Status of Medical Physics in Palestine

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Abstract— **Medical Physics is a branch of Applied Physics, pursued by medical physicists. It uses physics concepts and procedures in the prevention, diagnosis, and treatment of disease. Medical physics is classified into a number of sub-fields, including Radiation Oncology Physics, Medical Imaging Physics, Nuclear Medicine Physics, Medical Health Physics, and Non-ionizing Medical Radiation Physics. Medical Physics fulfils an important role in medicine, in biological and medical research, and in the optimization of certain health related activities. The activities in Medical Physics can be classified into three areas: research and development, clinical service and consultation, and teaching. In Palestine, Medical physicists are trained under the umbrella of Augusta Victoria Hospital (AVH) and the Palestinian Ministry of Health.**

Keywords— **Medical Physics, Radiotherapy, Training, Palestine.**

I. Introduction

Radiotherapy, surgery, and chemotherapy are the main therapies against cancer. Often various treatment possibilities are combined. The choice of treatment depends on cancer type, location, stage of the disease, and the general state of the patient. At present, in industrialized countries, about 70% of cancer patients are referred to a radiation therapy department for at least part of the treatment [1].

According to estimates by the world health organization (WHO), the number of new cancer patients in 2012 is about 14 million worldwide, which is expected to increase to 22 million by the year 2030. This represents an increase of 75% compared with 2008. As a result, cancer will then be the main cause of death [2-3]. In Palestine, the estimated cancer incidence was 1600 cases in 2012. This is expected to increase to 7000 by 2030, where it is estimated that 60% of these cases will benefit from having radiation therapy [4].

Palestine is a country in the Middle East and it is under the control of Israel. The resulting political conditions make it difficult to evaluate the status of medical physics in the country. Medical physics is one of the main themes that is required to improve healthcare in the country. Palestine makes great efforts to organize its national medical physics society to further enhance and improve the status of medical physics across the country. Palestine faces many obstacles to expand the level of medical physics knowledge due to political reasons. The main obstacles are: building the required infrastructures, buying the required equipment, and upgrading of qualified professionals.

For any expansion to take place to meet the growing needs to fight against cancer, trained professionals including Medical Physicists and Oncologists will be required. In order to increase the level of medical physics knowledge in Palestine, the Hebron University introduced a BSc Degree in Medical Physics in 2019 to fulfil the academic requirements for training medical physicists. The Program has been approved by the Ministry of Higher Education and accepted by the Ministry of Health as fulfilling the academic requirements of medical physicists. The program is structured to take four years with the last year dedicated to a research project and training at one or more of the centers across the country, with the possibility to receive a training abroad. The taught courses include: General Physics, Medical Physics, Radiation Physics, Accelerator Physics (including X-ray Machines), Nuclear Medicine & Medical Imaging (e.g CT Scan, MRI, PET Scan), Radiation Therapy (e.g X-rays & Protons), Radiation Protection Methods, Particle Physics, Nuclear Physics, Atomic Physics, Modern Physics, Mathematical Physics, Computational Physics, among others.

The BSc Degree in Medical Physics program at Hebron University faces some obstacles including lack of qualified lecturers to cover teaching of all courses and limited funding which is needed to establish a medical physics laboratory and to buy the required computing systems to support computer simulations and image processing.

II. infrastructure

The Cancer Care Center at AVH, located in Jerusalem, is the only center offering radiation therapy services for all Palestinian People. This center has one CT simulator and three LINACs capable of producing 6, 10, 15 MeV X-ray beams, and 6, 9, 12 MeV electron beams. There is a plan to have one brachytherapy unit in the close future. The Augusta Victoria radiotherapy division handles about 110 patients daily. There are many conventional X-ray scanners in both public and private institutions as well as CT scanners, mammography units and interventional radiology units. Table 1 summarizes medical equipment for medical imaging and radiation therapy in Palestine.

Although the qualified medical physicists in Palestine are rare, the presence of a medical physicist is mandatory for all Radiation therapy and Nuclear Medicine centers according the regulatory framework. Table 2 shows the distribution of Medical Physicists in Palestine.

Table 1 Palestinian Medical equipment for medical imaging and radiation therapy.

Equipment	Total
SPECT	1
Dose calibrators	1
Accelerator	3
MRI	6
CT	30
Mammography	10
Standard Radiology	350
Interventional	10

Table 2 Distribution of medical physicists in Palestine

Medical Physicists	Total
Radiotherapy	5
Nuclear Medicine	3
Radiology	1
Total	9

III. Education and training

In Palestine, medical physics education and training usually takes place after completion of a BSc degree in Physics or Applied Physics at one the University is the country, with the possibility to receive training abroad. The four-year BSc program at the Hebron University offers an excellent education in a thriving field of science and engineering. The foundation in core physics together with the major areas of physics applied to medicine prepare physicists for a wide variety of careers inside medical physics, including those in scientific research and industry. Due to the lack of clinical training in medical physics, all currently available medical physicists had their clinical training abroad. In addition, Palestine as a member of Middle East Federation of Medical Physics (MEFOMP) and International Atomic Energy Agency (IAEA) receives some funds to support Palestinian Medical Physicists in order to attend training schools and workshops in several areas of Medical Physics.

IV. Conclusion

In Palestine, it is necessary to develop a long-term policy that achieves the objectives of medical physics support in healthcare institutions. Development of medical physics in Palestine faces some challenges, including: encouraging universities to open departments of medical physics or at least start to teach some courses which is related to medical physics and encouraging decision-makers to support medical physics society. Medical physicists in Palestine follow a curriculum training syllabus for Medical Physicists which was derived from IAEA training publications [5-8].

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