Quality Control Checks through Visual Inspection of x-ray equipment in two Teaching Hospitals in North-Eastern Nigeria.

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Abstract

Background: Quality control is a system of routine technical activities which maintains or improves quality of Radiology services through visual inspection, monitoring, evaluating and maintenance at required levels of performance of the x-ray equipment.

Objective: The objective of this study is to conduct quality control checks through visual inspection of installed x-ray equipment's in the study locality.

Materials and methods: A cross-sectional descriptive research design was adopted and data on visual inspection of installed x-ray equipment were collected from the Radiology department of two Teaching Hospitals in the North-Eastern geo-political region of Nigeria, using data capture sheet in accordance with WHO (2001) guidelines. The x-ray equipment was divided into three namely; tube and tube suspension with eight components; table and upright bucky with seven components and Control panel with five components. Visual inspection was carried out on each of the components of the x-ray equipment. A component that a function accurately was assigned the score of two (2) while the one that did not function accurately was assigned the score one (1). The scores assigned were descriptively analyzed using statistical package for social sciences (SPSS) version 21.0 (IBM Chicago, USA) and mean was generated for each division of the x-ray equipment. The value of the mean for each division that lies between 1.0 and 1.5 was considered unacceptable while value of the mean that lies between 1.6 and 2.0 was considered acceptable.

Results: The tube and tube suspension, table and upright bucky and control panel of x-ray equipment in diagnostic room 1 of centre A and x-ray equipment of diagnostic room 1, 2 and 3 of centre B had a mean score between1.6 and 2.0, while the tube and tube suspension and control panel of x-ray equipment of diagnostic room 2 of centre A, had mean score of between 1.0 and 1.5.

Conclusion: Based on findings from this study, the visual inspection conducted on the x-ray equipment showed that the equipment in the locality are safe for use on patients. Hence, film or image rejection in the study locality may not be due to installation fault except for diagnostic x-ray room 2 of centre A which has unacceptable result.

Keywords: Radiology, Quality control checks, Visual inspection

Introduction

Quality control is a system of routine technical activities which measures and controls the quality of service delivery in radiology department [1,2]. The idea behind quality control is to maintain or to improve quality and it includes visual inspection, monitoring, evaluating and maintenance at required level of performance of the x-ray equipment [5]. A successful quality control technique begins with proper equipment procurement and installation [3]. A study on quality control checks on newly installed x-ray equipment in Malaysia showed that, all the measurement conducted was within acceptable limit. Therefore,

the equipment was declared safe for used [6]. In her report No. 175, the American Association of Physicist in Medicine [4], stated that x-ray tube head drift should not exceed 1 second after the operator has releases the tube head. As such, tube head and all components of x-ray equipment installation should be checked to ensure compliance to prescribed standard and safety. The researchers observed that visual inspection of installed x-ray equipment is not given priority in the study locality. As such, film rejection due to installation fault cannot be rule out and safety of patients for x-ray examination may not be guaranteed in the locality [5]. The aim of this study is to conduct quality control checks through visual inspection of installed x-ray equipment in the study locality.

Materials and Methods

A cross-sectional descriptive research design was conducted and data on visual inspection of installed x-ray equipment were collected from two teaching hospitals in North-Eastern geo-political region of Nigeria, using data capture sheet in accordance with WHO (2001) guidelines. The two teaching hospitals were labeled as centre A and B for ethical reasons. The x-ray equipment was divided into three namely; tube and tube suspension with eight components; table and upright bucky with seven components and Control panel with five components. The eight components of the tube and tube suspension were inspected for appropriate installation and functionality. These include the focus film distance (FFD) scale, angulation indicator, locks, perpendicularity of the tube support (using spirit level), collimator, tracks, high tension cables and general cleanliness.

The seven table and upright bucky components that were checked include; bucky mobility, bucky lock, cassette lock, bucky-grid movement, cables, table and general cleanliness while the five components of the control panel that were checked include; hand switch cable, panel swithes light and meters, technique charts, over-load protection and general cleanliness. A component of the x-ray equipment that passes the visual inspection test was assigned the score of 2 while the component that failed the test was assigned the score of 1. For example, the angulations indicator of x-ray equipment was measured for functionality using a compass. The x-ray tube was tilted and the angulations' degree on the x-ray tube was compared to that of the compass. A functional and accurate angulation indicator scored 2 while an inaccurate or dysfunctional angulation indicator scored 1. The scores assigned to the eight components of tube and tube suspension, seven components of table and upright bucky and five components of the control panel were descriptively analyzed using statistical package for social sciences (SPSS) version 21.0 (IBM Chicago, USA) and mean was generated for each division of the x-ray equipment. The value of the mean for each division that lies between 1.0 and 1.5 was considered unacceptable while value of the mean that lies between 1.6 and 2.0 was considered acceptable.

Results

Table 1: Visual Inspection of Installed x-ray Equipment's

Diagnostic Centre	Diagnostic Room	Visual Assessment Parameters	Mean Score	Remark
A	1	Tube and Tube Suspension	2.0	A
		Tube and Upright Bulky	2.0	A
		Control Panel	1.8	A
	2	Tube and Tube Suspension	1.3	NA
		Tube and Upright Bulky	1.6	A
		Control Panel	1.4	NA
B	1	Tube and Tube Suspension	2.0	A
		Tube and Upright Bulky	2.0	A
		Control Panel	1.8	A

Diagnostic Centre	Diagnostic Room	Visual Assessment Parameters	Mean Score	Remark
	2	Tube and Tube Suspension	1.9	A
		Tube and Upright Bulky	2.0	A
		Control Panel	1.8	A
	3	Tube and Tube Suspension	1.9	A
		Tube and Upright Bulky	1.6	A
		Control Panel	1.8	A

Keys: NA = Not Acceptable: 1.0 – 1.5 A = Acceptable: 1.6 – 2.0

Discussion

The results of this study on visual inspection of installed x-ray equipment are acceptable. This implies that the visual inspection of the tube and tube suspension, tube and upright bucky and control panels in the diagnostic x-ray rooms of centre A and centre B, were found to be within the acceptable limit. This agrees with the findings of a previous study [3] on the same subject. The similarity of the present study on visual inspection of installed x-ray equipments and that of Kareem et al [3], could likely be due to technological advancements in x-ray equipment manufacture and installation as well as pressure on adherence to safety standards by regulatory bodies[4]. In a report by the AAPM [4], it is recommended that x-ray tube head drift should not exceed 1 second after the operator has released the tube head. As such, the tube head and all components of x-ray equipment installations should be checked to ensure compliance to prescribed standards and safety. The implication of the acceptability of the visual inspection of installed x-ray equipment is patient's safety. Therefore, it means radiological examination of the patients in the study centres is relatively safe

Conclusion

Based on findings from this study, the visual inspection conducted on the x-ray equipment showed that the equipment in the locality are safe for use on patients. Hence, film or image rejection in the study locality may not be due to installation fault except for diagnostic x-ray room 2 of centre A which has unacceptable result.

Recommendation

This study recommend that corrective measures be taken on the tube and tube suspension as well as the control panel of x-ray equipment of diagnostic room 2 of centre A. This would ensure patient safety from both mechanical injury and unnecessary radiation exposure due to repeat x-ray examination.

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