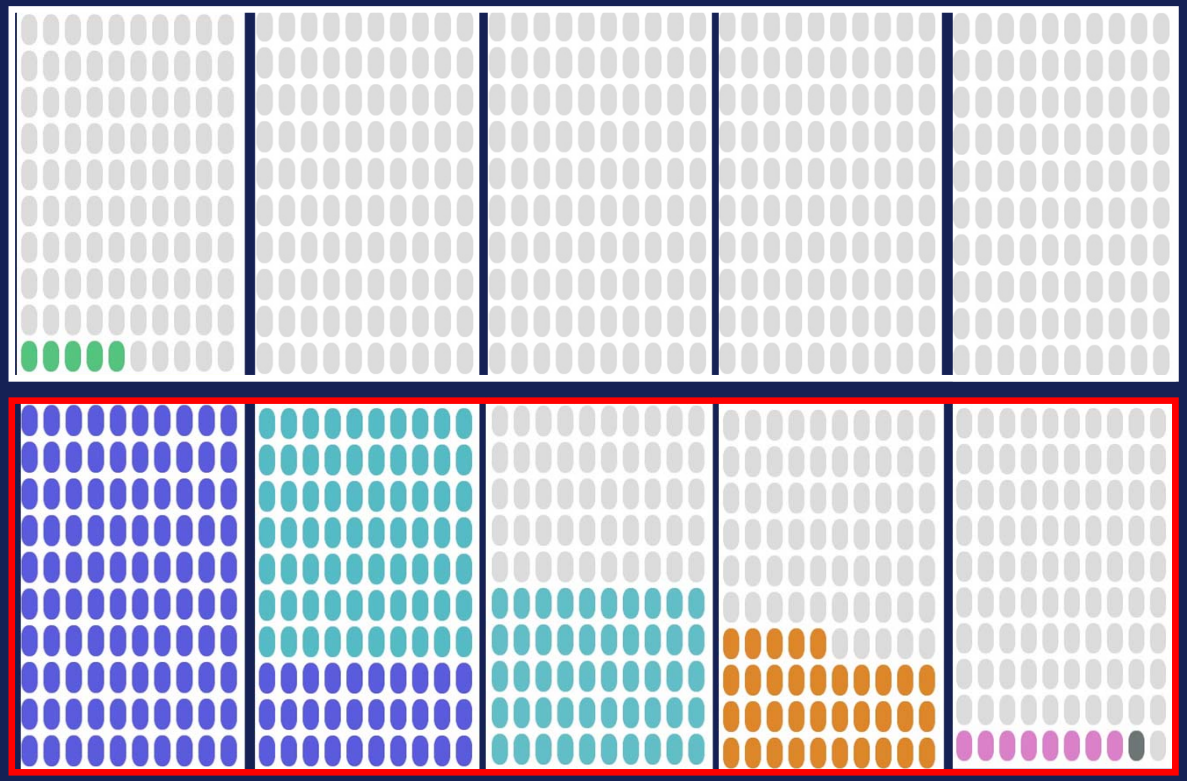
When the MRI is negative it is unlikely the patient has a bad/aggressive prostate cancer, i.e. tumor with Gleason pattern 4

Questions:
Do men with a negative MRI need a biopsy?
Do men with known cancer and negative MRI need immediate treatment?

PSA Screening in 1000 US men



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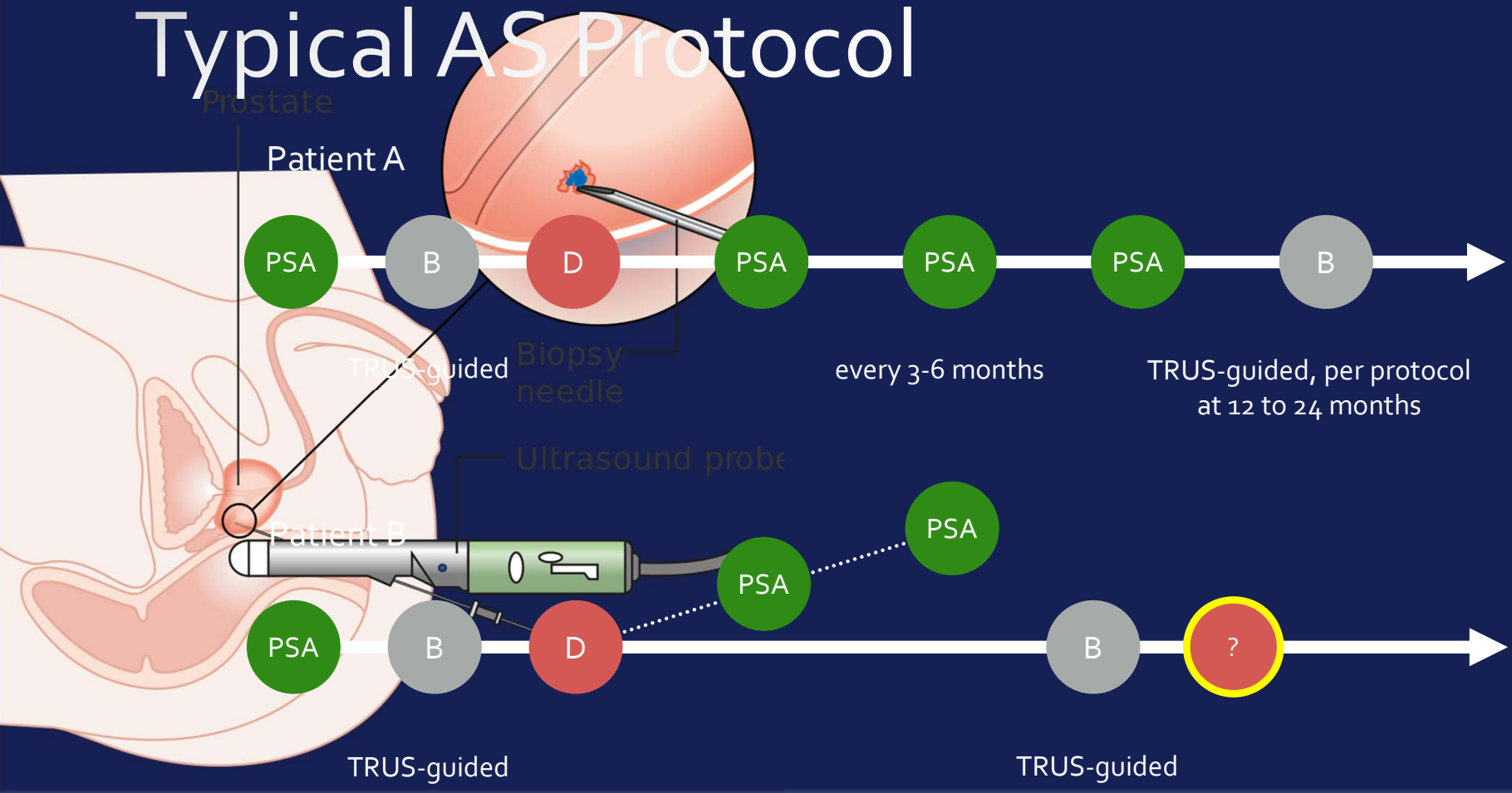
When the MRI is negative it is unlikely the patient has a bad/aggressive prostate cancer, i.e. tumor with Gleason pattern 4

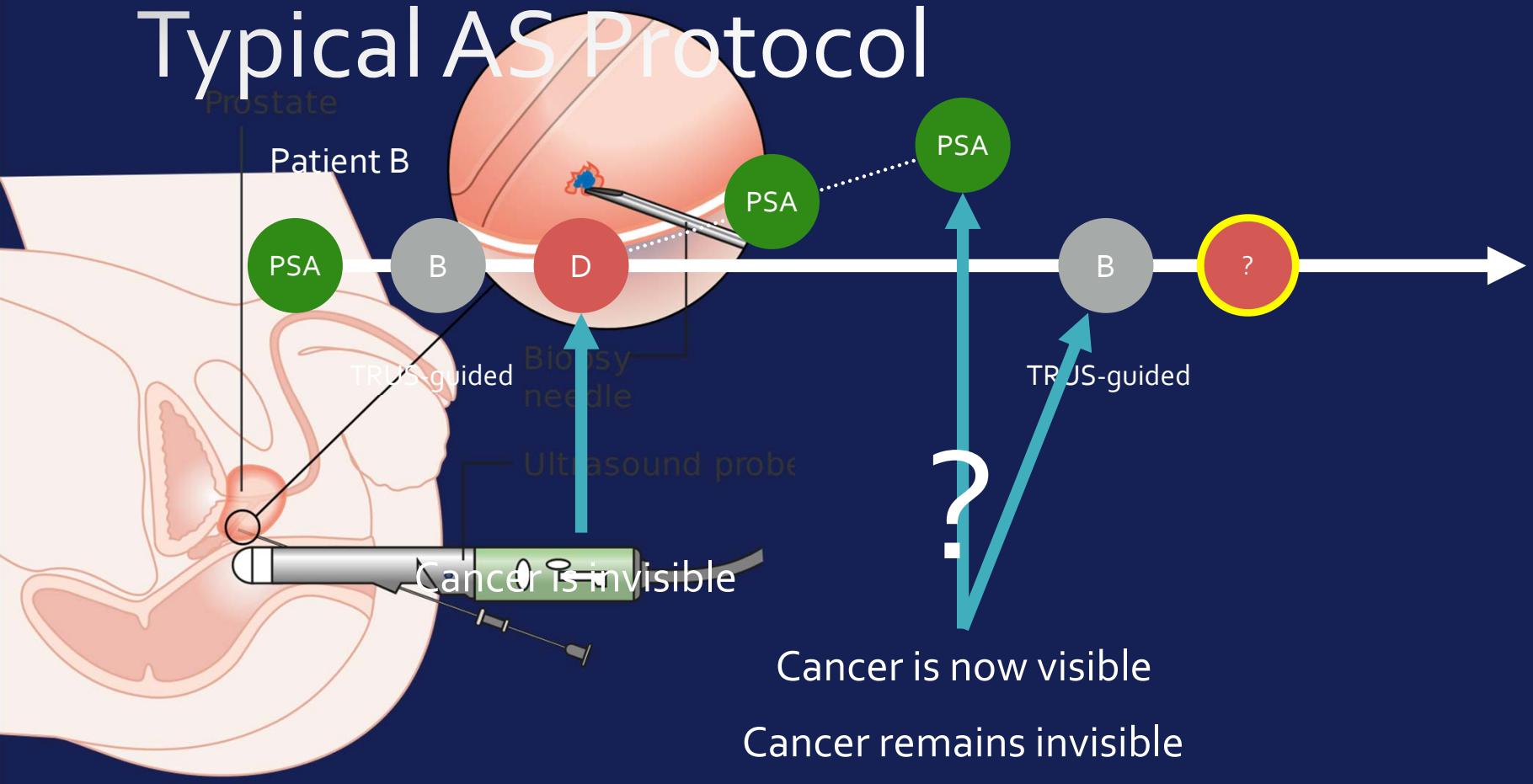
Problem:
Between 5 a

Do invisible tumors impact patients' lives?
Can these tumors be followed until visible?

Typical AS Protocol



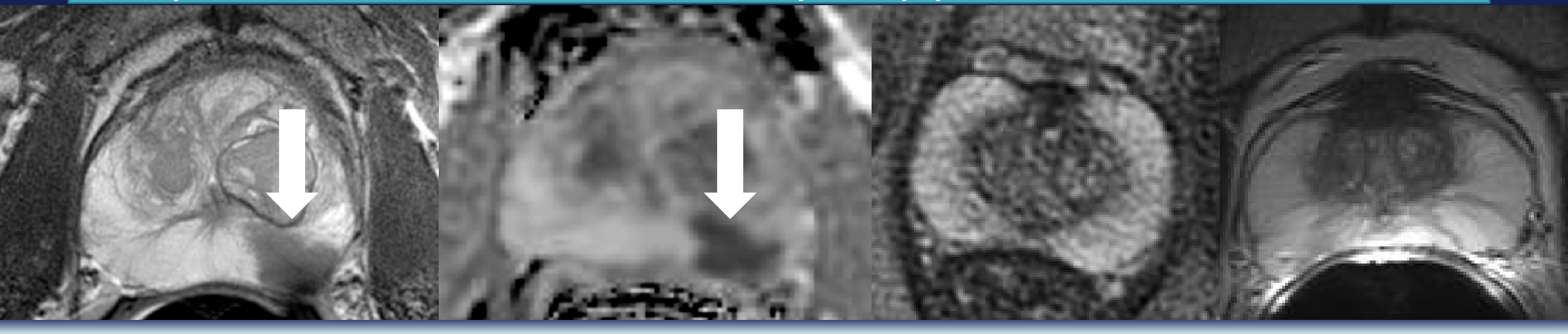
Typical AS Protocol



We want …

… to diagnose only prostate cancers that do need treatment because they will impact the patient's life

Flipside – bad tumors are usually very positive! PI-RADS scores



We want …

… to diagnose only prostate cancers that do need treatment because they will impact the patient's life

Flipside – bad tumors are usually very positive! PI-RADS scores

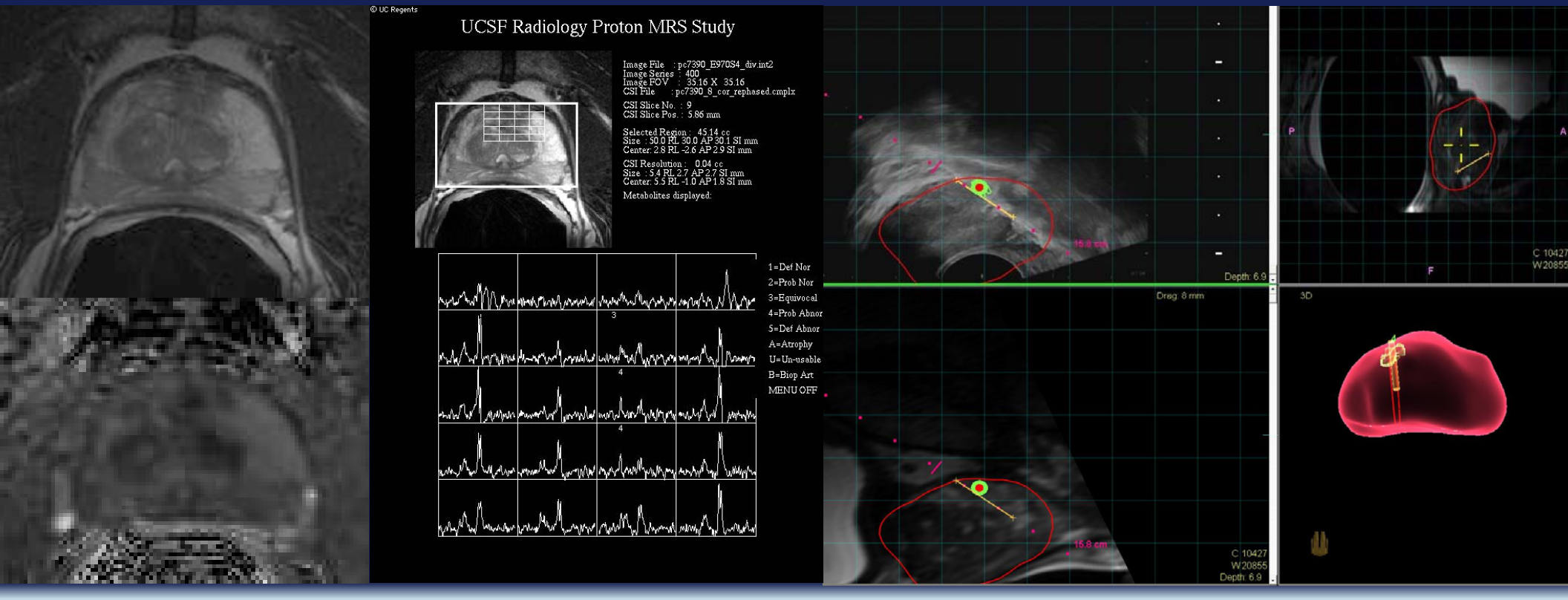
Questions:

– Can we target these areas on biopsy to diagnose the bad cancer?

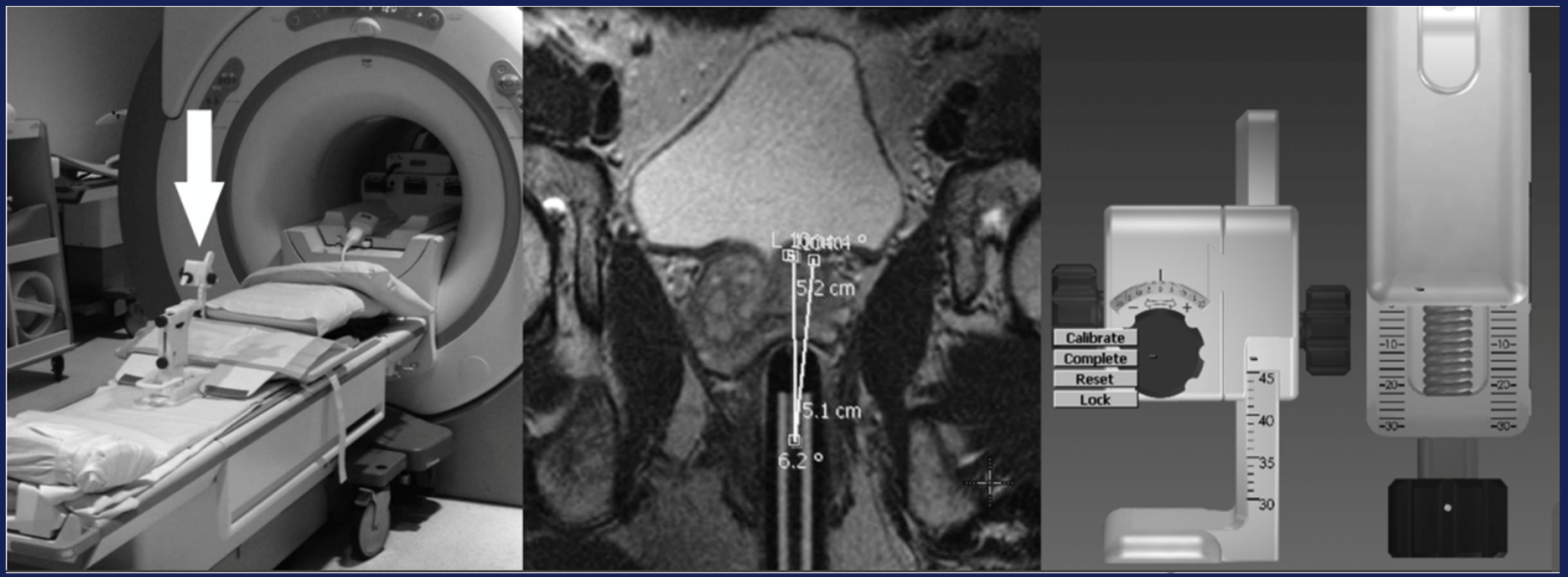
– Can we target only these areas?

– Can we treat only these areas?

MRI-TRUS fusion biopsy technique



In-bore biopsy technique



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Flipside – bad tumors are usually very positive! PI-RADS scores

Questions:

– Can we target these areas on biopsy to diagnose the bad cancer?

– Can we target only these areas?

– Can we treat only these areas?

Focal therapy

- Rationale: control of cancer with fewer complications

- Analogy: breast cancer

  1900 radical mastectomy (Halsted)

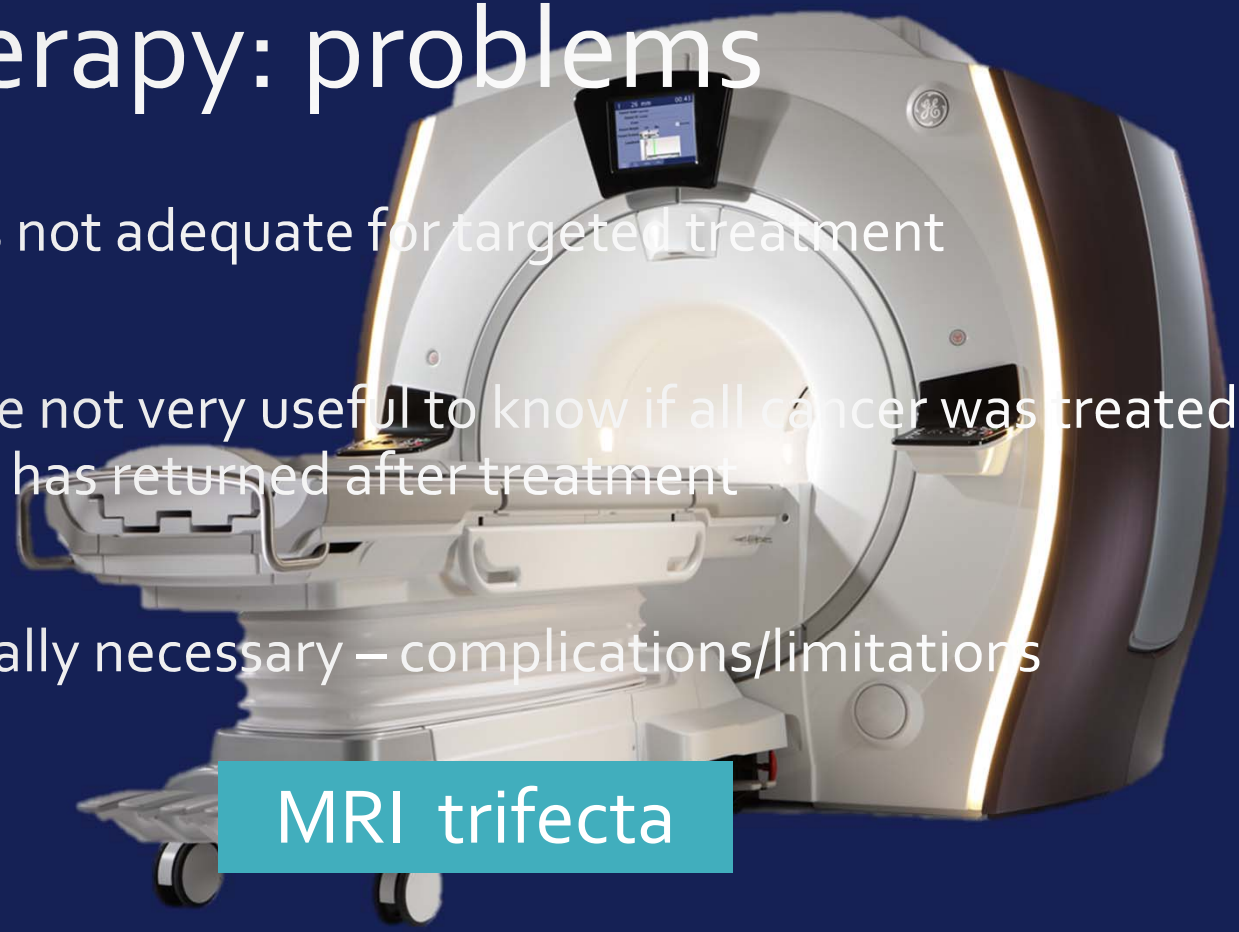
  1960 – 1970 need for the procedure is challenged

  1974 – simple mastectomy +/- radiation therapy

  today – lumpectomy

Focal therapy: problems

- Ultrasound is not adequate for targeted treatment
- PSA levels are not very useful to know if all cancer was treated or to decide if it has returned after treatment
- Biopsy is usually necessary – complications/limitations



MRI trifecta

We want …

… to diagnose only prostate cancers that do need treatment because they will impact the patient's life

Flipside – bad tumors are usually very positive! PI-RADS scores

Problem:

We are planning a study to investigate MRI-guided focal therapy

We want …

… to improve treatment/management decisions

Biopsy
Active surveillance
Focal therapy

We can also help patients and our physician colleagues to decide for definitive therapy (surgery or radiation)!

We want …

… to detect spreading of disease early to maximize the control of cancer and maintain life expectancy

- Molecular imaging!
- Previously discussed by Dr. Hope and Dr. Flavell
- PSMA PET scan (PET/CT or PET/MRI)

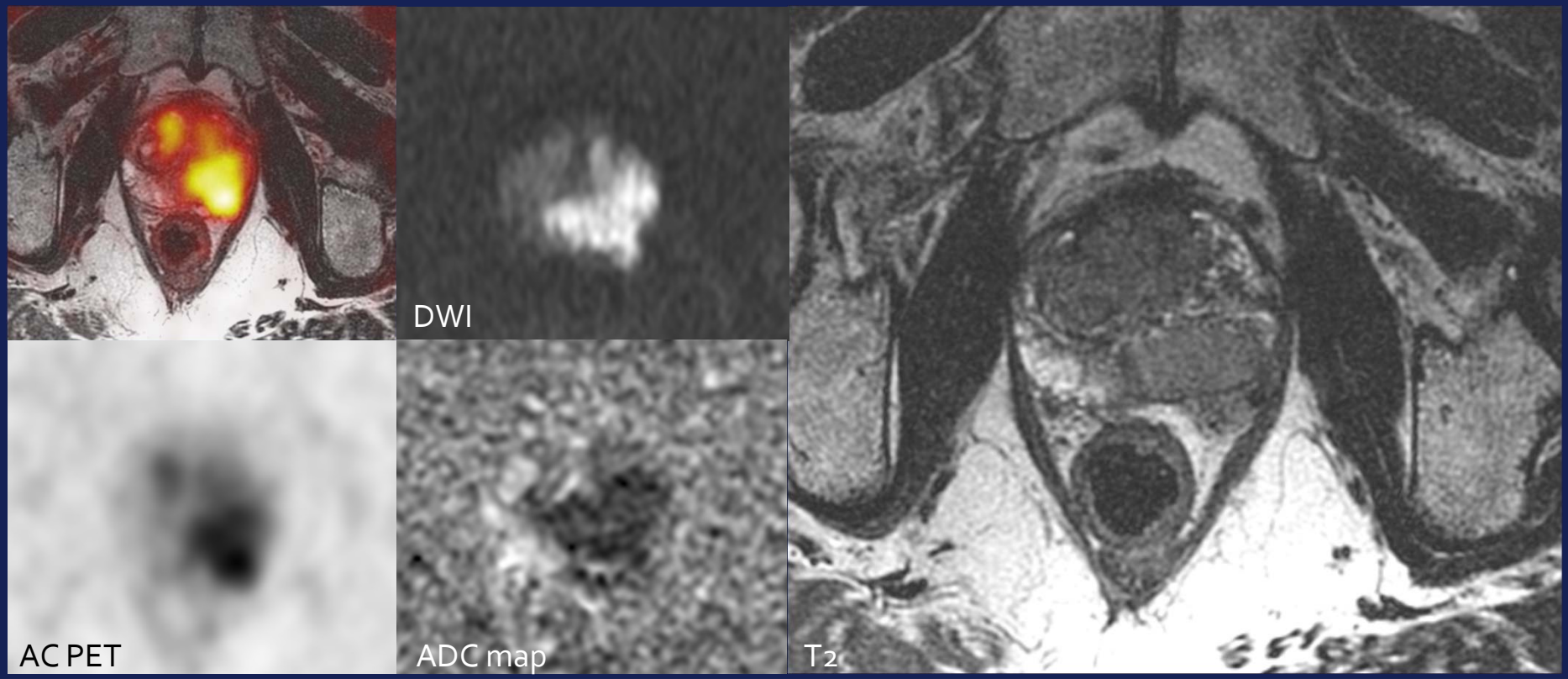
PSMA imaging agents

- The prostate-specific membrane antigen (PSMA) is present in excess (i.e. overexpressed) in the majority of prostate cancers.

PSMA imaging agents

- Several radionuclides can be ligated to PSMA protein and used for imaging. These include ^{68}Ga-PSMA-11, and indium (^{111}In) and fluorinated (^{18}F) agents.

72 years old, Gleason 4+4



Slide courtesy of Dr. Thomas Hope

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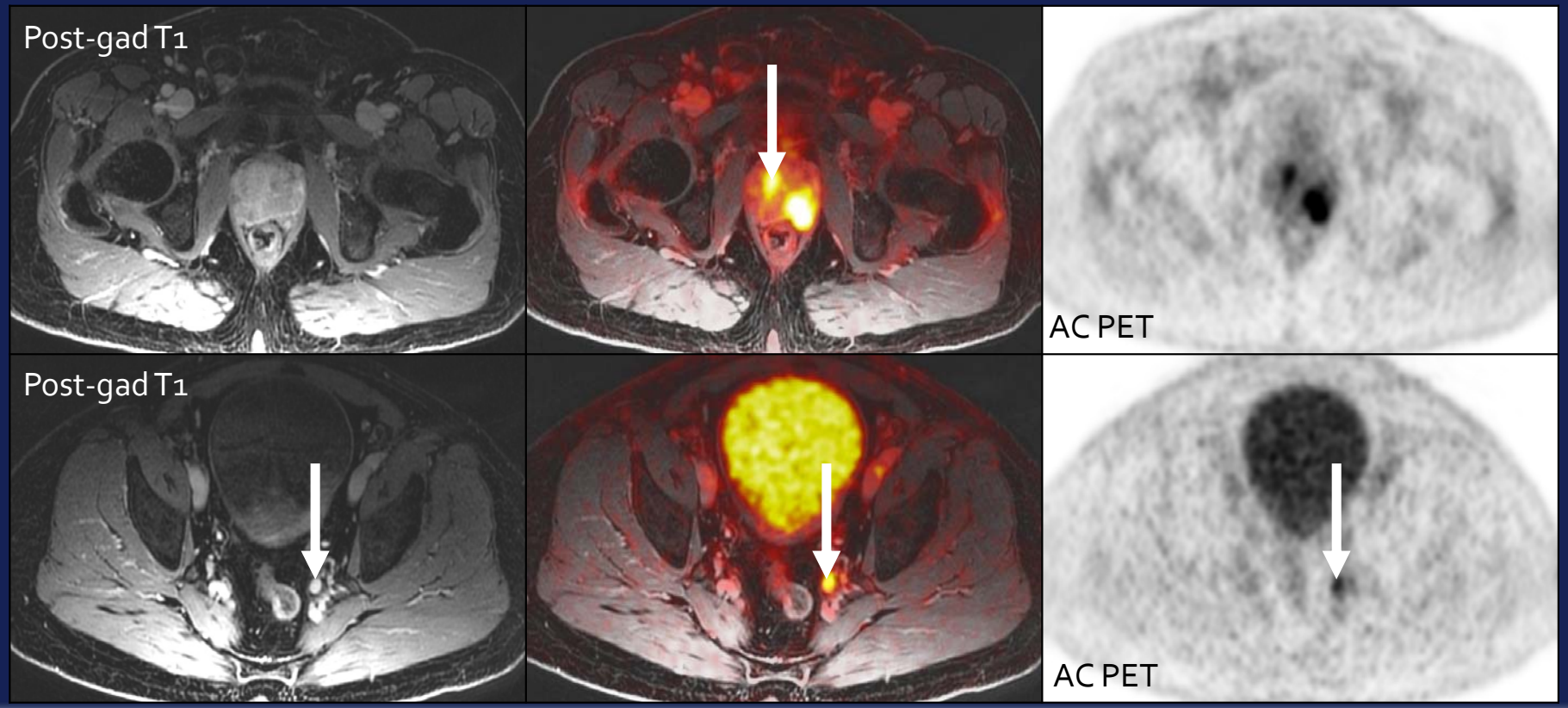
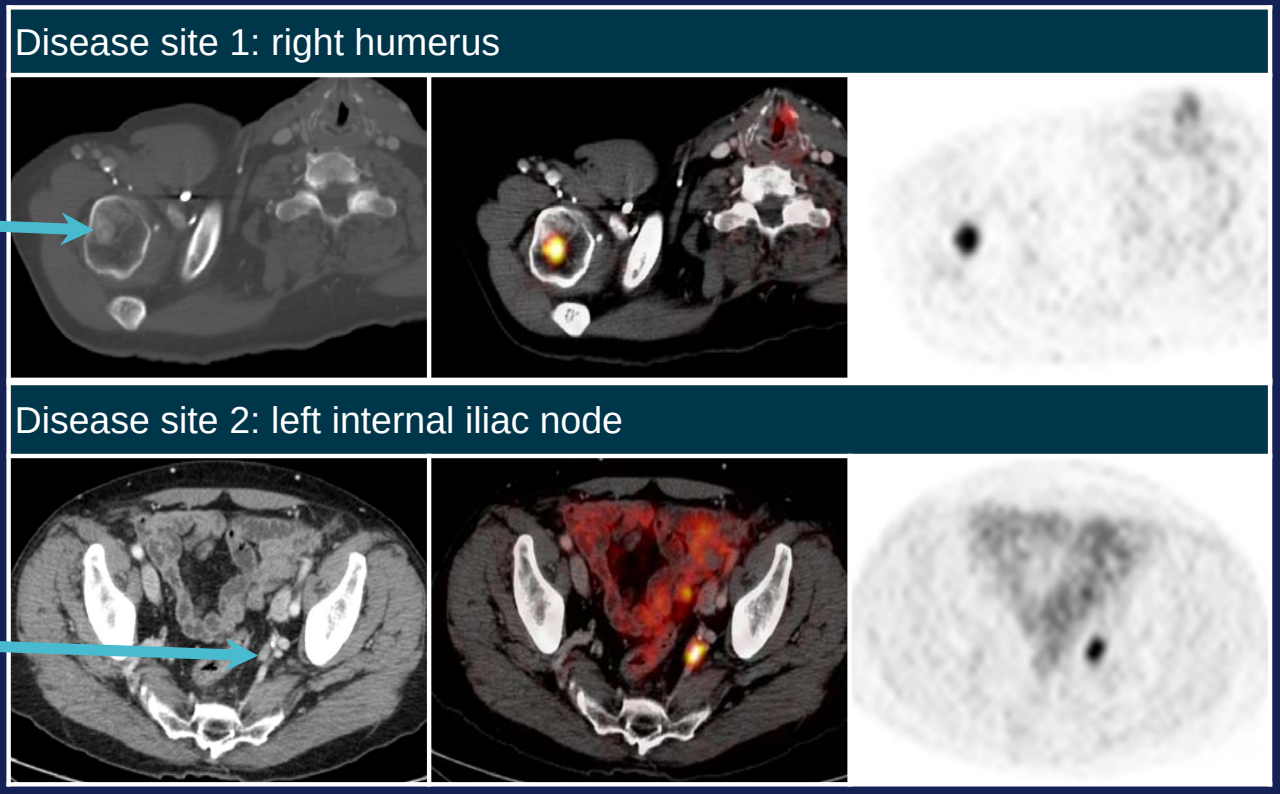
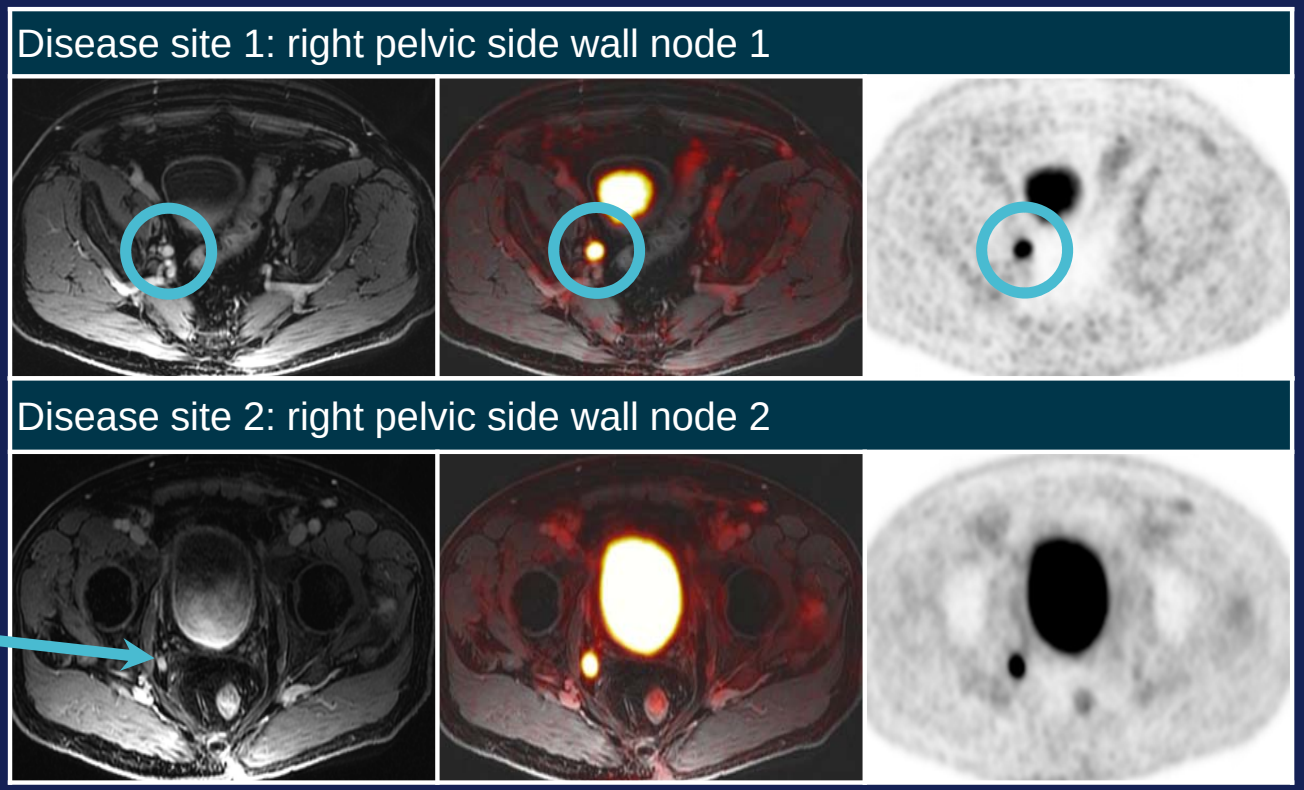


Slide courtesy of Dr. Thomas Hope

69 years old, S/P RP, PSA = 0.67 ng/ml

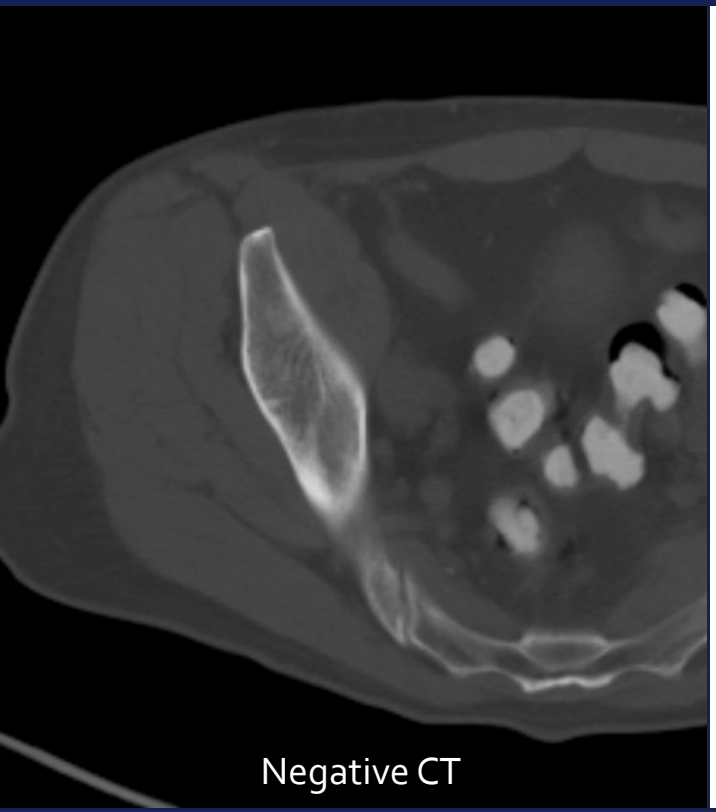


71 years old, S/P RP, PSA = 0.9 ng/ml



Slide courtesy of Dr. Thomas Hope

69 year old, S/P RP, PSA = 3.5 ng/ml



Negative CT

Negative bone scan

Positive PSMA

Slide courtesy of Dr. Thomas Hope

Closing comments

- UCSF radiologists are active members of a multidisciplinary team.
- UCSF radiologists are involved in all stages of care of men with known or suspected prostate cancer.
- UCSF radiologists are leading cutting edge research in the field of prostate MRI.
- UCSF radiologists are heavily engaged in the education/training of future generations of physicians, radiologists or not.

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Thank you!