



# The key role of nuclear technology in medical diagnosis for **CANCER**

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*Prevention, Diagnosis, Treatment*



# Facts on Cancer Mortality



- Second leading cause of **death** worldwide
  1. Lung (1 690 000 deaths)
  2. Liver (788 000 deaths)
  3. Colorectal (774 000 deaths)
  4. Stomach (754 000 deaths)
  5. Breast (571 000 deaths)
  6. Head and neck cancer (300 000 deaths)
  7. Cervical (270 000 deaths in women)
  8. Prostate (287 300 deaths in men)

# What causes **death** from cancer?



- Cancer is abnormal growth of cells.
- Metastases are cancer cells that invade and spread to any and/or all parts of the body.

# Role of nuclear technology

- Decision making
- Management change
- Cost effectiveness



# Role of nuclear technology



- Patient diagnosed with prostate cancer at the age of 58.
- Initially treated with surgery. Disease-free for 4 years.
- At the age of 62 his blood tumor indicator (prostate specific antigen - **PSA**) started to rise
- Anatomical images did not detect the site of **metastases**
- Urologist was considering prostate bed radiation therapy. *However, statistics show that 30% do not respond.*
- The urologist needs to know if this patient has metastases outside the field of radiation.

Radioisotope of  
radioactive substance

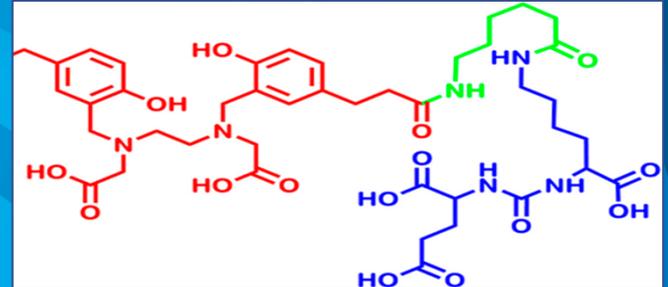
+

Non-radioactive  
substance that can  
target a cell

Radiotracer

Image the patient with radiation  
detectors

# Nuclear technology in prostate cancer



$^{68}\text{Ga}$ -PSMA



Imaging

PET/CT  
scanner

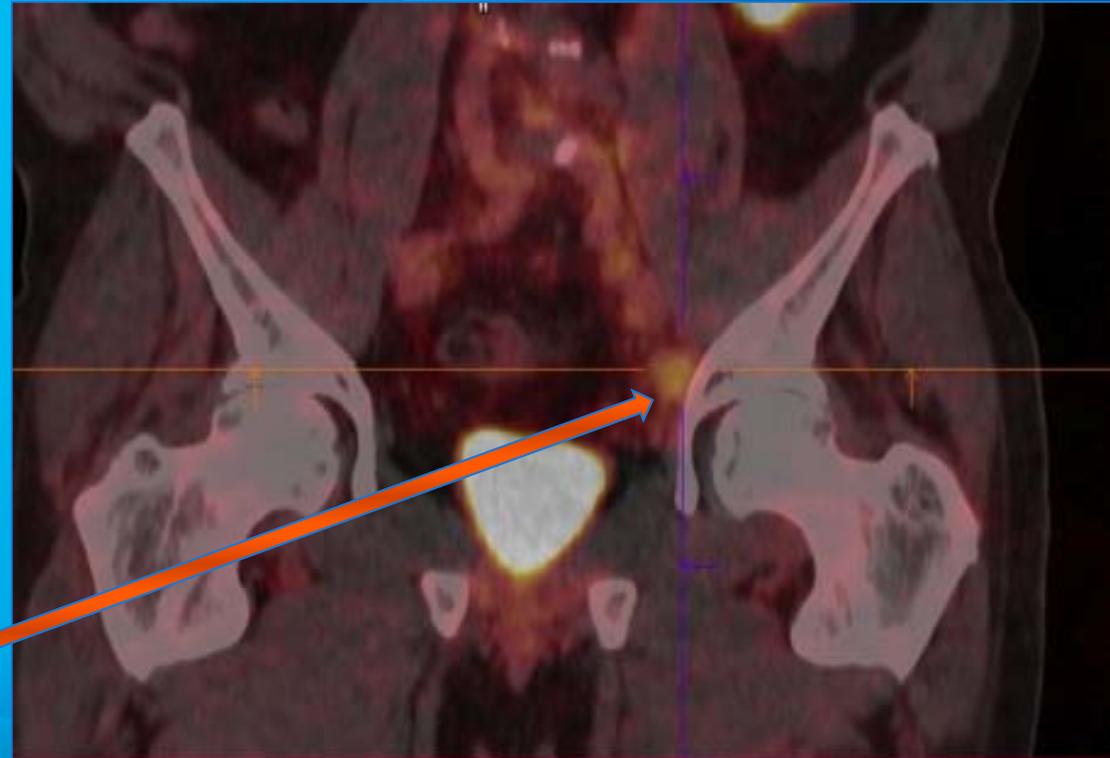
# Role of nuclear technology



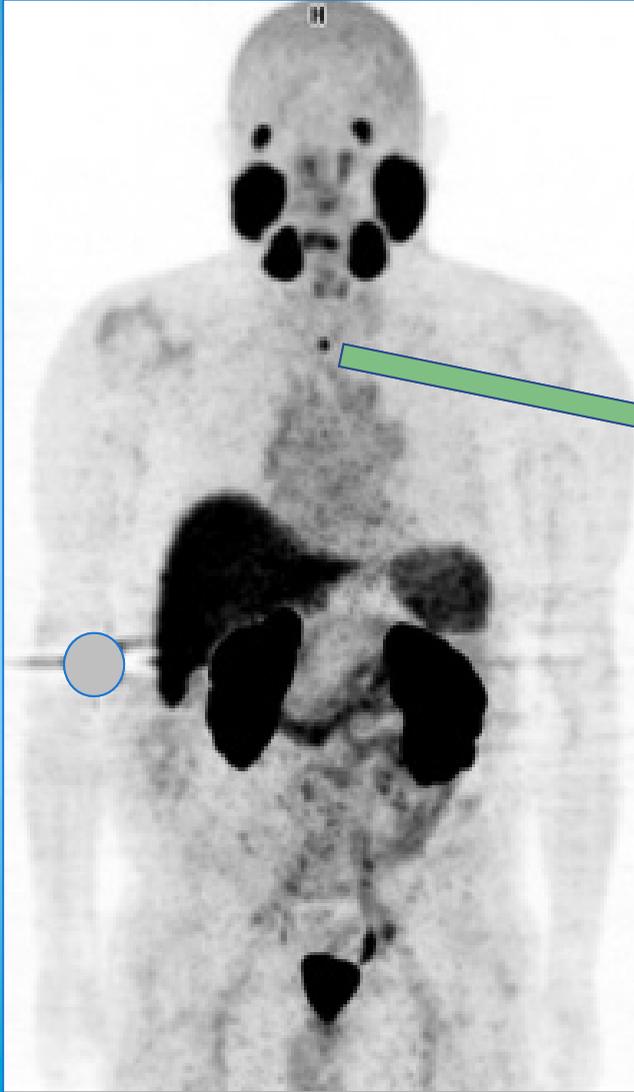
- Decision making
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# $^{68}\text{Ga}$ -PSMA PET/CT for Prostate Cancer

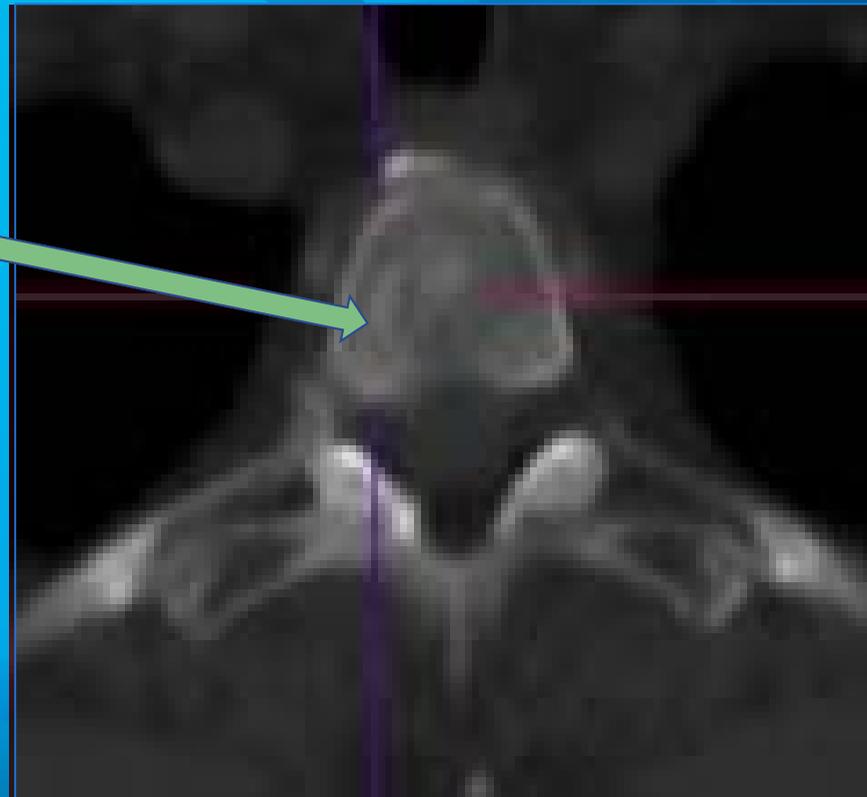
Pelvic lymph node metastasis



# $^{68}\text{Ga}$ -PSMA PET/CT for Prostate Cancer



Thoracic vertebral metastasis



# Role of nuclear technology

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# Nuclear technology for management change

Multidisciplinary team

- **62 year-old prostate cancer patient**

1. Did not undergo radiation therapy to the prostate bed



All metastases were outside the field of radiation

2. Radiation therapy to one pelvic lymph node



PSA dropped 50%

3. Radiation therapy to the vertebra



PSA normalized

- **Follow-up: 24 months disease-free**

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# Nuclear technology reduces the cost of cancer management



- **WHAT IF** nuclear technology was not performed for this 62 year-old prostate cancer patient?
  1. Undergo radiation therapy to the prostate bed (miss the pelvic lymph node and vertebra) ➔ **PSA would steadily increase**
  2. Undergo multiple anatomical images to detect disease outside the radiation field ➔ **PSA would continue rising**
  3. Begin systemic therapy (secondary hormonal therapy or chemotherapy)
- **Follow-up: progressive disease**

# NUCLEAR TECHNOLOGY



- **Improves diagnosis**
- **Improves staging (avoid expensive futile treatments)**
  - **Surgery**
  - **Chemotherapy**
  - **Radiation therapy**
- **Increases overall survival and progression-free survival**
- **Potential to increase the quality of life years and years of productivity**
- **Reduces cost burden over time to the healthcare system by identifying the most appropriate therapy**

THANK YOU!

