

NEW MEDICAL PHYSICS SPECIALTIES: A STUDY OF THE GENERAL MEDICAL PHYSICIST SPECIALTY IN THE NETHERLANDS: AN INITIAL REPORT

A. Pace¹, C.J. Caruana¹, S. Agius², E. Pace¹

¹ Medical Physics, Faculty of Health Sciences, University of Malta, Msida, Malta

² Nuclear Medicine Department, Mater Dei Hospital, Msida, Malta

Abstract — Globally, the Medical Physics profession is mostly delimited to diagnostic and interventional radiology, radiation oncology and nuclear medicine. This is true also in Malta. However, in the Netherlands there are other specialties, among which ‘General Medical Physics’. The objectives of this study were to: (i) investigate the role of the General Medical Physicist in the Netherlands (ii) identify aspects of the role which Medical Physicists in Malta do not exercise, (iii) consider the possible introduction of this specialty in Malta. The methodology used in the study can be utilised by Medical Physicists to introduce other specialties to their countries.

Keywords— **Role expansion, general medical physicist, medical physics in the Netherlands.**

I. INTRODUCTION

The scope of the role of Medical Physics (MP) both globally and in Malta is at present largely delimited to solely three specialty areas: diagnostic and interventional radiology (D&IR), nuclear medicine (NM) and radiation oncology (RO). Before the present study the profession has not explored other specialty areas practiced in Europe with a view of expanding the role nationally.

MP in the Netherlands has been successfully advancing for over 50 years and includes other specialties of MP such as Audiology and General Medical Physics (GMP). This study researches the role of the GMP in the Netherlands, a country with a highly developed healthcare system. Outside of the Netherlands, there is little understanding of the role of the GMP as of yet.

By investigating the role of the GMP and analysing the relevance of its role, it would be possible to assess whether introduction of this specialty within the healthcare systems of other countries including the Maltese healthcare system is feasible. The objectives of the study therefore were: (a) To study the role of the GMP within a selected number of hospitals in the Netherlands, (b) To identify aspects of the role which are not yet exercised by Medical Physicists in Malta, and (c) To consider whether and how this specialty of MP could be introduced in Malta.

II. METHODOLOGY

The data collection techniques included semi-structured interviews with Dutch GMPs, document analysis and direct observation. The semi-structured interviews provided a focused

approach using pre-planned open-ended questions that allowed flexibility, further discussion and follow-up questions based on the participants’ responses. The open-ended nature of the questions also allowed for the emergence of new themes or ideas not initially considered by the researcher.

The purpose of the interviews was to acquire individual perspectives of the GMP role by personally asking the GMPs about their daily duties and responsibilities as well as their perspectives on the specialty. Three different GMPs working in different hospitals with different systems and in different cities were interviewed to ensure a variety of perspectives from different work environments. Analysis of documentation and research articles provided by the participants gave additional information. Moreover, direct observation provided an additional source of primary data during the onsite visits. This variation of data collection methods ensures a well-advised view on the wide spectrum of the work of the GMP.

The sampling method used for this study was judgmental (expert) sampling. The three centers were chosen by an advisor from the Netherlands to ensure sufficient coverage of the role. The participants were in fact recommended by a member of the board of directors of the Dutch Medical Physicist Training Foundation (OKF) and were contacted by the secretary of OKF, which acted as an intermediary for this research. Each interview lasted approximately one hour. Prior to the study, the Dutch curriculum for the competences of the GMP was studied. This curriculum helped in formulating the interview schedule and further enhanced the structure for this research.

The questions were divided into 6 general themes:

Theme 1: General understanding of the role of the GMP in the Netherlands

Theme 2: What distinguishes the GMP from other MPs?

Theme 3: How GMPs interact/work with other healthcare professionals

Theme 4: What special education/training is required to become a GMP?

Theme 5: What specific medical devices and associated physical agents are GMPs involved with?

Theme 6: What was the origin of the GMP in the Netherlands?

The first objective of this study is addressed in themes 1-4, Themes 4 and 5 tackle objective 2, and Themes 4, 5 and 6 set the foundation for objective 3.

III. RESULTS AND DISCUSSION

Theme 1 - General understanding of the role of the GMP in the Netherlands

GMPs are a member of the medical staff of general hospitals – they are responsible for overseeing all medical devices (and associated physical agents) utilised within the hospital. While the specialist departmental MP manage the devices in D&IR, RO, and NM, GMPs can also be involved with tasks in these areas as needed, calling for specialists when necessary. GMPs have a broad overview of the medical technology in the hospital, so they can recognise the needs for new medical devices and treatment approaches. They offer guidance on their introduction into the clinic and try to guarantee optimised use. Additionally, they identify potential risks associated with each device and communicate these risks to ensure an overall safe environment in the hospital. The board of directors and medical staff rely on GMPs as their primary contact in events of device malfunction or other technical issues. Moreover, the participants stated that this specialty enhances overall safety, innovation, and financial management of hospitals.

Theme 2 - What distinguishes the GMP from other Medical Physics Professionals?

This theme aims to identify aspects of the GMP role, not performed by specialized MPs in D&IR, RO, and NM. Firstly, GMPs adopt a hospital-wide perspective, looking beyond any single department to identify what is best for the entire hospital. They apply successful strategies for all medical departments, leveraging their knowledge of medical devices, medical innovations, and the needs of medical professionals. By doing so, GMPs play a consultative and strategic role in the hospital, rather than solely providing department-specific expertise like other specialist MPs. GMPs also engage in hospital policy discussions and have considerable influence in the decision-making process concerning medical device technology.

GMPs need to have sound knowledge on particular medical devices; if they think additional expertise is required, they can consult other MPs in the hospital or in the country. They leverage their professional relationships and connections with other colleagues in the Netherlands to obtain advice and guidance when initiating new projects or implementing unfamiliar devices.

Theme 3 - How GMPs interact/work with other healthcare professionals.

GMPs undertake complex projects for the entire hospital, serving as intermediaries between doctors, the board of directors, and vendors. They try to ensure a balance between purchase of medical device technology and budget constraints. They also serve as intermediaries between doctors and other

hospital personnel regarding the use of medical equipment. In addition, GMPs cooperate with IT, estates, purchasing, and medical departments. They have a role in connecting medical device technology to patient databases, provide advice on the layout of examination rooms and help ensuring smooth introduction of medical devices. The participants expressed the importance of a close collaboration with the IT department. This is becoming more important, now that digital health applications are legally considered as medical devices. Any gaps in the connectivity between the medical software and devices can have significant implications in patient diagnosis and treatment. In the hospitals in the Netherlands, all medical departments have a medical manager. As the GMP department is part of the medical staff, the GMP provides a medical manager who has equivalent decision-making power to doctors in hospital-wide decisions. One of the more challenging aspects of the GMP role is getting other healthcare professionals involved in the process of implementation and maintenance of the medical device technology in the hospital. Participants expressed the concern that the risks and hazards associated with outdated medical devices are not always fully realised, even when there is need for urgent replacement.

Theme 4 - What special education/training is required to become a GMP?

The diagram illustrated in Figure 1 below, outlines the educational path to become a MP (including GMP), in the Netherlands. The training period involves two years of general training followed by two years of training in the chosen speciality of the trainee (one speciality being GMP).



Figure 1 – Educational path for becoming a Medical Physics Expert (MPE) in the Netherlands.

According to participants, knowledge of hospital business management and organization structure is advantageous for a GMP and it is therefore included in their training. Other essential skills for GMPs include expertise in radiation protection, risk analysis, communication skills, ethical and professional behavior, as well as research skills. In addition, essential skills for GMPs include expertise in radiation protection and risk analysis, robust communication skills, ethical and professional conduct, as well as research skills and IT skills.

Theme 5 - What specific medical devices are GMPs involved with?

The GMP addresses medical devices not addressed by MPs specialised in D&IR, RO, and NM. This theme looks into identification of these devices. This can shed light on particular medical devices that are managed by GMPs but have not yet been given attention by MPs in Malta, hence indicating the advantages of the inclusion of GMPs in the Maltese healthcare system. GMPs are generally involved with all medical devices in hospitals. GMPs are involved with all of the stages in the medical device lifecycle depicted in Figure 2 below, with an aim to optimise all medical devices; not only in terms of effective use and safety but also in cost-effectiveness.

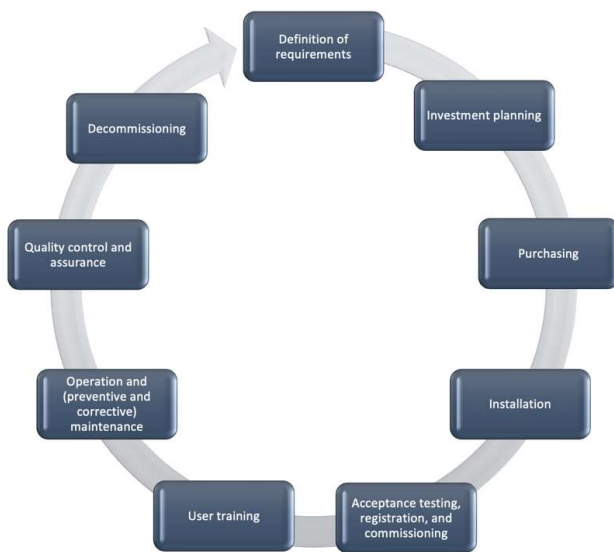


Figure 2 – Medical device lifecycle (Van Asten et al., 2023)

The participants work on devices such as infusion pumps and ventilators in intensive care units (ICU), pacemakers and ECG-carts in cardiology, lasers and all imaging devices in ophthalmology and surgery and patient monitoring devices in the operating room, amongst countless others. GMPs ensure appropriate selection and utilization of medical devices in the hospital, with careful consideration of patient-specific factors. For instance, when selecting respiratory equipment for premature infants, they pay great attention to device specifications, including the device’s ability to handle the tiny respiratory volumes of newborns. Regarding lasers, GMPs are generally appointed as laser safety experts and ensure compliance with the safety regulations. The participants emphasized that there are various other risks and hazards associated with medical devices used in hospitals, not only regarding ionizing radiation. Improper implementation or usage of these devices, such as infusion pumps, lasers, and electrosurgery equipment, can pose a significant and direct threat to patient safety. All participants stressed the need to pay close attention to these devices. Implementation of medical alarm system in hospitals (e.g., medical device alarms to

smartphones) are complex projects, and hospitals involve their GMPs for this.

Theme 6 - How was the GMP set up in the Netherlands?

In 1973, the Dutch MPs formed a national society. The group of physicists working in hospitals not only were working with radiation. Physicists working in academic and general hospitals in cardiology, urology or intensive care departments contributed to the society. Therefore, GMP from the beginning was defined as one of the subspecialties of the MPs in The Netherlands. Very importantly, GMPs played a proactive role for the equal treatment of physicists and doctors in Dutch law. The so-called BIG registration (defining professions in Dutch healthcare) provides clarity about their competence. It also defined the MP as a legally protected professional title with which MPs can perform reserved actions independently and requiring a specialist training as doctors (BIG Register. 2022).

IV. CONCLUSIONS AND RECOMMENDATIONS

This section provides a summary of the conclusions derived from the study, and suggestions for professional practice and future research.

The main conclusions of the study were:

(i) **Theme 1: General understanding of the role of the GMP in the Netherlands**

The main role of GMPs is to collaborate in healthcare facilities to ensure safe, effective and efficient use of medical device technology in all medical departments.

(ii) **Theme 2: What distinguishes the GMP from other MPs?**

GMPs adopt a hospital-wide perspective and are involved in all medical devices and physical agents in the hospital rather than for a specific medical department. They have a consultative and strategic role in the hospital broader than ionizing radiation only.

(iii) **Theme 3: How GMPs interact/work with other healthcare professionals**

GMPs act as intermediaries between medics, the hospital management, and vendors of medical equipment in balancing the cost of medical device technology and budget constraints. GMPs also cooperate with various departments, including IT, estates, purchasing, and medical device technology departments, in establishing the safety of patient data, advise on the layout of examination rooms, and help to ensure smooth commissioning of medical devices into clinical practice.

(iv) **Theme 4: What special education/training is required to become a GMP**

Master's degree in physics or equivalent, followed by two years of general hospital training and two years of specialised hospital training in GMP.

(v) **Theme 5:** *What specific medical devices are they involved with?*

GMPs are involved with *all* medical devices and all physical agents in the hospital.

(vi) **Theme 6:** *How was the GMP set up in the Netherlands?*

From the early start of the MP society in the Netherlands, the GMPs were present, showing their competency.

The recommendations for professional practice from the study are to (i) expand the scope of MP practice in Malta to introduce and include the role of the GMP and (ii) introduce the specialty in the local MP education and training framework for clinical Medical Physicists. An advantageous arrangement for Malta's healthcare system would entail the employment of GMPs at the main public hospitals (Mater Dei and Gozo General Hospital) whilst also offering consultancy to the small healthcare centres in different locations within Malta and perhaps even to the private sector. This model is similar to the approach used in the Netherlands where some GMPs manage several smaller hospitals for a few days every month in addition to their full-time work at their main larger hospital.

The recommendations for future research are to conduct a comprehensive study to identify the exigencies of the Maltese healthcare system concerning the medical devices that would fall under the purview of the GMP specialty.

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Contacts of the corresponding author:

Author: Amber Pace
 Institute: Medical Physics, Faculty of Health Sciences, University of Malta
 City: Msida
 Country: Malta
 Email: amber.pace.19@um.edu.mt