

*Düsseldorf, Germany*

## CTE 4 (Technologists)

Monday, October 15, 16:30-18:00

### Session Title

Latest Development in PET/MR

### Chairpersons

Marius Mada (Cambridge)

Pedro Fragoso Costa (Essen)

### Programme

16:30 - 17:00 Anna Barnes (London): The Physicist's View on PET/MR Developments

17:00 - 17:30 Christoph Rischpler (Essen): Clinical Applications of Cardiac PET/MR

17:30 - 18:00 Victoria Lupson (Cambridge): PET/MR in Brain Applications – A Technologist's Tale

### Educational Objectives

1. Understanding the advantages, challenges and clinical opportunities of simultaneous PET/MR
2. Basic understanding of the principles of attenuation correction, image reconstruction and motion correction in PET/MR systems
3. Recognise the potential applications of PET/MR in cardiac, oncology and neuroimaging
4. Realise the role of cross-training for PET/MR technologists
5. Understanding the challenges and opportunities of new radiotracer development for PET/MR
6. Basic knowledge of the research potential of PET/MR

### Summary

Over the last 20 years the research community was preoccupied with integrating PET and MRI. Driven by the success of combining PET with CT, the PET-MRI hybrid imaging was not a straightforward modality due to the presence of the magnetic field.

MRI compatible PET detectors had to be developed to replace the traditional photomultiplier tubes. Nowadays the two existing clinical systems use solid state photodetectors (APDs, SiPMs). Acquisition times in modern PET-MRs have dropped but still are longer than in PET-CT mostly because the MRI taking longer than CT. PET-MRI is a quantitative technique and there are challenges when performing attenuation and scatter correction in the absence of CT to provide the linear attenuation coefficients. Attenuation correction is an ongoing research subject in PET-MRI.

Clinical applications of PET-MR are currently under development as more and more systems come online around the world. Nevertheless, reduced radiation dose, high tissue contrast in the brain, breast, abdomen or the heart indicate a range of applications suitable for this new modality. PET-MRI opens up new avenues in the radiotracer development beyond the  $^{18}\text{F}$ -FDG making possible for PET-MR to distinguish from the classical comparison with PET-CT.

Considering the dual nature of this modality a practical aspect of PET-MR operation is the personnel and their skills set. Currently, departments operating PET-MRs either use cross-trained staff or rely on two sets of technologists.

PET-MRI is a comprehensive technique that combines the best of the morphological and functional imaging creating endless opportunities for new diagnostic. Nevertheless, there are numerous challenges that need addressing and technologist have to contribute to its success.

### Key Words

Simultaneous PET/MR, Attenuation correction, image reconstruction, PET/MR radiotracers, clinical PET/MR, research PET/MR, PET/MR workforce

### Take Home Message

PET/MR is a powerful and complex imaging modality that has the potential for innovation in medical imaging. The development of PET/MR continues to shape the way technologists perform their roles and offers a potential for professional achievement