

**Countess of Chester  
Radiology Department  
Visit to Kisiizi Hospital**

**October 2010**

**Report**

# **Contents**

## **1. Introduction**

## **2. Aims**

## **3. X-ray Imaging**

### 3.1. Project Work Undertaken

3.1.1. Education program

3.1.2. Equipment

3.1.3. Monitoring and Evaluation

### 3.2. Recommendations

## **4. Ultrasound Imaging**

4.1. Background/ objectives

4.2. Staffing

4.3. Equipment

4.4. Service Improvements

4.5. Department Issues

4.5.1. Scheduling of Patients

4.5.2. Infection control

4.5.3. Supplies

4.5.4. Hydrating Patients

### 4.2 Recommendations

## **5. Summary**

## **6. Appendices**

6.1. Reject Film Analysis Audit

6.2. Image Quality Audit

# 1. Introduction

On Friday 1<sup>st</sup> October the Countess of Chester Radiology department began their third visit to Kisiizi Hospital in Uganda

This visit was for two weeks and the team members were

Tracy Hughes Senior Radiographer

Carole Kendal Senior Sonographer

Teresa Dawkes Senior Radiographer

In order to provide a strong continuing link with Kisiizi all visits after the initial scoping visit in October 2009 have had a skill mix of team members that include at least one person that has been involved with the project from the beginning and has travelled out to Kisiizi before.

## 2. Aims

The aims were,

- i) to continue building on the knowledge and skills of the radiographers and sonographers in Kisiizi
- ii) to introduce more equipment so as to enable them to produce better quality radiographs and ultrasound images and
- iii) to continue to help expand the radiology service that Kisiizi provides.

This visit was exactly one year on since the beginning of the project and so we also planned to begin auditing the progress made to date.

## 3. X-ray Imaging (Tracy Hughes/Teresa Dawkes)

### 3.1 Significant changes since last visit

One of the members of staff that we had been working closely since the beginning of the project left Kisiizi in August this year. This was Richard Okullo and his departure has had quite a significant impact on the x-ray department.

The two other members of staff Reverend Esra and Benon are progressing very well with the education program set out for them. They are very enthusiastic and keen to learn new techniques. Richard however, having a diploma in radiography, had taken on a lead role in x-ray and had become responsible for ordering supplies and helping to implement new equipment and protocols. When we arrived in October some of the equipment that had been installed during the last visit wasn't been used effectively. The new faster speed Kodak cassettes and daylight name marker weren't in use as there was confusion over the green and blue sensitive film in store. We sorted the film and reintroduced the faster system and calculated new exposures charts. It also became apparent that they will not be able to switch over completely to the new system as quickly as we had hoped because of supply and cost issues. However before we left we spent time ensuring that the two systems can be combined to give the best intermediary solution until all of the current blue film supply is finished

Richards's departure has also affected the plan to train a radiographer to interpret and report x-ray images. He had been identified as the person suitable to do this and had been accepted on a course in Kampala that included a module in film interpretation. This won't now be possible. We will however continue to train the clinicians in this area by providing relevant teaching tutorials once a year.

Unfortunately Richard was the person we had e-mail contact through and so this link has been lost temporarily. We hope to be able to get regular emails from the other members of staff. The plan is to provide more IT training so that this is possible.

We were also told that Reverend Esra may be retiring in early 2011. This is not ideal as it will be half way through the project training program and there is no plan at present for someone to take over. We spoke to Dr Tony and Moses about this and if he were to retire would highly recommend that Benon take over. There would then be a need to train someone to cover holidays and off days.

## **3.2. Project work undertaken**

### **3.2.1 Education Program**

This program has been written by the team members specifically for the needs of the two radiographers in Kisiizi to enable them to perform the whole range of examinations required. It is been delivered gradually over three years

PowerPoint presentations were given on radiographic technique and anatomy of the upper limb. The tutorials were backed up by practical sessions and notes were given out to add to the files the radiographers were given on the last visit.

Tutorials were given on health and safety and included topics such as Electricity, Machinery, Hazardous Chemicals, Radiation Protection and Cross Infection. These hazards were discussed with particular relevance to the radiology department and equipment was supplied to help the staff work safer in their environment. Gloves, aprons, and masks were given to use when changing chemicals and dealing with infectious patients. Towels and soap were set up by sinks for hand washing. Radiation warning signs and locks were put up on the outer and inner doors to the x-ray room to prevent unauthorised personnel coming into the room unexpectedly during exposure.

Tutorials were given on barium swallows, meals and enemas. Protocols have been written to attempt to set up this service but unfortunately due to a lack of supply of barium we were unable to carry out any examinations while we were there. This will have to be scheduled for a future visit.

We began to set up a quality assurance program and power point presentations were given on the benefits of QA and regular monitoring. Over the three year program we will cover all aspects of QA but during this visit we concentrated on reject film analysis and standardising exposure factors. The benefits of monitoring reject films became apparent as we used the data collected over the last six months to help produce a report to the management to show that the chemicals in the automatic processor needed replenishing more frequently

We also took out a laptop to replace the one that had been given to Richard on the last visit. Benon is very keen to learn how to use this and we went over some basic IT skills with him. It is hoped that Benon will become proficient with the laptop enabling us to have e-mail communication with him as we had with Richard.

As part of the aim to reduce unnecessary radiation to patients we gave a tutorial on the importance of not exposing females of child bearing age without justification. We then set up a protocol and a method of recording this.

Exposures were established for the new cassettes and charts were drawn up to be used in conjunction with the existing system. This will be added to by the staff as they progress with more complex examinations

### **3.2.2. Equipment**

Numerous items of health and safety equipment were taken out on this visit. They were introduced gradually alongside relevant tutorials and include safety signs, locks on doors, cleaning equipment, masks, gloves and aprons.

Radiographic anatomy books to complement the tutorials were left for all staff to use

Positioning pads were purchased with funds to help improve radiographic technique. The radiographers found these very helpful.

A refurbished silver recovery unit was taken to Kisiizi on this visit. This was serviced in the UK by Graham Haslam from Carestream. Unfortunately we weren't able to set it up and leave it working as there wasn't sufficient fixer solution in store to do this. It has been discussed with the staff and the intention is to have extra fixer ordered before the next visit so this can be achieved. Also it was agreed with Moses that he would research the possibility of selling the recovered silver in Uganda. There are benefits to recovering silver from the fix solution. It is better for the environment as less toxic waste is disposed of and an income can be earned from selling the recovered silver to metal merchants. The cost benefits to Kisiizi have yet to be established.

The automatic processor was set up on the initial visit and has been running smoothly since then. However problems with underexposed films were identified as soon as we arrived. The radiographers were finding it difficult to achieve diagnostic images and patients were being given excessive doses of radiation towards the end of the month as the chemicals became expired. This backed up by data from the reject analysis audit lead us to recommend changing the chemicals in the processor every three weeks instead of four. A report to the management team was provided to provide the necessary evidence to do this as there is a significant cost implication to Kisiizi in doing this.

We checked all existing equipment to see if it was being used effectively and in good working order

### 3.2.3. Monitoring and evaluation

#### Reject Analysis

A reject analysis system was set up and the benefits of this have already become apparent as previously described. Being able to identify the main reasons for rejects and putting measures in place to reduce them will enable Kisiizi to reduce radiation doses to patients, save money by reducing waste, save time and effort and provide data for ongoing comparisons. The first data was collected and an initial audit done (appendix 1.)

#### Audit of image quality

The assessment of the quality of radiographs produced in Kisiizi is being measured in two ways. The assessment of image quality, radiographic technique audit will allow us to measure the improvements made through the education program whilst the assessment of image quality, exposure and processing audit will measure improvements made by introducing new equipment. Baseline data for this audit was collected on the first visit in October 2009 and then again on this visit. The results can be seen in the initial audit (appendix 2).

#### Audit of service improvement

Data on the numbers and types of x-ray examinations is being collected for this audit. Baseline data was collected on the first visit in October 2009 and again on this visit. The results will be available at the end of the project

## **3.3. Recommendations**

#### Objectives and Recommendations for Kisiizi staff

1. To order green sensitive films only in the future and gradually from the blue system to the green.
2. Radiographers to damp dust all electrical x-ray and ultrasound equipment weekly
3. Lock and secure the department when not in use for security and radiation protection reasons
4. Order supplies regularly so they don't run out. Eg Barium, film bags, fixer solution, developer solution, green film, soap, and towels

5. Cover the name marker in the evening
6. Keep the external x-ray room door closed except for access with beds and wheelchairs.
7. Close and lock the internal x-ray room door when exposing
8. Fill in the LMP pregnancy book and adhere to the 10day rule when x-raying females of child bearing age
9. Continue collection of rejects for analysis next time
10. Continue with the QA that has been started.
11. Change the developer and fixer chemicals in the processor every three weeks
12. Continue regular hand washing
13. Collect information for selling recovered silver in Uganda
14. Ensure sufficient fixer available to set up silver recovery system on next visit

#### Objectives and Recommendations for COCH Staff

1. Monitoring of radiation in the x-ray room – contact IRS
2. IVU Protocols
3. Barium protocols
4. QA
5. Reject Analysis

## **4. Ultrasound Imaging (Carole Kendal)**

### **4.1 Background/objectives**

Since the outset of this project, two Sonographers have left Kisiizi and been replaced by a newly qualified Sonographer/Radiographer Brenda Kamwesigye. This has caused a major setback to the Ultrasound Service. It has been agreed that Proscovia, a mid-wife, will attend an Ultrasound course in Kampala starting January 2011.

Equipment taken out this visit includes a portable/laptop ultrasound machine, an operators chair, a cooling fan and lamp.

Because of the change in staffing, the main objectives were to assess the needs of the new Sonographer and introduce new equipment and scanning techniques. An overview of equipment previously provided, and general conditions within the department was also undertaken.

### **4.2 Staffing**

Staffing had suffered a set-back since the previous visit. The newly appointed Sonographer, Brenda Kamwesigye, had just qualified and working in a single-handed, unsupervised post is not ideal. She is competent at uncomplicated obstetric scans but has some difficulty with other techniques. I am hoping Brenda will have the enthusiasm and commitment to develop her skills and take the service further. I feel she would benefit from mentoring at this stage in her career.

Proscovia, a mid-wife, has been accepted on the next ultrasound course in Kampala commencing January 2011. She spent a short time in ultrasound during our visit, seemed keen to learn and had a pleasant manner with patients. It is important she is supported in her training and given time in the department to gain experience.

### **4.3 Equipment**

The GE Logiq 9 is not being cleaned regularly, which is particularly important as the department suffers from a dusty environment. Dust covered the machine and had penetrated the protective filter. The dust sheet previously supplied was not in use. The 3.5MHz transducer had some damage to the cable.

A second machine (Aloka), which would serve as a useful backup, was also covered with dust. This was found to be in good working order, was cleaned and covered over.

A portable ultrasound machine (GE Logic notebook) was taken out and demonstrated to Brenda and Proscovia. This would be ideal to use on the ward or in out-reach clinics. Also, if suitable staff were identified, it could be used for 'fast-scanning' in the emergency department. If made available to several staff groups, security and care of the equipment should be considered

An operator's chair, cooling fan and lamp were also provided.

#### **4.4 Service developments**

Kisiizi ultrasound department is now very well equipped, the main machine having transvaginal, small parts and vascular imaging capabilities. The arrival of the portable equipment gives further opportunity to expand the service.

I demonstrated transvaginal scanning, a useful adjunct to conventional imaging, and gave various tutorials, including TV image orientation and equipment controls. Umbilical cord Doppler, for third trimester obstetric scans, was also covered practically and in theory. The department was busy, time for tutorials was limited, and further training and experience will be required.

#### **4.5 Department issues**

##### **4.5.1. Scheduling of patients.**

Organisation of work lists could be improved. Waiting times would be reduced if wards were to liaise with radiology staff before sending patients. It was suggested that the Maternity ward had allocated appointment slots spread though out the day, rather than sending several patients together.

##### **4.5.2. Infection control.**

The hand basin did not seem to be in use. It was cleaned and towels were found to enable regular hand washing. Annette was asked to maintain both.

There were no facilities for the disposal of clinical waste. Identifiable (colour-coded) bin liners were to be provided. This is of high importance with the advent of vaginal scanning, particularly with the incidence of infected patients.

Patients who are infected should be readily identifiable to staff, whilst maintaining their confidentiality.

Wipes/disinfectant to clean transducers should be made available. Tissues/wipes are also needed if a patient bleeds and to dispose of probe covers.

##### **4.5.3. Supplies**

The gel in use was in 20g sterile sachets and is unnecessarily expensive. It can be supplied in 5 litre containers and a source should be found. Other consumables such as gloves, wipes, thermal imaging paper, probe covers/condoms should be kept in stock.

##### **4.5.4. Hydrating patients.**

Patients currently purchase water to fill their bladders, in preparation for scan. Brenda suggested obtaining a water filter and cups for use within the waiting area. If hard to source locally, these could be taken out next visit.

The toilet facility was not being made available to patients, as intended, they had to cross to the ward. This is unsatisfactory when patients have been requested to fill their bladders.

## 4.6 Recommendations

1. Proscovia to be supported in her training and given time in the department for clinical experience.
2. Guidance from the clinical lead in Kisiizi, as to service needs. Opportunities exist for scanning on wards, in community setting/'fast scanning'. What future developments would benefit the hospital most?
3. When Brenda and Proscovia are established, it is recommended that other mid-wives are trained in basic obstetric scanning.
4. GE Logic 9 is due for a service. The local engineer who serviced the X-ray equipment to be contacted.
5. Instructions on transferring images to CD to be obtained from GE prior to next visit/e mailed to Brenda.
6. Put in place robust procedures for infection control – regular hand washing, cleaning of equipment, waste disposal and identifying infected patients.
7. Continue with training/support for Brenda and Proscovia.

### Suggested equipment for next visit.

- Thermal imager for second machine (soon to be available from old EPAU machine at COCH).
- Further reference books/medical dictionary/anatomy book.
- Signs/posters for waiting room.
- Sheets for couch and to serve as dust covers.
- Water filter/multiple use plastic cups

## 5. Summary

The visit to Kisiizi Hospital in October was very enjoyable. It was good to return and see so many friends old and new and we would like to thank everyone for making us feel so welcome.

The last year has presented with quite a few challenges for both project partners. It has been difficult for staff at COCH to deliver the original project plans particularly in ultrasound as the two sonographers that we began training are no longer employed in Kisiizi. Hopefully now with help from Brenda the new sonographer and Proscovia who is about to start a training course, then progress can begin to be made again.

The general x-ray department has also had a few set backs but thanks to the enthusiasm and hard work from Reverend Esra and Benon things are progressing well.

Annette is also a great support to all the radiology staff and as the department and service grow could extend her role in the future

We would like to thank everyone for all their hard work and dedication to the project and look forward to seeing everyone again soon.

## **6.1. Appendix 1.**

### **Kisiizi Hospital, Uganda Film Reject Analysis Audit**

#### Aim

The aim was to collect reject films and set up a system which would give detailed analysis of the rejected films and the reason for the rejections, in order to put in place remedial action

#### Objectives

The objectives were to design a reject film analysis program, set up and run the program, analyse the results and then act on the results. We then plan to instigate a follow up program to assess the effectiveness of the action taken

#### Benefits

In every department a number of films are discarded for one reason or another. Incorrect exposure, poor positioning and processing are some of the common causes. Knowing exactly what the major reasons are is a big step towards correcting faults and therefore reducing rejects.

Hopefully we will be able to identify the main errors and put measures in place to reduce them. By doing this we could save money, time and effort and reduce radiation doses to patients. The data provided will be available for future comparisons and the statistics will support claims to repair or replace faulty equipment

#### Potential Problems

The radiographers may see reject analysis as a threat and so won't cooperate. Radiographers also tend to retain substandard films on the grounds that they provide some information. The cost and availability of films may also be an issue in Kisiizi. Records may not be kept up to date.

#### Method

We have designed the reject analysis program in Kisiizi to collect the data over six months and then analyse it. This will hopefully fit in with the visits to Kisiizi. After a while it is hoped that the staff in Kisiizi will collect and analyse the data themselves as part of their quality control program. The films were collected from April 2010 to October 2010. It was explained to the staff in April the importance of keeping this data and why we were collecting it. We designed data recording sheets that would give us the most information relevant to Kisiizi. On arrival we counted and recorded the data. We also counted the number of films used in the same period. This information was taken from the daily records book in the department.

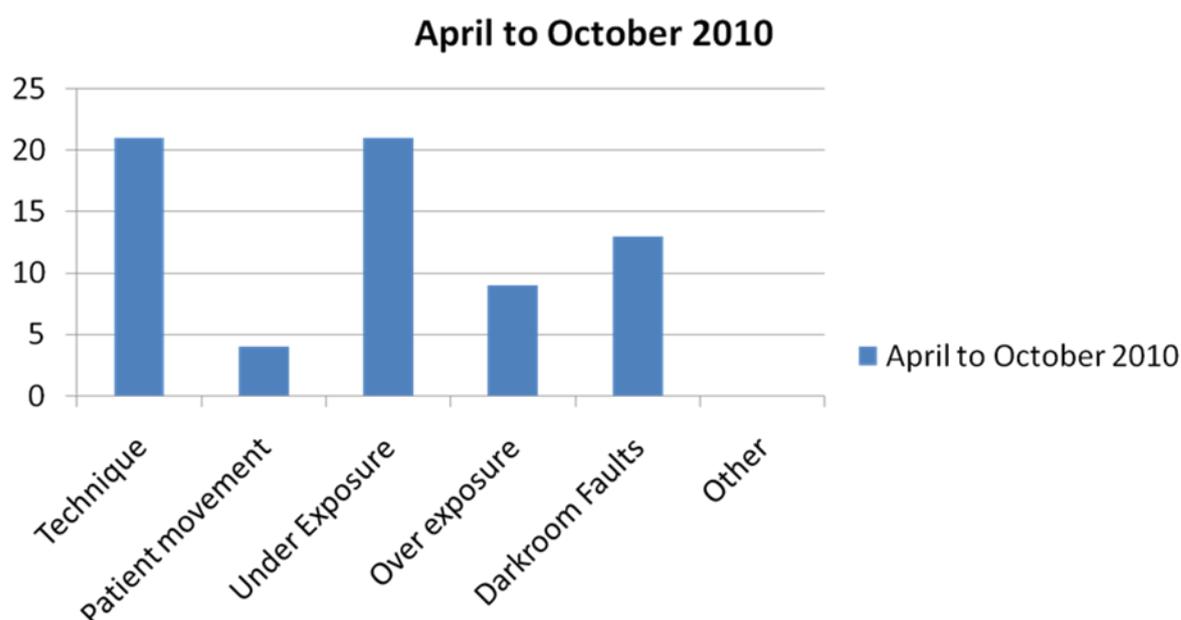
## Results

Period : 1	From: April 2010	To: October 2010
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Cause	Total
Technique	21
Patient Movement	4
Under Exposure	21
Over Exposure	9
Darkroom Faults (Fogging, Artefacts etc)	13
Processor Problems	3
Other	0
Total	71

Total films rejected 71  
Total films used 1023  
Rejected films as a percentage of films used 6.94%  
Cost of films rejected this period 106,500 Ugandan Shillings  
(Using 1,500 average cost per film)

# Reject Film Analysis Audit



- 71 overall reject films
- Overall cost of rejected films over the period 106,500 Ugandan Shillings
- The most common faults are technique and under exposed films
- 6.94% of films used were rejected
- Technique accounts for 29.6% of the rejects
- Under exposure accounts for 29.6% of the rejects
- Darkroom faults account for 18.3% of the rejects
- Over exposure 12.6%
- Patient movement 5.6%
- Processor problems 4.2%

## Conclusions

The two reasons for rejects that stand out above the rest are technique and under exposure.

As the education program continues it is hoped that the reject numbers due to errors in technique will improve. However this may not necessarily follow because as the knowledge and skills of the radiographers improves then they will have more understanding of what poor film quality is and will potentially reject more images. This will be monitored each six month period

The under exposed film rejects are possibly a little more easy to rectify. These could be from radiographer errors in selecting incorrect exposure factors or inadequate processing. Under exposed films can occur as chemicals in the processor become expired. If it were radiographer errors then you would expect as many over exposed films as under. The figures lead us to believe it is a problem with the expiry of the developer solution in the automatic processor. The chemicals are at present changed every 4 weeks so it is recommended that this is changed to 3 weeks. A report was written including the data results from this audit and presented to the management to support this change as there are cost implications in doing this. Moses Mugume, the hospital administrator agreed to this.

## Actions

The chemicals will be changed every 3 weeks and the education program will continue  
This will be re audited in 12 months

## **Appendix 2.**

### **Kisiizi Hospital Uganda Film Quality Audit**

#### Aim

The aim was to look at the image quality of radiographs produced in Kisiizi in order to measure and record improvements.

We have identified two main areas to make improvements. The first by delivering an education program over 3 years to improve radiographic technique and the second by introducing new and more modern processing and photographic equipment.

#### Objectives

The objective was to design a program to collect comparable data every 12 months though out the duration of the project. This data would then be analysed and used to measure where and if any improvements had been made. Appropriate action could then be taken.

#### Potential Problems

Radiographs are not stored in Kisiiz but are given to patients to take away with them. This means that films can only be assessed for quality when we visit and have to be done as each patient is x-rayed. We therefore only use a small sample of assessed films.

#### Method

We assessed all films taken over 7 working days in October 2009 and again 7 working days in October 2010. Each film was assessed twice once for its technical quality and again for its processing quality. A score of 1 to 4 was given for each film

Poor	1
Okay	2
Good	3
Very Good	4

The data was then collected and analysed

2009	- 45 examinations were assessed
2010	- 40 examinations were assessed

## Results

### **October 2009**

#### **Image Quality – Technique**

Poor - 1	Okay - 2	Good - 3	V Good - 4	Total
16	15	14	0	45

Total score – 88

Average Quality score for each film assessed – 1.955

#### **Image Quality – Processing**

Poor - 1	Okay - 2	Good - 3	V Good - 4	Total
23	10	12	0	45

Total score – 79

Average Quality score for each film assessed – 1.755

### **October 2010**

#### **Image Quality – Technique**

Poor - 1	Okay - 2	Good - 3	V Good - 4	Total
3	7	17	13	40

Total score – 120

Average Quality Score for each film assessed – 3

#### **Image Quality – Processing**

Poor - 1	Okay - 2	Good - 3	V Good - 4	Total
4	4	21	11	40

Total score – 119

Average Quality score for each film assessed – 2.975

### **Improvement of Quality of films from 2009 to 2010**

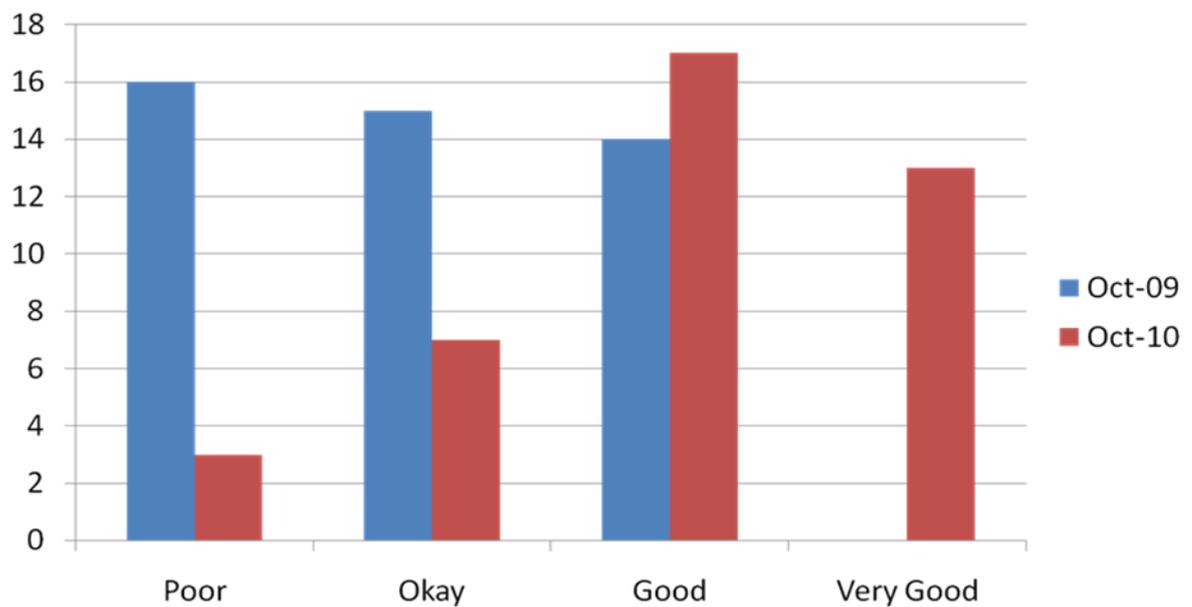
Technique 65% Improvement

Processing 60% Improvement

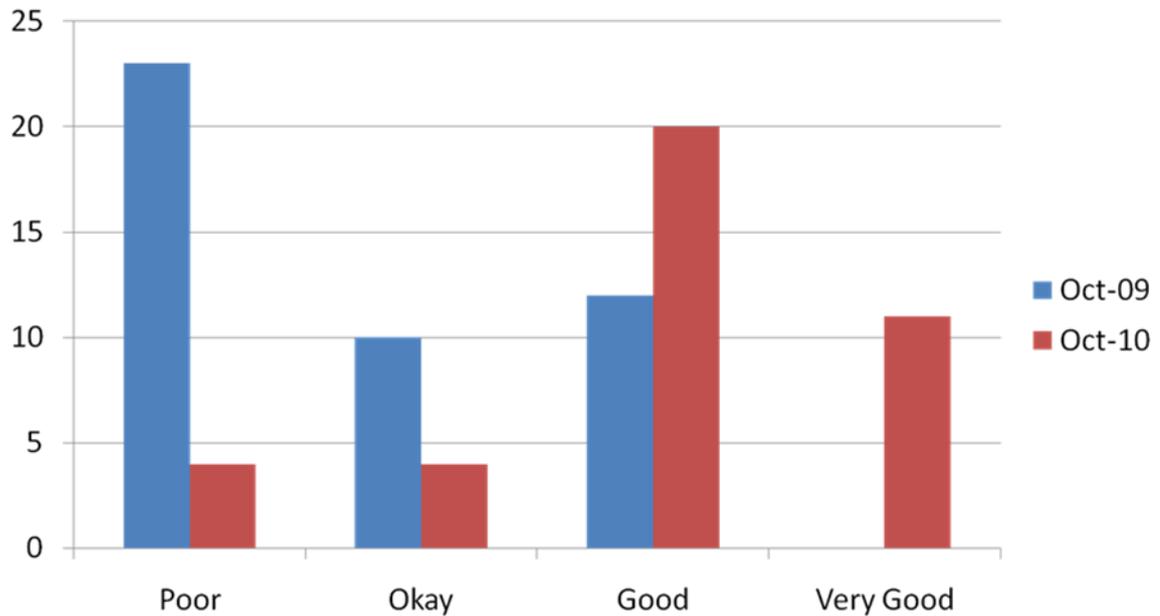
## Overall Image Quality

	Poor	Okay	Good	V Good	Total
2009	19.5 (43%)	12.5 (28%)	13 (29%)	0 (0%)	45
2010	3.5 (9%)	5.5 (14%)	19 (47%)	12 (30%)	40

## Audit on Image Quality (Technique)



# Audit on Image Quality (Processing)



## Conclusion

In 2009 most of the images were technically poor quality and none were very good. This was also the case for the quality assessment of the processing of the films. When we re-audited in 2010 most of the images were good and only 9% were classed as poor. The technical quality of the assessed films had improved by 65% and the processing of the films had improved by 60%. This is a clear indicator that there have been significant changes to the quality of images produced in Kisiizi. This is almost certainly down to the current education program and the introduction of new processing equipment.

## Actions

To be audited again in October 2011



Silver Recovery Unit



Annet washing the ultrasound linen



Benon researching



Practical teaching sessions



PowerPoint presentations



Ezra cleaning the electrical equipment



Carol teaching ultrasound



New radiation warning signs



Benon revising



Practical tutorial with Teresa



Benon and Ezra positioning a patient



The Team