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Comment

Going nuclear: it is time to embed the nuclear medicine physician in the prostate cancer multidisciplinary team

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The value of a multidisciplinary approach to the management of prostate cancer (PCa) is widely appreciated by both healthcare professionals and patients alike. Whether for the navigation of localized PCa, where management options can be perplexing, or the management of advanced PCa, where therapy options are evolving rapidly, and clinical trial options abound, it is best practice that patients are offered multidisciplinary options [1]. This may include the presence of healthcare practitioners of various types in a physical multidisciplinary clinic, or having a virtual network whereby patients can access multidisciplinary care in different environments. Importantly, a well-run multidisciplinary team (MDT) meeting is the key to anchoring such care and considering all multidisciplinary options for patients with prostate cancer (Fig. 1). Indeed, this approach is mandated by law in the UK, where multidisciplinary care was enshrined in the Health Care Act based on the Improving Outcome Guidance work which underpins cancer care in the NHS in the UK.

By convention, members of the PCa MDT include urologists, radiation oncologists, medical oncologists, radiologists, pathologists, nurses and other allied healthcare practitioners, such as physiotherapists, psychologists and dieticians (Table 1). The impact of androgen deprivation therapy on bone health and quality of life has led to endocrinologists and exercise physiologists also playing an important role in the

Fig. 1 The multidisciplinary team meeting in action. One of our screens is dedicated full-time to the nuclear medicine team.

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Table 1 Members of the prostate cancer multidisciplinary team

Medical Specialists	Nursing and Allied Health	Others
Urologist	Specialist nurse	Researchers
Medical oncologist	Psychologist	Administrative support
Radiation oncologist	Dietician	Clinical trial co-ordinators
Nuclear medicine physician	Exercise physiologist	Genetic counsellor
Radiologist	Physiotherapist	General practitioner
Pathologist	Intimacy specialist	Patient
Endocrinologist		

PCa MDT. Although the quality of MDT meetings will always vary depending on circumstances and resources, it is still a widely supported principle that patients with PCa should be managed within some sort of multidisciplinary framework [2].

In the past few years, it has become very clear to the present authors that we also need to work very closely with our nuclear medicine physician colleagues in our MDT approach to patients with PCa. Although in some jurisdictions, such as the UK, there are specialists who are dual-trained as radiologists and nuclear medicine physicians, this is not the case in most areas. Furthermore, specific expertise in positron-emission tomography (PET) imaging and theranostics is not usually found outside specific nuclear medicine specialists. Prior to 2014, the MDT meeting in our cancer centre did not routinely include nuclear medicine physicians. Those were the so-called days of 'unclear medicine' in genitourinary oncology. The introduction of prostate-specific membrane antigen (PSMA) PET/CT imaging, with its outstanding functional and anatomical imaging in our centre, however, sharply refocused the genitourinary oncology team at our centre in mid-2014, leading to a rapid growth in the use of this imaging method in our PCa service [3]. It also led to the development of clinical trials comparing PSMA PET/CT with conventional imaging [4], and also the use of other novel PSMA tracers [5]. We began to struggle with the optimal application of PET imaging, including the appropriate use and interpretation of findings, without having regular nuclear medicine support. Furthermore, the emergence of life-prolonging radionuclide therapies in advanced PCa such as ^{223}Radium also typically requires nuclear medicine expertise.

A decision was made in 2015, therefore, to support the weekly PCa MDT with the presence of a nuclear medicine physician. This support has now grown into the regular presence of two professors of nuclear medicine and numerous nuclear medicine fellows and trainees. We also have the technical infrastructure to support this, with a multi-screen projected display including nuclear medicine, radiology, medical records, light microscope, and MDT notes (see Video S1). In addition, we have full video-conferencing capability.

The nuclear medicine physicians use their PET workstation software (MIM Encore), enabling advanced display, image processing, cross-modality fusion and comparison of multi-time point imaging. Indeed, it is a specific consideration within MDT environments that most patient archiving and communications systems do not have the level of functionality required to manage adequately the rich hybrid imaging which PET/CT and PET/MRI offers. The impact on multidisciplinary care has been extraordinary. Apart from the value in having the expertise to interpret the very large number of PET scans being presented at our MDT meetings every week, there were other notable benefits, including:

- the development of successful concepts for clinical trials in PET imaging;
- numerous multidisciplinary publications involving the nuclear medicine team;
- evaluation of novel PET imaging tracers in prostate and other genitourinary cancers;
- the development of techniques to optimize quality in the performance of PSMA PET/CT in patients with PCa.

The cross-fertilization between nuclear medicine and the rest of the MDT PCa team also led to the development of a new area of research interest for our team, that of theranostic approaches in advanced PCa. We developed a prospective phase II study to evaluate the role of ^{177}Lu-PSMA therapy for men with heavily pre-treated metastatic castration-resistant PCa [6], and have since developed many protocols and attracted grants to evaluate the use of ^{177}Lu-PSMA therapy in earlier stages of aggressive PCa[7]. Furthermore, it is clear that there is much interdisciplinary educational value between the nuclear medicine physicians and other members of the team. The nuclear medicine team learn about the clinical management, unmet needs and research opportunities in PCa, and the rest of the team learn of the science, applications, quality control and research opportunities in nuclear medicine, PET imaging, and theranostics in particular. As the value of nuclear medicine increases in PCa, it may be necessary to expand the nuclear medicine presence and also invite medical physicists and nuclear medicine technologists to the MDT meeting.

These highly fruitful endeavours would not have been possible without the physical presence of our nuclear medicine physicians in our weekly MDT meeting. This has led to a very meaningful broadening of our MDT discussions every week. The nuclear medicine community is acutely aware of the opportunities for PSMA PET imaging and PSMA theranostics in PCa, and will probably be very pleased to join the PCa MDT. The message we have to others is this: it is time to invite your nuclear medicine physician colleagues into your MDT meeting. The two-way benefits we have experienced since we did this have been immense, and we encourage others to do the same.

Conflicts of Interest

Dr Murphy reports personal fees from Janssen, Astellas, Ipsen and Ferring outside the submitted work. Dr Azad reports personal fees from Janssen, grants, personal fees, non-financial support and other from Astellas, personal fees from Novartis, grants and non-financial support from Merck Serono, personal fees from Tolmar, personal fees, non-financial support and other from Amgen, personal fees and other from Pfizer, personal fees from Bayer, personal fees and other from Telix Pharmaceuticals, personal fees and other from Bristol-Myers Squibb, and personal fees and other from Sanofi, outside the submitted work.

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Abbreviations: PCa, prostate cancer; MDT, multidisciplinary team; PET, positron-emission tomography; PSMA, prostate-specific membrane antigen.

