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COLLEGE OF HEALTH SCIENCES  
SCHOOL OF MEDICINE  
RADIOLOGY DEPARTMENT  
AVAILABILITY OF RADIOGRAPHIC ACCESSORY EQUIPMENT AT KIRUDDU  
HOSPITAL  
BY

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A RESEARCH REPORT SUBMITTED TO MAKERERE UNIVERSITY SCHOOL OF  
MEDICINE IN PARTIAL FULFILMENT OF AWARD OF BACHELOR IN MEDICAL  
RADIOGRAPHY

Declaration

I declare that this research report was my original work and has been provided to the best of my knowledge with guidance of my supervisor.

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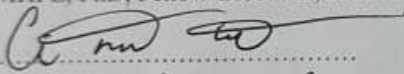
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I would want to extend my ultimate gratitude towards;

Kiruddu national referral hospital radiology department staff

Supervisor: Dr. Mubuuke Gonzaga- M.Rad (Cardiff), MSc.HPE (Stellenbosch), Bioethics Fellow (Johns Hopkins), PhD (Stellenbosch), FAIMER Fellow, IFME

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## Abstract

### Introduction

Radiographic accessories are devices that supplement performance of different radiological machines such as x-ray, CT scanner, Fluoroscopy scanner etc. For example Apron Racks, Callipers, Catheter Cabinets, CD/DVD Burners, Compression Devices, Filtration Systems, Lead Letters, Markers, Positioning Blocks, Restraints, Sand Bags, Stools, vaginal speculum, vulsellum forceps etc.

In a resource constrained facility, in addition to inadequate cleaning Criteria there was a high risk of hospital associated infection (G. R Chingarade et al 2014)

Several Ugandan radiographic units lacked radiation protection accessories and their current radiation protection strategies were found to be ineffective (David Makumbi, Adenola Olatide et al)

### Objective:

To determine the availability of radiographic accessories in the radiology department of kiruddu hospital and the possible effect they have on Quality assurance, radiation protection and infection control in department.

### Methods:

Structured observation methodology with a checklist in addition to quantitative methodology through interviewing imaging technologist in charge.

### Result

Out of the 25 listed accessory equipment , 36% were available and 64% unavailable. 8% of these equipment were principally for radiation protection for both radiographer and patients and patient attendants. 4% for quality control in the CT scanner. 12% for positioning during examination. And lastly 12% accessory supplies for storage of different accessory equipment in the department.

### Conclusion

Kiruddu hospital radiology department is not adequately equipped with radiographic accessory equipment. Radiations protection, quality and assurance and infection control are compromised by the various available radiographic accessory equipment

#### Terms

HSG- hysterosalpingography

CUG- cystourethrography

Quality assurance- the planned and systemic actions that results into consistently high quality images with minimum exposure to the patients and workers

Quality control- are means in monitoring, testing, and maintenance of the components of the radiology equipment.

RSO- radiation safety officer

## CHAPTER ONE

### BACKGROUND.

In a publication titled “Radiation protection in interventional radiology” by Declan R. Johnson, Edward J. Morton, Andrew Clifton, Micheal Fitzgerald and Emer Macsweeney, the consequent risks to operators and patients and the radiation dose reduction could be achieved by employing a rigorous approach to radiation protection in response to the growing interventional procedures, particularly in view of the increasing frequency and complexity of these techniques.

Patients undergoing diagnosis or interventional X-ray based imaging for medical purposes are at risk, but even more so physicians who are repeatedly exposed to small doses. Indeed, for a physician performing 100 peripheral angiographic procedures per year, the annual dose has been estimated to be up to 40 mSv to the eye and 30 mSv to the head,<sup>19</sup> and up to 6 mSv under protective aprons.<sup>20</sup> This can be compared with annual environmental exposure, which has been estimated to be between 1 and 3 mSv (Donald L. Miller et al 2010)

In a case study of selected hospitals in Kampala Uganda by David Makumbi, Afam Uzorka, Adenola Olatide Olaniyan titled Radiation protection status in hospitals, Four hospitals were selected and 92 radiation workers were selected for this inquiry and the study found an acceptable level of occupational radiation monitoring knowledge among radio-diagnostic staff in Kampala Uganda, as well as an acceptable level of radiation monitoring among radio-diagnostic staff in Kampala Uganda, though much work remained to be done on radiation protection practice, as some radiation workers’ attitudes toward wearing personnel monitoring devices (dosimeters) were found to be insufficient. Several participants mentioned that their unit lacked personnel monitoring devices. The current study reveals that radiographer ‘current strategies for reducing radiation exposure to patients and to themselves are ineffective.

In the Quality assurance workbook for radiographers and radiological technologists by Peter J Lloyd, module 2 defines different accessory equipment such as positioning accessory, radiation protection accessories and highlights their importance in improving quality assurance and how to handle these devices.

Problem statement:

There has been challenges in radiation protection from patients, patient attendants and an increase in occupational radiation dosage. (M. Kawooya et al 2020)

The number of radiographic procedures in the department are few and this results in under exploitation of the department. Special procedures such as CUG, HSG etc aren't being examined in the department in addition to challenges in managing special patients such as traumatic patients, children in positioning to produce quality diagnosis.

Kiruddu hospital specialises in internal medicine and infectious diseases with many clinics for example TB clinic, lung ward, renal and hepatic clinics all of which use the radiology department for imaging diagnosis. Infection control is compromised if the department is resource constrained. (<https://kiruddu.hosp.go.ug/>)

Radiation protection and special techniques require specific radiologic accessories in addition to technique and knowledge of the radiographer.

With insufficient accessory equipment in the department in addition to inefficient cleaning Criteria leads to high risk of infection spread within the department. (G.R Chingarande et al)

This study is to spread awareness m of the necessity of the different radiological accessory equipment in upholding quality assurance, quality control, radiation protection and infection control in the radiological units.

Justification:

The results of this study was shared to kiruddu hospital administration about availability of radiographic accessory to create awareness of their necessity in fully exploiting the radiology department and improving quality assurance, radiation protection and infection control.

General objective:

- To assess the availability of radiographic accessory equipment at Kiruddu hospital radiology department.

Specific objectives:

- To assess challenges to quality assurance, infection control and radiation protection in the department in relation to radiographic equipment.



## **INTRODUCTION**

Accessory is a separate, finished device intended to “support, supplement, and/or augment the performance” of at least one parent device.

A parent device is a finished device whose performance is supported, supplemented, and/or augmented by one or more accessories.

Radiographic accessories are devices that supplement performance of different radiological machines such as x-ray, CT scanner, Fluoroscopy scanner etc. For example Apron Racks, Callipers, Catheter Cabinets, CD/DVD Burners, Compression Devices, Filtration Systems, Lead Letters, Markers, Positioning Blocks, Restraints, Sand Bags, Stools, vaginal speculum, vulsellum forceps etc.

Quality Control accessories: Densitometers, Phantoms, Roller Cleaner, Sensitometers, Step Wedge. Accessory Supplies: Blank CDs, Blank DVDs, CR Plate Cleaner, Examination Gowns, Label Print Ink. Radiation Protection accessories: Aprons, Gonad Shields, Lead Glass, Lead Gloves, Lead Lining – Walls, Lead Screens, Safety Glasses, Thyroid Collars.

Radiographic accessories have serious impact on radiation protection, quality assurance, infection control in the department. Most special procedures offered by the department more so depend on the availability of these accessory equipment as much as on radiographic techniques of imaging staff and available radiology machines.

Study on radiation protection, infection control and quality assurance have been performed in several regions of the world however there are few publications with information on the impact the available radiographic accessories have on these studies.

The objective of this study was to determine the availability of radiographic accessories in the radiology department of kiruddu hospital and the possible impact they have on Quality assurance, radiation protection and infection control in department

## CHAPTER TWO

### LITERATURE REVIEW

In a recent study carried out in Nigeria by J.A Achuka, M.R Usikalu, C.A. Enemuwe titled “x ray imaging techniques appraisal: pathway to sustainable health status.” Several health care institutions and hospitals lacked adequate fundamental imaging equipment and accessories of medical x-ray facilities were inadequate and a challenge to radiation protection in Nigeria [3.7]. Further more research noted poor technical expertise among upcoming radiation technologists due to inadequate facilities [9.11]

In the same study it was noted that several imaging centres are not adequately equipped as such medical imaging practice in Nigeria was still being under explored and under exploited [11]

In Uganda, x-ray and ultrasound are the most cheap and used imaging modalities and inadequacy of imaging accessories limits techniques that could be used to reach a more conclusive diagnosis hence imaging technologist refer patients to more expensive examination such as CT or MRI which the patient could be unable to access hence leading to a halt in the treatment plan of the patient. This leaves x-ray under exploited in most investigation as techniques most employed are the basic projections that can easily be carried out with or without need for such accessories. As some patients are too fragile to be positioned in certain investigation without causing harm to them due to limited radiographer technique arsenal.

In a study carried out in May 2014 Zimbabwe titled “infection control in a resource constrained radiology department” by G.R Chingarande. All cassettes, probes, hatches, door handle, lead, rubber aprons accessory materials were examined. It was noted that there was a high risky of hospital associated infections was a challenge with x-ray cassettes having the highest number of bacteria isolated 55%. As evidenced by the presence of micro organisms on equipment and observation of radiographers in practice. Cleaning criteria at the hospital radiology department were not adequate too. This risked patient health especially where large number of patients had direct skin contact with the equipment . In addition the equipment used being in contact with the radiographer also presented a risk of infecting the radiographer.

In Uganda, inadequate x-ray accessory present the same problem, as in many instances due to unavailability of these accessories could lead to an iatrogenic infectious spread when patients are examined back to back using the inadequate accessory materials for example lead aprons, changing aprons gonadal shields etc.

In addition, cleaning criteria of the available hospital resources can not keep up with the large number of patients examined daily.

In attempt to prevent such health problems, radiographers discard use of these materials which are in small numbers which present a problem of patient privacy which make patients uncomfortable in some examinations.

## CHAPTER THREE

### METHODS

#### STUDY DESIGN

A structured observation was used. This is a qualitative research methodology that is used to records events or series of events in their natural settings. (Robert Grover and Jack Glazier, “Information Transfer in City Government,” Public Library Quarterly 5 (Winter 1984): 9-27)

This study design was chosen because it’s a straightforward conduct to utilise pre-existing data and can provide information about difficult to analyse topics in a low cost efficient manner (George T at el 2023)

Quantitative methodology through interviewing radiographers in charge of x-ray unit about

- Accessory equipment available in the department.
- The cleaning criteria and equipment maintenance implemented in the unit.
- Challenges involved in acquiring these accessories and possible solutions to ensure availability.

#### Study area

The study was carried out in kiruddu hospital Kampala. Kiruddu hospital is part of the 17 regional referral hospitals in the country located in Makindye division central region Uganda. This facility was established in 2016. (MoH Uganda). This facility has a bed capacity of 200, with a catchment population of 200,000 offering clinical services such as diagnostic services, cardiology, dental, immunization, psychiatric, burns and plastic surgery, nephrology, ophthalmology, ENT and lung services. In addition offers education and training and research.

#### Study population

The study participants were the radiographers in the radiology department kiruddu hospital Kampala.

#### Consent form

No consent form will be provided during the study but permission from the radiology department staff of Kiruddu Hospital to carry out the study will be got.

### Background and rationale of study

Accessory equipment in radiology department setup aren't emphasized and their use is not prioritised in the day to day diagnostic radiology practice. This research will create awareness about the use of these equipment and extent of their availability and guide other researchers with information on the accessory incorporated practice.

### Procedure

Observation data collection with accessory equipment checklist to note the equipment available and their quantity.

Interviewing the radiographers at the department on challenges in acquisition of the different accessories, radiation protection.

### Data quality control

Information and interview will be got from the radiographer in charge of x-ray unit, head of department of radiology department at Kiruddu national referral hospital and RSO kiruddu hospital

### Risks and benefits

There are no risks involved in study

### Benefits of the study

Awareness from this research project will enable appropriate equipping of radiology department in Uganda, improve day to day practice in the department and improve the quality assurance and quality control of the department. The investigator did not get any monetary benefit from this study.

### Dissemination of the study findings

A copy of the research findings was distributed to the radiology department Makerere university, college of health sciences library, the supervisor and kiruddu hospital radiology department.

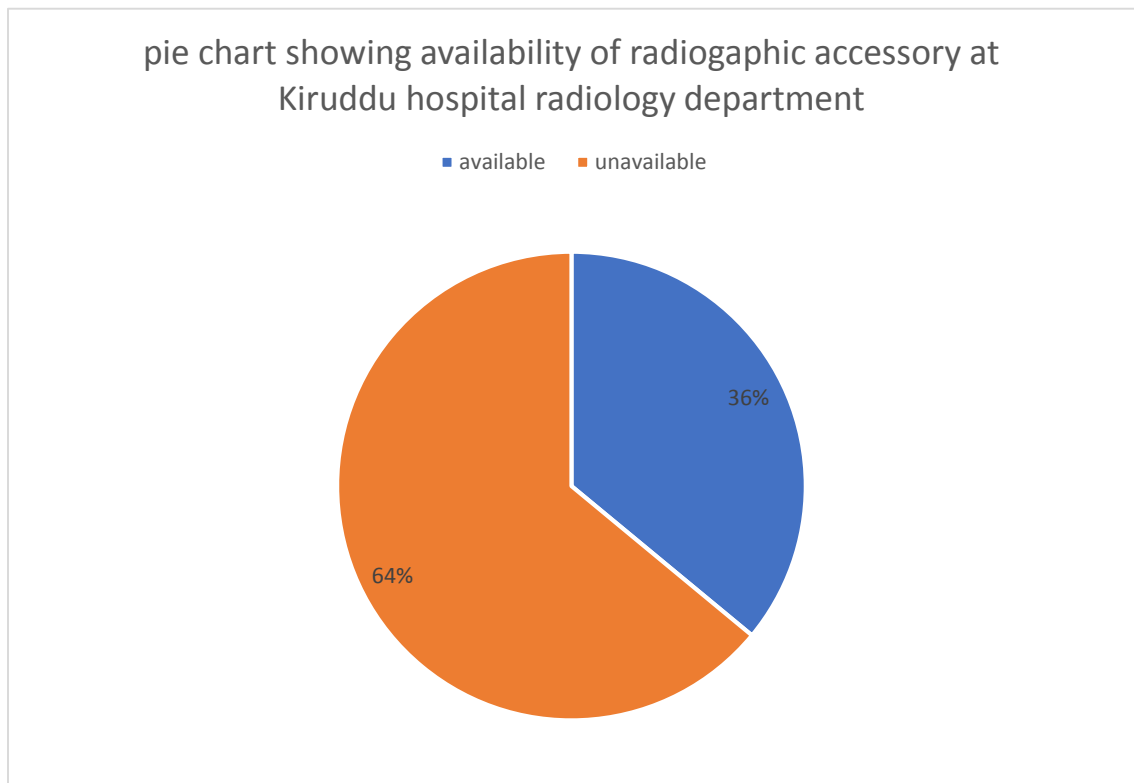
#### Ethical consideration.

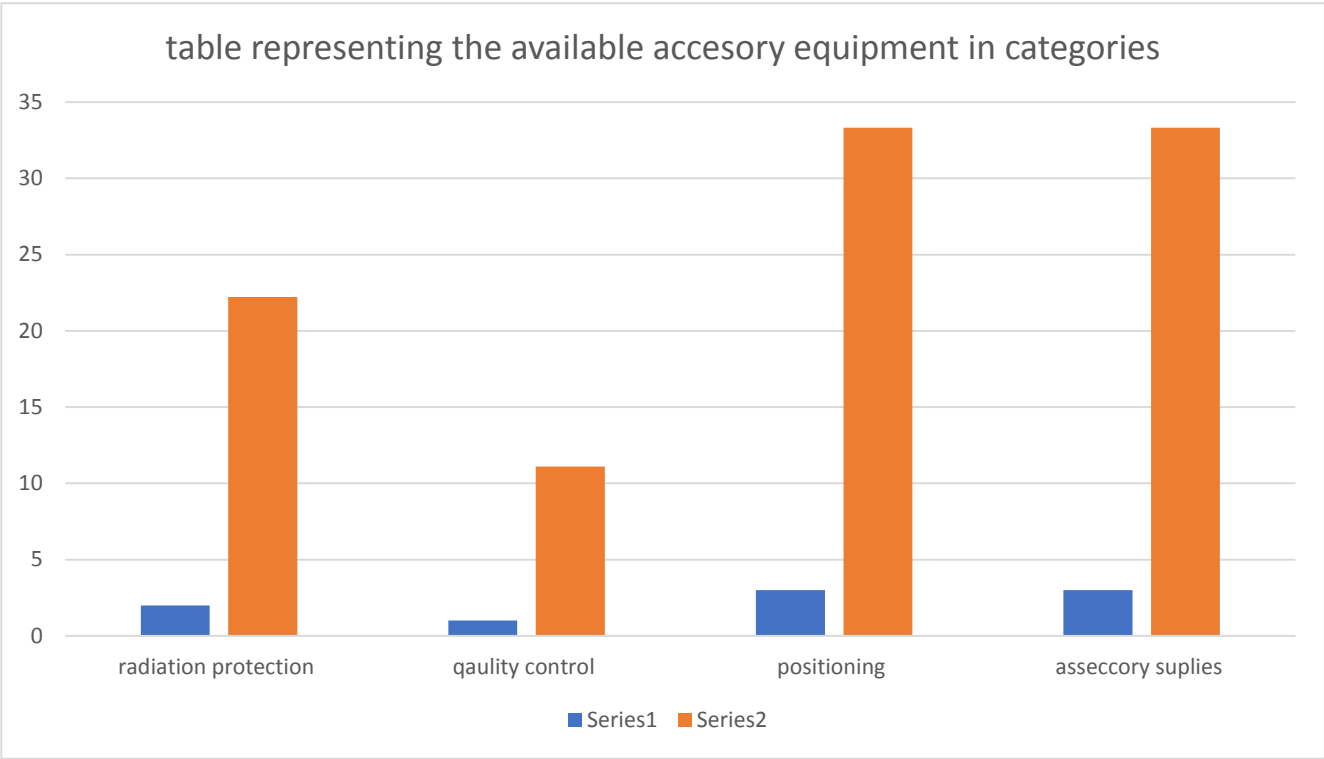
The research proposal was submitted to the department of Radiology and radiotherapy, College Of Medicine, school of Health Science, Makerere University and was approved. Introductory Letter was obtained from College of Medicine, department of Radiology and Radiotherapy, Makerere University. The research proposal and letter of introduction was used in gaining Access to the radiology department kiruddu hospital. Permission was granted before the start of data collection

## CHAPTER FOUR

### RESULTS PRESENTATION.

Out of the 25 listed accessory equipment, 36% were available and 64% unavailable. 8% of these equipment were principally for radiation protection for both radiographer and patients and patient attendants. 4% for quality control in the CT scanner. 12% for positioning during examination. And lastly 12% accessory supplies for storage of different accessory equipment in the department.







## INTERVIEW

Q. Are there challenges in quality assurance, radiation protection and infection control due to lack of these accessories?

A. Yes. For example linen and examination gowns when they get dirty along the week. Then we resort to working on patients without examination gowns on or without linen. It compromises patient privacy sometimes. Radiation protection is mostly through use of lead aprons for attendants and collimation for the patient. Equipment to protect the patient's delicate organs such as gonad shields, thyroid shield are unavailable.

We can resort to working without equipment due to their sanitary state sometimes and this compromise quality. Especially working on trauma patients in x-ray unit which requires special techniques which would be much easier with variability in the department's accessories.

Q. Are there steps are being taken to acquire the minimum necessary accessory equipment for the department?

A. Yes. Requisition for accessory material was submitted to the administration office and probably soon we will get equipped with all the necessary equipment to improve quality assurance and radiation protection.

Q. What's the cleaning criteria for the accessory equipment available?

A. General cleaning every morning before work of the accessories and the machines. Linen is cleaned every week. But replaced with clean ones every after use. In addition to Sanitising accessories.

Q. Would availability of these accessories improve on radiation protection, quality assurance and infection control in the department?

A. Yes

Q. How many radiographic l procedures are being performed in the department?

A. We offer basic x-ray examination, ultrasound imaging, CT scan imaging, CT and ultrasound guided biopsies.

Q. Are fluoroscopic procedures offered at the department?

A. Not currently. We have the fluoroscopy machine but its not functional at the moment.

RADIOGRAPHIC ACCESSORIES AT KIRUDDU NATIONAL REFERRAL HOSPITAL  
CHECKLIST

Accessories	Available/unavailable
X-ray viewer	✓
X-ray protective glasses	x
Lead gloves	x
Thyroid collars	x
Gonad shields	x
Lead letters	x
Apron stands	✓
Lead numbers	x
Lead aprons	✓
Filters; arm filters, gentle slope filters	x
Sand bags	x
Catheter cabinets	✓
Compression devices	x
Restraints	✓
Densitometers	x
Thermoluminescence dosimetry	✓
Phantoms	✓
Roller cleaners	x
Step wedge	x
Positioning blocks CT	✓
Positioning blocks X-ray	x
Examination gowns	✓
Sensitometers	x
Vaginal speculum	x
Vulsellum forceps	x

If available ✓

if unavailable x

## DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Radiation protection accessory equipment make up a total of 8%, this comprises of lead aprons and TLDs, TLD for the radiographers on site and lead aprons for both radiographers and patient attendants and patients when the region of interest is periphery. Protective gear for the sensitive body parts such as gonads and thyroid of the patient aren't protected as they aren't available in the x-ray unit. This leaves collimation by the radiographer as the first line of radiation protection which don't count for scattered beams. This is inadequate to effectively protect patients from unnecessary radiations.

5 Lead aprons available are shared by patients and patient attendants and radiographers during intervention studies. This automatically makes them insufficient for infection control. The cleaning criteria for these accessories is poor. This creates a high risk for hospital infection spread.

4% of the available accessories account for quality control in the CT unit. This is the phantom available which is used for quarterly or annually CT tests to assess the machines functionality. There are many phantoms which serve different functions in testing different aspects of the CT scanner which can't be covered by one phantom. This also compromises quality control in the CT scan and overall quality assurance.

12% accessories were used for positioning and patient comfort. There comprised of examinations gowns, positioning blocks and restraints. Most of these accessories were used in CT unit. X-ray unit lacked these accessories such as compensation blocks, sand bags, step wedges, positioning of uncooperative patients proved a challenge in addition to producing quality work. Repeat examination due to poor technique and positioning lead to increased patient doses in the unit.

12% of the other accessory equipment in the department were the catheter cabinets, apron racks, film viewer,

Many special procedures and radiation protection that can be performed by the department are dependent on the available accessories in addition to the machines available. Procedures such as HSG, CUG. Kiruddu hospital administration is in process of repairing flourosopy machine and

resuming special procedures which are mostly fluoroscopic, radiation protection for both patient and radiographer are mandate. This is however compromised if the unit is not fully equipped.

Many QC procedures can only be carried out using the different radiographic accessories such as phantoms. This helps in keeping track of the functionality of the radiology machines.

### Conclusion

Kiruddu hospital radiology department is not adequately equipped with radiographic accessory equipment. Radiations protection, quality and assurance and infection control are capable and compromised by the available radiographic accessory equipment which then enables the radiographer to fully exploit his or her technique which can improve quality assurance and quality control In the department.

### Recommendation

The administration of kiruddu hospital was asked to respond positively to the requisition requests from the department to make sure it's equipped to offer better and more radiographic services and improve quality assurance to the patients.

Have strong quality assurance programmes. Have continuous medical education to staff. Avail S. O. Ps in all departments.

## REFERENCE

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Occupational Radiation Protection in Interventional Radiology: A Joint Guideline of the Cardiovascular and Interventional Radiology Society of Europe and the Society of Interventional Radiology by Donald L. Miller

## APPENDIX I

### 1.1 Study plan

The study will be performed in one week at kiruddu Hospital

### 1.2 Consent form

No consent form will be provided during the study but permission from the radiology department staff of Kiruddu Hospital to carry out the study will be got.

### 1.3 Title of study

Availability of radiographic accessory equipment at Kiruddu Hospital

### 1.4 Investigator

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### 1.5 Study Sponsor

This study will be self sponsored by the Investigator.

### 1.6 Background and rationale of study

Accessory equipment in radiology department setup aren't emphasized and their use is not prioritised in the day to day diagnostic radiology practice. This research will create awareness about the use of these equipment and extent of their availability and guide other researchers with information on the accessory incorporated practice.

### 1.6 Study purpose

This research study purpose is to establish availability of accessory equipment at Kiruddu Hospital and active participation will enable the investigator come up with sufficient data on the extent availability and use of the accessory equipment

## 1.7 Procedure

Observation data collection with accessory equipment checklist to note the equipment available and those unavailable in the radiology department.

Interviewing the radiographers at the department

## 1.8 Who will participate in the study and where will the study be conducted from

Radiographer in charge of x-ray unit, head of department of radiology department at Kiruddu national referral hospital. The RSO kiruddu hospital

## 1.9 Risks and benefits

There are no risks involved in study

Benefits of the study

Awareness from this research project will enable appropriate equipping of radiology department in Uganda, improve day to day practice in the department and improve the quality assurance and quality control of the department. The investigator did not get any monetary benefit from this study.

## 1.10 Dissemination of the study findings

A copy of the research findings was distributed to the radiology department Makerere university, college of health sciences library, the supervisor and kiruddu hospital radiology department.

## 1.11 Ethical consideration.

The research proposal was submitted to the department of Radiology and radiotherapy, College Of Medicine, school of Health Science, Makerere University and was approved. Introductory Letter was obtained from College of Medicine, department of Radiology and Radiotherapy, Makerere University. The research proposal and letter of introduction was used in gaining Access to the radiology department kiruddu hospital. Permission was granted before the start of data collection