Inspired by research. Driven by compassion. Inspiré par la recherche. Guidé par la compassion.

Physics Opportunities In Industry

Imagine the Possibilities

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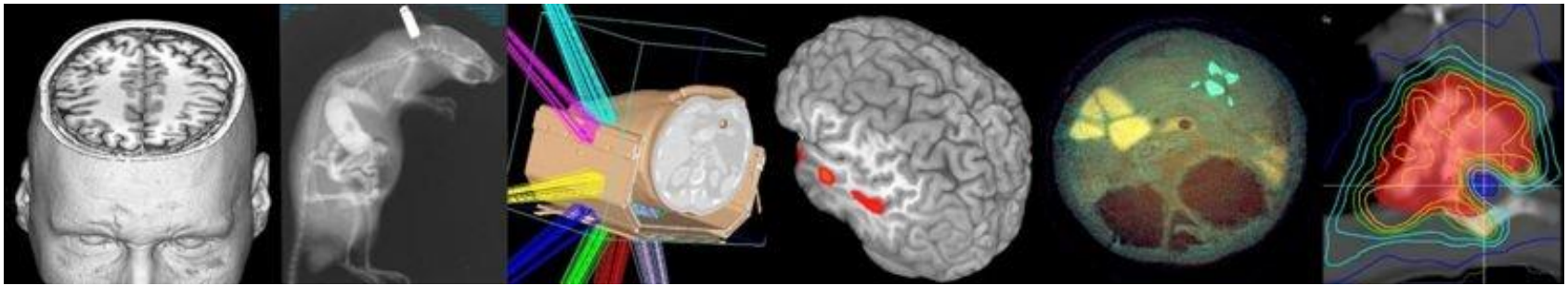
What is Medical Physics?

The application of physics concepts, theories and methods to medicine or healthcare.



aka: Biomedical Physics, Medical Biophysics or Applied Physics In Medicine

Who Are Medical Physicists?

- Health care professionals with specialized training in the medical applications of physics.
- Our work often involves the use of x-rays, ultrasound, magnetic and electric fields, infra-red and ultraviolet light, heat and lasers in diagnosis and therapy.

Where Do Medical Physicists Work?

- hospital diagnostic imaging departments, cancer treatment facilities, or hospital-based research establishments
- universities, government, and industry

COMP MEMBERSHIP BY WORKPLACE

Results from 242 respondents in the 2014 professional survey.

55% - 129
Hospital

30% - 71
Cancer Institute

12% - 27
University/
Gouvernment/
Research Institute

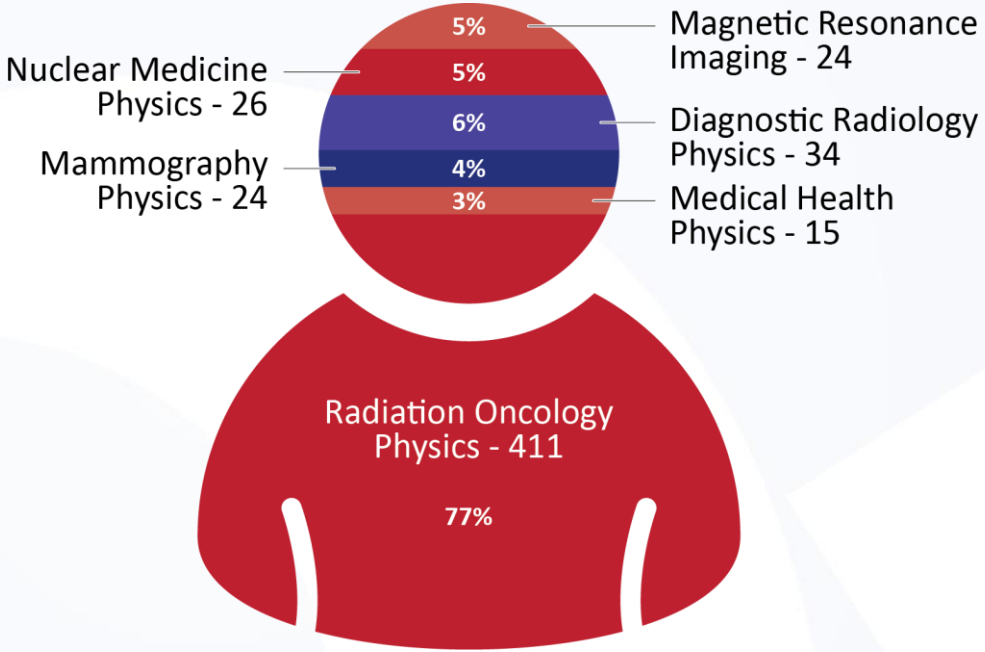
3% - 8
Private
Company

COMP = Canadian Organization of Medical Physicists

What Do Medical Physicists Do?

COMP MEMBERSHIP BY SPECIALIZATION

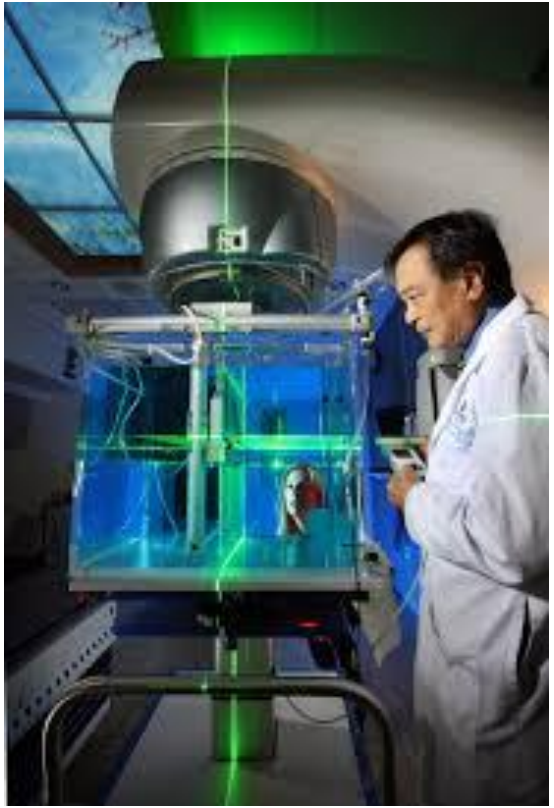
Results from 534 respondents in the 2016 membership survey.



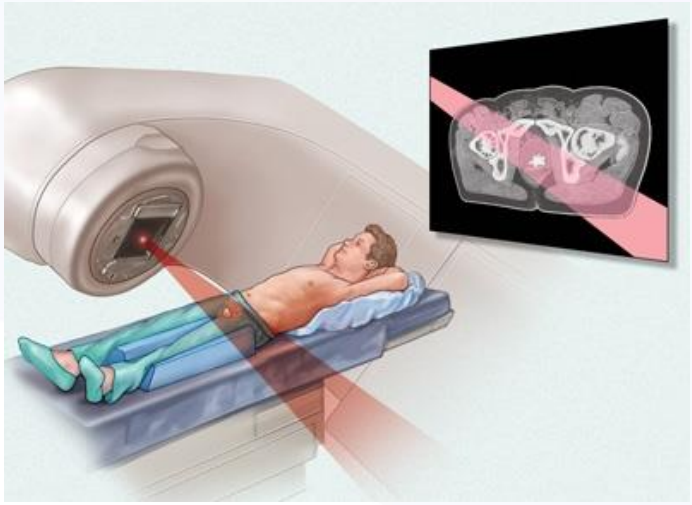
COMP = Canadian Organization of Medical Physicists

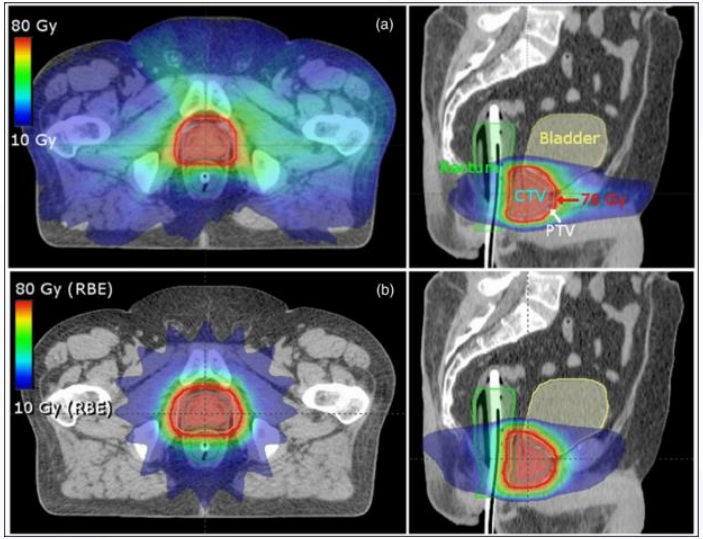
What Do Medical Physicists Do?

- Clinical Service
- Radiation Safety
- Research and Development
- Teaching

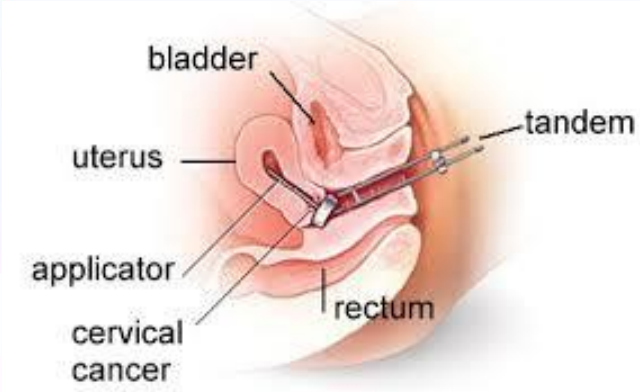


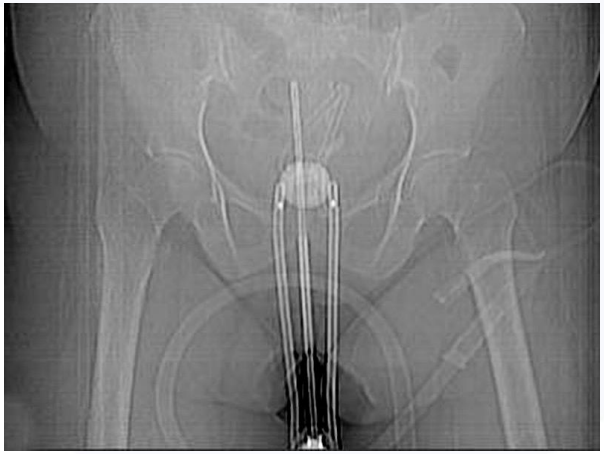
Teletherapy - External Beam Radiotherapy

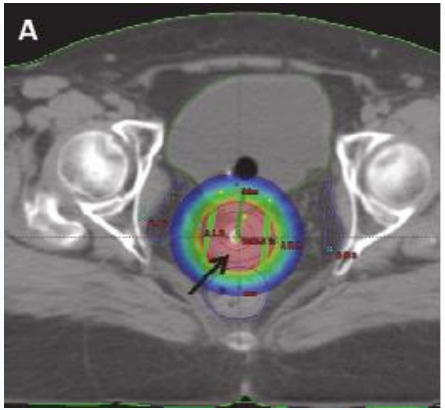


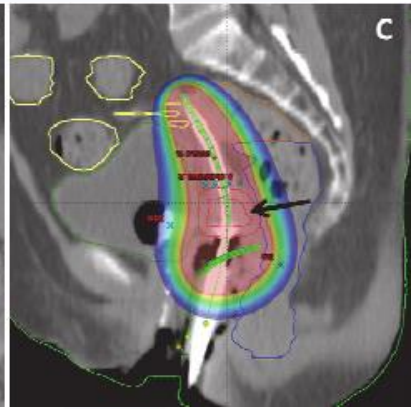


Brachytherapy - Internal Radiotherapy

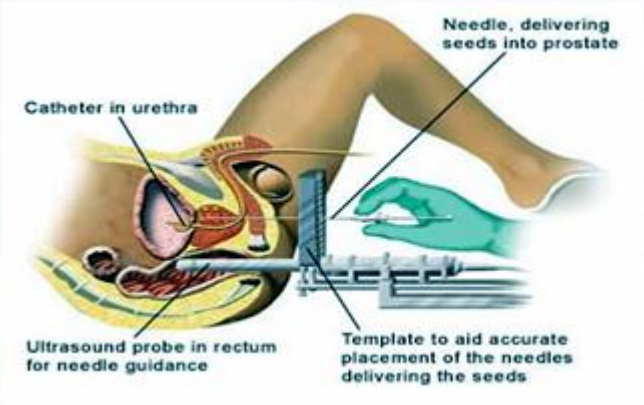








Brachytherapy – Seed Implants



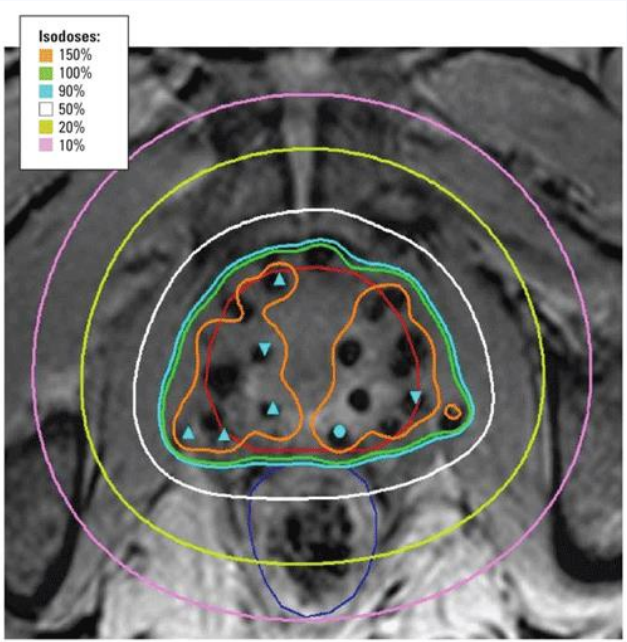


Figure 2. MRI/CT fusion image of the prostate (contours in red), prescription dose 145 Gy (dark green). Rectum outlined in dark blue. The figure illustrates the very steep dose fall-off with prostate brachytherapy and the low radiation dose to surrounding tissues.

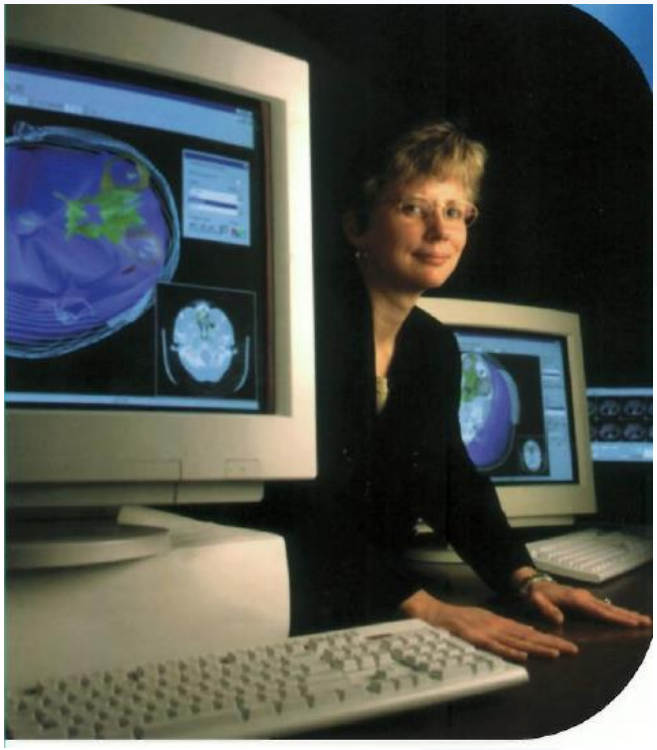
Applying Your Knowledge

A VARIED CAREER

- Your technical knowledge can be applied in many different domains
- As a Medical Physics I have worn many different hats throughout my varied career

Software Development

- Software design
- Software development in a formal environment
- Medical Device Regulations
- Data modeling

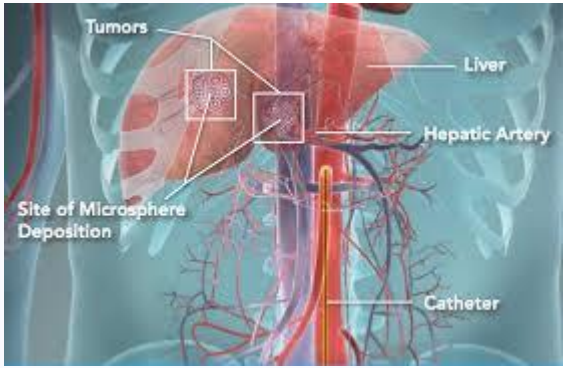


Product Management

- Sales and marketing
- Product life cycle
- Product service
- Strategic planning

Process and Product Engineering

- Radioisotope manufacturing processes in a highly regulated environment
- New product development



Safety Analyst

- Hazards
- Controls
- Risk Analysis

Systems Engineering

- Medical Device Design and Development
- Radiation Shielding
- Mechanical Engineering
- Labeling, User Documentation & Translation

Specialize in Quality and Safety

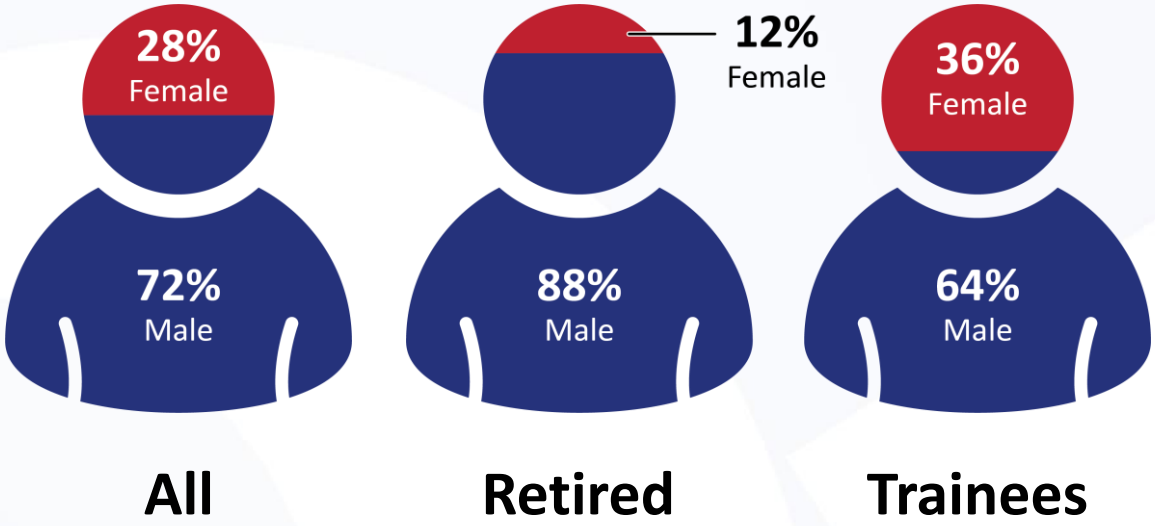
- Radiation Equipment Quality Control Program
- Incident Learning

Career Pathways

- **Medical Physicist:** PhD (or MSc) in medical physics + 2 year clinical residency + certifying exams
- **Radiation Oncologists:** medical school + 5 years clinical residency
- **Radiation Therapist:** BSc degree from Michener Institute of Allied Health Sciences or Laurentian
- **Treatment Planner:** RT + additional on the job training + certification
- **Physics Assistant:** BSc in physics
- **Service technologist:** diploma + on the job

Who Are Medical Physicists?

COMP MEMBERSHIP BY GENDER



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ADDITIONAL SLIDES

SOME RESOURCES

Physicists amongst us, CAPhys

https://www.youtube.com/watch?v=P--rGVOglWU

COMP Canadian Organization of Medical Physicists | OCPM Organisation canadienne des physiciens médicaux

https://www.comp-ocpm.ca

CELEBRATING MEDICAL PHYSICS ACROSS THE GLOBE, IN HONOUR OF MARIE CURIE'S 150TH!

THE 5TH INTERNATIONAL DAY OF MEDICAL PHYSICS (IDMP)

Lisa Glass, Radiation Oncology Physicist, Allan Blair Cancer Centre, Regina, SK

What is your most gratifying experience as a medical physicist? My most gratifying experience as a medical physicist is when we get to use our skills to pull together and make a real impact on the care that patients receive. It's amazing to use physics problem-solving skills in meaningful ways to help people who are sick.

Who was your role model as an aspiring student and why? One of my biggest role models as I was training as a medical physicist was Katharina Sixel, head of the physics department at the Durham Regional Cancer Centre. She taught a lot of the subtleties of being a medical physicist. She is a very strong, well respected leader, but she's not afraid to ask questions and she is always learning. I find it helpful in my day-to-day work to ask myself, "What would Katharina do?"

What is your favourite food? My favourite food is chocolate. (Hello?!)

Who is your favourite action hero and why? My favourite action hero is probably ... Channing Tatum. I don't know what it is about him, I just want to watch everything he's in. Like, "White House Down?" Brilliant!

What was your second career choice, after medical physics? Well, my PhD is in astrophysics, so it's more like medical physics was a second career choice for me, after initially pursuing astro. Honestly, I like medical physics so much more and I would never go back, but sometimes I do catch myself staring at the stars ...

Naomi Shin, Radiation Oncology Physicist, Dr. Léon-Richard Oncology Centre, Moncton, NB

What is your most gratifying experience as a medical physicist? My most gratifying experience as a medical physicist is when we work with all members of the radiation oncology team to develop and implement a new treatment technique that improves the treatment patients receive.

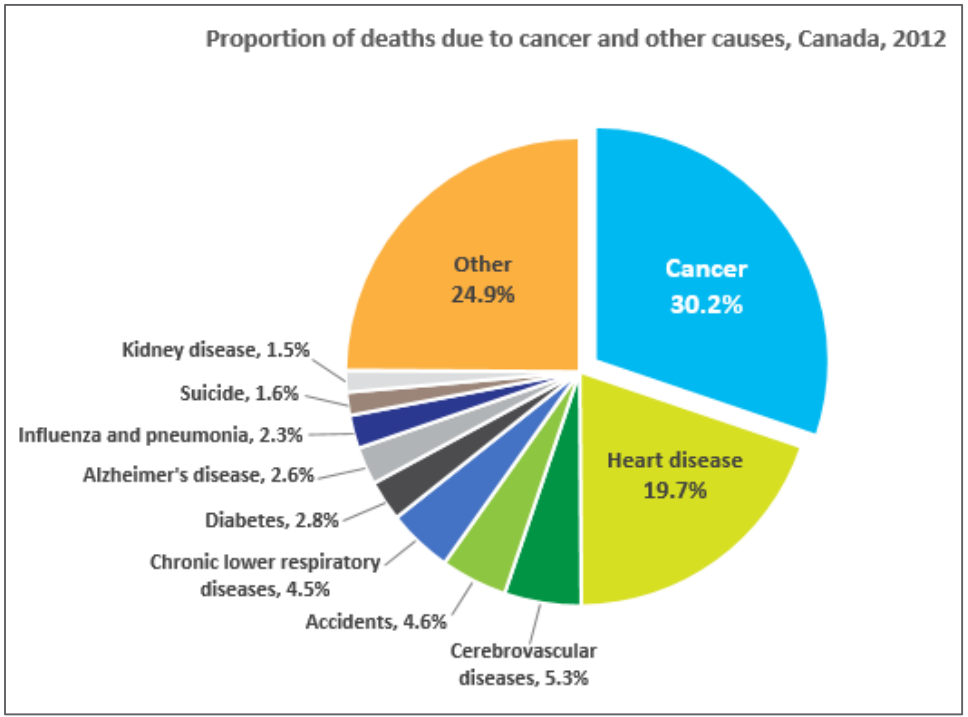
Who was your role model as an aspiring student and why? My high school physics teacher, Mrs. Shaver, was probably one of the main reasons that I decided to go into physics. While she was tough, she made physics fun! I still remember some of the stories she used to help us remember equations and constants.

What is your favourite food? I'd say it's probably a tie ... sushi and chocolate.

Who is your favourite action hero and why? My favourite action hero is probably Matt Damon because he's a smart, normal guy who played many really interesting characters. He's a great mix of brains and brawn!

What was your second career choice, after medical physics? I honestly don't know what I would have done had I not pursued medical physics. I took singing lessons for many years and have always sung in choirs, perhaps I might have become a singer?!

CANCER STATS



- Lung, breast, colorectal and prostate cancer are the most common types of cancer in Canada (excluding non-melanoma skin cancer). Based on 2017 estimates:
- These cancers account for half (50%) of all new cancer cases.
- Prostate cancer accounts for about one-fifth (21%) of all new cancer cases in men.
- Lung cancer accounts for 14% of all new cases of cancer.
- Breast cancer accounts for about one-quarter (25%) of all new cancer cases in women.
- Colorectal cancer accounts for 13% of all new cancer cases.

http://www.cancer.ca/en/cancer-information/cancer-101/cancer-statistics-at-a-glance/?region=on#ixzz53ziGUwjj

HOW DOES ONE BECOME A MEDICAL PHYSICIST?

- Undergrad degree in physics (usually)
- PhD (or MSc) in medical physics
  - CAMPEP accredited preferable (Commission on Accreditation of Medical Physics Education Programs)
  - Currently: Carleton, Dalhousie, McGill, Ryerson, University of Alberta, University of British Columbia, University of Calgary, University of Manitoba, University of Victoria, Western University
- Medical physics clinical residency (2 years)
  - CAMPEP accredited preferable
- CCPM (Canadian College of Physicists in Medicine) certification
  - Requires 2 years clinical experience (residency counts) and either a CAMPEP graduate program or residency
  - Application process and laborious written and oral exam

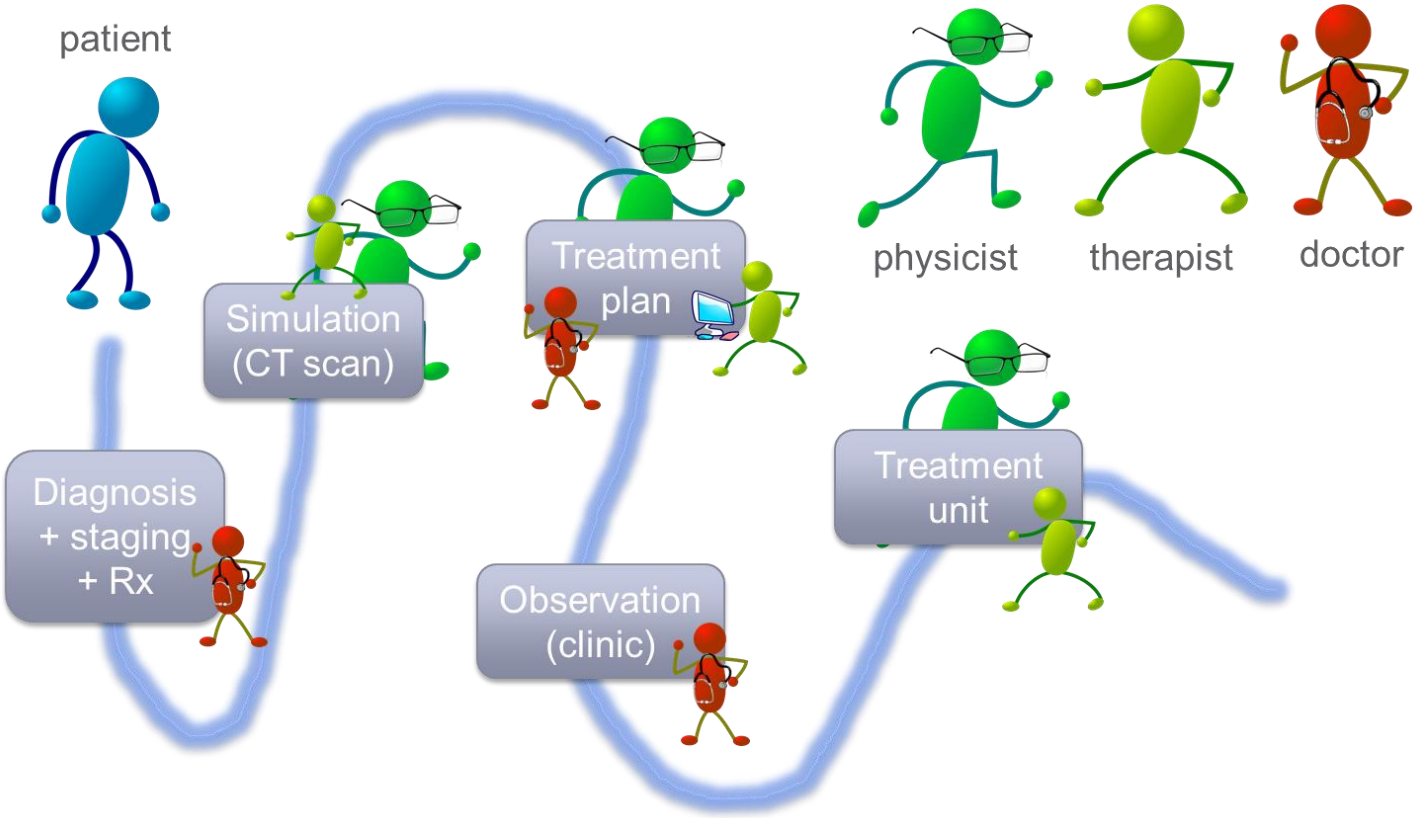
THE ROLE OF MEDICAL PHYSICS

- Understand the interactions between biological systems and ionizing radiation
  - Need to understand the underlying physics to ensure safe delivery of the radiation (safe for patients and staff)
  - Need a strong understanding of the mechanisms of cell division, human physiology and human anatomy

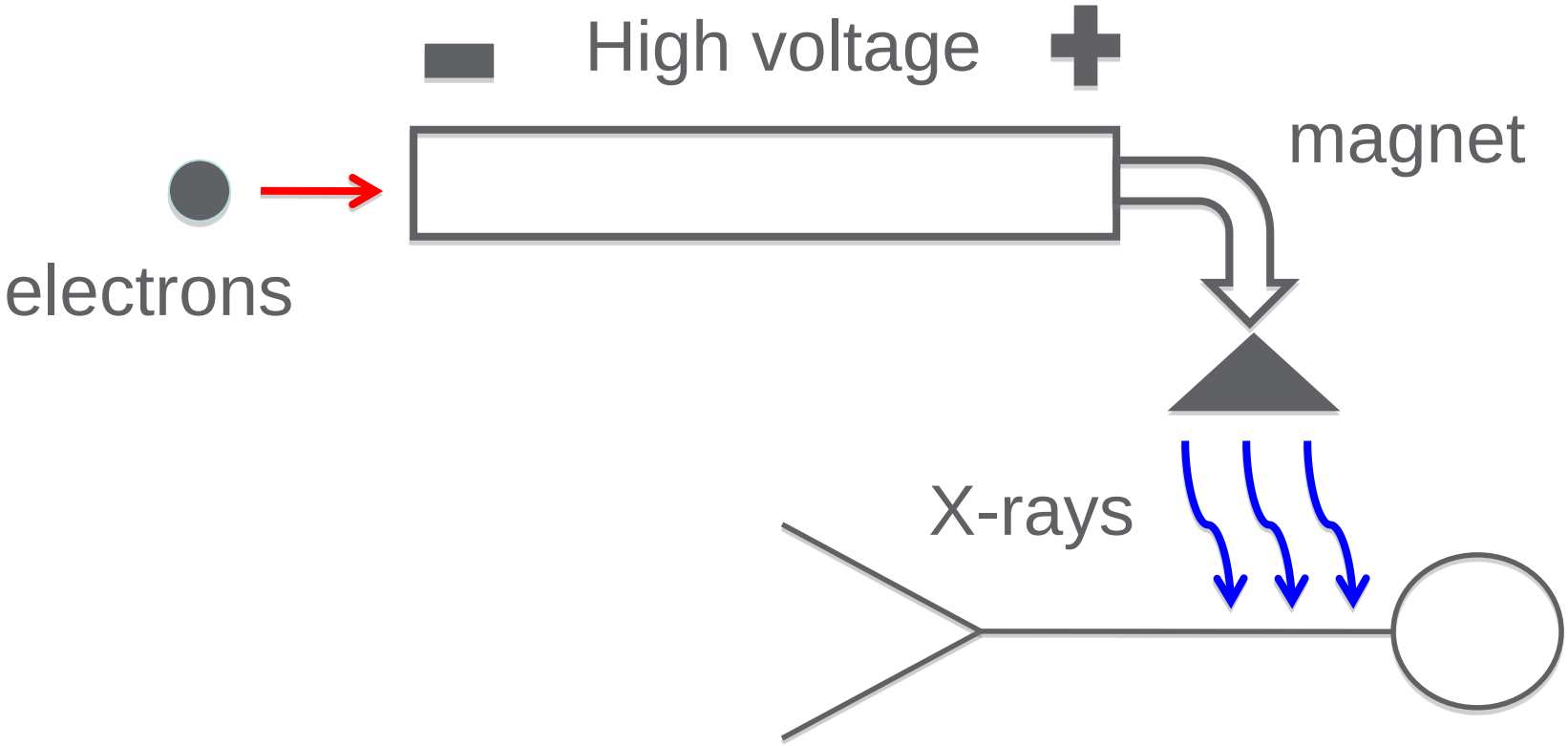
PATIENT PATH

- Diagnosis and staging
- Decision to treat
- CT scan
- Planning
- Treatment
- Follow up

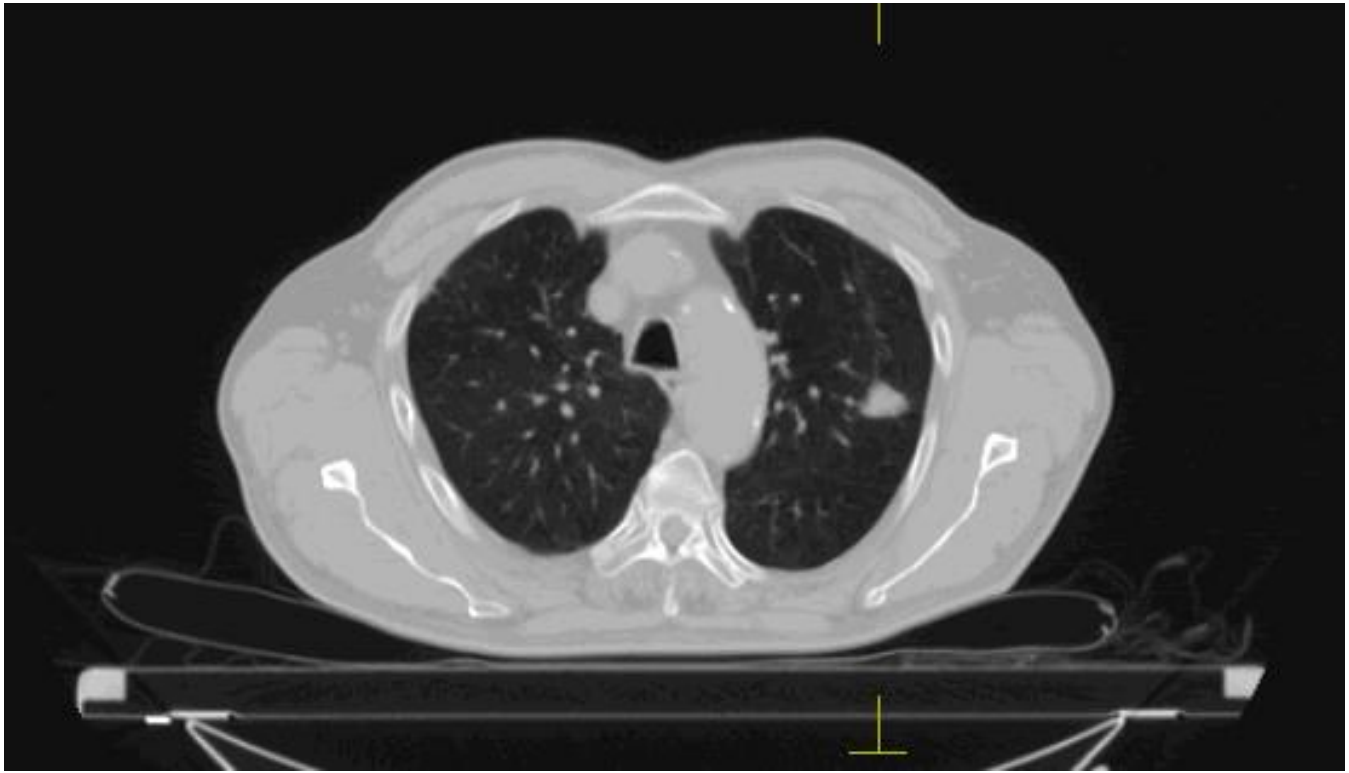
WHERE DOES THE PHYSICIST FIT IN? (IN RADIATION ONCOLOGY)



HOW DOES IT WORK?

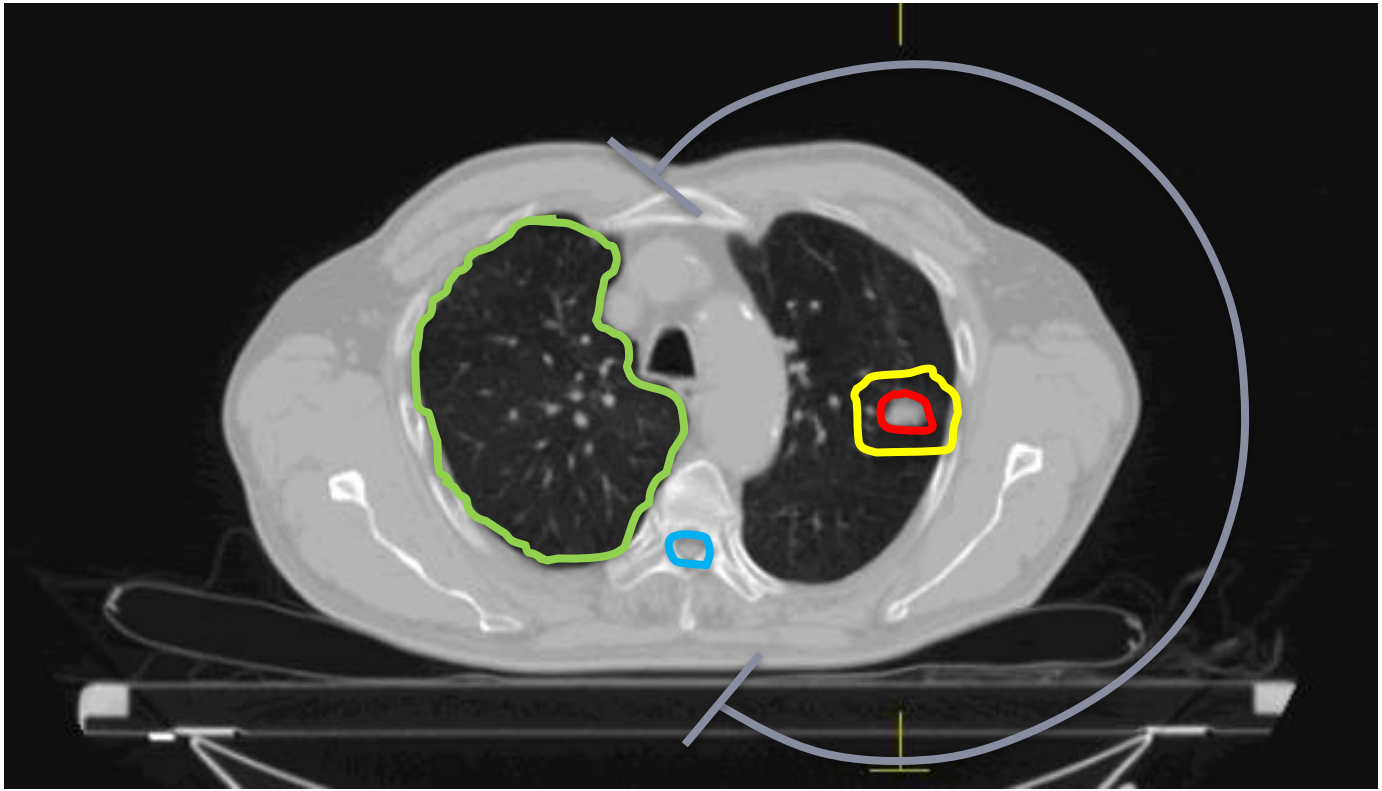


X-RAYS ARE EXTERNAL, BUT TARGETS ARE INTERNAL

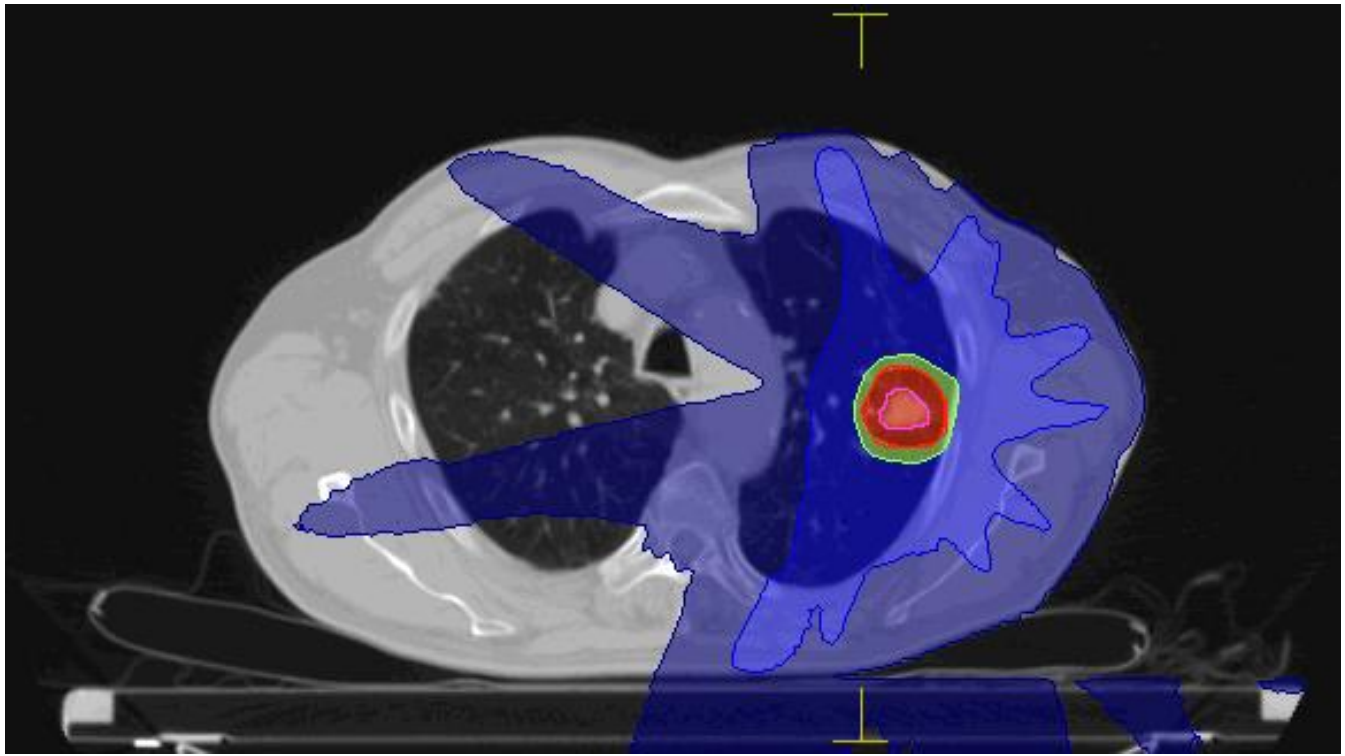


TREATMENT PLANNING

FROM CT SCAN TO TREATMENT



FROM CT SCAN TO TREATMENT



FROM CT SCAN TO TREATMENT