

# Clinical Audit in Diagnostic Radiography

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**Abstract**—Clinical audit is a quality improvement process that seeks to improve imaging standards through a systematic review of the practice. In radiography, clinical audits have been part of quality assurance (QA) for a long time, but less attention was paid to this important quality improvement activity. Nonetheless, in the last decade, it has received more attention globally due to patient's concerns and demands for quality of imaging services. This has resulted in the publications of guidelines from the International Atomic Energy Agency (IAEA) and the European Commission (EC). Despite this, literature from a radiography perspective on how to conduct a successful clinical audit to impact knowledge and skills to radiographers is limited. This article discusses the process involved in conducting a successful clinical audit, with the aim of providing guidelines to radiographers and other healthcare professionals, such as medical doctors and nurses.

**Keywords**—Clinical audit, Quality assurance, Radiographer, Radiography, Standard

## INTRODUCTION

Diagnostic radiography involves providing high-quality images that aid in the diagnosis and treatment of patients. To achieve this, radiographers always aim at enhancing the quality of medical imaging services through clinical auditing of the structures, processes, and outcomes of care.<sup>1,2</sup> A clinical audit is a systematic examination or review of radiological procedures, comparing it against an agreed standard, and making changes in imaging practice to reach the chosen standard if necessary.<sup>1,3</sup> In other words, clinical auditing is a quality assurance (QA) programme that aims at improving patient care by maximising the benefits of clinical care and minimising harm to patients and members of the public.

Clinical auditing is a professional and organisational responsibility that must take a multidisciplinary approach, involving all stakeholders.<sup>3,4</sup> In the radiology department, this means involving all staff groups including radiologists, medical physicists, radiographers, radiology nurses, and clerical staff. Health professionals, such as radiographers have a professional responsibility to conduct or participate in clinical auditing.<sup>1-4</sup> It is good practice to appoint a designated radiographer in each radiology department to be responsible for initiating, coordinating, and

conducting audits. This task is usually undertaken by a radiographer responsible for radiation protection and QA programmes. However, there is limited literature on how to conduct clinical audits in radiography to impact knowledge and skills to radiographers. Therefore, the purpose of this educational article is to describe the process involved in conducting a successful clinical audit, with the aim of providing guidelines to radiographers and other healthcare professionals, such as medical doctors and nurses.

## DIFFERENCE BETWEEN CLINICAL AUDIT AND RESEARCH

The distinction between clinical audit and research is blurred.<sup>5</sup> This is because clinical audit and research have much in common such as literature search, methodology, data collection procedures, data analysis, and interpretation of results. This contributes to confusion in appreciating the difference between the two terms or activities. Table 1 shows the differences between clinical audit and research.

**Table 1: Differences between audit and research**<sup>1,5</sup>

Clinical audit	Research
<ul style="list-style-type: none"> <li>Require permission from the gatekeeper. If you need to publish the audit, an ethical waiver may be required from research ethics committee</li> </ul>	<ul style="list-style-type: none"> <li>Requires both ethical approval from the research ethics committee and permission from the gatekeeper</li> </ul>
<ul style="list-style-type: none"> <li>Aims at comparing the current practice with agreed standard (best practice)</li> </ul>	<ul style="list-style-type: none"> <li>Aims to increase the sum of knowledge</li> </ul>
<ul style="list-style-type: none"> <li>Measures against an established standard</li> </ul>	<ul style="list-style-type: none"> <li>Usually, involve an attempt to test a hypothesis</li> </ul>
<ul style="list-style-type: none"> <li>Normally conducted quantitatively</li> </ul>	<ul style="list-style-type: none"> <li>Conducted qualitatively, quantitatively, or both (mixed methods)</li> </ul>
<ul style="list-style-type: none"> <li>Normally data is analysed using descriptive statistics such as percentages, tables, and graphs</li> </ul>	<ul style="list-style-type: none"> <li>Data analysed by qualitative or quantitative means (may use descriptive and advanced statistics)</li> </ul>

## REASONS FOR UNDERTAKING CLINICAL AUDITS IN RADIOGRAPHY

There are six (6) main reasons identified from the literature for undertaking clinical audits:

1. It improves the quality of patient care offered by healthcare professionals.<sup>3</sup> The results of the audit inform stakeholders of the strength of the services being offered and where improvements are needed. In other words, regular audit activities help to create a culture of quality improvement in the delivery of imaging services.<sup>4</sup>

2. It upholds professional standards.<sup>1,2</sup> In radiography context, clinical auditing aim at reviewing part of

imaging practice, comparing it to the standard, and making changes of imaging practice where necessary to reach the standard required. In this way, radiography professional standards are maintained.

3. It is an educational activity.<sup>1,6</sup> Healthcare professionals conducting the audit learn many transferable skills, such as data collection, data management and analysis, report writing, communication skills and teamwork. It is also a continuous professional development (CPD) learning activity. The audit can also be published in professional journals to share knowledge and experiences.

4. It promotes the effective use of resources.<sup>1</sup> For example, reducing unnecessary medical exposures through auditing of the justification of imaging examinations reduces radiation doses to patients, the workload for radiographers and radiologists, increases the X-ray tube life, and positively contribute to shorter patient waiting times.

5. It offers enhanced job satisfaction amongst healthcare professionals involved in the audit.<sup>7,8</sup> There is a feeling of satisfaction when knowing that you have contributed to the improvement of patient care.

6. It is a legal requirement for European Union (EU) member states.<sup>3</sup> For this reason, guidelines have been produced to provide comprehensive information on procedures and criteria for clinical audits in radiological practices: diagnostic radiology, nuclear medicine, and radiotherapy.

Given the above, radiographers need to know how to conduct clinical audits. The next section provides the six (6) main stages involved in conducting a successful clinical audit.

## STAGES OF CLINICAL AUDIT

Clinical audit can be described as a cyclical or spiral systematic process to improve patient care.<sup>7</sup> The spiral suggests a continuous process with each cycle completed leading to a higher standard of patient care.<sup>1,7</sup> There are six (6) main stages involved in conducting a successful clinical audit: identifying a problem and aim of the audit, setting the standard, collecting data, analysing data and writing a report, implementing change, and re-auditing (Figure 1).

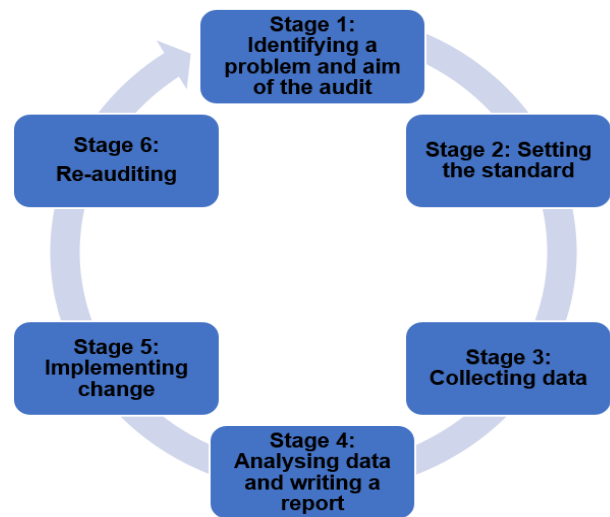


Figure 1: Stages of clinical audit

### Stage 1: Identifying a problem and aim of the audit

The starting point is the identification of a problem and the purpose of the audit. The guiding principle is to think about the imaging process, from requesting the imaging examination to the referring medical practitioner receiving a diagnostic report from the radiologist or reporting radiographer. In this way, the auditing team can easily identify the problems or areas that need to be audited and improved to reach the required standard. During this planning stage, it is important to involve all stakeholders in problem identification and aim of the audit. In medical imaging, stakeholders include radiologists, medical physicists, medical doctors, radiographers, radiology nurses, and clerical staff. The most common radiography audited areas reported in the literature are shown in Table 2.

Table 2: Most common radiography audit areas reported in the literature

	Audit topic
1	Accuracy and completeness of radiology request forms (RRF)
2	Reject X-ray film or digital image analysis in general radiography
3	Correct use of permanent anatomical side markers in general radiography
4	Radiation doses received by patients undergoing medical exposures
5	Gonad shielding during imaging for paediatric patients
6	Compliance to wearing of thermoluminescent dosimeters (TLDs) by radiation workers
7	Correct identification of patients before medical imaging examinations or procedures
8	Collimation of X-ray beam and cropping of images in computed and direct digital radiography

### Stage 2: Setting the standard

Once the problem and aim of the audit have been identified, a standard against which performance can be measured should be chosen or set by the auditing team. The standard of good practice should be based on guidelines, peer-reviewed research, consensus statements, and local consensus agreement.<sup>2,7</sup> For example, in auditing the accuracy and completeness of radiology request forms (RRFs), the standard should be based on the Royal College of Radiologists (RCR) guidelines.<sup>9</sup> It should be mentioned that the standard of good clinical practice should be realistic

for the given environment. If the standard of good practice is set at unachievable levels, it can be counterproductive and demoralising to staff.<sup>2,6</sup>

In clinical auditing, the standard is often expressed as a percentage.<sup>1,2,7</sup> Standards for high-risk imaging practices, such as identification of patients using the 3 IDs (full names, date of birth, and address) before imaging should be set at 100%. It should be mentioned that incorrect patient identification can be harmful as it can lead to exposing an individual to unnecessary ionising radiation, wrong treatment or procedure. However, the standard for less risk imaging practices should be set at less than 100%, such as acceptability of radiographic images because a lot of factors (some of which are due to non-human errors) influence the overall quality of radiographic images.<sup>10</sup> This leads to rejection and repetition of the radiographic images.

### Stage 3: Collecting the data

The purpose of collecting data for the audit is to measure the levels of performance.<sup>7</sup> It may not be always possible to include the entire population in the audit, and in this case, a representative sample is selected from which data is collected. The same sampling methods used in research apply to an audit. Data collection should aim at ensuring that the data are complete, accurate and representative of the population to have valid conclusions.<sup>2</sup> The sources of information or data depend on the identified problem and aim of the clinical audit. In radiography, sources of data include radiographic images for image reject analysis and use of permanent anatomical side markers, patient records for diagnostic reference levels (radiation doses), radiology request forms for justification of medical exposures, and so on. Data can also be collected through observation of the practice, such as compliance to wearing of thermoluminescent dosimeters (TLDs) by radiation workers.

There are two approaches to collecting audit data: retrospectively and prospectively.<sup>6,11</sup> Retrospective data collection involves using existing data that have been recorded in the hospital information systems.<sup>6,11</sup> For example, in a clinical audit on the correct use of permanent anatomical side markers, data can be collected from old radiographic images. Table 3 presents the advantages and disadvantages of retrospective data collection approach.

**Table 3: Advantages and disadvantages of retrospective data collection**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>It is quicker, cheaper, and easier because the data is already available</li> <li>It does not interfere with the departmental workflow and care of patients</li> </ul>	<ul style="list-style-type: none"> <li>It can provide information about past practices that may have changed over time</li> <li>Missing data may occur due to lost manual records or accidental deleted electronic data</li> </ul>

Prospective data collection involves recording the data while undertaking a clinical audit over a period.<sup>2</sup> For example, an audit on compliance to wearing of TLD badges by radiation workers can be done by observation during the auditing period. Table 4 presents the advantages and disadvantages of prospective data collection.

**Table 4: Advantages and disadvantages of prospective data collection**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>It ensures completeness of data collected as there is no missing data</li> <li>It gives the auditors more immediate feedback on its current performance and can act as a positive reinforcement to improve or maintain imaging practice</li> </ul>	<ul style="list-style-type: none"> <li>The process of collection may influence the behaviour of participants and therefore the outcome of an audit</li> <li>It takes a long time to collect the data and interfere with the departmental workflow and care of patients</li> </ul>

An audit proforma (questionnaire or checklist) is used to collect data and is designed based on the established guidelines and protocols. For example, the design of the data collection tool for an audit on the accuracy and completeness of RRFs should be based on the local RRF used in the medical facility being audited. Questions can be constructed from variables or items on the RRF such as clinical background, clinical indication, patient demographic data (name, age, address, and phone number), hospital ward or location of the patient, and name of the requesting clinician and other information.<sup>9</sup> The data can be collected electronically from the hospital's computerised information systems such as Radiology Information System (RIS) and Picture Archiving and Communication System (PACS), or manually. It is always important during the planning stage to consider the type of data to be collected, where it will be found and retrieved, and individuals who will collect the data. Data collection can be done by clerical staff, RIS/PACS staff or audit team.

### Stage 4: Analysing the data and writing a report

The analysis stage involves comparing the data collected with the standard and including how well the standard was met; if it was not met, identifying the reasons for this.<sup>6</sup> By comparing the practice of the service against the standard of good practice, audits can inform stakeholders about the essential elements of quality and the weak points of the overall clinical service.<sup>3</sup> Mostly, audit data is analysed using simple descriptive statistics such as percentages with appropriate tables and graphs.<sup>7,12</sup> Clinical audit is not research; the data analysis should be simple for everyone to understand to successfully implement change.<sup>12</sup> Just as the analysis should be as simple as possible, the audit report should be simple and clear to the readers. When the chosen standard is attained, this can be taken as an affirmation of the quality of the services and reassurance that no change is necessary to the practice.<sup>2</sup> If the standard is not attained, the audit report should state the weaknesses

of the practice that need to be improved.<sup>7</sup> The European Society of Radiology (ESR)<sup>2</sup> adds that an audit is a quality improvement tool, where if the chosen standard is not reached, the results should be interpreted and reported in a culture that does not blame individuals involved in providing a service.

### Stage 5: Implementing change

The audit report has no chance of making any impact unless the recommendations are implemented.<sup>6</sup> Before implementation of the recommendations, it is important to identify barriers to change and develop an action plan to help reach the target set. It should be mentioned that there will be less or no resistance to change if all stakeholders were involved in the planning and auditing process, including the formulation of an action plan or recommendations. Rawlins and Hine<sup>7</sup> state that disseminating educational materials, such as guidelines, has little effect unless accompanied by implementation methods, such as tutorials, reviews, or reminders. The interventions depend on the audited area. For example, in auditing the completion of RRFs, the interventions may include the holding of meetings with referring medical practitioners to discuss the findings of the audit and the requirements of the radiology department, inclusion of the completion of RRFs in the induction programme for new medical practitioners, returning individual incomplete RRF to a referring medical practitioner for completion, and in radiology departments with RIS and PACS, consideration should be made for completing all mandatory fields before an electronic RRF can be submitted.<sup>9</sup>

### Stage 6: Re-auditing

When change has been implemented, it is mandatory to repeat the audit process to ensure that the changes introduced have led to the expected improvement.<sup>2,6</sup> This is what it means when clinical auditing is described as a continuous process or spiral and not as one cycle. Sometimes, re-auditing may be carried out several times before improvement in the imaging practice is made and the set standard achieved.

### BARRIERS TO CLINICAL AUDIT

The barriers to successful audit reported in the literature include:

1. Lack of knowledge and skills amongst healthcare professionals.<sup>7</sup> To overcome this challenge, clinical auditing should be integrated into both undergraduate and postgraduate healthcare professional's curricula, including radiography.
2. Fear of being blamed, amongst healthcare professionals, if mistakes are identified. Employers should assure their employees that the aim of audits is for quality improvement and not to blame individuals.<sup>2</sup>

3. Organisation problems, such as lack of a supportive relationship between healthcare professionals and their managers in terms of audit resources.<sup>13</sup> Provision of support is important to keep the improvements going.

4. Lack of time to conduct audits.<sup>7,14</sup> In a study conducted by Nachalwe and Bwanga,<sup>14</sup> a lack of time to conduct audits was reported by consultant radiographers as one of the challenges in the delivery of quality breast imaging services in the United Kingdom (UK). Therefore, radiology departments should secure time for conducting clinical audits.

### CONCLUSION

This educational article has demonstrated the importance of conducting clinical audits for the improvement of imaging services. Radiographers have a professional responsibility to conduct or participate in clinical auditing of the imaging practices. To perform this role effectively and efficiently, radiographers should acquire knowledge and skills during their undergraduate and postgraduate studies as well as through continuing professional development (CPD) learning activities. To understand the process of clinical auditing, radiographers are encouraged to undertake a clinical audit on any imaging practice that may require improvement, in their respective radiology departments.

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