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PET/CT Gaining Ground: Demand for Exams Fuels Installations in Western Europe

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Positron Emission Tomography (PET) is now an established technique for cancer diagnosis and is increasingly being used to follow-up cancer therapies. As a mature modality, the challenge now is for the molecular imaging community to increase patient numbers through a wider adoption of 18FDG scanning and the introduction of new tracers.

Scanner Numbers in the EU Growing

There are now more than 500 PET/CT scanners installed in Western Europe, a number that provides more than one scanner per million of the population, and a level that has been suggested as suitable to meet demand. It seems likely that this target will be raised in future. One PET/CT per 500,000 patients seems perfectly attainable based on current applications and types of service provision. One would, for example, expect a higher number of scanners in countries where there is a traditional insufficiency in supply of general healthcare or where private medicine is important.

In 2008, approximately 660,000 patients received PET scans in Europe, the majority of these cancer studies using 18FDG. The annual growth in procedures, while slowing, exceeds 20%. The installed base of PET/CT continues to shift from larger institutions and into settings such as general hospitals and private practice. Today, universities comprise less than one third of those centres offering PET or PET/CT examinations.

Last Two Years Show Increased Patient Numbers

In the past two years, Scandinavia, the Netherlands, Ireland and the UK have shown a major upsurge in patient numbers as an increasing number of clinical systems have been installed. Mobile PET/CT scanning has been an important contributor to growth in these countries. Italy heads the table as the country with most scans per head of population. Statistics in the table are propped up by Germany, where the restrictive reimbursement regime has kept patient numbers low. It hasn't stopped investment in technology, and over 100 PET and PET/CT scanners are installed.

Centres are retiring scanners, cynical as to whether the reimbursement regime will improve. Others are investing, optimistically believing a widening franchise is just around the corner.

PET/CT Reducing Imaging Times, Becoming Routine

In recent years, the most noticeable development has been the reduction in imaging times driven by hybrid PET/CT and improved detector geometries along with technologies, which have improved image quality. Today, all of the major manufacturers offer Time of Flight (TOF) data capture with detectors based on Lutetium Orthosilicate (LSO). Examination times of less than 20 minutes following uptake of tracer are now within reach.

PET is no longer the bespoke exam of ten years ago, but now lends itself to routine high throughput environments. Higher patient throughput is increasingly important in pushing up scan volumes (see figure 1). While the average throughput per scanner is ~1,600 patients per year, around one third of sites exceed 2,000 patients; the average workload of a gamma camera.

This places challenges on departments not geared up for large patient numbers. Whereas five patients per day could easily be handled with a

single uptake room, three patients per hour demands four rooms if patients are not expected to share facilities. Moreover the radiation dose to staff primarily from patient handling is also an issue. Products that improve the handling of radiotracers within the PET/CT suite have been launched in the past twelve months.

Major Challenges for PET/CT

Today the major challenge for PET/CT is garnering referrals. Even in the most permissive financial environments, persuading clinicians to refer can be an issue. It is a problem facing imaging in general. More modalities are chasing the same patient. PET/CT imaging studies are more accurate, mitigate against follow-up procedures and reinforce payers' reticence to countenance duplicated studies. The future for imaging departments is to manage the diagnostic algorithm, for example shifting from conventional angiography to CT or MR. Nuclear medicine now faces similar choices. Nuclear medicine practitioners are the first to observe that its demise has been talked about for the last 30 years but it is still going strong. The impact of CT and MR has been minimal. PET/CT presents a new challenge to procedures based around gamma imaging; a threat from within nuclear medicine. PET/CT was the stimulus for discussions between the EANM and ESR in 2007 over the future of the disciplines. But it also raises the dilemma for nuclear physicians of whether to shift studies from the gamma camera to PET/CT.

Cost of PET/CT Studies Versus Alternatives

To date, the cost of PET/CT studies versus examinations performed on a gamma camera is far higher, and is driven by equipment and radiotracer costs. In 2010 the availability of molybdenum generators will continue to be an issue, although the situation should be an improvement on 2009. Any threat to technetium (99Tc) supply challenges nuclear medicine practitioners to defend their referral base and PET/CT is the obvious solution. A number of European countries have relaxed reimbursement on NaF for bone examinations due to issues with 99Tc supply.

The quality of images is excellent, however, current thinking is that PET/CT will only replace a small proportion of the 2.5 million bone scans performed using 99TcMDP. However other agents may displace current nuclear studies. 68Ga chelates linked to octrotide or 18FDOPA are alternatives to image endocrine tumours. 18FDOPA is also a potential agent to confirm Parkinson's. Rubidium can be used to measure cardiac viability.

Oncology will continue as the mainstay of PET/CT in the medium term with 18FDG as the universal tracer. Indications such as treatment and therapy planning with 'follow-up' alongside a broadening of the tumour indications will fuel growth. Other applications will wait for the wider availability of other tracers. The present trends point to increased availability of PET/CT to undertake new studies if new installations of PET/CT continue at the current level of 40 - 50 per year. Even with throughput growing at the current rate there should be spare capacity in the next five years (see figure 2). Capacity may be far greater if sites deliver the higher throughputs, which are achievable. This all depends on a permissive funding regime and remembering that in provision of diagnostic imaging in Europe is a three lane highway and not all countries travel in the fast lane.

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