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Going nuclear - It is time to embed the nuclear medicine physician in the prostate cancer multidisciplinary team

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Keywords: Prostate neoplasm, Neoplasm metastasis, Theranostic Nanomedicine, PSMA protein, 177Lu-PSMA-617, Lutetium, ligands, Radioimmunotherapy, #PCSM

Word count: 873

References: 6

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Article type : Comment

Article Category: Comment

The value of a multidisciplinary approach to the management of prostate cancer (PC) is widely appreciated by both health care professionals and patients alike. Whether for the navigation of localised PC where management options can be perplexing, or the management of advanced prostate cancer 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 health care 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 prostate cancer patients. 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 National Health Service in the UK.

By convention, members of the PC MDT include urologists, radiation oncologists, medical oncologists, radiologists, pathologists, nurses and other allied health care 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 prostate cancer MDT. Although the quality of MDT meetings will always vary depending on circumstances and resources, it is still a widely supported principle that PC patients should be managed within some sort of multidisciplinary framework[2].

In the past few years, it has become very clear to the authors, that we also need to work very closely with our nuclear medicine physician colleagues in our MDT approach to PC patients. 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 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 GU Oncology. However, the introduction of PSMA PET/CT imaging with its outstanding functional and anatomic imaging in our centre sharply refocused us in GU Oncology in our centre in mid-2014 leading to a rapid growth in the use of this imaging modality in our PC 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 appropriate use and interpretation of findings, without having regular nuclear medicine support. Furthermore, the emergence of life-prolonging radionuclide therapies in advanced prostate cancer such as $^{223}\text{Radium}$ also typically requires nuclear medicine expertise.

Therefore a decision was made in 2015 to support the weekly prostate cancer MDT with the presence of a nuclear medicine physician. This support has now grown to 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 including a multi-screen projected display including nuclear medicine, radiology, medical records, light microscope, and MDT notes (see supplementary video). We also have full video-conferencing capability. The nuclear medicine physicians utilise 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 (PACS) do not have the level of functionality required to adequately manage 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 in our MDT meeting every week, there were other notable benefits including:

- 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 GU cancers
- Development of techniques to optimise quality in the performance of PSMA PET/CT in prostate cancer patients

The cross-fertilisation between nuclear medicine and the rest of the MDT prostate cancer team also led to the development of a new area of research interest for our team, that of theranostic approaches in advanced prostate cancer. We developed a prospective phase 2 study to evaluate the role of ^{177}Lu -PSMA therapy for men with heavily pre-treated metastatic castration resistant prostate cancer[6], and have since developed many protocols and attracted grants to evaluate the use of ^{177}Lu -PSMA therapy in earlier stages of aggressive prostate cancer. 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 prostate cancer, 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 prostate cancer, it may be necessary to expand the nuclear medicine presence and also invite medical physicists and nuclear medicine technologist 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 are acutely aware of the opportunities for PSMA PET imaging and PSMA theranostics in prostate cancer, and will likely be very pleased to join the prostate cancer 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, personal fees and other from Sanofi, outside the submitted work.

Figure 1: The MDT meeting in action. One of our screens is dedicated fulltime to the nuclear medicine team

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Table 1: Members of the prostate cancer multidisciplinary team

Medical Specialists	Nursing & 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

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Title:

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Date:

2019-07-16

Citation:

Murphy, D. G., Hofman, M. S., Azad, A., Violet, J., Hicks, R. J. & Lawrentschuk, N. (2019). Going nuclear: it is time to embed the nuclear medicine physician in the prostate cancer multidisciplinary team. *BJU INTERNATIONAL*, 124 (4), pp.551-553. <https://doi.org/10.1111/bju.14814>.

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