

Title

Green light for medical imaging: what is the most sustainable technique?

Problem statement

Nuclear Medicine is a specialized field that uses very small amounts of radioactive materials, or radiopharmaceuticals, to examine organ function and structure. The Nuclear Medicine department at Alrijne collaborates with referring departments such as: orthopaedics, oncology, neurology and cardiology. We think that optimizing patient workflows and introducing new technologies in clinical practise is of importance.

At the Alrijne Hospital we use several scanners for diagnostic imaging as: Magnetic Resonance Imaging (MRI), Computer Tomography (CT), Ultrasound, Positon Emission Tomography combined with CT (PET/CT) and Single Photon Emission Computed Tomography combined with CT (SPECT/CT).

Up to now sustainability is not yet integrated in the (clinical) decision making of the departments Nuclear Medicine and Radiology. Furthermore, it is challenging to incorporate sustainability since there is no insight in the impact and life cycle of the scanners. Therefore, we need to investigate how sustainable (nuclear) imaging actually is.

Since Alrijne is moving towards an environmentally sustainable hospital, there is a need for quantifiable parameters to define the sustainability of PET/CT examinations and to guide decision making. In addition, a comparison with other diagnostic imaging is required to enable evaluation of diagnostic workflows. As supplemental deliverable - a sustainability package of requirements can be composed to add to the procurement procedure of diagnostic (nuclear) imaging systems.



Figure 1, CT (left), PET (center) and PET/CT fused images (right) of the lower extremities (knee, ankle)

Research question(s)

What is the optimal and sustainable application of PET/CT examinations at Alrijne hospital?

Subquestions include:

- How does PET/CT relate to other diagnostic imaging modalities regarding sustainability?
 - Incorporate factors as: power consumption, radiation protection, heat production, production of radiopharmaceuticals, contrast agents, waste, data



Figure 2, MRI of the left ankle

storage, manufacturing of the scanner and used materials as helium etc.)

- Which quantifiable parameters should be considered to assess the sustainability of a diagnostic modality?
- How sustainable are radiopharmaceuticals?
- How does the life cycle of PET/CT relate to CT and MRI?
- How can we apply sustainable quantifiable parameters in our decision making?
- How can we incorporate sustainability in the procurement procedure of diagnostic (nuclear) imaging systems?
 - Package of "sustainability" requirements
- Deliverable: Compose a sustainability package of requirements that can be used for the procurement procedure of diagnostic (nuclear) imaging systems

Expected type of work

This research subject includes: Life cycle assessment PET/CT, MRI and CT. Material flow analysis of the diagnostic scanners (power consumption, heat production, radiation protection, production of radiopharmaceuticals, contrast agents, manufacturing of the scanner and used materials as helium etc.)

Remarks

Especially students with interest in the combination of economics, technology and healthcare would fit this project. Since the assignment has a considerable breadth and depth, the student can pursue subquestions fitting to their field of interest.

References

(Clinical) data are available for this project in the hospital.

Commissioner details

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