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Evaluation of Level of Implementation of Quality Control Programme in Diagnostic Radiology facilities in Akwa Ibom State, Nigeria

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ABSTRACT

The level of implementation of quality control program (QCP) in diagnostic radiology facilities in Akwa Ibom state, Nigeria, was investigated. A total of thirty (30) diagnostic radiology centres took part in the study. A two part structured self completion questionnaire of thirty six items was the instrument used for data collection. Result shows that the level of implementation of quality control programme (QCP) in these diagnostic radiology facilities was low, importance of QC to the facility and radiation safety notwithstanding. This low level of implementation of QCP was identified with some fundamental factors namely, lack of radiation safety officers (RSO), lack of retraining programme for the medical personnel, lack of adequate funding, power and QC test equipment for the facilities. The aim of this investigation is to study the level of implementation of quality control programme which enhances radiation protection in diagnostic radiology facilities.

Introduction

The use of x-ray in the diagnosis of defects in patients and also for the treatment of diseases affecting the tissues is on the increase. However, interaction of x-rays with tissue though useful, also has been identified to have harmful effect when the equipment emitting this ionising radiation is not maintained and repaired in case of total breakdown. The risk to individual from the diagnostic x-rays is small compared to the benefits only if the machines are working optimally. For the protection of patients, workers and public against the potential hazards of ionising radiation, it is required that its use should be justified, optimised and operated within the principle of as low as reasonably achievable (ALARA) [1-2]

The use of diagnostic x-ray in medicine is the largest man made contribution to human exposures to external ionising radiation, 80% of radiation dose to the population is estimated to come from this source [3].

Quality control (QC) is a major item in the optimization of diagnostic radiology procedures. It comprises of regular testing of the major components of the diagnostic radiology facility. Equipment in diagnostic radiology that requires regular testing include X-ray generators, x-ray detection, and image processing units and image viewing. Other QC tests are daily visual checks of the components and accessories, grids, electrical safety etc [4]. Quality control process is expected to start with equipment selection, acceptance testing, installation and adequate staffing of the facility [5].

Adequate and appropriate QC programme in a facility have been observed to enhance image quality and ensures that the diagnostic radiology facility delivers lower possible radiation doses for patients without any loss in diagnostic information [5-6]. Implementation of QC is also known to reduce the financial burden on patients and the facility operators, reduces repeat/reject film rate and reduces unnecessary exposure to patients and consequently reduces the patient risk to develop cancer ([4, 8]. The aim of this work is to evaluate the level of implementation of quality control programme in diagnostic radiology facilities in Akwa Ibom State, Nigeria. This work is necessary because QC is a basic requirement by ionising radiation regulatory authority in Nigeria to license diagnostic radiology facility [9].

Materials and method

The facilities considered for this study were tertiary, secondary and private. Tertiary facilities (TF) are facilities in teaching hospitals, specialist hospitals and Federal Medical centres; secondary facilities (SF) are facilities in general hospitals while private facilities (PF) are those in stand alone diagnostic x-ray facilities. TF and SF are government owned while PF are privately owned facility. Thirty (30) facilities took part in the study. These comprises of one (3.3%) tertiary facility in the only one teaching hospital in Akwa Ibom state, 10 (33%) secondary facilities and 19(63.3%) private facilities.

A two part questionnaire of 36 items was designed to evaluate the level of implementation of QC in these facilities. This questionnaire was completed by the radiographers and radiologist in the facilities. Part one was designed to investigate their feelings on fundamental issues in QC programme. Part two was designed to investigate on the frequency of conducting basic QC tests on the equipment.

For independence view from the personnel, a confidentiality clause was incorporated in the questionnaire, to guaranty the facility that the study was purely for research purpose to establish a quality assurance baseline for radiological protection of patients undergoing diagnostic radiology in these facilities. However, despite this assurance some radiographers especially in stand alone facilities declined to cooperate with the investigators.

The personnel were required to agree or disagree, strongly agree or strongly disagree on some fundamental indicators on QC administration in their respective facility. On the frequency

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of conducting QC test, personnel where required to rate the frequency as daily, weekly, monthly, annually and not at all.

Results

The questionnaires were duly completed by radiographers who were willing to take part in the study. A total of 30 respondents completed and returned the questionnaire. Data collected were analysed using descriptive statistics namely tables and percentages.

The rating of the fundamental issues to evaluate the feelings of the medical personnel in diagnostic radiology on level of implementation of QC in their respective facilities is presented in table 1.0. The rating of the frequency of conducting QC tests in their facilities is captured in table 2.0

The rating of professional expected to be in- charge of QC in the diagnostic radiology facility is presented in table1.0. 75% of the respondents disagreed and strongly disagreed that a radiologist should be in charge of QC while 80% agreed and strongly agreed that a radiographer should take charge of QC, also 66% strongly disagreed that a medical physicist should take charge of QC in the diagnostic radiology facility. Responds on the provision of adequate equipment, personnel, power and funds to the facilities show 78% of the facilities do not have adequate QC test equipment, 50% are without adequate number of personnel, and power supply is not adequate (72%). Medical personnel in 50% of the facilities require adequate retraining. On the conduct of acceptance test (AT) on the x-ray machines before installation, 30% of the medical personnel disagreed that AT was conducted in their facilities while personnel in 43% of the facilities agreed AT was conducted in their facilities. Responds on QC records keeping show that 50% of the facilities have no records of previous QC test carried out in their facilities while 30% have these records. On the setting up of QC committees and QC review meetings 30% of the respondent disagreed that it was necessary to have these committees while 50% agreed it was necessary.

Results from table 2.0 show variations in the frequencies of conducting QC tests on major components of the X- ray machine such that respondents varying between 5 (16.6%) and 11(36.7%) stated that QC test should not be conducted at all. Majority of the respondents varying between 6(20%) and 18(60%) believe that the entire QC test listed in table 2.0 be conducted daily except densitometry and shielding integrity checks. Further analysis of table 2.0, show respondents varying between 3(10%) and 12(40%), supporting annual test on all the QC parameters.

Discussions

From fig. 1.0, (12) 40% of the respondents disagreed that a radiologist should be in-charge of QC programme (QCP) in a diagnostic radiology facility, (12) 43% strongly disagreed and (5) 17% agreed. (14) 47% of the respondents agreed that a radiographer should be in charge of QC programme, (10) 33% strongly agreed and (6) 20% disagreed. On whether a medical physicist should be in charge of QC, (22) 73% strongly disagreed, none of the respondents agreed.

This responds from the diagnostic radiology personnel is against international guidelines on the administration of QC programme in facility which specifies that a medical physicist and a radiation physicist known as radiation safety officers (RSO) should be in charge of QC who are expected to train personnel, develop and supervise an efficient QCP in any facility utilising ionising radiation [5,10]. The reason for the poor placement of a medical physicist on the hierarchy of QC administration might be because of a long standing tradition of the radiographer being in-charge of radiological practice in Nigeria (12). For 50% of the facilities to be without previous QC test records show that those facilities have a poorly managed QCP and the facilities have low professional interactions as seen in the responds on the need for QC review meetings. Further analysis of information presented in table 1.0 show that in facilities where the respondents have sufficient knowledge of QC, their level of implementation of QCP is affected by lack of sufficient funds, lack of adequate power supply, lack of QC manual and lack of sufficient computer software for QC data analysis.

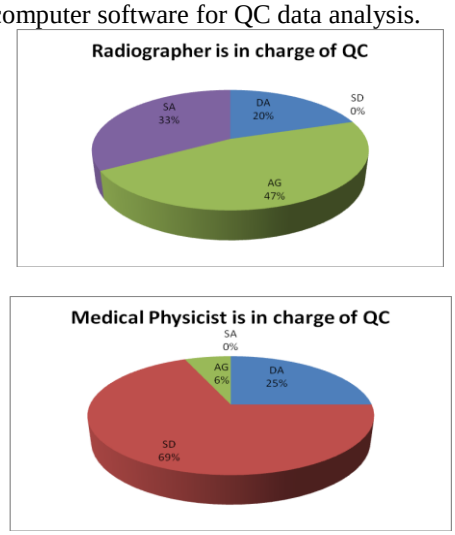

Fig 1.0 Rating of the level importance of the different professionals in charge of QC programme

Analysis of the responds on the frequency of conducting QC test on major components of the X-ray machines shows most respondents supporting daily measurements of QC parameters, some respondents supported weekly, monthly, annually while some did not support the measurement of these QC parameters at all. This frequency of measurement of QC parameter as presented in Table 2.0 did not follow the recommendations (AAPM) which show that most of the QC parameters do not require daily measurements. Some of the parameters are expected to be measured either, weekly or monthly or annually [5, 10].

The level of implementation of QCP in diagnostic radiology facilities studied was poor, some facilities had no QCP at all while those that seem to have were poorly managed because of lack of the RSO [5]. This low level of implementing QC programme in diagnostic radiology facilities is a national problem as it is reported elsewhere [4,10]

Conclusion

The study reveals that the level of implementation of quality control programme in diagnostic radiology facilities in Akwa Ibom State, Nigeria is low even though the medical personnel in these facilities appreciates the importance of QCP to radiation safety. It is suggested that since this low level of implementation of QC programme in diagnostic radiology facilities is obtained in facilities in other states in Nigeria, the radiation regulatory agency in Nigeria, Nigeria Nuclear Regulatory Authority (NNRA) should enforce the compliance of her regulations on radiation safety in diagnostic radiology facilities.

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Table 2.0 Rating of the frequency of measurement of QC parameters

S/N	Items	Daily	Weekly	Monthly	Annually	Not at all	Total
1	Repeat /reject film analysis	8	5	5	3	9	30
2	Light/x-ray field alignment	8	6	8	3	8	30
3	Beam limitations	12	0	6	6	6	30
4	X -ray bucky alignment	11	6	0	6	7	30
5	Focal spot size	18	0	0	7	5	30
6	kVp Test	15	0	0	6	9	30
7	mAs Test	14	1	0	6	9	30
8	AEC density control	8	7	0	7	8	30
9	Grid artefacts	10	5	1	6	8	30
10	X-ray beam grid alignment	10	9	0	5	6	30
11	Sensitometry check	10	0	0	12	8	30
12	Densitometry check	0	7	7	7	9	30
13	Film storage	10	6	0	8	6	30
14	Dark room condition check	11	0	6	6	7	30
15	Back ground radiation survey	6	5	5	5	9	30
16	Beam quality (HVL)	9	6	0	7	8	30
17	Beam quantity (mR/mAs)	11	7	0	5	7	30
18	Shielding integrity check	0	0	10	10	10	30
19	AEC detector selection	9	6	0	4	11	30

Table 1.0: Rating of fundamental issues on QC in diagnostic radiology. DA=disagree, SD=strongly disagree, UD = undecided, AG= agree and SA= strongly agree

S/N	ITEM	DA	SD	UD	AG	SA	Total
1	The Radiologist is in charge of QA/QC	12	13	0	5	0	30
2	The radiographer is in charge of QA/QC	6	0	0	14	10	30
3	The medical physicist is in charge of QC/QA	8	21	1	0	0	30
4	Equipment log book are kept	2	0	0	18	10	30
5	QC manual / protocol are kept	10	13	0	7	0	30
6	QC chart are kept	13	6	0	10	1	30
7	QC report are kept	15	6	0	8	1	30
8	There is adequate equipment for QC	13	13	1	3	0	30
9	There is adequate personnel for QC	15	7	8	0	0	30
10	There is sufficient power supply for QC	15	7	3	0	0	30
11	There is sufficient computer and software for QC data analysis	13	16	1	0	0	30
12	There is sufficient funds provided for QC	6	24	0	0	0	30
13	Acceptance test (AT) are preformed on all new equipment	8	1	7	14	0	38
14	AT establishes baseline data for subsequent QC	2	0	3	20	5	30
15	QC committee is necessary	10	0	3	15	2	30
16	QC review meeting is necessary	10	0	3	15	2	30
17	There is sufficient staff training and retraining for QC	22	2	0	5	1	30

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10	X-ray beam grid alignment	10	9	0	5	6	30
11	Sensitometry check	10	0	0	12	8	30
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13	Film storage	10	6	0	8	6	30
14	Dark room condition check	11	0	6	6	7	30
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19	AEC detector selection	9	6	0	4	11	30

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