Quality Control for PET systems
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Positron Emission Tomography (PET) technology started to be a research tool since early 1970s. Since that moment, this imaging technique has been developed into one of the most medical imaging technique. PET technology has two main achievements that made this technology to gain a tremendous development related to its applicability in different pathologies: the possibility to be combined with structural imaging techniques (e.g. computer tomography, magnetic resonance imaging) and the possibility to obtain quantitative information. These two main aspects make from this non-invasive imaging technique a very sensitive modality used in the assessment of different pathologies in the field of clinical oncology, but also with good success in neurology and cardiology.

The complexity of this imaging method and the key role that it plays in diagnostic and therapeutic strategies requests strict quality control and quality assurance procedures. Like radiation protection, quality control and quality assurance aspects are present in every step of every procedure in nuclear medicine daily practice and implicitly in PET. The procedures related to quality control and quality assurance involves different specialists, being necessary a multidisciplinary approach that involves installation specialists and engineers, radiopharmacists, physicists, physicians and technologists.

The process of quality control starts from the moment of installation when the acceptance tests are performed in order to verify if the equipment meets the required standards and reference values are obtained for different parameters. These parameters are verified during the quality control process along the period of warranty but also along the period of use. In the case of some corrective actions or service are needed, post-service/corrective action quality control tests are performed in order to ensure that the equipment respects the parameters and works properly.

In PET or PET/CT technology, the parameters related to positron emission tomography evaluated by the acceptance tests but also by the routine quality control tests are directly related to data acquisition (e.g. spatial resolution, energy resolution, coincidence timing resolution, sensitivity, scatter fraction, random measurements, attenuation accuracy, scatter correction, image uniformity, detector normalization) and they are mandatory to ensure the correct assessment of the radiopharmaceutical distribution.

A satisfactory quality control program is the main premise for an accurate PET/CT technique and for a correct diagnostic in order to establish an appropriate therapeutic strategy for our patients.

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