Republic of the Philippines
Department of Science and Technology
PHILIPPINE NUCLEAR RESEARCH INSTITUTE

09 November 2021

PNRI REGULATORY BULLETIN No. 2021- 02

GUIDANCE ON MEDICAL PHYSICS STAFFING IN NUCLEAR MEDICINE

ADDRESSEE

All PNRI license holders for the medical use of unsealed radioactive material

PURPOSE

The Philippine Nuclear Research Institute (PNRI) issues this Bulletin to provide guidance for the appropriate medical physics staffing levels in nuclear medicine in view of its full implementation of the requirement in Section 40 of CPR Part 13, Code of PNRI Regulations (CPR) Part 13, Licenses for Medical Use of Unsealed Radioactive Material, Rev. 02 which took effect on April 8, 2014. It is expected that the addressee will review this Bulletin and consider appropriate actions in order to ensure strict compliance with the PNRI regulations.

DESCRIPTION OF CIRCUMSTANCES

Having recognized the shortage of qualified medical physicists in the country, the PNRI issued in 2018 a Regulatory Bulletin No. 18-01, "Transitory Measures for the Designation of Medical Physicist in Nuclear Medicine Facilities" allowing licensees designate a medical physicist who may not have met the education and training requirements stipulated in Section 40 of CPR Part 13 by the time of their license renewal application. Licensees were allowed this transitory provision provided that they commit, in writing, to the PNRI to work on their compliance with the one-year relevant full-time training and work experience requirement for a medical physicist in radiation protection, radiation dosimetry, quality assurance and quality control, and equipment management.

During a meeting with the Society of Medical Physicists in the Republic of the Philippines (SMPRP) (formerly known as Philippine Organization of Medical Physicists) in 2014, the SMPRP has committed to establish the Nuclear Medicine Medical Physics Residency Program - an IAEA Residency Training Program designed for individuals with an MS degree or PhD in medical physics to prepare him for a certification and a professional, clinically oriented career in nuclear medicine. Four (4) medical physics supervisors and seven (7) resident-trainees have participated in the pilot implementation of this program in 2016 and are set to finish in 2022.

Medical physicists have been recognized internationally as vital health professionals with important responsibilities related to the applications of ionizing radiation in medicine. Their tasks are dedicated to ensuring the safety of patients, medical staff, and the general public and improving quality of care to ensure accurate diagnosis and treatment of disease. The responsibilities of Medical Physicists in Nuclear Medicine were outlined in the Regulatory Guide that accompanied CPR Part 13. The skills required to perform these tasks are uniquely obtained through the scientific and clinical training of a medical physicist and cannot be delegated to any other healthcare professional.

To date, there are 60 nuclear medicine and 12 PET facilities across the country, an increase of 11% from 2018. More than 80% of these facilities have access to experts for medical physics support. However, many of these medical physicists are listed in multiple licenses. While the approval of this arrangement underwent a thorough evaluation from NRD, this arrangement could potentially result to inadequacy of meeting each facility's needs in accordance with the requirements set forth by the regulations.

To address this problem, the PNRI establishes this guidance to estimate the degree of involvement of medical physicists in each facility. This scheme will enable the licensee to determine whether his facility needs to employ a full-time medical physicist or if they may be allowed to have access to the services on a part-time basis only. A medical physicist who may have opted to provide part-time services to several hospitals and clinics may also use this guidance to determine his degree of involvement and to determine the number of facilities he can be allowed to be designated to the role. The guidelines presented in this document is based on the recommendation described in the IAEA in its Human Health Reports No. 15, Medical Physics Staffing Needs in Diagnostic Imaging and Radionuclide Therapy: An Activity Based Approach (IAEA, 2018), which arise from the requirements of good clinical practice but have been narrowed down to meet the minimum requirements that primarily relate to radiation safety. The PNRI considers this an initial solution to the problem; however, it is the duty of the licensee to bring up this aspect to good clinical practice levels as soon as feasible.

DISCUSSIONS

The PNRI categorizes the roles and responsibilities of nuclear medicine medical physicists into three elements: (1) number and type of equipment; (2) amount of patient activity; and (3) radiation protection support and training. The following guidance describes these elements and quantifies the level of involvement in terms of the Full-Time Equivalent (FTE) of a clinically qualified medical physicist required to adequately provide the services.

Section 1. Staffing Factors and its Associated Duties.

a. Equipment Dependent Factors.

(1) The medical physicist shall have the following duties related to the medical equipment:

(i) Equipment specification, evaluation and acceptance testing, and development of equipment testing protocol, associated software, and phantoms;
(ii) A complete range of periodic equipment performance tests with associated documentation, carried out at least annually;
(iii) Testing after major maintenance procedures that could affect the relevant parameters for assessing patient dose and displayed image quality; and
(iv) Review or evaluation of routine quality controls.

(2) The equipment dependent variables and weighting factors used shall be as described in ***Table 1***.

Table 1: Equipment Dependent Factors

Input Variable	Per No. of Equipment	Weighting Factor	Remarks
Planar Gamma Camera	1	0.02	
SPECT Systems	1	0.06	
SPECT/CT PET/CT PET/MR	1	0.1	Applies to the whole system. This includes quality control of associated image display devices.
Other equipment	1	0.005	Includes: thyroid probes, radionuclide activity calibrators, sentinel lymph node probes, gamma counters, different types of isotope generator.

b. Patient Dependent Factors.

(1) The medical physicist shall have the following duties related to the protection of patients:
(i) Radiation safety for patient management;
(ii) Patient specific dosimetry in radionuclide therapy;
(iii) Patient dosimetry and risk assessment for individual patients (unintended exposures and paediatric, pregnant and breast feeding patients);
(iv) Troubleshooting of technical and clinical physics issues related to patient examinations (e.g. sub-optimal image quality, artefacts).

(2) The patient dependent variables and weighting factors used shall be as described in ***Table 2***.

Table 2: Patient Dependent Factors

Input Variable	Per No. of Procedures/ Patients	Weighting Factor	Remarks
Procedures with no image data processing	1000 patients	0.01	Such as blood sampling, thyroid uptake, sentinel lymph node mapping
Imaging procedures	1000 procedures	0.02	Imaging procedures including planar, SPECT(/CT), PET/CT
Outpatient radionuclide therapy (e.g. I-131 for thyrotoxicosis)	100 procedures	0.05	For patient dosimetry and radiation safety
Inpatient radionuclide therapy (e.g. I-131 for thyroid carcinoma)	1 procedure	0.001	For patient dosimetry and radiation safety
Complex radionuclide therapy (e.g. 131I mIBG (metaiodobenzylguanidine), 177Lu, 90Y)	1 procedure	0.005	For patient dosimetry and radiation safety
Risk assessment in pregnant or breast feeding patients	1 procedure	0.002	Includes dose assessment and reporting of results

c. Radiation Protection Services and Training Factor.

(1) The medical physicist shall have the following duties related to radiation protection services and in the clinical training of health professionals:

i. General protection aspects for ionizing radiation in a hospital, including staff dosimetry reviews, risk assessments and radiation protection surveys, occupational dose monitoring of staff, and investigation of high occupational doses and other radiation incidents;
ii. Deliver clinical training and develop educational material for health professionals including other medical physicists, medical practitioners, technologists, nurses, students, residents and technical maintenance staff;
iii. Provide support for research and development, as necessary.

(2) The radiation protection related factors dependent variables and weighting factors used shall be as described in ***Table 3***.

Table 3: Radiation Protection Services and Training Factor

Input Variable	Per no. of staff/ department	Weighting Factor	Remarks
Practical radiation protection support for a typical Nuclear Medicine department unit, including training and R&D support	Per 10 monitored staff	0.1	Includes staff dosimetry reviews; exposure incident evaluations; assessment of typical doses and administered activities in standard radiological examinations; Training of health professionals, including delivery and preparation; Support for clinical research

Section 2. Determining the Number of Medical Physicist in Nuclear Medicine.

a. The total number of Medical Physicist, N_{MP}, needed to provide adequate medical physics services shall be calculated using the following formulation.

$$N_{MP} = N_{sum} = \sum_{x=1}^{3} N_x$$

where N_1 to N_3 are the estimated number of FTE medical physicists required for each of the three factors described in **Section 1**. Each of these N_X values is individually calculated according to:

$$N_x = \sum_i w_i n_i$$

where w_i is the relevant weighting factor in terms of FTE per input quantity and n_i is the associated input parameter.

b. Additional adjustments and considerations shall be made, as necessary and justified.

c. To demonstrate the application of this staffing model, two indicative examples are given in the ANNEXES for facilities of different sizes and offering different services.

REQUIRED LICENSEE RESPONSE

The licensee will use this guidance to determine the number of FTE medical physicist in each facility to comply with the minimum standards covered by the national regulations.

CONTACT

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Date: 9 Nov 2021

ANNEX 1
Example of Medical Physics Staffing Level for Large Nuclear Medicine Facility

Sample 1: Santa Clara Memorial Medical Center

- 3 SPECT cameras
- 2 SPECT/CT
- 4 non-imaging systems
- 5000 SPECT studies per year
- 200 outpatient radionuclide treatments per year
- 3000 non-imaging procedures per year
- > 20 staff

Table 4: Calculation of staffing levels in Nuclear Medicine

Factors	**Items**	**Weighting Factor**	**Total**
Equipment Dependent	3 SPECT cameras	0.06	0.18
	2 SPECT/CT	0.1	0.2
	4 non-imaging systems	0.005	0.02
Patient Dependent	5000 SPECT studies per year	0.02	0.1
	200 outpatient radionuclide treatments	0.05	0.1
	3000 non-imaging procedures	0.01	0.03
RP Services and Training	20 monitored staff	0.1	0.2
TOTAL			**0.83**

For a department consisting of the above units and patient activity, the medical physics services will require 0.83 FTE of a medical physicist. This may be rounded to **1 FTE MP** but the total staffing levels must be kept as calculated.

ANNEX 2
Example of Medical Physics Staffing Level for an Intermediate Nuclear Medicine Facility

Sample 2: San Antonio Capitol Doctors' Corporation

- 1 Gamma Camera;
- 1 Gamma Well Counter;
- 1 Dose Calibrator;
- 1 Heliprobe;
- 200 Imaging procedures;
- 3000 RIA procedures;
- 50 outpatient radionuclide treatments;
- 60 inpatient radionuclide therapy
- 5 monitored staff

Table 5: Calculation of staffing levels in Nuclear Medicine

	Items	**WF**	**Total**
Equipment Dependent	1 Gamma Camera	0.02	0.02
	3 non-imaging systems	0.005	0.015
Patient Dependent	200 Imaging procedures	0.02	0.004
	3000 RIA procedures;	0.01	0.03
	50 outpatient radionuclide treatments	0.05	0.025
	60 inpatient radionuclide therapy	0.001	0.06
RP Services and Training	5 monitored staff (<10)	0.1	0.05
TOTAL			**0.204**

For a department consisting of the above units and patient activity, the medical physics services will require **0.2 FTE** of a medical physicist. This may be a part-time physicist who could have other responsibilities in other departments, but his involvement must be kept as calculated.