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Audit in ultrasound: An introduction and overview

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Introduction

This paper provides an introduction and overview to clinical audits within ultrasound. It describes what an audit can achieve, who is involved, and its role in contemporary medicine. We highlight how audits are used to optimise patient care and the smooth running of departments. Drawing from our experience and local practice within the United Kingdom (UK) we demonstrate the practical uses and benefits of audit in clinical departments. Sonographers can use this paper as a resource to take their audit ideas forward and implement them in the clinical environment. Although examples within this paper have been provided from a UK perspective, the principles can be transferred to other countries and regions.

What is an audit?

Audit is defined as a tool for healthcare professions to review the quality of care being provided and whether this is in line with current guidelines and standards (1). Audits provide transparency for healthcare providers and patients; reviewing how services are operating, highlighting areas that are doing well and, identifying where there could be improvements (1). Audits aim to review current performance and facilitate optimisation of care as part of the continuing evolution of healthcare provision (1, 2). Audits review clinical practice against explicit standards of care (3) and can also be utilised to guide training programs, advanced practice and research projects facilitating sonographer role development and expansion.

Audit is a systematic, cyclical process (1, 2, 3) which takes a specific question, or area of interest, and tries to answer or review it with a systematic and analytical approach to data collection and interpretation. The audit cycle progresses by using the insights and answers gained, to positively change practice. The audit cycle then repeats to review whether the implemented changes have the desired effects and outcomes or whether further changes need to be made (3). Audit in clinical practice forms one of the key areas of clinical governance (1, 2, 3).

What is clinical governance?

Clinical governance is a broad system through which healthcare organisations are accountable for continuously improving and safeguarding the quality of care through the creation of an environment in which clinical care excellence can flourish (4). It is upheld by seven key pillars (5) which are audit, clinical effectiveness, risk management, openness in the use of clinical information, education and training, staff management, and the patient experience. In clinical ultrasound, ultrasound practitioners should be actively involved in this process of accountability as a part of their professional activities.

Audit forms a key part of clinical governance, using a defined process to assess, evaluate and improve the care of patients (2, 3). Audit's specific methodology allows the first steps of clinical governance to occur, facilitating investigations into current practice, and identifying any changes that may be required to improve care and the patient experience. Without audit, we could not have clinical governance.

Whose responsibility is an audit?

Every healthcare profession must aim to improve their standard of care (3). There is a well-documented gap between the gold standards of care outlined in national guidelines and literature versus clinical performance (3, 6). Health professionals have an ethical obligation to close this gap wherever possible to avoid harm coming to their local population (5,7), and as a result should proactively participate in clinical audit. Audit teams include several roles that are customisable for the specific audit project (Table 1). If not a part of the clinical audit team, sonographers must be involved with the audit process. For example, peer-review audit informs sonographers on their competency levels and areas for self-improvement. It can be regarded as a Continued Professional Development (CPD) activity for sonographers, helping them to reach cutting edge practice and benefit of their patients and service users.

Ethical considerations

Ethical conduct is a key focus of healthcare. Ethics need to be considered in any case where there are potential causes of harm or benefit to others (6). As audit focuses on reviewing performance to minimise harm and implement beneficial changes for the local population, we must review whether an audit requires ethical approval before being conducted. The National Health and Medical Research Council (Australia) and the Healthcare Quality Improvement Partnership (UK), for example, have both produced several resources to help elucidate the ethical considerations surrounding audit, quality improvement, and research (6,7).

Clinical audit is a data-driven quality improvement process which has the potential to positively or negatively affect the delivery of healthcare services, and as such, requires ethical consideration (6). Clinical audits should undergo ethical consideration and be assessed and documented with the local research and ethics team, audit lead/ manager, or a clinical audit committee (6,7). This is to ensure that approval and authorisation for the project has taken place, as individuals conducting the audit may not recognise that the project proposal breaches any ethical issues (6).

Some institutions state that clinical audit does not require ethical review (6,7) and as such, guidance from the local institution as to whether audits require ethical approval or not should be sought (6,7). However, guidance documentation advises that at minimum, there should be a designated member of staff who is responsible for the ethical considerations of audits undertaken to ensure that any ethical issues are identified and addressed accordingly (6,7).

What types of audits are there?

Anything that is measurable and can be compared to an explicit benchmark can be audited. For example, measuring true waiting times against current target waiting times can be used to facilitate the reduction of delays. Another example is assessing sonographer accuracy in calculating foetal weight by comparing sonographer foetal weight calculations to the true birth-weight of the new-born. If significant discrepancies are found, review of sonographer education and training relating to birth-weight calculation is indicated. We describe three different types of audit below, and their potential impact on different facets of sonography.

Audits locally and nationally

Audits can be undertaken locally and nationally (8). Local audits can ensure that the local population of patients and service users receive optimal care which is held up to the highest standards of openness and transparency (8). These may have limited focus, or be larger, contributing to national audits. National audits are generally registered through external regulatory bodies (7,8), where these bodies review the national standards of care across the governing region (7,8). Overseeing

bodies for national audits help to ensure that patients or service users with some of the most commonplace conditions are receiving the best quality of care possible, within their geographical location. This is achieved by working with national groups to assess the quality of healthcare provided, and assist managers and care providers in policy-making, based on the outcomes of adverse events and other collected data (7,8).

Performance-related audit: Peer review audit

Peer review audit can be used within ultrasound departments to ensure that departmental practices are safe and effective for service users/patients. Peer review audit has been a great success in the UK with multiple hospitals reporting good outcomes from audits, highlighting how local audit teams ensure sonographers are operating at high standards and that they and their team are providing optimal care (9). If substandard quality is found, performance review and development can be addressed to improve the quality of practice. A peer review audit requires reviewing 5% of all or 5% of a focussed area of sonographer's work be peer reviewed anonymously to ensure high-quality imaging and measurements, and that documented images and sonographer reports are in agreement.
Peer review audit tools such as the British Medical Ultrasound Society (BMUS) tool demonstrated in Table 2, have been designed as a quality assurance tool specifically for sonographers (10).

Outcome related audit: Ultrasound findings against a defined standard

Outcome audits examine and review the results of aspects relating to the delivery of care, such as medical outcomes (12). In ultrasound departments, this type of audit can be useful in demonstrating the accuracy of ultrasound findings to identify areas for further education, training or research. Furthermore, outcome audits may be useful for sonographers comparing their accuracy in creating accurate diagnostic conclusions, such as accurate diagnosis of appendicitis in children (13). This is important for individuals extending and developing their roles, scope of practice and expertise.

With outcome related audits, it is important to identify several key criteria to optimise the results including:

1. A clear objective – addressing an underlying issue or question such as “what is the diagnostic accuracy of an individual’s staging of cancerous lesions”
2. Criteria of good practice – a comparator to audit against with defined acceptability levels based on evidence or guidelines such as “positive predictive value of 95%”
3. Assessment criteria – a clear method of measuring the objective “ultrasound report compared to histopathology”

The advantages of outcome related audits are that they can confirm competence in individuals and/or a diagnostic tool, identify areas for further training and provide reassurance to individuals and teams involved in specific areas of patient management.

Process audit: Assessment of pathways and processes in ultrasound departments.

Process audits examine the processes involved in the delivery of care from referrals to final ultrasound reports, which may involve aspects such as waiting times, examination practices and protocols. Similar to outcome audits, process audits require clear objectives, a set standard for comparison and a measurable assessment where the aim is linked to quality/service improvement.

An example is to review a care pathway to identify how to improve the time from presentation to diagnosis and treatment in a patient group. Using Williams et al’s audit of timescales related to

Achilles tendon rupture within an English NHS trust (14), the process audit steps are described below.

1. Determine clear audit objective – What are the current timescales involved in the diagnosis and management of suspected Achilles tendon rupture?
2. Determine criteria of good practice – a comparator to recognised standards (Swansea Morriston Achilles Rupture Treatment (SMART) protocol) (14)
3. Determine assessment criteria – timescales from presentation to management decisions, accessed from patient information records.
4. Identifying improvements – key areas of the patient pathway are identified for redesign/improvement
5. Plan for sustaining improvements – implementing new pathway with audit cycle to be repeated in 1 year to re-evaluate changes made and identify any further improvements or changes.

The advantage of process audits is their ability to identify areas for improvement and provide evidence to support anecdotal observations seen in day to day clinical activity. Disadvantages include the time-consuming nature of collecting data, and the recommended detailed preparation that is required.

The Audit process

The audit process can be applied at all stages of the ultrasound service, from initial referral to the delivery of ultrasound in the clinic. It can address examination practices and protocols, ultrasound report quality and waiting times. When utilised as a tool for learning, development, and role expansion audit can be used to compare a trainee's standards and progression overtime to a pre-established benchmark, i.e. the success rate of a sonographer performing thyroid fine-needle aspirations compared to the standard established by current consultant success rates.

The audit process can be broken down into five stages (3, 10):

1. **Preparing for the audit/identifying the topic**

Audit requires investment in both time allocation, skill mixes, staffing, and occasionally monetary funding. Audit preparation requires clear, well-defined aims (3, 14) where time is required to choose and hone the topic or theme and scope of audit. Without a clear focus, it becomes difficult to pinpoint any focus areas and subsequently implement any successful changes. The audit team needs to have regular dedicated time and clearly defined roles to allow the smooth running and review of the audit findings (3, 15).

2. **Selecting criteria and setting standards**

To maintain a clear focus throughout the audit, clearly defined, systematic data collection methods with explicit criteria should be selected. The aspects that are going to be reviewed must be measurable, using qualitative or quantitative data and must have an agreed measurement system for calculations. If this cannot be achieved then the audit topic may need reviewing and refocusing (3,15). It is vital that an explicit standard is set, such as published guidelines, benchmarks or gold standards.

3. **Measuring the level of performance and data collection**

The audit team openly, systematically, and thoroughly measures and reviews the current performance of the agreed subject against the pre-agreed standard (2, 3, 15). This data is used to

highlight any gaps between current practice and the desired best practice that need addressing (2, 15). The audit methodology will vary depending on the topic being audited, however, the measurements and calculations must be systematic, pre-agreed, and rigid to allow through interrogation of the data collected. Data may be collected prospectively, or retrospectively depending on the audit design (3, 15). Following the data collection and analysis the findings from the audit should be documented and reported by the audit leader to the appropriate overseeing department or body so that the results can be formally recorded. Depending on the type of audit the results may also be presented to the individual or group for feedback, this may be in the form of a formal report or presentation.

4. Making improvements

Once areas of improvement are identified, a review of potential barriers is advised to optimise the implementation of changes. Open discussion with staff, patients, and all relevant people involved in the audit regarding the findings can help address potential barriers and assist in the implementation of change as all parties feel involved and can feedback any concerns. Depending on the audit style and focus, focused individual changes may be required, or more broadly, optimisation of education and training may be required (3,15). Changes can be characterised as organisational change, or behavioural change, or cultural or group changes (3, 15).

5. Sustaining improvements

Re-audit is vital to assess the success of any implemented changes. Re-auditing compares the new clinical norm to the pre-established benchmark and allows review of any positive or negative outcomes that may occur due to the implemented changes (3, 15).

Re-audit requires dedicated time and staffing to ensure it is optimally performed. Furthermore, the quality of the audit needs to be assessed, this can be performed via a range of tools widely available such as by Walshe and Spurgeon (16) and Millard (17). A review of the audit quality allows healthcare professionals to develop and advance their auditing skills as well as ensure that their work is up-to-task when it comes to implementing practice changes (3).

The audit cycle (Fig1) is the main framework used to describe the above process and helps healthcare workers visualise how the cycle repeats and facilitates perpetual forward motion. Setting up a successful audit may take several attempts.

What do you need for an audit?

To undertake an effective and worthwhile audit there are several aspects to consider in preparation to ensure success.

- Set a topic

When setting the topic and its objectives as identified earlier, the team should aim to be SMART: specific, measurable, attainable, relevant and time-based. These criteria should be met for audit to have the best chance of success. Topics can range from national screening programs to local department issues such as handwashing, probe decontamination or waiting times.

When setting the topic it is also important to identify whether the audit is to measure or evaluate an existing service provided as this may affect the data collection methods, for example reviewing ultrasound reports from the previous month, or whether the audit is to evaluate something in real-time/prospectively, for example collecting patient experience information in real-time following service use.

- Standards

As previously established, it is essential to identify an evidence-based standard against which quality can be measured. Sources of standards may include: Professional guidance/legislation, research findings, recommendations or consensus and/or local agreements. Standards must also have measurable indicators such as time, patient experience factors, diagnostic accuracy (sensitivity/specificity/positive predictive value).

- Data to collect

The standard and indicator allow the measure of quality, however a SMART topic must be achievable to collect the required information. For example, the data must exist and be available, or be feasibly created without bias, be relevant and explicitly measurable to facilitate collection and interrogation. Only with such data can the audit team assess the accuracy of the variables compared to the desired standard. For instance, it is unhelpful to audit an outcome of a patient attribute, if that attribute is not recorded or available.

- Time/resources

The time and resources required to collect and evaluate data in an audit should not be underestimated. The audit team should be allocated appropriate and regular time to undertake their work. As an example, peer review within an established system has been informally estimated to take 5 minutes per examination. Optimal time management can be facilitated by the audit team working collaboratively with set tasks and a timeline. Setting deadlines is key to maintaining schedules, even if they need to be adjusted.

Pitfalls of conducting an audit

Some pitfalls to be aware of when conducting audit come from perceived disadvantages by those undertaking or being audited and barriers to conducting an audit. Audit in clinical environments have been perceived as diminishing of the work that others have conducted, with health care professionals fearing litigation and professional isolation (19). To overcome these fears and perceptions by ultrasound practitioners it is vital that the audit is conducted transparently with involvement at all levels of the workforce to reassure everyone the purpose and benefits of being involved in audit in clinical practice.

Barriers to conducting audit include a lack of resources, lack of expertise in audit design and analysis, intergroup working disagreement, lack of an overall plan for audit and organisational impediments (19). Throughout this article the authors have sought to provide the resources to prevent many of these barriers. Through reviewing the guidance of professional groups and their own experiences of audit, this comprehensive overview described how to plan an audit, highlighting the need for time and resources, whilst pointing out the ethical and professional organisations that may need to be involved.

Where to start?

This article has provided key factors to consider, with the authors providing examples from their experience within the UK. Despite this, any topic may be used as the basis for an audit, if it fits the relevant criteria, is within ethical standards, and can be measured with a clear standard for comparison. There are with several historical and freely available tools to aid assessment of audits to ensure they are safe and performing well (16, 17). UK based organisations, such as the Royal College of Radiologists, the Society and College of Radiographers the Royal College of Obstetricians and

Gynaecologists and BMUS also offer guidance relating to standards of ultrasound service provision which can be applied to most ultrasound audit topics outside of the UK (9,10,12). These resources provide valuable advice on standards of ultrasound within the UK with updates and definitions of high standard ultrasound examinations, quality assurance methods and examples of pre-existing audits with several publications within the published literature demonstrating how to begin setting up an audit, and how to ensure that the audits are conducted thoroughly (15, 12, 20).

Conclusion

Audits ensure that sonographers are continually meeting the optimal standards of care outlined in guidelines or contemporary literature. They identify issues which might inhibit sonographers from achieving these standards. The utilisation of clinical audits both nationally and locally performed clinical audits ensure the clinical proficiency of sonographers, help guide education and training, and open doors for advanced practice and role development. Sonographers should be involved in audit to some degree to facilitate optimal care, education, and training. There is an abundance of online resources to help facilitate the adoption of clinical audit into day-to-day practice.

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Table 1. Audit team and their roles

Audit team roles	Responsibilities	Example
Leader	Identifying and creating the audit criteria. Identify other members of the team, organise meetings and disseminate results/feedback.	Clinical lead sonographer auditing quality of ultrasound scans and reports for fetal anomaly screening standards (FASP). The leader identifies senior sonographers to peer review students and junior members of the team against FASP standards on review of 20-week anomaly scans in their local department in the UK. The leader organises a meeting at the beginning and end of the audit period, organising retrieval of audit data.
Data collection	Organises data suitable for information retrieval during the audit process.	IT systems administrator provides a list of patient data as requested by the leader, in this case, a list of all of the patients who have received an anomaly scan from the specific sonographers during the period specified.
Data analysis	Analyses of the data collected using the specific standard and tool for measurement and comparison.	Senior sonographers compare the scans and reports against the set standard (FASP anomaly standards). This is recorded using an audit tool and shared with the audit leader.
Audit meeting	The audit team meet at the beginning and end of the audit process to identify the set standard and identify the results. Any recommendations for further improvement or re-audit it decided.	Leader to organise, all sonographers involved to attend the set-up of the audit and the end of the audit. Any areas for improvements are highlighted, where the lead sonographer will feed this back to the individual sonographers. Any improvement plans are decided, this is implemented and plans for re-audit are made with the team. A summary is provided to the local hospital audit team.

Table 2. Peer review audit – quality indicators (11)

Image scoring	Image quality	Report scoring	Report quality
3	High-quality examination. Or, suboptimal images with evidence of patient factors and attempts to address these.	3	Content and structure optimal
2	Reasonable image quality but a few poorer quality images. (incorrect focus, measurement, protocol, label etc)	2	Report satisfactory but additional diagnosis or advice could have been provided
1	Poor image quality with inadequate attempt to optimise	1a	A disagreement of interpretation: requiring action
		1b	A disagreement of interpretation: not requiring action

Figure 1. Audit cycle (18)