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.
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 imaging [4], and also the use of other novel PSMA tracers [5]. We began to struggle with the optimal application of imaging [4], and also the use of other novel PSMA tracers [5].

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 value 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.

### Table 1 Members of the prostate cancer multidisciplinary team

<table>
<thead>
<tr>
<th>Medical Specialists</th>
<th>Nursing and Allied Health</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urologist</td>
<td>Specialist nurse</td>
<td>Researchers</td>
</tr>
<tr>
<td>Medical oncologist</td>
<td>Psychologist</td>
<td>Administrative support</td>
</tr>
<tr>
<td>Radiation oncologist</td>
<td>Dietitian</td>
<td>Clinical trial co-ordinators</td>
</tr>
<tr>
<td>Nuclear medicine physician</td>
<td>Exercise physiologist</td>
<td>Genetic counsellor</td>
</tr>
<tr>
<td>Radiologist</td>
<td>Physiotherapist</td>
<td>General practitioner</td>
</tr>
<tr>
<td>Pathologist</td>
<td>Intimacy specialist</td>
<td>Patient</td>
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<tr>
<td>Endocrinologist</td>
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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.

Supporting Information
Additional Supporting Information may be found in the online version of this article:

Video S1. Professor Declan Murphy and colleagues at Peter MacCallum Cancer Centre discuss why they have embedded PET Imaging and Theranostics in their multidisciplinary team