ClinicSearch

Clinical Research and Studies

Ebtesam A. Beshna *

Open Access

Review Article

An Overview: The Role of Diagnostic Medical Physics in Medicine

Ebtesam A. Beshna [1]*, Marzoga R. Salem [2], Zahrah K. Rahoumah [3]

[1]Department of Pharmaceutics and Pharmaceutical Industry, Faculty of Pharmacy, University of Zawia, Libya.

[2]Department of Pharmaceutical Technology, Faculty of Medical Sciences and Technology, University of Triple, Libya.

[3]Department of Physics, Faculty of Sciences, University of Zawia, Libya.

***Correspondence Author:** Ebtesam A. Beshna, Department of Pharmaceutics and Pharmaceutical Industry, Faculty of Pharmacy, University of Zawia, Libya.

Received Date: January 27, 2025; **Accepted date:** February 03, 2025; **Published date:** February 11, 2025

Citation: Ebtesam A. Beshna, Marzoga R. Salem, Zahrah K. Rahoumah., (2025), An Overview: The Role of Diagnostic Medical Physics in Medicine, Clinical Research and Studies, 4(1); **DOI:**10.31579/2835-2882/075

Abstract

The study of medical physics is a subfield of physics that focusses on using its concepts and methods to identify, treat, and manage human illnesses. This study's primary goal was to compile basic descriptive information about medical physicists working in diagnostic radiology, their particular diagnostic activities, and maintaining patient and staff safety. These experts, referred to as "Diagnostic Radiology Medical Physicists," use their knowledge of physics, which includes imaging science, radiation physics, and the complexities of contemporary imaging technology, to help provide safe and accurate diagnoses for patients. The study concludes by emphasising how important diagnostic medical Modern healthcare emphasises the vital roles that physicists play in patient care. safety, accurate diagnosis, and advancements in technology

Key words: diagnostic radiology; medical physicists

Introduction

In essence, physics explores every phenomenon that occurs in the physical world, from the smallest subatomic particles to the largest regions of the cosmos. In order to better understand how the world functions at different scales, physicists try to develop conceptual and mathematical frameworks that clarify interactions between entities of all sizes [1]. Medical physics is one of the core radiology courses that the ACGME mandates formal teaching in. An experienced medical physicist, ideally with extensive clinical experience and a passion for teaching, should be in charge of resident medical physics instruction, even if the ACGME does not specify any particular credentials. As guest lecturers and subject matter experts for particular subjects, physicists with more specialized clinical or research backgrounds can make a substantial contribution to resident didactic education. Certain aspects of didactic physics instruction, particularly those related to nuclear medicine, are prescribed by the ACGME [2].

The aim of the study:

This study's primary goal was to compile basic descriptive information about medical physicists working in diagnostic radiology, their particular diagnostic activities, and maintaining patient and staff safety.

Medical physics:

A dynamic and ever-expanding area of applied physics, medical physics is primarily focused on applying physics principles to healthcare to guarantee safety and quality in ionizing radiation-based diagnostic and therapeutic operations. Four primary areas of applied physics in medicine are often covered by medical physics:

1. Physics of diagnostic and interventional radiology.

2. Physics of radiation oncology and radiation therapy.

3. Physics of nuclear medicine.

4. Health physics, often known as radiation protection physics [3].

Applications of Medical Physics:

Diagnostic Imaging:

For the diagnosis, treatment, and prevention of movement, function, and health-related impairments, functional limitations, and disabilities, consumers have direct access to physical therapists who are doctors of physical therapy and who are acknowledged by patients and other medical professionals as practitioners of choice [4]. It was acknowledged at the time that military physical therapists may serve as physician extenders to promptly treat patients with nonsurgical musculoskeletal diseases in the middle of a congested healthcare system. Physical therapists have been

acknowledged as the preferred treatment option for nonsurgical musculoskeletal disorders in the military system for almost 40 years, and they are regarded as a vital member of the medical team [4].

Radiotherapy:

Even with the advancements in medical therapies for cancer, such as radiation therapy, chemotherapy, and surgical resection, cancer survivors may still face significant functional limits and physical impairments both during and after these procedures. Cancer-related fatigue (CRF), deconditioning, discomfort, muscular contractions and shortening, peripheral neuropathy, lymphoedema, and genitourinary dysfunction are a few of these problems. There is evidence to support conservative management of various side effects of cancer treatments, including tactics that are specifically linked to physical therapists' education and expertise [5].

Nuclear Medicine:

In order to investigate physiological processes in vivo, nuclear medicine (NM) offers incredibly sensitive functional imaging techniques that make use of trace doses of radiopharmaceuticals [6]. Ionizing radiation is used in this therapy technique to destroy internal tumours or cancer cells. Throughout the entire radiation therapy procedure, medical imaging is essential to ensure safe and accurate radiation delivery and to evaluate any structural changes brought about by the treatment [1].

Radiation Protection Dosimetry/Health Physics:

Health physicists have been involved in safeguarding the environment, employees, and members of the public against the dangerous effects of ionising radiation since the Manhattan Project [7]. Health physicists have a reactive role, such as calculating the dose to staff following an unintentional exposure, but their primary responsibility has been to prevent overexposure and maintain radiation doses as low as practically possible while taking social and economic factors into consideration. The job of the health physicist in the aftermath of an adversary assault utilising nuclear or other radioactive material has gained more attention since the 9/11 terrorist attacks on the United States [8].

Nuclear security is concerned with the prevention and detection of criminal or intentional unauthorised acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities, usually with the intent to cause economic and social disruption. In contrast, safety is concerned with actions taken to prevent unintentional, unforeseen, or unplanned events that can lead to hazards like radiation exposure or to limit their consequences figure1 [9].

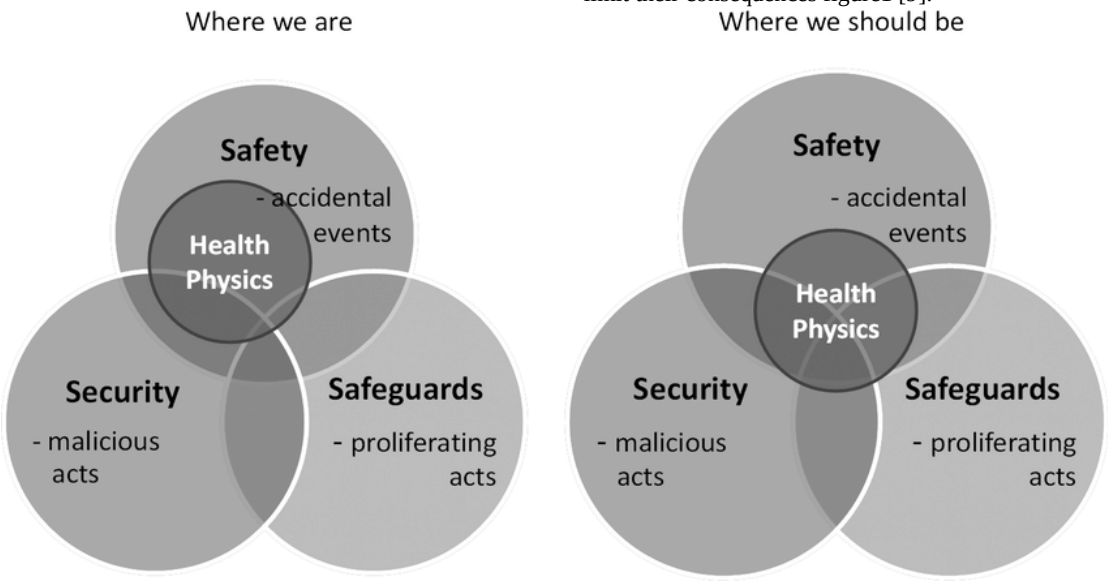

Figure 1: Many of the systems and mechanisms portrayed in safety, security, and protections are similar.

Medical physicists are thought to be essential for preventing and handling circumstances that endanger the health of employees and patients. Surprisingly, laws in some nations do not require the Radiation Protection Officer (RPO) to have a university degree or even be a medical physicist [10].

Physical education and training in medicine:

The development of the profession of physical education in public health is influenced by the day-to-day activities of the profession, which highlight the deficiencies and gaps in performance and the spread of the profession in various settings [11]. In Brazil, where it first emerged, physical education was strongly associated with both the military and the medical community. Amidst global historical and political circumstances in the 1930s, the army emerged as the primary organisation spearheading a push for the "ideal" of physical education in Brazil, which combined military training with nationalistic goals. Hygiene and disease prevention goals quickly replaced the eugenics debate. These can be implemented in an educational setting [11].

Medical physicists are qualified to instruct diagnostic radiology and medical physics personnel on the effects of radiation. They also work together when it comes to purchasing equipment systems. These experts are also in charge of managing the procurement and management of equipment [12].

Result for this study:

These experts, referred to as "Diagnostic Radiology Medical Physicists," use their knowledge of physics, which includes imaging science, radiation physics, and the complexities of contemporary imaging technology, to help provide safe and accurate diagnoses for patients. From dosimetry and picture quality to research, instruction, and equipment administration, their diverse duties highlight their critical role in guaranteeing the success of medical imaging treatments. Along with other medical specialities, the study emphasises the wider contributions made by medical physicists to radiation therapy, nuclear medicine, and diagnostic imaging. MRIs, CT scans, X-rays, radiation treatment, nuclear medicine, and other important applications of physics in medical technology are discussed. In diagnostic radiology, the importance of equipment evaluation, compliance, and quality control.

Conclusion:

The study concludes by emphasising how important diagnostic medical Modern healthcare emphasises the vital roles that physicists play in patient care. safety, accurate diagnosis, and advancements in technology. The final remarks emphasise how important these professionals are to the intricate relationship between physics and medicine, significantly raising the standard and safety of medical treatments.

References:

1. GAMBO, Nura; SHEHU, Mustapha. (2024). The Role of Diagnostic Medical Physics in Medicine: An Overview. Sahel Journal of Life Sciences FUDMA, 2.1: 103-109.
2. SENSAKOVIC, William F. (2017). Role of medical physicists in the diagnostic residency training program. *Journal of the American College of Radiology*, 14.1: 119-121.
3. CASAR, Bozidar, et al. (2016). Medical physics in Europe following recommendations of the International Atomic Energy Agency. Radiology and oncology, 50.1: 64-72.
4. BOYLES, Robert E., et al. (2011). Physical therapist practice and the role of diagnostic imaging. *journal of orthopaedic & sports physical therapy*, 41.11: 829-837.
5. ALAPPATTU, Meryl J., et al. (2015). Clinical characteristics of patients with cancer referred for outpatient physical therapy. Physical therapy, 95.4: 526-538.
6. WALLER, Michael L.; CHOWDHURY, Fahmid U. (2016). The basic science of nuclear medicine. *Orthopaedics and Trauma*, 30.3: 201-222.
7. WALLER, Edward J.; VAN MAANEN, Jim. (2015). The role of the health physicist in nuclear security. Health Physics, 108.4: 468-476.
8. GONZÁLEZ, Abel J. Lauriston S. (2005). Taylor Lecture: Radiation protection in the aftermath of a terrorist attack involving exposure to ionizing radiation. Health physics, 89.5: 418-446.
9. INTERNATIONAL ATOMIC ENERGY AGENCY. IAEA safety glossary: terminology used in nuclear safety and radiation protection. *Internat. Atomic Energy Agency*, 2007.
10. MALICKI, Julian. (2015). Medical physics in radiotherapy: The importance of preserving clinical responsibilities and expanding the profession's role in research, education, and quality control. Reports of Practical Oncology and Radiotherapy, 20.3: 161-169.
11. AGUIAR, Viviany Caetano Freire; SOARES, Stela LOPES; LEITÃO, Hamilton VALE. (2019). Physical education and its health training process. Revista on line de Política e Gestão Educacional, 23.2: 428-439.
12. CARUANA, Carmel J.; PADOVANI, Renato; CHRISTOFIDES, Stelios. (2008). Physics and society: the medical physics profession and its contribution to healthcare.