IMPLEMENTATION OF IAEA/AFRA HARMONIZED QUALITY CONTROL PROTOCOL FOR DIAGNOSTIC RADIOLOGY: THE GHANA EXPERIENCE

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***Abstract*— Quality control test have been undertaken in some selected public and quasi-government diagnostic radiology Centres with the aim of improving the overall safety and effectiveness of diagnostic radiology service within those departments whiles developing the skills of trained medical physicists who have been employed in diagnostic radiology centres. The test was performed as part of implementation of the new "Harmonized Diagnostic Radiology Quality Control Manual" developed under the Technical Cooperation Regional Project RAF6/053 entitled: "Enhancing Capacity Building of Medical Physicists to Improve Safety and Effectiveness of Medical Imaging". Test were performed on twenty (20) operational conventional X-ray, seven (7) Computed Tomography (CT) systems and three (3) mammography systems. The tests were undertaken using the Radcal Multimeter and accessories. 8 out of 15 tests could not be performed under the "Radiography" due to unavailability of Screen Film (Cassette) systems at facilities visited. 10 out of 15 tests could not be performed under Computed Tomography dues to unavailability of certain phantoms and the absence of Engineers to "lock the tube in the gantry". 2 out of 9 tests were not performed under Mammography due to the systems available at the units visited. Generally, results obtained were with tolerance level for a majority of test undertaken. Newly posted Medical Physicist and Interns benefitted from the exercise. It was observed that the test for Entrance Surface Dose was not present under the "Radiography" tests. It is recommended that the Manual should be updated to include procedures to undertake quality control on Computed Radiology (CR) systems and other newer imaging modalities.**

Keywords— **Quality Control, Mammography, Computed Tomography, Dose, Radiology**

I. Introduction

Diagnostic imaging, which includes the use of mammography, fluoroscopy, conventional radiography, computed tomography, angiography and magnetic resonance imaging in diagnosing diseases, has increased in Africa. In as much as this offers advantages such as early detection, rapid and precise diagnosis, these advantages could quickly be outweighed by unfavorable impacts related to inappropriate, ineffective imaging, and subpar examinations [1]. This increase in technological innovation has the potential to greatly increase population exposure to ionizing radiation or inaccurate diagnosis due to improper usage of X-ray equipment without the required specialized support [2]. For medical imaging to have the needed impact, among other things, the equipment must perform at its optimum [3]. Medical physicists - are health care professionals with specialized training in the medical applications of physics, who can ensure that radiation medicine is applied safely and effectively in diagnosis or treatment, improving quality of services and health related quality of life. However, in Africa there is shortage of these health professionals in the practice of diagnostic medical imaging.

The International Atomic Energy Agency through the Technical Cooperation Regional Project RAF6/053 has developed a quality control manual for diagnostic X-ray imaging in Africa. The Medical Radiation Physics Centre, Radiological and Medical Sciences Research Institute (RAMSRI), Ghana Atomic Energy Commission (GAE) sought to implement this quality control manual which aims at improving the overall safety and effectiveness of diagnostic radiology services in Ghana through appropriate quality control (QC) / quality assurance (QA) and dose optimization programme conducted by medical physicists.

II Methodology

Measurements were untaken at 19 facilities within the Greater Accra region of Ghana. Measurements were untaken according to the processes outlined in the manual provided by the International Atomic Energy Agency. The general radiography section of the manual has fifteen (15) tests, Computed Tomography (CT) has fifteen (15) tests, Mammography has nine (9) tests whiles fluoroscopy has five (5) tests. The tests were undertaken using the Radcal Multimeter and accessories. For each test, the objective, frequency, equipment needed, and procedure are clearly spelt out. The Acceptance parameters for evaluating the machine after the results has been analyzed is also provided.

III. RESULTS

A total of nineteen (19) facilities took part under this implementation program. Of the number, fifteen were public (government) hospitals whereas four (4) were quasi-government hospitals. Table 1 presents the distribution of imaging machines used during the study. The various tests were conducted on a total of thirty-four (34) X-ray generating machines distributed across the nineteen (19) facilities visited.

Table 1: Distribution of X-ray machines tested.

Modality	Number
Radiography	24
Computed Tomography (CT)	7
Mammography	3
TOTAL	34

Eight (8) out of the fifteen (15) tests, five (5) out of the fifteen (15) test and seven (7) out of the nine (9) tests were undertaken on the Radiography, Computed Tomography and Mammography machines respectively. All the results from the test conducted were within tolerance level as recommended by the quality control manual. For the Radiography and Mammography systems, the test that were not done was due to the nature of the systems available at the facilities. There were no Screen Film (Cassette) systems available at the facility visited and hence tests were not undertaken. For the CT systems, the unavailability of the Electron Density phantom made it impossible to undertake test that required the use of that phantom. For some test, the procedure required that the Engineer puts the machine in the service mode in order for the test to be undertaken and the non-availability of a resident Engineer made it impossible to undertake the tests.

IV. ACHIEVEMENT

The quality control tests were performed at facilities where new Medical Physics employees had been posted by the Ministry of Health. The exercise gave them the opportunity to learn at first hand some of the important quality control tests that the Medical Physicist is to undertake. It also provided for them reference quality control data that result from future test can be compared with. Graduate Medical Physicist who had also been posted by the Allied Health professions Council to undertake a six (6) months internship programme also benefitted from the implementation of the quality control manual.

V. RECOMMENDATION

It is recommended that; the quality control manual be updated to include Computed Radiography systems so as to ensure that a lot more test can be done by Countries where Screen Film systems are not available or are limited. There should be the introduction of quality control test on Dental X-ray machines as well. It is recommended that Entrance Surface Dose (ESD) estimates/calculations be added to the tests that should be undertaken. With ESD estimates, further studies such as Diagnostic Reference Level (DRL) could be estimated.

VI CONCLUSION

The IAEA/AFRA Harmonized Quality Control Protocol for Diagnostic Radiology have been implemented on some selected diagnostic radiology machines within the Greater Accra region of Ghana. Generally, the results of the test conducted was within the tolerance levels. The test will be conducted on other machines in the near future.

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