



ACPSEM POSITION STATEMENT

THE ROLE OF
PHYSICISTS,
SCIENTISTS AND
ENGINEERS IN
MEDICINE IN
AUSTRALASIA



ACPSEM

Australasian College of Physical
Scientists & Engineers in Medicine

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INTRODUCTION

The Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM) is the professional body that supports physical scientists (medical physicists, radiopharmaceutical scientists and clinical engineers) in Australia and New Zealand. Additionally, and with the support of Australian Commonwealth funding, the ACPSEM maintains the professional Register of Qualified Medical Physics Specialists.

This Position statement was authored by delegates of the ACPSEM 2017/18 Advisory Forum* and approved by the ACPSEM Board in December 2018. It uses the term physical scientists to describe medical physicists, radiopharmaceutical scientists, clinical engineers, and other allied physical scientists working in hospitals, clinics, regulatory bodies, academia, industry and research facilities who apply their skills and knowledge to improve the health and wellbeing of the community.

PURPOSE

- Modern clinical practice and research in radiation oncology, radiology and nuclear medicine requires the contributions and skillsets of physical scientists to an increasing degree.
- This Position statement provides those responsible for the delivery of healthcare services, regulators, ACPSEM members and the community with a renewed understanding of how physical scientists are utilized in the pursuit of patient-centred, safe, efficient and effective health care in Australasia. It outlines the unique contributions these professionals bring to an environment characterized by innovation and a growing reliance on technology integration and optimization, and data analysis; where clinical and financial risk is high and the need to ensure safe practice is paramount.

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CHALLENGES AND OPPORTUNITIES

Historically, and reflecting the experience of similar organizations across the world, ACPSEM activity has focused on building the profile and professionalism of its members (and the professions in general) with the goal of maximising the safe and efficient use of ionising and non-ionising radiation and its applications in medicine. The ACPSEM has detailed the more traditional role of medical physicists in an earlier position paper:

“ACPSEM Position on the Roles and Responsibilities of The Qualified Medical Physicist” (June 2014 version 2.4).

Due to the shift in priorities of health systems from the traditional focus on safety and compliance, to include new priorities such as health economics and the centrality of the patient experience, the aspirations and influence of physical scientists have evolved to suit. Different careers and research agendas that focus on supporting intentional and evidence-based use of technology and data have emerged, with examples including:

- In radiology and imaging, optimisation of the use of ionising radiation now includes focus on both the acquisition of images and the adaptation of computer aided diagnostic tools and techniques in support of the clinical team and improved clinical results.
- Utilising scientific and quantitative skills to develop niche opportunities which focus on analysing and optimising clinical outcomes in areas such as orthopaedics, cardiac surgery and interventional cardiology.

- Engaging with opportunities offered by AI and machine learning as well as linking and developing datasets to inform clinical practice.
- Leading collaborative work focusing on innovation in radiation oncology such as MR-Linac technology development and proton therapy centre planning.
- On-site synthesis of both radionuclides and radiopharmaceuticals for diagnostic and therapeutic use.
- In clinical engineering, working to ensure safe, optimised and effective use of IT enabled medical devices in the face of rapidly changing technologies and a density of information.

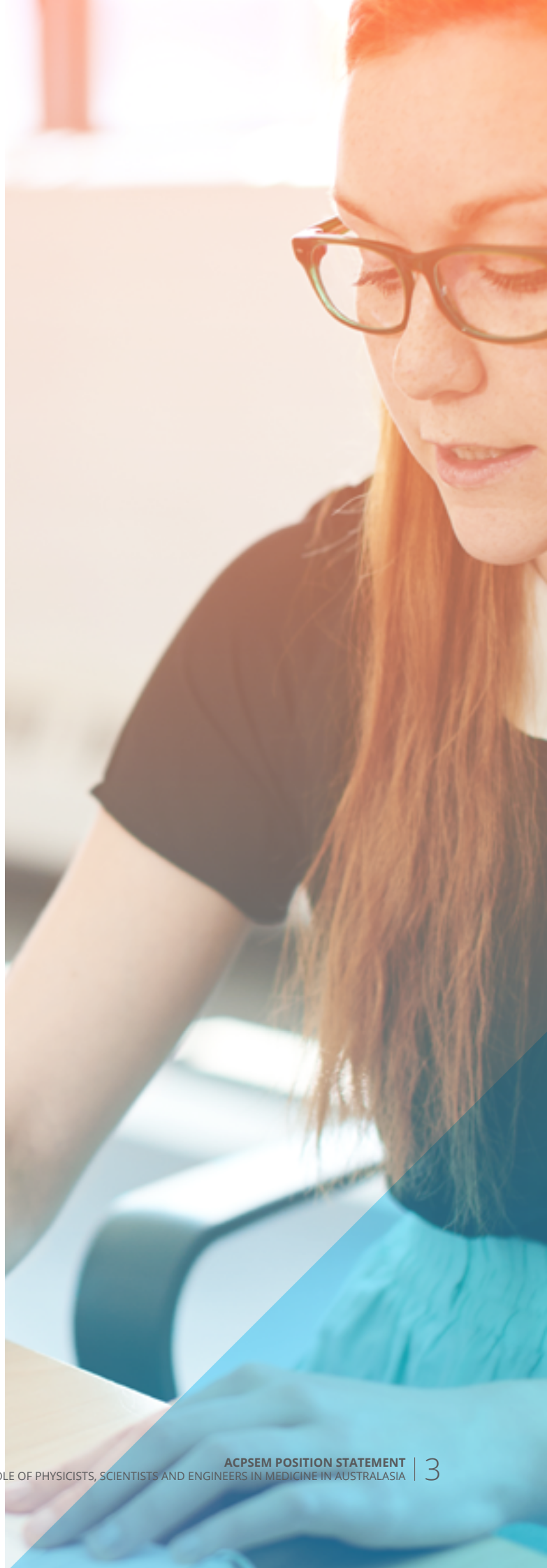
The core attributes and skills of physical scientists lend themselves to these broader roles*.

Modern evidence-based medicine requires that treatments be informed by science, and physical scientists are trained to solve problems and optimise solutions; not simply follow processes. With these inherent attributes and specific skills, physical scientists are an adaptable workforce suited to working in complex and increasingly technology-dependent health systems.

The following sections of this Position Statement provide a functional perspective on the observed broader contributions of physical scientists in medicine to modern healthcare systems, as reported by the membership of the ACPSEM.

* E.g.s of skills: critical thinking, problem solving, data analysis and visualization, decision support, computational modelling, machine learning and AI support, statistics, translation and interface from bench to bedside, basic knowledge in physics/chemistry/mathematics, measurement, experimental design, and coding.

E.g.s of attributes: scientific, analytical, systematic, quantitative, rigorous, inquisitive, curious, creative, innovative, synthesizing, enthusiastic, altruistic, technical, and tech savvy.



CLINICAL GOVERNANCE

ACPSEM members now report increasing opportunity and involvement in clinical governance, including:



Advising, managing and implementing systems for the safe use of medical technologies and techniques.



Bringing additional scientific rigor to clinical trials including preparation for governance and ethics, ensuring high quality trial interventions, and evaluation of outcomes.



Measuring, analysing and effectively reporting on quantitative clinical and safety parameters, to improve outcomes and reduce patient and staff risks.



Facilitating the use of clinical data for workforce planning and capital investment decisions.



Collaboration with other healthcare professionals to achieve bench to bedside translation of innovations in the physical sciences, to bring research into clinical practice.



Implementing changes and increasing scientific rigor in regulatory processes.

The challenge for the ACPSEM is to facilitate continuing professional development (CPD) opportunities and broader use of resources to ensure its members can continuously adapt their skill sets to keep pace with these opportunities. This includes ensuring that registration of physical scientists maintains relevancy to the work place beyond initial qualification.

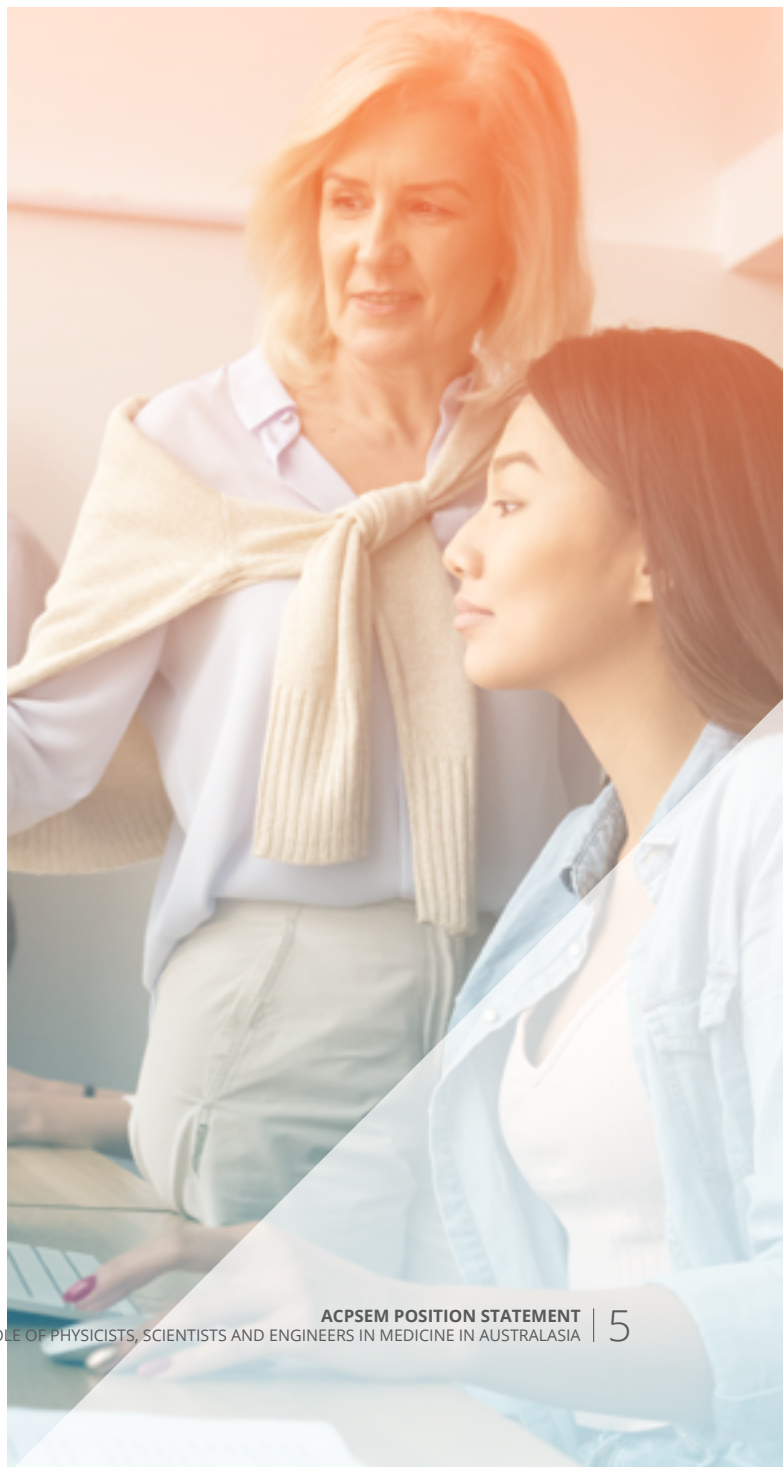
PERSONALISED HEALTHCARE

ACPSEM members play key roles in analysing and interpreting clinical data, to improve clinical decision support and delivery systems, including contributing to the growing personalisation of healthcare and more sophisticated use of modelling to successfully:

- Optimise efficiency and effectiveness of:
 - Patient pathways.
 - Diagnostic and medical devices and their output (e.g. imaging) to maximise diagnostic potential.
 - Treatment modalities (planning through to delivery).
 - On-site production and quality assurance of an increasingly wider range of radiopharmaceuticals for diagnosis and therapy.
- Facilitate the use of clinical data for decision making, audit and system evaluation.
- Educate patients seeking technological treatment information.
- Evaluate the quality and cost-benefit ratio of technology implementation
- Implementing governance that ensures the best use (safe and efficient/effective) of radiation in healthcare

A further challenge for the ACPSEM is to advocate to regulators the necessary and growing role physical scientists play in aspects of patient care traditionally carried out by others. This could ultimately pose a challenge for regulators; for example, in Australia, unlike in larger nations, physical scientists are not subject to mandatory national registration, due to size and highly specialised nature of the workforce.

At the same time, it places the onus on the ACPSEM to increase the scope and quality of its self-regulating processes, including advocating to regulators the need for the broader Australian physical sciences and clinical engineering workforces to at a minimum be completing CPD and preferably seeking professional registration.





A DRIVING FORCE IN TECHNOLOGY ADVANCEMENT

The ACPSEM recognises the challenge inherent in ensuring that its vocational certification and CPD programs keep up with emerging roles as opposed to solely the traditional positions it supports in radiation oncology, radiology and nuclear medicine. Notably it has recently introduced a certification process for Radiopharmaceutical Scientists. A Working Group is also focused on maximizing the College's input in the introduction of Particle Therapy treatments in Australia. New foci will also be needed to support future College members including physical scientists already branching away from a focus on radiation safety and dosimetry, to include roles such as:

1. Providing leadership and/or expertise in the delivery of scientific advances and the commercialization of new technologies, through collaborations with clinical partners, academia and industry.
2. Evidence-based clinical implementation and evaluation of the use of new technology.
3. Optimizing the evidence-based use of technology to support clinical care and achieve cost effectiveness.
4. Working in the "crossover space" in support of the application of imaging in radiation oncology and other interventional domains (e.g. augmented reality).

SUMMARY

This position statement addresses the need identified by the ACPSEM Board in 2017 to update and inform those responsible for the delivery of healthcare services, regulators, ACPSEM members and the community; regarding the roles and responsibilities of physical scientists in modern healthcare systems. While the traditional functions of maximising the safe and efficient use of ionising and non-ionising radiation and its applications in medicine, remain, this statement encapsulates changes that have occurred and provides a signpost to a future characterized by a growing range of opportunities for physical scientists in medicine.

This statement also demonstrates that the ACPSEM and its members are ensuring that certification, registration and professional development programs reflect the ongoing technological changes in the delivery of healthcare, while maintaining a commitment to safeguarding patients and the broader community.



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