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CENTRE FOR CLINICAL GOVERNANCE RESEARCH

Clinical audit: a comprehensive review of the literature



The Centre for Clinical Governance Research in Health

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Clinical audit: a comprehensive review of the literature

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- Audit

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- *Embase from 1980*
- *CINAHL from 1982*

Criteria applied

- Phrase

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CONTENTS

1. Introduction	2
2. Background	2
2.1 Definition of clinical audit.....	3
3. Method	4
3.1 Overview of method and research question.....	4
3.2 Review process	4
3.3 Search strategies	5
3.3.1 Search of databases	5
3.3.2 Hand search of journals	5
3.3.3 Search of grey literature	6
3.3.4 Snowball and citation tracking.....	6
3.4 Search findings.....	6
3.5 Analysis.....	7
3.5.1 Triangulated reviewer analysis.....	7
3.5.2 Concept analysis.....	7
4. Findings and discussion	8
4.1 Overview of concepts emerging from the clinical audit literature	8
4.2 Thematic analysis of clinical audit literature	10
4.2.1 The purpose of clinical audit.....	10
4.2.2 The clinical audit process	11
4.2.3 Clinical audit instruments and tools.....	17
4.3 The evidence base for clinical audit.....	13
4.4 Limitations of clinical audit	13
4.4.1 Criteria.....	14
4.4.2 Quality of data	15
4.4.3 Involvement of consumers in audits	16
4.4.4 Role of feedback	17
5. Conclusion.....	18
6. References.....	19
7. Appendices.....	25
Appendix A: Evidence sheet	26
Appendix B: Examples of peer review instruments.....	27
Appendix C: Advice given by HcAT to assessors providing feedback	29
Appendix D: Bibliography and abstracts	39

1. INTRODUCTION

The Centre for Clinical Governance Research (CCGR) was asked by Statewide Quality Branch in March 2009 to identify, review and synthesise evidence on a range of topics intended to support the *Understanding clinical practice toolkit*. This review is a comprehensive analysis of the literature on the use of peer review with and by doctors. Following reviews address issues of: peer review; morbidity and mortality; case review; limited adverse occurrence screening; clinical indicators and complaints.

The review uses the protocol for the rapid assessment, conceptualization, and timely concise analysis of the literature [PRACTICAL],^a developed by the CCGR. PRACTICAL emerged from CCGR's research in the fields of clinical governance, patient safety, interprofessionalism and accreditation amongst other areas.

In this review we present the results of a comprehensive review of the literature on *clinical audit*. The literature was identified using a combination of data searching, hand searching of journals and snowball technique. At the end of the review we provide a selection of abstracts and citations, arranged alphabetically by author, for the articles identified using the outlined search strategy.

2. BACKGROUND

Clinical audit has a history stretching back to the work of Florence Nightingale (1800s) and Ernest Codman (early 1900s). Both Nightingale and Codman monitored mortality and morbidity rates in their respective institutions. Nightingale used an epidemiological method of review, monitoring rates of nosocomial infections in relation to standards of hygiene. Codman introduced the idea of systematic record review as a way of identifying errors.¹⁻³

Clinical audit is gaining popularity in health services as a first step in quality improvement strategies and as part of accreditation processes.⁴ As this monograph is part of a series which addresses other type of audit mechanisms, including record reviews and limited adverse event occurrence screening, this review will focus on clinical audits in particular (as compared to audits in general). As the authors of the Cochrane review state in a follow up article to their systematic review of audits and feedback: "... *audit and feedback will continue to be an unreliable approach to quality improvement until we learn how and when it works best. Conceptualising audit and feedback within a theoretical framework offers a way forward.*"^{5: 50}

^a Jeffrey Braithwaite had the idea of labelling the Centre's mode for reviewing literature 'PRACTICAL'. This monograph was written by Joanne Travaglia, Jeffrey Braithwaite and Deborah Debono

2.1 Definition of clinical audit

The notion of clinical audit emerges from that of medical audit. The National Health Services (NHS) in the United Kingdom (UK) defined medical audit in 1989 as *“the systematic critical analysis of the quality of medical care including the procedures used for diagnosis and treatment, the use of resources and the resulting outcome and quality of life for the patient.”*⁶

In subsequent years, the definition of audit has changed to be more encompassing of all clinicians, although the term medical audit, along with nursing and pharmacy audit continue to be utilised. The UK’s National Institute for Health and Clinical Excellence (NICE) defines clinical audit as:

“.. a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the review of change. Aspects of the structure, process and outcome of care are selected and systematically evaluated against explicit criteria. Where indicated changes are implemented at an individual, team, or service level and further monitoring is used to confirm improvement in healthcare delivery.”^{7: 1}

The authors of the Cochrane Review on audit and feedback offer a narrower definition. For them clinical audit is: *“The provision of any summary of clinical performance over a specified period of time. The summary may include data on processes of care (e.g. number of diagnostic tests ordered), clinical endpoints (e.g. blood pressure readings), and clinical practice recommendations (proportion of patients managed in line with a recommendation).”*⁸

3. METHOD

3.1 Overview of method and research question

We undertook a search of the term clinical audit using several databases, hand searches of key journals, using the snowball method, and via a search of the grey literature on websites associated with clinical governance. As a Cochrane review on audit in general has already been conducted,⁹ this review focused on the specifics of clinical audit. The original list of search terms used in this review is presented in Table 1.

Table 1: List of search terms for clinical audit literature

Search terms
1. clinical
2. audit

3.2 Review process

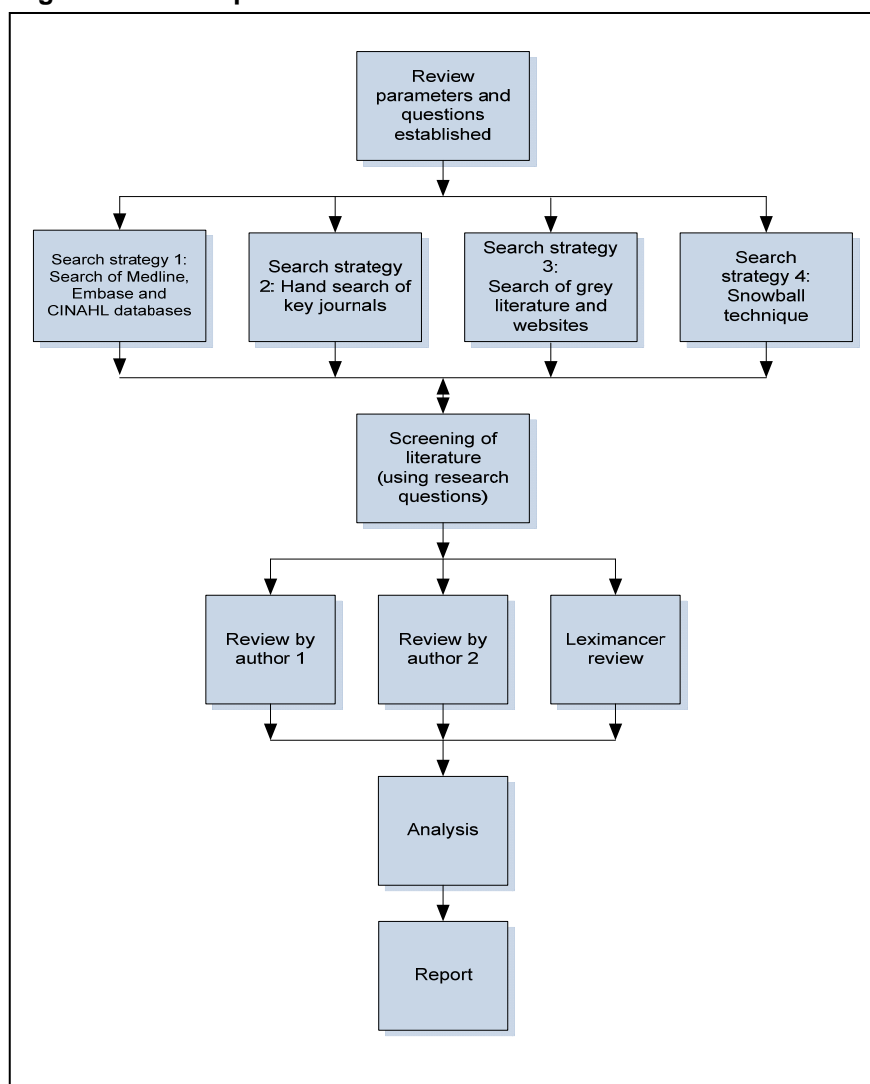
We utilised a five phase review process, as outlined in Figure 1. Phase one involved establishing the review parameters, as required by Statewide Quality Branch. The search was limited to clinical audit and was to consider instruments as well as evidence for the effectiveness of the tool.

Phase two was the search itself, which involved identifying literature and resources associated with clinical audit from four different, but overlapping sources: databases; key journals; grey literature; and through snowball technique and citation tracking.

Phase three was screening of the literature. This involved removing any extraneous, inappropriate or incomplete references. As this is a targeted review, only directly relevant references were included.

Phase four was the review of the literature. Research articles were noted, as were articles which provided examples of clinical audit tools or instruments. The remaining articles were examined by two reviewers, and then the abstracts subjected to data-mining in order to identify the key concepts. Phases five and six were the analysis of findings, and the writing of this report.

Figure 1: Review process



3.3 Search strategies

3.3.1 Search of databases

The first level of our search strategy was to use the terms indicated in Table 1 to interrogate three databases: Medline, EMBASE (medicine) and CINAHL (nursing and allied health). In the first analysis limited our results to references those relating to human subjects, and those pertaining to physicians (using the variety of terms indicated above).

3.3.2 Hand search of journals

We then hand-searched key journals for similar terms relating to clinical audit. The journals searched included:

- Quality and Safety in Health Care;
- International Journal of Quality in Health Care;
- Journal of Evaluation of Clinical Practice;

- Academic Medicine; and
- American Journal of Medical Quality.

3.3.3 Search of grey literature

Our third strategy was to examine the grey literature. Amongst the websites reviewed were:

- Department of Human Services (Victoria)
- Departments of Health in each state and capital Territory in Australia
- Agency for Healthcare Research and Quality (United States)
- National Health Service (United Kingdom)

3.3.4 Snowball technique and citation tracking

Our final strategy was to “snowball” that is, to follow up on any additionally, previously un-identified references in the bibliographies or reference list of articles reviewed, or as listed on websites.

3.4 Search Findings

We present our search findings in Table 2. These include all findings from our database searches up to, and including, the removal of duplicates. Once the references were identified they were downloaded into Endnote X2, a citation manager.

Table 2: Search findings for selected databases

	Medline 1950 to June Week 2 2009	Medline in process & other non- indexed citations June 18, 2009	EMBASE 1980	CINAHL 1981 – 2009 (Includes pre- CINAHL)	Total
1. Clinical audit\$	1137	35	843	454	2469
2. Total minus duplicates					1607

On examination of the findings, and in line with the purpose of the review, we removed citations that were incomplete and could not be verified (ie were missing information such as author or source, and references to veterinary audits. Many of the articles identified were, as is common in this type of search, studies of outcomes of audits. These articles were reviewed for inclusion of types of use. The focus of the review was, however, on articles which address the clinical audit method per se. We then included 60 additional references

which were identified using hand searches and the snowball technique.

3.5 Analysis

3.5.1 Triangulated reviewer analysis

Once the preliminary screening and review was completed, thematic content analysis of the citations was undertaken. As the data was analysed, selected studies of clinical audit were extracted and are presented separately in Appendix C.

Two independent reviewers were used to analyse the evidence and our findings were blinded from each until completed. At that point, a discussion of the similarities or differences of categorisation of the literature was undertaken until agreement was reached. This step, along with the data mining of the literature, reduces the amount of subjective bias in the analysis of evidence.

3.5.2 Concept analysis

The citations and abstracts relating to clinical audit were mined using Leximancer, a computerised content analysis tool. A conceptual map which summarises the key concepts in the literature, and a ranked list of concepts from emerging from the citations are produced in the next section of this document.

Table 3: Ranked map of key concepts relating to clinical audit

Concept	Count	Relevance
audit	4449	100%
clinical	3715	84%
patients	1166	26%
care	1072	24%
practice	750	17%
quality	682	15%
health	549	12%
patient	541	12%
study	540	12%
data	514	12%
use	507	11%
management	485	11%
hospital	437	10%
treatment	417	09%
used	410	09%
guidelines	361	08%
general	359	08%
medical	352	08%
results	338	08%
Clinical	326	07%
assessment	307	07%
review	285	06%
improvement	282	06%
improve	281	06%
information	270	06%
staff	270	06%
using	269	06%
outcome	269	06%
time	261	06%
service	257	06%
process	255	06%
services	255	06%
development	251	06%
research	247	06%
cases	242	05%
outcomes	228	05%
primary	222	05%
significant	218	05%
standards	217	05%
effective	216	05%
risk	215	05%
analysis	211	05%
during	211	05%
system	210	05%
period	204	05%
audits	203	05%
case	196	04%
factors	195	04%
acute	191	04%
group	188	04%
including	182	04%
methods	182	04%
therapy	178	04%
approach	177	04%
based	177	04%
rate	177	04%

Concept	Count	Relevance
studies	176	04%
surgery	168	04%
criteria	163	04%
performed	163	04%
months	162	04%
pain	159	04%
diagnosis	158	04%
cancer	156	04%
required	156	04%
year	150	03%
surgical	146	03%
disease	146	03%
women	137	03%
common	134	03%
age	127	03%
following	126	03%
included	119	03%
blood	117	03%
total	110	02%
reported	97	02%

4.2 Thematic analysis of the clinical audit literature

Once we had reviewed the findings from the data mining of the literature, and had undertaken our preliminary review of citations, we established four key organising themes. These are presented in Table 4, below.

Table 4: Categories identified in the literature on clinical audit

Category
Purpose
Process
Instruments and tools
Feedback

4.2.1 The purpose of clinical audit

Clinical audit is a broad term which encompasses several of the other quality improvement strategies reviewed in this series including record reviews, peer review, standard reviews (to see if standards are being met, guidelines followed and or evidence based practice utilised) and patient satisfaction surveys. As mentioned in the introduction, the purpose of clinical audits is essentially to improve the quality of healthcare services by systematically reviewing the care provided against set criteria. The gap between the criteria and the assessed performance provides guidance for priority improvement strategies.^{7 10} Although medical audits pre-date clinical governance, clinical audits are seen as an important tool in the clinical governance ‘tool kit’.^{11 10 12-15}

In 2002 the National Institute for Clinical Excellence (NICE) in the UK released

a document entitled “Principles for best practice in clinical audit”⁷ which established the parameters for clinical audits. A number of professional and quality and safety bodies also provide their own audit advice and standards, including, for example the Royal College of Anaesthetists.

4.2.2 The clinical audit process

Sneddon et al (2006) provide an effective summary of the clinical audit purpose and process. Clinical audit is for them “... one of the main tools to establish whether the best evidence is being used in practice, as it compares actual practice to a standard of practice. Clinical audit identifies any gaps between what is done and what should be done, and rectifies any deficiencies in the actual processes of care.”¹⁶

The clinical audit process is a cycle or spiral of activities which can be repeated as required, as depicted in Figure 3. Clinicians choose a topic or area which they want to assess or which they know they wish to improve. They then establish objectives for the audit and review available evidence. Based on these objectives and evidence a set of standards or criteria are established, against which current practice will be assessed. Clinicians then decide on a data strategy, and conduct a pilot audit. Once the results of the pilot have been examined, the actual practice to be assessed is observed and data collected. These data are then analysed, the findings discussed with relevant stakeholders, a quality improvement or change strategy identified and implemented, and a re-audit conducted.⁷ Several cycles can be utilised.¹⁷ Table 5 below summarises each of the stages in the audit

Figure 3: Standard audit cycle (modified from NICE)⁷

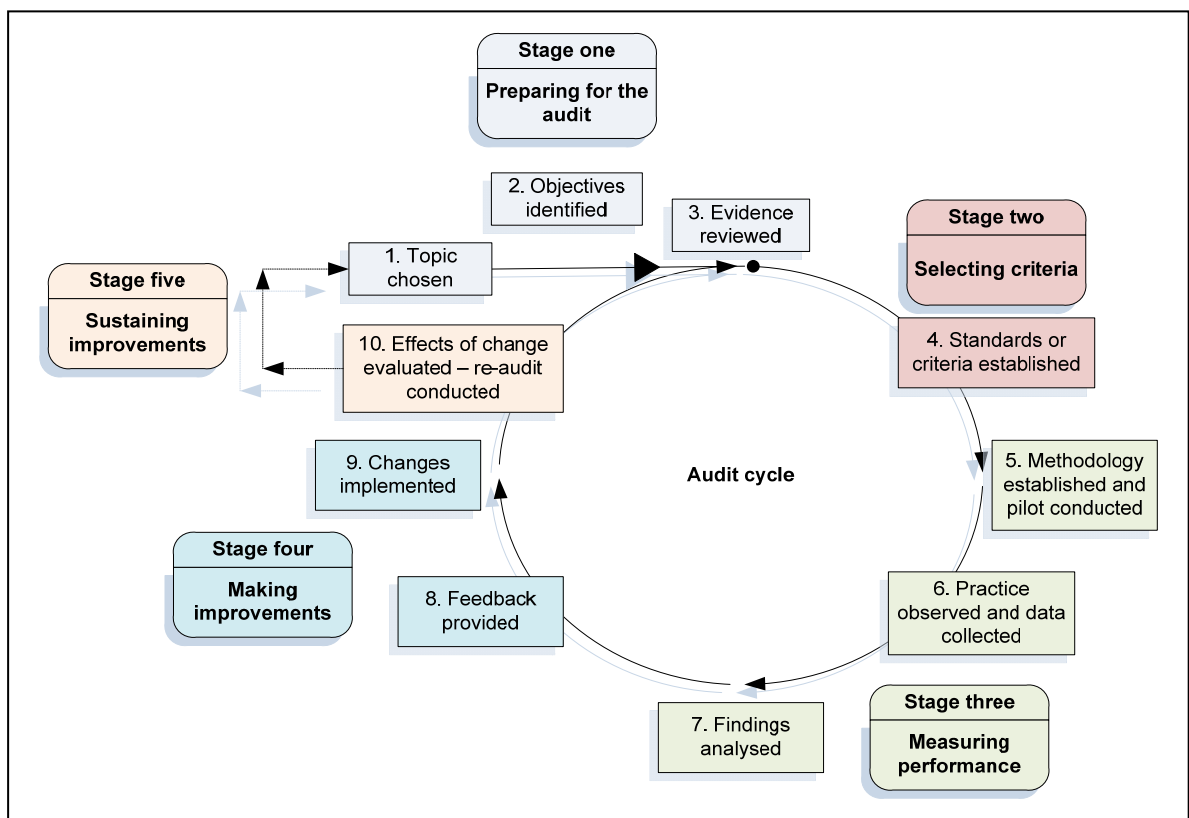


Table 5: Steps in the clinical audit process^{5 7}

Stage	Step(s)
1. Preparing for the audit	<ul style="list-style-type: none"> • Involving stakeholders, including consumers, in the process • Select a topic (based on cost, volume, risk to consumers, serious quality problem, complaints, available evidence, amenability to change, priority, policy directives or guidelines) • Defining the purpose of the audit (improvement, enhancement, ensuring quality, or instigating change) • Establishing or activating necessary structures (committees and meetings, feedback systems) • Identifying skills and people needed to carry out audit • Providing training to audit team as necessary (project management, audit method skills, change management skills, data collection and analysis and facilitation skills)
2. Selecting criteria	<ul style="list-style-type: none"> • Defining criteria (measurable) and standards (level of performance or care to be achieved) against which to assess the process and or outcome of care • Drawing criteria from existing guidelines and or systematic reviews • Prioritising criteria (based on the research evidence) • Making criteria explicit and subjecting it to external peer review
3. Measuring performance levels	<ul style="list-style-type: none"> • Identifying the data to be collected (patient and case types, healthcare professionals and their involvement, time period), determining sample size, data sources, data extraction tools and techniques, reviewer training and method of analysis
4. Making improvement	<ul style="list-style-type: none"> • Identifying the level and location of change (organisational, group, individual); the barriers to change establishing the environment for the audit; and involving stakeholders
5. Sustaining improvement	<ul style="list-style-type: none"> • Monitoring and evaluating change • Maintaining and reinforcing the change

4.2.3 Clinical audit instruments and tools

Clinical audit is a process or approach and as such lends itself less to the creation of specific tools and more to the application of existing resources to a set method. That said, as in the case of peer or record reviews, checklists, alerts and computer software programs have been developed as a way of improving the accuracy of, and reducing the time taken, for clinical audits.^{12 18 7}

The results in one study show that the use of this type of technology did reduce the time taken for audits, and was positively viewed by clinicians.¹⁹ A second study utilising computerised record review for the monitoring of hypertension found that while *“using a computerized clinical record appears [did not appear] to be sufficient to obtain good clinical performances [it was] a necessary first step to clinical audit.”*²⁰ An example of an Australian internet based clinical audit tool, developed by the Royal Australian College of General Practitioners, is

provided in Appendix B.

4.3 Evidence base for clinical audit

A systematic Cochrane review of evidence for the effectiveness of audit and feedback was first conducted in 2003.⁹ That review found that while *“Audit and feedback continues to be widely used as a strategy to improve professional practice. It appears logical that healthcare professionals would be prompted to modify their practice if given feedback that their clinical practice was inconsistent with that of their peers or accepted guidelines. Yet, audit and feedback has not consistently been found to be effective and when it is effective, the effects are generally small to moderate. The results of this review do not support mandatory or unevaluated use of audit and feedback as an intervention to change practice.”*⁹

The review was updated by the same authors in 2006.⁸ In this second review, the authors had come to another conclusion. After reviewing an additional 30 new studies (making the total 118) they found that: *“Audit and feedback can² be effective in improving professional practice. When it is effective, the effects are generally small to moderate. The relative effectiveness of audit and feedback is likely to be greater when baseline adherence to recommended practice is low and when feedback is delivered more intensively.”*^{8: 2}

Even with the reconsideration by the Cochrane Review team the evidence base for impact of audits on performance improvement is relatively weak.^{5 8 21-23} Counter argument for the effectiveness of audits argue that the evidence is weak not because audits are ineffective per se, but because the conditions under which audits are include a number of barriers which limit their success. These barriers include: lack of resources; lack of expertise in audit project design and analysis; lack of planning; poor relationships between professional groups and agencies, and within audit teams; hierarchical relationships between clinicians; lack of trust between clinicians and managers; and a lack of integration with other activities and priorities.²³⁻²⁶

Irrespective of the current limits of the evidence base, clinical audits continue to be requested, supported, and implemented across healthcare. Clinical audits have been used to: reduce the liability for mental health services;²⁷ reduce postpartum haemorrhages by an audit of severe cases;²⁸ review caesarean sections;²⁹ diagnosis of pulmonary tuberculosis;³⁰ evaluate the impact of nurse practitioners;³¹ assess the quality for dental,³² ambulance,³³ podiatry,³⁴ brain injury,³⁵ hemodialysis,³⁶ radiology,³⁷ obstetrics,³⁸ psychiatry,¹² general practice,³⁹ 40 emergency department,⁴¹ and rheumatology and arthritis^{42 43} services amongst others.

² Emphasis is that of the authors of this monograph

4.4 Limitations of clinical audit

In addition to the factors identified in the previous section, the effectiveness and value of clinical audit as a quality improvement method depends on a number of variables. These include the:

- clarity and measurability of the criteria and standards chosen,^{32 44 45}
- quality of the data available,^{12 18}
- engagement of clinicians^{12 13 14}
- involvement of consumers⁴⁶
- skills and training of participants,^{7 47-49}
- time involved to undertake an audit,¹⁹
- use of information technology⁵⁰
- feedback provided,^{5 8 51-53}
- if and how the findings are translated into quality improvement strategies^{33 28 54}
- evaluation of improvement strategies (closing the loop).^{47 55}

4.4.1 Criteria

As with all forms of evaluation and review, the clarity, relevance and measurability of the criteria against which the audit is conducted is a major determining factor in the effectiveness of the audit.⁴⁴ ‘Good’ criteria, Baker and Fraser (1995) note, can be used to aid in the implementation of guidelines (which conversely are a common source of audit criteria themselves⁷), and in providing a standard against performance can be assessed, and clinical audit enacted.⁵⁶ In the first instance, too broad or generalised an audit tool has been shown to result in “99%” consumer satisfaction with a service, too high a figure to be realistic.³² Benchmark criteria (comparisons of chosen criteria with others from similar services) may need to be in order to set audit expectations at an appropriate level.⁵⁷

A comprehensive review of the methods used to select clinical audit criteria by Hearnshaw et al (2002) showed that of the respondents surveyed:⁴⁴

- 71% per cent ($n = 337$) based their audit criteria on research literature and of these 78% used a literature review that was less than 3 years old and only 1% ($n = 3$) used systematic reviews;
- Only 27% recorded whether the validity of the research was appraised and 25% recorded the methods used to appraise it. In practice, over 70% of the cases that used evidence as the base for review criteria did not check the validity of the evidence;

- Of the 305 respondents who used both literature and expert opinion, 33% (n = 102) said that the method used to combine evidence and expert opinion was not made explicit;
- Consultation with colleagues was the most commonly used basis for review criterion selection and this was used as an alternative or supplement to evidence from the literature;
- Patients and carers were rarely consulted;
- Assessing the validity of review criteria is impeded by the lack of information on how review criteria were developed, even in published audit protocols.
- About half of respondents used audit review criteria that had been piloted.

The authors argued that assessment of the validity of audit criteria is hampered by a lack of information on how review criteria were developed, even when the criteria appeared in published protocols. Those using unpiloted audit criteria, they found *“risk wasting time and resources in discovering that the criteria are unfeasible, contradictory or ambiguous after collecting large amounts of data.”*^{44: iv} The risks of using implicit or undefined criteria have been noted in a number of other reports.^{45 58}

In addition to the use of guidelines, systematic reviews, and research, two additional methods for developing criteria are the use of expert panels and professional opinion, and the involvement of consumers (which will be addressed in a subsequent section). The RAND/UCLA appropriateness method, for example, combines systematic reviews of the literature with expert panel judgement.^{45 59} Limitations of the use of expert panels are common to that in the use of all reviewers: inter-rater reliability and the reproducibility of results.⁶⁰⁻⁶²

4.4.2 Quality of the data

The quality of the data gathered for the audit is dependent on factors such as sample selection and size, data sources, data abstraction tools, training of data reviewers, whether data is collected retrospectively or concurrently, and how it is analysed.^{7 63 64} Most of these issues have been addressed in the companion monograph on case review, including the need to develop audit protocols, to pilot the audit extraction tools, to compare findings across reviewers, to retrain reviewers if required and to engage clinicians. As with case reviews, the major concerns for the degree of confidence in the audit are the representativeness of the sample selected and the rigour of the audit method. One study found, for example, that a significant proportion of the clinicians interviewed were unable to adequately apply audit methods, raising questions about the reliability of the method and results for individuals who have not been adequately trained in its use.⁶³

Data is generally drawn retrospectively from electronic or traditional patient or other records (as discussed previously), or from interviews and or surveys amongst other methods. Various forms of quantitative and qualitative data analysis can be utilised, depending the source data. Plesk (1999) makes the proviso that whatever form the data analysis takes, the presentation of findings should be clear enough to be understood by all stakeholders.⁶⁵

One method of strengthening audits has been the shift from purely medical to clinical audits (implying the involvement of all health professionals and relevant staff) is supported by research. Multidisciplinary audit teams are said to result in more “robust” review processes,^{13 17 33 66} although their use is not without difficulties, particularly in the case of the integration of nurses in what were previously understood as ‘medical’ audits.⁶⁷

Finally, while most clinical audits are planned in advance, some healthcare services have introduced the concept of ‘random safety audits’. In the study reviewed, the use of these audits (conducted during grand rounds with immediate feedback provided) were shown to significantly improve the rate of compliance with infection control standards.⁵¹ One method suggested for improving the reliability of outcomes is for re-audits to be conducted periodically.³³

4.4.3 Involvement of consumers in audits

Debate about the adequate and appropriate involvement of consumers (clients, patients, service users) in clinical audits has continued for decades.⁶⁸⁻⁷¹ One of the earliest reviews, Balogh et al (1995), argued that clients should be involved in every stage of the audit process from defining the topics to the actual audit process.⁷² Yet, one of the most recent surveys of consumers’ involvement in clinical audit published in 2008 the UK showed that while National Health Service (NHS) Trusts had, over the last decade, developed more policies and structures to support consumer involvement in clinical audits the role of consumers remained essentially the same: that is limited to the provision of feedback after an audit occurred, rather than as active participants in the process. The authors’ suggestion was that the organisational culture of user involvement in audits needed to be improved, and health professionals educated and informed about the value of consumer involvement in audits.⁴⁶

Suggested sources of information for audits about consumers’ experience with the health service include: complaints letters and satisfactions surveys (addressed in a companion monograph); patient forums, critical incident and error reports; qualitative studies of patient experiences, including focus groups, interviews and patient stories; and observations of care.^{7 69 70 73 74} Comparisons between clinicians’ and consumers’ perceptions of service quality are valuable source of data for audits in that provide insight into discrepancies between clinician, patients, and clinical standards. One study into stroke care, for example, showed positive correlation between clinicians and consumers perceptions of the organisational quality of care (neither of which correlated to

clinical process standards), but discrepancies in the assessment of communication about diagnosis.⁷⁵

4.4.4 The role of feedback

As indicated by the findings of the Cochrane review⁸ audit and feedback are closely intertwined. Several follow up papers including Foy et al (2005)⁵ – the authors of the Cochrane Review and Hysong (2009) reinforce this link. Hysong reviewed the studies included in the 2006 Cochrane review,⁸ and utilising the same criteria, added studies based on a number of new inclusion criteria. She found that, like the Cochrane review, audit effectiveness was improved with good feedback. Evidence showed that the three main characteristics of effective feedback were: specific suggestions for improvement; feedback provided in writing; and feedback which was provided frequently.⁵³

In contrast a study of “maternity professionals” which compared printed reports, reports plus action planning letters, and reports plus face to face facilitated action planning as methods of audit feedback, that although feedback that was more intense was both feasible and acceptable to clinicians, the researchers were unable to demonstrate that such research actually increased the clinicians’ intention to comply with the audit criteria. Interviews with the participants showed positive attitudes towards the audit process, but a level of frustration with their ability to implement changes based on that audit.⁷⁶

Foy et al (2005) suggest caution however, in making too strong a link between the effectiveness of feedback and that of audits. They argue that the limited number of what they call “head to head” comparisons of audit and feedback alone compared to other interventions or variations in providing feedback, making it difficult to extract “*generalisable lessons about how audit and feedback achieves its effects.*”^{5: 50}

4.4.5 Making and sustaining improvements as a result of clinical audits

An analysis of the organisational, professional and change management strategies required to make and sustaining improvement strategies as a result of clinical audits is outside of the scope of this monograph. It is important to note, however, that many of the factors discussed previously as barriers to the effective implementation of audits are equally relevant to the effective implementation of the findings from those audits. Most important amongst these, are cultural change, adequate training and development for staff, and supportive organisational structures, the need for strong leadership, and support for the learning organisation approach.⁷

5. CONCLUSION

The evidence base for clinical audit is increasing. Lack of evidence may stem from two major sources: the difficulty in comparing results across studies (because of differences in settings, participants, foci of intervention and the interventions themselves vary) and because implementation of audit and feedback strategies may themselves be subject to serious limitations and barriers. As with all forms of clinical review, the effectiveness, efficiency and usefulness of clinical audit appears to depend heavily on the sponsoring institutions ability to support and facilitate the audit, feedback and, most importantly, improvement processes required to complete the audit loop.

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Appendix A: Evidence sheet

Topic area	Clinical audit
Definition:	The purpose of clinical audits is to systematically review the quality and outcomes of care against predetermined criteria, with the aim of identifying areas for improvement and then developing, implementing and evaluating strategies intended to achieve that improvement.
Origin:	Florence Nightingale and Ernest Codman in the late 1880s and early 1900s were the first to use a systematic form of clinical audit. Since the late 1990s clinical audit has been utilised as part of clinical governance and quality and safety strategies as a method monitoring and improving the quality of healthcare. It received special mentioned as an improvement strategy in the Bristol Royal Infirmary Inquiry in the UK. ⁷⁷
Description:	Clinical audit is a cyclical process, similar to action research, where individuals, teams or services identify a topic of interest or concern, identify appropriate sources of data, including medical records and feedback from clinicians and consumers, review the data against set criteria and standards, identify areas for improvement, and implement those improvements. In many cases, a second round of data collection will emerge: either as way of evaluating the effectiveness of the first round of improvements, or as subsequent issues or topics emerge. Feedback to and from participants appears to be a crucial indicator of the success of audits.
Evidence base:	Two Cochrane systematic reviews and a meta-analysis have been conducted on the use of audit and feedback on professional practice and healthcare outcomes. The reviews show that audit has a moderate impact, but that that impact is dependent on the level of performance prior to the audit, and on the feedback process. The establishment of valid criteria, the training of reviewers, particularly if they are conducting their own audits, and the provision of effective feedback are important factors in the validity of the method. Comparisons are difficult as settings, settings, participants, foci of intervention and the interventions themselves vary.
Current use:	Clinical audit is widely used as part of accreditation, quality and safety, peer review and clinical governance processes.
Applications for clinical practice improvement:	Despite the noted limitations, clinical audit appears to provide a structured, relatively simple, and effective method for practice improvement. As well as the technical issues (such as the development of valid criteria, appropriate sampling methods and training of reviewers) key issues for services are the: provision of support to clinicians undertaking audits; the adequate and skilled delivery of feedback; and the facilitation and monitoring of quality improvement practices and strategies which emerge from the audit.

Appendix B: Examples of an online clinical audit instrument

Example of an Australian online clinical audit tool³

The screenshot shows a Mozilla Firefox browser window displaying the Clinical Audit Tool website. The browser's address bar shows the URL <http://www.clinicalaudit.com.au/>. The website has a blue header with navigation links: Home, About CAT, How do I use CAT?, Forum, Tour and download, News, Testimonials, and Cooking with CAT promotion. Below the header is a large graphic with three overlapping circles in blue and green, and the text "CLINICAL AUDIT TOOL". To the right of the graphic, a text block states: "CAT allows you to: provide high quality patient care, be in complete control of your own patient information, identify patients in high risk target groups, improve practice revenue and meet accreditation requirements... and that's just the beginning!". Below this are two buttons: "Download Clinical Audit Tool" and "Tour key features of CAT". The main content area features three news items: "CAT FREE Demonstration Version now available" (dated 5 May 2009), "CAT registered for PIP eHealth Incentive Requirement 1 – Secure messaging Capability" (dated 30 April 2009), and "CAT Pap Smear Summary Report Card" (dated 27 April 2009). On the right side, there are two sections: "CAT downloads" and "What CAT users say...". The "CAT downloads" section lists three options: "Full version of CAT, details available from your division.", "CAT Demo - requires no clinical software and uses generic data set.", and "FREE 14 Day Trial of CAT - requires participating clinical software and uses your practice data.". The "What CAT users say..." section features a quote from Ken Mansbridge (CEO) and Noel Stewart (IM Program Officer) at North East Valley Division of General Practice. The browser's taskbar at the bottom shows several open applications, including "Clinical audit May 200...", "EndNote X2 - [Compl...", "Clinical Audit Tool | H...", "Radio National Strea...", and "Eudora - [In]". The system tray shows the time as 15:47.

³ <http://www.clinicalaudit.com.au/>

Appendix C: Selected evidence base for clinical audit

Table 6: Recent studies of clinical audit

Author	Purpose	Design and method	Outcome measures and results	Conclusion
Bowie et al (2008) ⁶²	Clinical audit informs general practitioner (GP) appraisal and will provide evidence of performance for revalidation in the UK. However, objective evidence is now required. An established peer assessment system may offer an educational solution for making objective judgements on clinical audit quality. National Health Service (NHS) clinical audit specialists could potentially support this system if their audit assessments were comparable with established medical peer assessors. The study aimed to quantify differences between clinical audit specialists and medical peer assessors in their assessments of clinical audit projects.	A comparison study of the assessment outcomes of clinical audit reports by two groups using appropriate assessment instruments was conducted. Mean scores were compared and 95% confidence intervals (CIs) and limits of agreement calculated. A two-point mean difference would be relevant.	Twelve significant event analysis (SEA) reports and 12 criterion audit projects were assessed by 11 experienced GP assessors and 10 NHS audit specialist novice assessors. For SEA, the mean score difference between groups was <1.0. The 95% CI for bias was -0.1 to 0.5 (P = 0.14). Limits of agreement ranged from -0.7 to 1.2. For criterion audit, a mean score difference of <or=1.0 was calculated for seven projects and scores between 1.1 and 1.9 for four. The 95% CI for bias was 0.8 to 1.5 (P < 0.001). Limits of agreement ranged from -2.5 to -0.0.	The study findings suggest that a sample of NHS clinical audit specialists can give numerically accurate feedback scores to GPs on the quality of their clinical audit activity compared with established peer assessors as part of the model outlined.
Davies et al (2007) ⁷⁴	<i>There was local concern over possible delays in the diagnosis and referral of patients with suspected colorectal cancer and</i>	<i>To use clinical audit, qualitative data from patients and feedback from general practitioners (GPs) to identify possible delays in referral, and to decrease these by implementing referral guidelines.</i>	<i>Most patients referred for endoscopy were seen within 2 weeks (67%, 119/177), but only 47% (71/151) of available referral letters mentioned rectal examination. Patients perceived most delay in secondary care and case</i>	<i>Feeding back qualitative data from patients together with audit results seemed a powerful lever to stimulate action about hospital delays. Average waiting</i>

Author	Purpose	Design and method	Outcome measures and results	Conclusion
	interest in understanding more about patients' experiences of diagnosis.	Audit of endoscopy referrals assessed how often these recorded rectal examination and whether patients were seen within 2 weeks. Qualitative interviews with 19 patients explored their experience of referral and diagnosis. Review of 33 case records assessed other possible delays.	records suggested that this occurred after non-urgent referral. Patients also identified some problems with communication, information and support about the diagnosis. We used the results to stimulate local acceptance of national referral guidelines and wider discussion about care. A consultation exercise with GPs informed the development of a faxable urgent referral pro forma and supporting educational meetings. We designed a database to monitor changes in waiting times and made plans to improve communication and support after diagnosis.	times dropped quickly and remained low due to the continuing national focus upon them. Seeking GP views may have promoted the use of referral pro formas, but monitoring waiting times distracted from a more thorough evaluation of their use. Qualitative data from patients raised awareness of their experience, but was time-consuming to collect and we had limited success in using it for specific initiatives around communication and support.
Foy et al (2005) ⁵	Improving the quality of health care requires a range of evidence-based activities. Audit and feedback is commonly used as a quality improvement tool in the UK National Health Service [NHS]. We set out to assess whether current guidance and systematic review evidence can sufficiently inform practical decisions about how to use audit and feedback to improve quality of care.	We selected an important chronic disease encountered in primary care: diabetes mellitus. We identified recommendations from National Institute for Clinical Excellence (NICE) guidance on conducting audit and generated questions which would be relevant to any attempt to operationalise audit and feedback in a healthcare service setting. We explored the extent to which a systematic review of audit and feedback could provide practical guidance about whether audit and feedback should be used to improve quality of diabetes care and, if so, how audit and feedback could be optimised.	National guidance suggests the importance of securing the right organisational conditions and processes. Review evidence suggests that audit and feedback can be effective in changing healthcare professional practice. However, the available evidence says relatively little about the detail of how to use audit and feedback most efficiently.	Audit and feedback will continue to be an unreliable approach to quality improvement until we learn how and when it works best. Conceptualising audit and feedback within a theoretical framework offers a way forward.
Hysong	Audit and feedback	Data source: studies cited by	Of 519 studies initially identified, 19 met	A&F effectiveness is

Author	Purpose	Design and method	Outcome measures and results	Conclusion
(2009) ⁵³	<i>(A&F) has long been used to improve quality of care, albeit with variable results. This meta-analytic study tested whether Feedback Intervention Theory, a framework from industrial/organizational psychology, explains the observed variability in health care A&F research.</i>	<i>Jamtvedt's 2006 Cochrane systematic review of A&F, followed by database searches using the Cochrane review's search strategy to identify more recent studies. Inclusion criteria: Cochrane review criteria, plus: presence of a treatment group receiving only A & F; a control group receiving no intervention; a quantitatively measurable outcome; minimum n of 10 per arm; sufficient statistics for effect size calculations. Moderators: presence of discouragement and praise; correct solution, attainment level, velocity, frequency, and normative information; feedback format (verbal, textual, graphic, public, computerized, group vs. individual); goal setting activity. Procedure: meta-analytic procedures using the Hedges-Olkin method.</i>	<i>all inclusion criteria. Studies were most often excluded due to the lack of a feedback-only arm. A&F has a modest, though significant positive effect on quality outcomes ($d = 0.40$, 95% confidence interval = ± 0.20); providing specific suggestions for improvement, written, and more frequent feedback strengthened this effect, whereas graphical and verbal feedback attenuated this effect.</i>	<i>improved when feedback is delivered with specific suggestions for improvement, in writing, and frequently. Other feedback characteristics could also potentially improve effectiveness; however, research with stricter experimental controls is needed to identify the specific feedback characteristics that maximize its effectiveness.</i>
Hun Yinbo et al (2008)	<i>Study evaluated criteria-based clinical audit in measuring and improving quality of obstetric care for five life-threatening obstetric complications: obstetric haemorrhage, eclampsia, genital tract infections, obstructed labor and uterine rupture.</i>	<i>Clinical management of 65 patients was audited using a 'before (Phase I) and after (Phase II)' audit cycle design using standard criteria. Following Phase I, areas in need of improvement were identified; mechanisms for improving quality of care were identified and implemented.</i>	<i>Overall care of the complications improved significantly in obstetric haemorrhage (61 to 81%, $p = 0.000$), eclampsia (54.3 to 90%, $p = 0.00$), obstructed labour (81.7 to 93.5%, $p < 0.001$) and genital tract sepsis (66 to 85.2%, $p < 0.01$). Clinical monitoring, drug use, and urgent attention by senior medical staff also improved significantly after intervention.</i>	<i>Criteria-based clinical audit is feasible and acceptable for improving management of life-threatening obstetric complications. Its application is recommended in health institutions in developing countries.</i>
Jamtvedt et al (2006) ⁸	<i>Audit and feedback continues to be widely used as a strategy to</i>	<i>We searched the Cochrane Effective Practice and Organisation of Care Group's register and pending file up</i>	<i>Thirty new studies were added to this update, and a total of 118 studies are included. In the primary analysis 88</i>	<i>Audit and feedback can be effective in improving professional practice. When</i>

Author	Purpose	Design and method	Outcome measures and results	Conclusion
<p>Cochrane review</p>	<p><i>improve professional practice. It appears logical that healthcare professionals would be prompted to modify their practice if given feedback that their clinical practice was inconsistent with that of their peers or accepted guidelines. Yet, audit and feedback has not consistently been found to be effective.</i></p> <p><i>To assess the effects of audit and feedback on the practice of healthcare professionals and patient outcomes.</i></p>	<p><i>to January 2004.</i></p> <p><i>Randomised trials of audit and feedback (defined as any summary of clinical performance over a specified period of time) that reported objectively measured professional practice in a healthcare setting or healthcare outcomes.</i></p> <p><i>Two reviewers independently extracted data and assessed study quality. Quantitative (meta-regression), visual and qualitative analyses were undertaken. For each comparison we calculated the risk difference (RD) and risk ratio (RR), adjusted for baseline compliance when possible, for dichotomous outcomes and the percentage and the percent change relative to the control group average after the intervention, adjusted for baseline performance when possible, for continuous outcomes. We investigated the following factors as possible explanations for the variation in the effectiveness of interventions across comparisons: the type of intervention (audit and feedback alone, audit and feedback with educational meetings, or multifaceted interventions that included audit and feedback), the intensity of the audit and feedback, the complexity of the targeted behaviour, the seriousness of the outcome, baseline compliance and study quality.</i></p>	<p><i>comparisons from 72 studies were included that compared any intervention in which audit and feedback is a component compared to no intervention. For dichotomous outcomes the adjusted risk difference of compliance with desired practice varied from - 0.16 (a 16 % absolute decrease in compliance) to 0.70 (a 70% increase in compliance) (median = 0.05, inter-quartile range = 0.03 to 0.11) and the adjusted risk ratio varied from 0.71 to 18.3 (median = 1.08, inter-quartile range = 0.99 to 1.30). For continuous outcomes the adjusted percent change relative to control varied from -0.10 (a 10 % absolute decrease in compliance) to 0.68 (a 68% increase in compliance) (median = 0.16, inter-quartile range = 0.05 to 0.37). Low baseline compliance with recommended practice and higher intensity of audit and feedback were associated with larger adjusted risk ratios (greater effectiveness) across studies.</i></p>	<p><i>it is effective, the effects are generally small to moderate. The relative effectiveness of audit and feedback is likely to be greater when baseline adherence to recommended practice is low and when feedback is delivered more intensively.</i></p>

Author	Purpose	Design and method	Outcome measures and results	Conclusion
Lee et al 2009 ²⁸	<i>Random safety audits have been shown to be effective in improving standards of practice in high-risk industries. They are process audits rapidly performed during real-time clinical activity, with immediate feedback, allowing for immediate change of practice. AIM: Based on a concept described by the Vermont-Oxford Network, we aimed to introduce random safety audits to our unit to improve infection control and routine neonatal care.</i>	<i>We designed simple data collection tables to audit 11 infection control and four routine care standards. Audits were undertaken during the weekly grand round. Immediate feedback was given.</i>	<i>In 6 months we completed three cycles of 15 audits each. Complete results were available for 14 audits. The compliance with the infection control standards improved from a median of 70% (range 20%-100%) to 95% (range 66%-100%). The results of the routine care standards were more variable.</i>	<i>We have shown that this innovative method of random safety audits is effective in quickly improving practice. We believe this to be due to the instant feedback, continued emphasis on infection control and good clinical practice, and improved teamwork.</i>
Lefevre et al 2009 ²⁸	<i>Postpartum haemorrhage (PPH) is still the first cause of maternal mortality in France. Most of these cases include inappropriate management. In 2004, regional guidelines were diffused to all the birthplaces in Basse-Normandie. To assess the impact of this regional management, an epidemiological study "before-after" (2002-2005) has been</i>	<i>A clinical audit has been conducted in all the birthplaces from the region to assess the management of all severe PPH identified during 2002 and 2005. PPH were considered as severe when they presented one or more of the following: blood transfusion, uterine embolisation, hemostatic surgery, difference in hemoglobin rates greater than 4 g / dl, or maternal death. All of these cases have been analysed except those defined by hemoglobin difference. Assessment has been carried out by pairs of practitioners (obstetrician and anesthetist) blinded to the origin of the case. Criteria</i>	<i>The number of severe PPH was 34 in 2002 and 63 in 2005. The quality of care was increased with rates of inadequate management falling from 32 to 13% ($p < 0,02$), respectively. The follow-up of the guidelines was correct in the whole area, most of the criteria having been respected in about 90% of cases in 2005. However, active management of the third stage of delivery was only conducted in 71% of cases. The rates of severe PPH were not significantly different between 2002 (44%) and 2005 (38%).</i>	<i>The originality from this study is that the modifications of the practices were conducted at a regional level in order to enhance the management of PPH. The assessment which was performed showed that quality of care was improved all over the area but that there is still place to progress.</i>

Author	Purpose	Design and method	Outcome measures and results	Conclusion
	<p>performed. Part of this study was the evaluation of the management of severe PPH.</p> <p>This study assessed the quality of care for major PPH and the correct follow-up of the guidelines before and after 2004.</p>	<p>assessed were the quality of care for major PPH, the correct follow-up of the guidelines and the degree of severity of the PPH which was estimated as moderate or severe on clinical arguments.</p>		
Rehmani et al 2008 ⁴¹	<p>To describe the quality assurance/improvement program in our emergency department ED. METHODS: This program involved monthly data collection and analysis, data-driven process change, staff education in the core concepts of quality, and data reanalysis from the years 2003 to 2006 at the King Abdul-Aziz Hospital, Al-Ahsa, Kingdom of Saudi Arabia.</p>	<p>Data captured during the program included census data, chart review, and focused clinical audits. Continuous quality improvement measures collected at the beginning of the program and quarterly included: 1) quality indicators (length of stay [LOS] and rates of left against medical advice [AMA] or left without being seen [LWBS]), 2) percentage of patients that stay > or =3 hours in ED, unscheduled returns within 48 hours, inter-hospital transfer data, sentinel events tracking rates, and 3) nature of patient complaints.</p>	<p>During the study period, the program demonstrated improvement in all measured areas. Despite an increase in patient volume of 47% to 51,698 visits/year, the mean monthly LOS remained static, the unscheduled returned visits dropped by 50% (2% to 1%), and patients leaving AMA decreased from 1.5% to 1.2%, and LWBS decreased from 1.6% to 0.8%. The rate of complaints dropped by 5 fold (1.3 per 1000 patients to 0.25).</p>	<p>Our program demonstrated improvement in all the measured parameters.</p>
Mitchell et al 2008 ¹³	<p>To determine if a robust clinical review process can influence an organisation's response to adverse patient outcomes.</p>	<p>Retrospective analysis of the activity and outputs of the Clinical Review Committee (CRC) of a university-affiliated tertiary hospital from 1 September 2002 to 30 June 2006.</p>	<p>Engagement of clinicians (number on CRC, number interviewed for the clinical review process, number of specific referrals from clinicians); and numbers of cases reviewed, system issues identified, recommendations made to the hospital board, and ensuing actions.</p>	<p>A robust, multidisciplinary clinical review process with strong links to managers and policymakers can influence an organisation's response to adverse patient outcomes and underpin a clinical</p>

Author	Purpose	Design and method	Outcome measures and results	Conclusion
			<i>A multidisciplinary CRC with 34 members established a robust clinical review process and identified 5925 cases for initial case review. Of these, 2776 (46.8%) fulfilled one or more of the specified criteria for adverse events and progressed to detailed review; 342 of these (12.3%) were classed as serious or major. A total of 317 staff (11%) were interviewed, and 881 system issues were identified, resulting in 98 specific recommendations being made to the Clinical Board and implementation of 81 practice changes (including seven hospital-wide projects) to improve patient care.</i>	<i>governance framework</i>
Siddiqi et al 2008 ³⁰	<i>To assess the effectiveness of clinical audit in improving the quality of diagnostic care provided to patients suspected of tuberculosis; and to understand the contextual factors which impede or facilitate its success.</i>	<i>Twenty-six health centres in Cuba, Peru and Bolivia were recruited. Clinical audit was introduced to improve the diagnostic care for patients attending with suspected TB. Standards were based on the WHO and TB programme guidelines relating to the appropriate use of microscopy, culture and radiological investigations. At least two audit cycles were completed over 2 years. Improvement was determined by comparing the performance between two six-month periods pre- and post-intervention. Qualitative methods were used to ascertain facilitating and limiting contextual factors influencing change among healthcare professionals' clinical behaviour after the introduction of clinical audit.</i>	<i>We found a significant improvement in 11 of 13 criteria in Cuba, in 2 of 6 criteria in Bolivia and in 2 of 5 criteria in Peru. Twelve out of 24 of the audit criteria in all three countries reached the agreed standards. Barriers to quality improvement included conflicting objectives for clinicians and TB programmes, poor coordination within the health system and patients' attitudes towards illness.</i>	<i>Clinical audit may drive improvements in the quality of clinical care in resource-poor settings. It is likely to be more effective if integrated within and supported by the local TB programmes. We recommend developing and evaluating an integrated model of quality improvement including clinical audit.</i>
Snooks et al	<i>An initial audit of the</i>	<i>A multidisciplinary advisory group</i>	<i>Effects of change: The number of patients</i>	<i>Messages from the first audit</i>

Author	Purpose	Design and method	Outcome measures and results	Conclusion
2005 ³³	care provided to emergency asthma patients by the ambulance service was carried out in 1996. Some under-recognition and under-treatment of severe asthma was found as well as a lack of documentation of patient condition on scene. A re-audit was undertaken in 1999	was reconvened. The same method was adopted as for the first audit. Patients included were those administered nebulised salbutamol by crews in the catchment areas of four hospitals and those diagnosed with asthma at the Accident Emergency (A&E) departments of those hospitals between January and March 1999. Setting: London Ambulance Service. Key measures for improvement: (1) Accuracy of diagnosis and appropriateness of treatment, and (2) adherence to protocol. Strategies for change: Following the first audit, treatment protocols were widened and brought into line with the British Thoracic Society guidelines for care of acute asthma patients. The results were widely disseminated within the service and training was initiated for all operational staff.	included in the re-audit more than doubled (audit 1: n = 252, audit 2: n = 532). The increase occurred exclusively in those administered nebulised salbutamol by ambulance crews but diagnosed with conditions other than asthma in A&E (audit 1: n = 15, audit 2: n = 161). The proportion of patients diagnosed with asthma in A&E who were administered nebulised salbutamol by their attending crew rose from 58% to 75%. However, 43 asthma patients were not treated; several of these were not recognised as suffering from asthma and others fell within the changed protocols for treatment. Adherence to protocol for administration of salbutamol remained high. Pre-hospital documentation of key observations did not improve.	seem to have been acted upon selectively. Implementing change is complex, and re-audit is necessary to understand the effects of the changes made.
Ugolini et al 2009 ¹⁹	Clinical audit has been increasingly required for the accreditation process in every modern healthcare system. Data collection and analysis are excessively time-consuming in everyday practice. The primary aim of our study was to evaluate the effectiveness of an innovative database to assist surgeons in	Data were evaluated from 208 consecutive patients undergoing elective and emergency surgery for colorectal cancer over a 2-year period (2003-2004). A new database was developed with specific queries to compare the observed and the expected mortality rates according to 3 scoring systems: the Portsmouth-Physiological and Operative Severity Score for enUmeration of Mortality and morbidity (P-POSSUM), the ColoRectal-Physiological and Operative	The observed mortality rate was 6.25%, which was significantly lower than the values predicted by CR-POSSUM and ACPGBI colorectal scores (9.14% and 19.42%, respectively; $P < .05$). P-POSSUM was the most accurate predictor of mortality, with a value of 7.93%. A total of 80% of the surgical staff considered this type of surgical audit activity as clinically useful.	The study confirms the usefulness of a dedicated database in a surgical audit activity. The ACPGBI colorectal score largely overestimated 30-day mortality in our experience.

Author	Purpose	Design and method	Outcome measures and results	Conclusion
	<p>monitoring clinical practice outcomes in colorectal cancer surgery. The second purpose was to compare observed mortality rates to 3 risk-predicting operative scoring systems.</p>	<p>Severity Score for enUmeration of Mortality and morbidity (CR-POSSUM), and the Association of ColoProctology or Great Britain & Ireland (ACPGBI) score. Results were discussed at regular intervals. Surgeons' satisfaction with each system was evaluated with a questionnaire.</p>		

Appendix D: Bibliography and abstracts

Ayanian, J. Z., M. B. Landrum, et al. (1998). "Rating appropriateness of coronary angiography - do practicing physicians agree with an expert panel and with each other." New England Journal of Medicine **338**: 1896-1904.

Baker, R. and R. C. Fraser (1995). "Development of review criteria: linking guidelines and assessment of quality." BMJ **311**(7001): 370-3.

Review criteria are designed to enable clinicians and others to assess care. However, there is no established method for developing criteria, and they are often confused with guidelines. Criteria should comprise measurable activities that are appropriate for the setting in which they are to be used. They should also be based on research evidence and prioritised according to the strength of that evidence and effect on outcome. Good criteria can be used to aid implementation of guidelines by providing a standard against which to monitor performance and enabling clinical audit.

Balogh, R., A. Simpson, et al. (1995). "Involving clients in clinical audits of mental health services." International Journal for Quality in Health Care **7**(4): 343-53.

Involving clients in service audits is never straightforward. In developing a new audit system for use in mental health settings a review of the literature demonstrated that the concept of satisfaction, like quality, is problematic because it is multidimensional, it is affected by expectations, and may be defined differently by professionals and clients. Furthermore, it fails to address the notion of empowerment. However, the literature provided some clear methodological guidance about involving clients in clinical audit. Clients must be involved in defining audit topics, and the most appropriate techniques of data-collection are open-ended and qualitative. Clients can also be involved in the process of audit, particularly through conducting audits in collaboration with professionals. Evidence from the literature persuaded the authors to abandon the idea of developing an audit module on patient satisfaction, and instead to develop one with a clear focus on clients' perspectives, entitled "Clients' Appraisal of Care" as part of the Newcastle Audit System, with clients involved throughout.

Barnard, S. (1998). "Consumer involvement and inter-agency collaboration in clinical audit." Health & Social Care in the Community **6**(2): 138-142.

Bowie, P., J. McKay, et al. (2008). "Judging the quality of clinical audit by general practitioners: a pilot study comparing the assessments of medical peers and NHS audit specialists." Journal of Evaluation in Clinical Practice **14**(6): 1038-43.

RATIONALE, AIMS AND OBJECTIVES: Clinical audit informs general practitioner (GP) appraisal and will provide evidence of performance for revalidation in the UK. However, objective evidence is now required. An established peer assessment system may offer an educational solution for making objective judgements on clinical audit quality. National Health Service (NHS) clinical audit specialists could potentially support this system if their audit assessments were comparable with established medical peer assessors. The study aimed to quantify differences between clinical audit specialists and medical peer assessors in their assessments of clinical audit projects. **METHODS:** A comparison study of the assessment outcomes of clinical audit reports by two groups using appropriate assessment instruments was conducted. Mean scores were compared and 95% confidence intervals (CIs) and limits of agreement calculated. A two-point mean difference would be relevant. **RESULTS:** Twelve significant event analysis (SEA) reports and 12 criterion audit projects were assessed by 11 experienced GP assessors and 10 NHS audit specialist novice assessors. For SEA, the mean score difference between groups was <1.0. The 95% CI for bias was -0.1 to 0.5 (P = 0.14). Limits of agreement ranged from -0.7 to 1.2. For criterion audit, a mean score difference of ≤ 1.0 was calculated for seven projects and scores between 1.1 and 1.9 for four. The 95% CI for bias was 0.8 to 1.5 (P < 0.001). Limits of agreement ranged from -2.5 to -0.0. **CONCLUSIONS:** The study findings suggest that a sample of NHS clinical audit specialists can give numerically accurate feedback scores to GPs on the quality

of their clinical audit activity compared with established peer assessors as part of the model outlined.

Braithwaite, J. and J. F. Travaglia (2008). "An overview of clinical governance policies, practices and initiatives." Australian Health Review **32**(1): 10-22.

Buttery, Y., K. Walse, et al. (1995). Provider audit in England. London, CASPE Research.

Cameron, M., G. Penney, et al. (2007). "Impact on maternity professionals of novel approaches to clinical audit feedback." Evaluation & the Health Professions **30**(1): 75-95.

The authors compared three approaches to feedback of clinical audit findings relating to miscarriage in 15 Scottish maternity services (printed report alone; report plus action planning letter; report plus face-to-face facilitated action planning). Clinicians were surveyed to measure theory of planned behavior constructs (in the context of two audit criteria) before and after feedback (n = 253) and assessed perceptions of the audit through in-depth interviews (n = 17). Prefeedback, clinicians had positive attitudes and strong subjective norms and intentions to comply, although perceived behavioral control was lower. Generally, positive attitudes, subjective norms, and intentions increased after feedback but for one of the two criteria (providing a 7-day miscarriage service), perceived behavioral control decreased. No changes over time reached statistical significance, and analysis of covariance (adjusting for prefeedback scores) showed no consistent relationships between method of feedback and postfeedback construct scores. Interviews revealed positive perceptions of audit but frustration at lack of capacity to implement changes. Although interventions that increased intensity of feedback proved feasible and acceptable to clinicians, the authors were unable to demonstrate that they increased intention to comply with audit criteria.

Campbell, S. M., M. Hann, et al. (2002). "Quality assessment for three common conditions in primary care: validity and reliability of review criteria developed by expert panels for angina, asthma and type 2 diabetes." Quality & Safety in Health Care **11**(2): 125-30.

OBJECTIVES: To field test the reliability, validity, and acceptability of review criteria for angina, asthma, and type 2 diabetes which had been developed by expert panels using a systematic process to combine evidence with expert opinion. DESIGN: Statistical analysis of data derived from a clinical audit, and postal questionnaire and semi-structured interviews with general practitioners and practice nurses in a representative sample of general practices in England. SETTING: 60 general practices in England. MAIN OUTCOME MEASURES: Clinical audit results for angina, asthma, and type 2 diabetes. General practitioner and practice nurse validity ratings from the postal questionnaire. RESULTS: 54%, 59%, and 70% of relevant criteria rated valid by the expert panels for angina, asthma, and type 2 diabetes, respectively, were found to be usable, valid, reliable, and acceptable for assessing quality of care. General practitioners and practice nurses agreed with panellists that these criteria were valid but not that they should always be recorded in the medical record. CONCLUSION: Quality measures derived using expert panels need field testing before they can be considered valid, reliable, and acceptable for use in quality assessment. These findings provide additional evidence that the RAND panel method develops valid and reliable review criteria for assessing clinical quality of care.

Campbell, S. M., M. O. Roland, et al. (1999). "Development of review criteria for assessing the quality of management of non-insulin dependent diabetes mellitus in general practice." Quality in Health Care **8**: 61-5.

Cheater, F. M. and M. Keane (1998). "Nurses' participation in audit: a regional

study." Quality in Health Care **1998**(7).

Collis, S. (2006). "A review of the literature on the nurse role in clinical audit." Nursing Times **102**(12): 38-40.

Delivering quality in the NHS is not a new concept. However, the recent focus on clinical governance has resulted in the need for effective methods of systematically reviewing quality. Clinical audit is a tool that has been created for this purpose. This literature review assesses the benefits of clinical audit and critiques the nurse's role in the process, addressing any barriers to their involvement

Cowan, P. J. (2002). "The role of clinical audit in risk reduction." British Journal of Clinical Governance **7**(3): 220-223.

Recent criticism of some aspects of current practice within the NHS has placed the role of clinical audit increasingly under the spotlight. In a recent publication, the National Institute for Clinical Excellence states that "the time has come for everyone in the NHS to take clinical audit very seriously". This article considers the intimate link between clinical audit and clinical governance, a philosophy that has not yet been universally adopted. It describes the key principles of risk management within the context of clinical audit, and examines the audit burden imposed on primary and secondary care by assessors, National Service Frameworks and regulatory bodies. It discusses the challenges risk managers face in adopting a systematic review of care that seeks to avoid harm to patients, while improving outcomes and care standards.

Davies, E., B. van der Molen, et al. (2007). "Using clinical audit, qualitative data from patients and feedback from general practitioners to decrease delay in the referral of suspected colorectal cancer." Journal of Evaluation in Clinical Practice **13**(2): 310-7.

RATIONALE: There was local concern over possible delays in the diagnosis and referral of patients with suspected colorectal cancer and interest in understanding more about patients' experiences of diagnosis. **AIMS AND OBJECTIVES:** To use clinical audit, qualitative data from patients and feedback from general practitioners (GPs) to identify possible delays in referral, and to decrease these by implementing referral guidelines. **METHODS:** Audit of endoscopy referrals assessed how often these recorded rectal examination and whether patients were seen within 2 weeks. Qualitative interviews with 19 patients explored their experience of referral and diagnosis. Review of 33 case records assessed other possible delays. **RESULTS:** Most patients referred for endoscopy were seen within 2 weeks (67%, 119/177), but only 47% (71/151) of available referral letters mentioned rectal examination. Patients perceived most delay in secondary care and case records suggested that this occurred after non-urgent referral. Patients also identified some problems with communication, information and support about the diagnosis. We used the results to stimulate local acceptance of national referral guidelines and wider discussion about care. A consultation exercise with GPs informed the development of a faxable urgent referral pro forma and supporting educational meetings. We designed a database to monitor changes in waiting times and made plans to improve communication and support after diagnosis. **DISCUSSION:** Feeding back qualitative data from patients together with audit results seemed a powerful lever to stimulate action about hospital delays. Average waiting times dropped quickly and remained low due to the continuing national focus upon them. Seeking GP views may have promoted the use of referral pro formas, but monitoring waiting times distracted from a more thorough evaluation of their use. Qualitative data from patients raised awareness of their experience, but was time-consuming to collect and we had limited success in using it for specific initiatives around communication and support.

Department of Health (1989). Working for Patients. London, HMSO.

Department of Health (2001). The report of the public inquiry into children's heart surgery at the Bristol Royal Infirmary 1984-1995: learning from Bristol London, Stationery Office.

Dixon, N. (1996). Good practice in clinical audit: a summary of selected literature to support criteria for clinical audit. London, National Centre for Clinical Audit.

Farndon, L., A. Barnes, et al. (2009). "Clinical audit of core podiatry treatment in the NHS." Journal of Foot & Ankle Research 2: 7.

ABSTRACT: BACKGROUND: Core podiatry involves treatment of the nails, corns and callus and also giving footwear and foot health advice. Though it is an integral part of current podiatric practice little evidence is available to support its efficacy in terms of research and audit data. This information is important in order to support the current NHS commissioning process where services are expected to provide data on standards including outcomes. This study aimed to increase the evidence base for this area of practice by conducting a multi-centre audit in 8 NHS podiatry departments over a 1-year period. METHODS: The outcome measure used in this audit was the Podiatry Health Questionnaire which is a self completed short measure of foot health including a pain visual analogue scale and a section for the podiatrist to rate an individual's foot health based on their podiatric problems. The patient questionnaire was completed by individuals prior to receiving podiatry care and then 2 weeks after treatment to assess the effect of core podiatry in terms of pain and foot health. RESULTS: 1047 patients completed both questionnaires, with an age range from 26-95 years and a mean age of 72.9 years. The podiatrists clinical rating at baseline showed 75% of patients had either slight or moderate podiatric problems. The differences in questionnaire and visual analogue scores before and after treatment were determined according to three categories - better, same, worse and 75% of patients' scores either remained the same or improved after core podiatry treatment. A student t-test showed a statistical significant difference in pre and post treatment scores where $P < 0.001$, though the confidence interval indicated that the improvement was relatively small. CONCLUSION: Core podiatry has been shown to sustain or improve foot health and pain in 75% of the patients taking part in the audit. Simple outcome measures including pain scales should be used routinely in podiatric practice to assess the affect of different aspects of treatments and improve the evidence base for podiatry.

Foy, R., M. P. Eccles, et al. (2005). "What do we know about how to do audit and feedback? Pitfalls in applying evidence from a systematic review." BMC Health Services Research 5(1): 50.

BACKGROUND: Improving the quality of health care requires a range of evidence-based activities. Audit and feedback is commonly used as a quality improvement tool in the UK National Health Service [NHS]. We set out to assess whether current guidance and systematic review evidence can sufficiently inform practical decisions about how to use audit and feedback to improve quality of care. METHODS: We selected an important chronic disease encountered in primary care: diabetes mellitus. We identified recommendations from National Institute for Clinical Excellence (NICE) guidance on conducting audit and generated questions which would be relevant to any attempt to operationalise audit and feedback in a healthcare service setting. We explored the extent to which a systematic review of audit and feedback could provide practical guidance about whether audit and feedback should be used to improve quality of diabetes care and, if so, how audit and feedback could be optimised. RESULTS: National guidance suggests the importance of securing the right organisational conditions and processes. Review evidence suggests that audit and feedback can be effective in changing healthcare professional practice. However, the available evidence says relatively little about the detail of how to use audit and feedback most efficiently. CONCLUSION: Audit and feedback will continue to be an unreliable approach to quality improvement until we learn how and when it works best. Conceptualising audit and feedback within a theoretical

framework offers a way forward.

Gibbs, H., J. P. Fletcher, et al. (2009). "Does a dedicated nurse practitioner improve thromboprophylaxis use in acutely ill medical patients in Australia? The methodology for a multicentre VTE task force audit." International Angiology **28**(1): 73-78.

Aim. To determine the extent to which a multifaceted venous thromboembolism (VTE) prophylaxis program, coordinated by a dedicated nurse practitioner, improves the level of appropriate prophylaxis in patients hospitalised with an acute medical illness. Methods. A multicentre clinical audit was conducted in 16 hospitals across Australia. Approximately 9600 acutely ill medical patients over 18 years of age hospitalised for at least 3 days. A 4-month programme implemented by a VTE Nurse Educator to raise awareness of the risk of VTE, the importance of risk assessment and the appropriate prophylactic management of high-risk medical patients with local VTE prophylaxis audit result feedback. Results. The effect of this programme on the proportion of high-risk medical patients receiving appropriate thromboprophylaxis according to current guidelines. Conclusion. The VTE Task Force Audit will be the first multicentre clinical audit in Australia to evaluate thromboprophylaxis use in acutely ill medical patients and the effects of employing a nurse educator. Based on published results from clinical audits conducted overseas, it is expected that thromboprophylaxis will be underutilised in these patients. It is hypothesised that an active multifaceted programme will improve the rate of thromboprophylaxis among eligible medical patients through the effective implementation of evidence-based guidelines.

Giles, P. D., A. R. Cunningham, et al. (1998). "Cholesterol reduction for the secondary prevention of coronary heart disease: a successful multi-disciplinary approach to implementing evidence-based treatment in a district general hospital." Journal of Clinical Effectiveness **3**: 156-60.

Graham, W. J. (2009). "Criterion-based clinical audit in obstetrics: bridging the quality gap?" Best Practice & Research in Clinical Obstetrics & Gynaecology **23**(3): 375-88.

The Millennium Development Goal 5 - reducing maternal mortality by 75% - is unlikely to be met globally and for the majority of low-income countries. At this time of heightened concern to scale-up services for mothers and babies, it is crucial that not only shortfalls in the quantity of care - in terms of location and financial access - are addressed, but also the quality. Reductions in maternal and perinatal mortality in the immediate term depend in large part on the timely delivery of effective practices in the management of life-threatening complications. Such practices require a functioning health system - including skilled and motivated providers engaged with the women and communities whom they serve. Assuring the quality of this system, the services and the care that women receive requires many inputs, including effective and efficient monitoring mechanisms. The purpose of this article is to summarise the practical steps involved in applying one such mechanism, criterion-based clinical audit (CBCA), and to highlight recent lessons from its application in developing countries. Like all audit tools, the ultimate worth of CBCA relates to the action it stimulates in the health system and among providers.

Harvey, G. and M. Wensing (2003). "Methods for evaluation of small scale quality improvement projects." Qual Saf Health Care **12**(3): 210-214.

Evaluation is an integral component of quality improvement and there is much to be learned from the evaluation of small scale quality improvement initiatives at a local level. This type of evaluation is useful for a number of different reasons including monitoring the impact of local projects, identifying and dealing with issues as they arise within a project, comparing local projects to draw lessons, and collecting more detailed information as part of a bigger evaluation project. Focused audits and developmental studies can be used for

evaluation within projects, while methods such as multiple case studies and process evaluations can be used to draw generalised lessons from local experiences and to provide examples of successful projects. Evaluations of small scale quality improvement projects help those involved in improvement initiatives to optimise their choice of interventions and use of resources. Important information to add to the knowledge base of quality improvement in health care can be derived by undertaking formal evaluation of local projects, particularly in relation to building theory around the processes of implementation and increasing understanding of the complex change processes involved.

Hearnshaw, H., R. Baker, et al. (1998). "A survey of audit activity in general practice." *British Journal of General Practice* **48**(427): 979-81.

BACKGROUND: Since 1991, all general practices have been encouraged to undertake clinical audit. Audit groups report that participation is high, and some local surveys have been undertaken, but no detailed national survey has been reported. **AIM:** To determine audit activities in general practices and the perceptions of general practitioners (GPs) regarding the future of clinical audit in primary care. **METHOD:** A questionnaire on audit activities was sent to 707 practices from 18 medical audit advisory group areas. The audit groups had been ranked by annual funding from 1992 to 1995. Six groups were selected at random from the top, middle, and lowest thirds of this rank order. **RESULTS:** A total of 428 (60.5%) usable responses were received. Overall, 346 (85%) responders reported 125.7 audits from the previous year with a median of three audits per practice. There was no correlation between the number of audits reported and the funding per GP for the medical audit advisory group. Of 997 audits described in detail, changes were reported as 'not needed' in 220 (22%), 'not made' in 142 (14%), 'made' in 439 (44%), and 'made and remeasured' in 196 (20%). Thus, 635 (64%) audits were reported to have led to changes. Some 853 (81%) of the topics identified were on clinical care. Responders made 242 (42%) positive comments on the future of clinical audit in primary care, and 152 (26%) negative views were recorded. **CONCLUSION:** The level of audit activity in general practice is reasonably high, and most of the audits result in change. The number of audits per practice seems to be independent of the level of funding that the medical audit advisory group has received. Although there is room for improvement in the levels of effective audit activity in general practice, continued support by the professionally led audit groups could enable all practices to undertake effective audit that leads to improvement in patient care.

Hearnshaw, H., R. Harker, et al. (2002). "A study of the methods used to select review criteria for clinical audit." *Health Technology Assessment* **6**(1): 1-78.

Hirvonen-Kari, M., S. Salo, et al. (2009). "Effect of clinical audits of radiation use in one hospital district in Finland." *Acta Radiologica* **50**(4): 389-95.

BACKGROUND: A clinical audit is a systematic, independent, and documented process to improve the quality of radiological processes and radiation safety for patients. **PURPOSE:** To evaluate the effect of an audit process by comparing the results of two consecutive audits at the same units. **MATERIAL AND METHODS:** Audits were carried out twice at each imaging unit in the southwest hospital district of Finland: first, at the end of 2003, and again in November 2007. Both evaluations were carried out in a similar way: by interviewing personnel and examining documents, independent experts from other hospital districts ensured that diagnostic medical imaging processes at each unit were carried out according to generally accepted standards for good medical radiological procedures. The results of the consecutive audits were compared in order to analyze the effects of the clinical audits. **RESULTS:** The use of radiation was in accordance with the requirements and standards of good medical procedures at every audited unit during both evaluations. The list of audit criteria was fulfilled satisfactorily on both occasions at all of the audited units, and clearly better during the second run. In the first audit, the auditors made 80 recommendations for improving diagnostic procedures and, in the

second audit, 53 recommendations. During the first audit, most of the recommendations (22/80) concerned instructions in the fundamental practice of examining a patient. During the second audit, most recommendations were in the category of radiation doses. CONCLUSION: The clinical audit had a positive impact on the practice of work procedures in radiological departments. Most of the recommendations made after the first audit had been taken into consideration by the time of the second audit.

Houghton, G. (1997). "From audit to effectiveness: an historical evaluation of the changing role of Medical Audit Advisory Groups." Journal of Evaluation in Clinical Practice **3**(4): 245-53.

MAAGs were introduced as a result of the 1989 White Paper 'Working for Patients', with the remit to direct, coordinate and monitor medical audit activities in general practice. They were funded through the new FHSA management budget and each MAAG was responsible to its own FHSA. They were accepted as a completely new institution as a part of the introduction of an innovative management structure in a reformed NHS. When viewed in an historical context, MAAGs can actually be seen as a part of an expanding culture of greater objectivity and critical analysis which has burgeoned in medical practice over the last two decades. Although MAAGs began with an educational role with uniprofessional medical audit, they have embraced multiprofessional clinical audit in primary care in the context of the wider aspects of quality in practice. The last 20 years have seen the development of clinical guidelines, evidence-based medicine and application of business management theory to clinical quality. All these have reflected the increasing demand for explicit standards of care which has also formed the basis of clinical audit and MAAG activity. MAAGs should be seen as an inevitable concomitant of this historical trend to improve the application of scientific rigour in medical practice. With the adoption of clinical effectiveness, incorporating all these themes, as one of the NHS Executive's six medium-term priority areas, MAAGs are uniquely placed to act as agents of change to enhance the quality of primary health care.

Houghton, G. and B. Mendes da Costa (1998). "Clinical effectiveness: A multi-disciplinary educational needs assessment in the West Midlands." Journal of Clinical Effectiveness **3**(4): 142-145.

The Evidence Supported Medicine Union (EMU) was formed in the West Midlands to introduce and develop the ideas of evidence-based medicine into general and hospital practice. To understand the educational needs of multi-disciplinary members of acute trusts, a series of half-day workshops were planned. All acute trusts accepted the invitation to send multi-disciplinary teams - delegates attended in total in groups varying from one to nine. The major needs of acute trusts were: 1. critical appraisal skills, 2. multi-disciplinary training workshops, 3. prioritizing areas for evidence-based medicine, and 4. linking evidence-based medicine into clinical audit.

Houghton, G., D. O'Mahoney, et al. (1999). "The clinical implementation of clinical governance: acute stroke management as an example." Journal of Clinical Excellence **1**: 129-32.

Howard-Williams, P. (2009). "Clinical audit and peer review scheme for the South West post-new 2006 dental contract: a report on progress so far." British Dental Journal **206**(1): 37-41.

With the introduction of personal dental services (PDS) into the South West the Local Assessment Panel (LAP) devised a new scheme consisting of 'cookbook' audits and piloted the scheme amongst the PDS dentists of South and West Devon, Somerset and Avon in 2005/2006. When the new contracting arrangements came into force, and in the absence of guidance from above, the LAP in consultation with the PCTs decided to consolidate the successful pilot audit scheme for PDS dentists and extend the new scheme to all the participating PCTs and their performers. The current scheme covers Devon,

Somerset, Avon and Gloucester PCTs and is administrated by Mrs Jackie Derrick on behalf of Somerset PCT. All the audits showed improvement with the exception of the patient satisfaction survey where the first audit cycle showed an average patient satisfaction rating of 99% which cannot be improved on. We have redesigned this audit to try and make it more challenging and informative. The improvement in clinical record keeping was particularly marked. With the advent of new contractual arrangements in April 2009 it is essential that practitioners are able to demonstrate quality assurance in their practice and we believe that the South West scheme is a dentist friendly scheme, relevant to everyday dental practice.

Howell, E., C. Graham, et al. (2007). "Comparison of patients' assessments of the quality of stroke care with audit findings." Qual Saf Health Care **16**(6): 450-455.

ObjectiveTo determine the extent of correlation between stroke patients' experiences of hospital care with the quality of services assessed in a national audit. **Methods**Patients' assessments of their care derived from survey data were linked to data obtained in the National Sentinel Stroke Audit 2004 for 670 patients in 51 English NHS trusts. A measure of patients' experience of hospital stroke care was derived by summing responses to 31 survey items and grouping these into three broad concept domains: quality of care; information; and relationships with staff. Audit data were extracted from hospital admissions data and management information to assess the organisation of services, and obtained retrospectively from patient records to evaluate the delivery of care. Patient survey responses were compared with audit measures of organisation of care and compliance with clinical process standards. **Results**Patient experience scores were positively correlated with clinicians' assessment of the organisational quality of stroke care, but were largely unrelated to clinical process standards. Responses to individual questions regarding communication about diagnosis revealed a discrepancy between clinicians' and patients' reports. **Conclusions**Better organised stroke care is associated with more positive patient experiences. Examining areas of disparity between patients' and clinicians' reports is important for understanding the complex nature of healthcare and for identifying areas for quality improvement. Future evaluations of the quality of stroke services should include a validated patient experience survey in addition to audit of clinical records.

Hunyinbo, K. I., A. O. Fawole, et al. (2008). "Evaluation of criteria-based clinical audit in improving quality of obstetric care in a developing country hospital." African Journal of Reproductive Health **12**(3): 59-70.

Study evaluated criteria-based clinical audit in measuring and improving quality of obstetric care for five life-threatening obstetric complications: obstetric haemorrhage, eclampsia, genital tract infections, obstructed labor and uterine rupture. Clinical management of 65 patients was audited using a 'before (Phase I) and after (Phase II)' audit cycle design using standard criteria. Following Phase I, areas in need of improvement were identified; mechanisms for improving quality of care were identified and implemented. Overall care of the complications improved significantly in obstetric haemorrhage (61 to 81%, $p = 0.000$), eclampsia (54.3 to 90%, $p = 0.00$), obstructed labour (81.7 to 93.5%, $p < 0.001$) and genital tract sepsis (66 to 85.2%, $p < 0.01$). Clinical monitoring, drug use, and urgent attention by senior medial staff also improved significantly after intervention. Criteria-based clinical audit is feasible and acceptable for improving management of life-threatening obstetric complications. Its application is recommended in health institutions in developing countries.

Hysong, S., R. Best, et al. (2006). "Audit and feedback and clinical practice guideline adherence: Making feedback actionable." Implementation Science **1**(1): 9.

BACKGROUND:As a strategy for improving clinical practice guideline (CPG) adherence, audit and feedback (A&F) has been found to be variably effective,

yet A&F research has not investigated the impact of feedback characteristics on its effectiveness. This paper explores how high performing facilities (HPF) and low performing facilities (LPF) differ in the way they use clinical audit data for feedback purposes. **METHOD:** Descriptive, qualitative, cross-sectional study of a purposeful sample of six Veterans Affairs Medical Centers (VAMCs) with high and low adherence to six CPGs, as measured by external chart review audits. One-hundred and two employees involved with outpatient CPG implementation across the six facilities participated in one-hour semi-structured interviews where they discussed strategies, facilitators and barriers to implementing CPGs. Interviews were analyzed using techniques from the grounded theory method. **RESULTS:** High performers provided timely, individualized, non-punitive feedback to providers, whereas low performers were more variable in their timeliness and non-punitiveness and relied on more standardized, facility-level reports. The concept of actionable feedback emerged as the core category from the data, around which timeliness, individualization, non-punitiveness, and customizability can be hierarchically ordered. **CONCLUSION:** Facilities with a successful record of guideline adherence tend to deliver more timely, individualized and non-punitive feedback to providers about their adherence than facilities with a poor record of guideline adherence. Consistent with findings from organizational research, feedback intervention characteristics may influence the feedback's effectiveness at changing desired behaviors.

Hysong, S. J. (2009). "Meta-analysis: audit and feedback features impact effectiveness on care quality." Medical Care **47**(3): 356-63.

BACKGROUND: Audit and feedback (A&F) has long been used to improve quality of care, albeit with variable results. This meta-analytic study tested whether Feedback Intervention Theory, a framework from industrial/organizational psychology, explains the observed variability in health care A&F research. **METHOD:** Data source: studies cited by Jamtvedt's 2006 Cochrane systematic review of A&F, followed by database searches using the Cochrane review's search strategy to identify more recent studies. Inclusion criteria: Cochrane review criteria, plus: presence of a treatment group receiving only A & F; a control group receiving no intervention; a quantitatively measurable outcome; minimum n of 10 per arm; sufficient statistics for effect size calculations. Moderators: presence of discouragement and praise; correct solution, attainment level, velocity, frequency, and normative information; feedback format (verbal, textual, graphic, public, computerized, group vs. individual); goal setting activity. Procedure: meta-analytic procedures using the Hedges-Olkin method. **RESULTS:** Of 519 studies initially identified, 19 met all inclusion criteria. Studies were most often excluded due to the lack of a feedback-only arm. A&F has a modest, though significant positive effect on quality outcomes ($d = 0.40$, 95% confidence interval = ± 0.20); providing specific suggestions for improvement, written, and more frequent feedback strengthened this effect, whereas graphical and verbal feedback attenuated this effect. **CONCLUSIONS:** A&F effectiveness is improved when feedback is delivered with specific suggestions for improvement, in writing, and frequently. Other feedback characteristics could also potentially improve effectiveness; however, research with stricter experimental controls is needed to identify the specific feedback characteristics that maximize its effectiveness.

Jamtvedt, G., J. M. Young, et al. (2004). "Audit and feedback: effects on professional practice and health care outcomes." The Cochrane Library(2).

Jamtvedt, G., J. M. Young, et al. (2006). "Audit and feedback: effects on professional practice and health care outcomes." Cochrane Database of Systematic Reviews(2): CD000259.

Jamtvedt, G., J. M. Young, et al. (2003). "Audit and feedback: effects on professional practice and health care outcomes." Cochrane Database Syst Rev.

Johnston, G., I. K. Crombie, et al. (2000). "Reviewing audit: Barriers and facilitating factors for effective clinical audit." Quality in Health Care **9**(1): 23-36.

Objective - To review the literature on the benefits and disadvantages of clinical and medical audit, and to assess the main facilitators and barriers to conducting the audit process. Design - A comprehensive literature review was undertaken through a thorough review of Medline and CINAHL databases using the keywords of 'audit', 'audit of audits', and 'evaluation of audits' and a handsearch of the indexes of relevant journals for key papers. Results - Findings from 93 publications were reviewed. These ranged from single case studies of individual audit projects through retrospective reviews of departmental audit programmes to studies of interface projects between primary and secondary care. The studies reviewed incorporated the experiences of a wide variety of clinicians, from medical consultants to professionals allied to medicine and from those involved in unidisciplinary and multidisciplinary ventures. Perceived benefits of audit included improved communication among colleagues and other professional groups, improved patient care, increased professional satisfaction, and better administration. Some disadvantages of audit were perceived as diminished clinical ownership, fear of litigation, hierarchical and territorial suspicions, and professional isolation. The main barriers to clinical audit can be classified under five main headings. These are lack of resources, lack of expertise or advice in project design and analysis, problems between groups and group members, lack of an overall plan for audit, and organisational impediments. Key facilitating factors to audit were also identified: they included modern medical records systems, effective training, dedicated staff, protected time, structured programmes, and a shared dialogue between purchasers and providers. Conclusions - Clinical audit can be a valuable assistance to any programme which aims to improve the quality of health care and its delivery. Yet without a coherent strategy aimed at nurturing effective audits, valuable opportunities will be lost. Paying careful attention to the professional attitudes highlighted in this review may help audit to deliver on some of its promise.

Johnston, G., H. T. O. Davies, et al. (2000). "Improving care or professional advantage? What makes clinicians do audit and how well do they fare?" Health Bulletin **58**(4): 276-285.

Objective: To find out why clinicians undertake audit, the extent to which they complete the process of audit and their perception of the benefits of taking part. Design: Semi-structured interviews. Setting: Twelve trusts in three Scottish Health Boards. Subjects: One hundred and forty five respondents of different status from a wide range of clinical specialities. Results: Sixty six per cent of respondents defined clinical audit as a means of making changes with a view to improving care, but 62% reported the purpose of audit as the examination of the usefulness of treatment or the observation of practice. Personal reasons for taking part included justifying practice (32%) and as a means of professional development (15%). Twenty one percent held formal minuted meetings, the majority were informal. Sixty six percent of clinicians completed a project plan but pilot studies (49%) and re-audits (26%) were less common. Twenty four percent changed practice as a result of the audit. The extent to which the audit process had been completed predicted clinicians' ability to make changes. Conclusion: Clinicians' understanding of the concept of audit was not translated into practical projects. The main reasons for this are the organisational difficulties clinicians are faced with when carrying out audit and a lack of attention to all parts of the audit process. Despite this failure to achieve change, many clinicians felt they had benefited from their experience of audit. Management should appeal to these motivations of employees and provide a culture which enforces their importance over and above changing practice.

Judd, M. (1997). "A pragmatic approach to user involvement in clinical audit - making it happen." Journal of Clinical Effectiveness **2**(2): 35-38.

The quality of clinical care is a fundamental issue for both providers and

recipients. It seems logical for the parties to collaborate. Increasing understanding of each other's values and perceived needs with commitment to incorporating both users' and clinicians' unique perspectives on clinical quality and effectiveness is a new venture which will further contribute to improving the quality of health care in the NHS.

Kelson, M. (1996). "User involvement in clinical audit: a review of developments and issues of good practice." Journal of Evaluation in Clinical Practice 2(2): 97-109.

There have been considerable political and organizational moves to involve 'consumers' (patients, carers, service users, potential users, local communities and the public at large) in the provision, planning and monitoring of health services. Such developments beg the question 'what constitutes good practice in user involvement?'. Taking user views into account relates not only to obtaining feedback on 'hotel' aspects of care (issues such as food and cleanliness) but also to the potential for patient input to clinical audit and the standards by which care itself is measured. Recent policy statements specifically advocate involving users in the process and product of clinical audit. In practice, 'involvement' has meant anything from passing on information to full and active participation in partnership with professionals. This paper outlines some of the issues raised in the published literature on user involvement in clinical audit. Suggesting that real involvement refers to users as active participants, not passive recipients, the paper documents the increasing policy commitment to user involvement and considers issues that influence how the rhetoric is put into practice

Kelson, M. and L. Redpath (1996). "Promoting user involvement in clinical audit: surveys of audit committees in primary and secondary care." Journal of Clinical Effectiveness 1(1): 14-18.

The Department of Health has suggested that organizations should develop mechanisms to ensure successful input from patients and carers into clinical audit processes, advocating the involvement of consumers at all stages of the audit cycle. Two national surveys, of Trust Clinical Audit Committees and Medical Audit Advisory Groups respectively, explored the extent to which audit committees involve users, either as committee members or in relation to other methods of involvement in the audit process. The results indicate limited but increasing involvement of users as audit committee members, but there are benefits, limitations and barriers to user membership. Other reported activities suggest that the most widespread method of involving users is in user satisfaction surveys with little systematic evidence of input to the decision-making stage and negotiation of topics for audit. The research suggests that guidance is needed on how to involve users effectively at different stages in the audit cycle.

Kongnyuy, E. J. and N. van den Broek (2008). "Criteria for clinical audit of women friendly care and providers' perception in Malawi." BMC Pregnancy & Childbirth 8: 28.

BACKGROUND: There are two dimensions of quality of maternity care, namely quality of health outcomes and quality as perceived by clients. The feasibility of using clinical audit to assess and improve the quality of maternity care as perceived by women was studied in Malawi. **OBJECTIVE:** We sought to (a) establish standards for women friendly care and (b) explore attitudinal barriers which could impede the proper implementation of clinical audit. **METHODS:** We used evidence from Malawi national guidelines and World Health Organisation manuals to establish local standards for women friendly care in three districts. We equally conducted a survey of health care providers to explore their attitudes towards criterion based audit. **RESULTS:** The standards addressed different aspects of care given to women in maternity units, namely (i) reception, (ii) attitudes towards women, (iii) respect for culture, (iv) respect for women, (v) waiting time, (vi) enabling environment, (vii) provision of information, (viii) individualised care, (ix) provision of skilled attendance at birth and

emergency obstetric care, (x) confidentiality, and (xi) proper management of patient information. The health providers in Malawi generally held a favourable attitude towards clinical audit: 100.0% (54/54) agreed that criterion based audit will improve the quality of care and 92.6% believed that clinical audit is a good educational tool. However, there are concerns that criterion based audit would create a feeling of blame among providers (35.2%), and that manager would use clinical audit to identify and punish providers who fail to meet standards (27.8%). CONCLUSION: Developing standards of maternity care that are acceptable to, and valued by, women requires consideration of both the research evidence and cultural values. Clinical audit is acceptable to health professionals in Malawi although there are concerns about its negative implications to the providers.

Lee, L., S. Girish, et al. (2009). "Random safety audits in the neonatal unit." Archives of Disease in Childhood Fetal & Neonatal Edition **94**(2): F116-9.

BACKGROUND: Random safety audits have been shown to be effective in improving standards of practice in high-risk industries. They are process audits rapidly performed during real-time clinical activity, with immediate feedback, allowing for immediate change of practice. AIM: Based on a concept described by the Vermont-Oxford Network, we aimed to introduce random safety audits to our unit to improve infection control and routine neonatal care. METHOD: We designed simple data collection tables to audit 11 infection control and four routine care standards. Audits were undertaken during the weekly grand round. Immediate feedback was given. RESULTS: In 6 months we completed three cycles of 15 audits each. Complete results were available for 14 audits. The compliance with the infection control standards improved from a median of 70% (range 20%-100%) to 95% (range 66%-100%). The results of the routine care standards were more variable. CONCLUSION: We have shown that this innovative method of random safety audits is effective in quickly improving practice. We believe this to be due to the instant feedback, continued emphasis on infection control and good clinical practice, and improved teamwork.

Lefevre, P., S. Brucato, et al. (2009). "Impact of a new regional management for postpartum haemorrhages by an audit of severe cases: study before-after (2002-2005)." Journal de Gynecologie, Obstetrique et Biologie de la Reproduction **38**(3): 209-19.

BACKGROUND: Postpartum haemorrhage (PPH) is still the first cause of maternal mortality in France. Most of these cases include inappropriate management. In 2004, regional guidelines were diffused to all the birthplaces in Basse-Normandie. To assess the impact of this regional management, an epidemiological study "before-after" (2002-2005) has been performed. Part of this study was the evaluation of the management of severe PPH. OBJECTIVE: This study assessed the quality of care for major PPH and the correct follow-up of the guidelines before and after 2004. MATERIAL AND METHODS: A clinical audit has been conducted in all the birthplaces from the region to assess the management of all severe PPH identified during 2002 and 2005. PPH were considered as severe when they presented one or more of the following: blood transfusion, uterine embolisation, hemostatic surgery, difference in hemoglobin rates greater than 4 g / dl, or maternal death. All of these cases have been analysed except those defined by hemoglobin difference. Assessment has been carried out by pairs of practitioners (obstetrician and anesthetist) blinded to the origin of the case. Criteria assessed were the quality of care for major PPH, the correct follow-up of the guidelines and the degree of severity of the PPH which was estimated as moderate or severe on clinical arguments. RESULTS: The number of severe PPH was 34 in 2002 and 63 in 2005. The quality of care was increased with rates of inadequate management falling from 32 to 13% ($p < 0,02$), respectively. The follow-up of the guidelines was correct in the whole area, most of the criteria having been respected in about 90% of cases in 2005. However, active management of the third stage of delivery was only conducted in 71% of cases. The rates of severe PPH were not significantly different between 2002 (44%) and 2005 (38%). CONCLUSION: The originality from this

study is that the modifications of the practices were conducted at a regional level in order to enhance the management of PPH. The assessment which was performed showed that quality of care was improved all over the area but that there is still place to progress.

McKay-Brown, L., N. Bishop, et al. (2008). "The impact of a GP clinical audit on the provision of smoking cessation advice." *Asia Pacific Family Medicine* 7(1): 4.

ABSTRACT: AIM: To investigate whether participation in a clinical audit and education session would improve GP management of patients who smoke. METHODS: GPs who participated in an associated smoking cessation research program were invited to complete a three-stage clinical audit. This process included a retrospective self-audit of smoking cessation management practices over the 6 months prior to commencing the study, attending a 2.5 hour education session about GP management of smoking cessation, and completion of a second retrospective self-audit 6 months later. Twenty-eight GPs completed the full audit and education process, providing information about their smoking cessation management with 1114 patients. The main outcome measure was changes in GP management of smoking cessation with patients across the audit period, as measured by the clinical audit tool. RESULTS: The majority of GPs (57%) indicated that as a result of the audit process they had altered their approach to the management of patients who smoke. Quantitative analyses confirmed significant increases in various forms of evidence-based smoking cessation management practices to assist patients to quit, or maintain quitting across the audit period. However comparative analyses of patient data challenged these findings, suggesting that the clinical audit process had less impact on GP practice than suggested in GP's self-reported audit data. CONCLUSION: This study provides some support for the combined use of self-auditing, feedback and education to improve GP management of smoking cessation. However further research is warranted to examine GP- and patient-based reports of outcomes from clinical audit and other educational interventions.

McKay, J., P. Bowie, et al. (2006). "Variations in the ability of general medical practitioners to apply two methods of clinical audit: A five-year study of assessment by peer review." *Journal of Evaluation in Clinical Practice* 12(6): 622-9.

INTRODUCTION: Clinical audit has a central role in the NHS clinical governance agenda and the professional appraisal of medical practitioners in the UK. However, concerns have been raised about the poor design and impact of clinical audit studies and the ability of practitioners to apply audit methods. One method of making informed judgements on audit performance is by peer review. In the west of Scotland a voluntary peer review model has been open to general practitioners since 1999, while general practice trainees are compelled to participate as part of summative assessment. The study aimed to compare the outcomes of peer review for two methods of audit undertaken by different professional and academic groups of doctors. METHODS: Participants submitted a criterion audit or significant event analysis in standard formats for review by two informed general practitioners (GPs) using appropriate instruments. Peer review outcome data and the professional status of doctors participating were generated by computer search. Differences in proportions of those gaining a satisfactory peer review for each group were calculated. RESULTS: Of 1002 criterion audit submissions, 552 (55%) were judged to be satisfactory. GP registrars were significantly more likely than GP trainers ($P < 0.001$) and other established GP groups ($P < 0.001$) to gain a satisfactory peer review. GPs in non-training practices were less likely to achieve a satisfactory review than registrars ($P < 0.001$) and colleagues in training practices ($P < 0.001$). Of 883 SEA submissions, 541 (65%) were judged as satisfactory, with all groups gaining a similar proportion of satisfactory assessments, although GP registrars may have outperformed non-training practice GPs ($P = 0.05$). CONCLUSION: A significant proportion of GPs may be unable to adequately apply audit methods,

potentially raising serious questions about the effectiveness of clinical audit as a health care improvement policy in general medical practice.

Mitchell, I. A., B. Antoniou, et al. (2008). "A robust clinical review process: the catalyst for clinical governance in an Australian tertiary hospital." Medical Journal of Australia **189**(8): 451-5.

OBJECTIVE: To determine if a robust clinical review process can influence an organisation's response to adverse patient outcomes. DESIGN AND SETTING: Retrospective analysis of the activity and outputs of the Clinical Review Committee (CRC) of a university-affiliated tertiary hospital from 1 September 2002 to 30 June 2006. MAIN OUTCOME MEASURES: Engagement of clinicians (number on CRC, number interviewed for the clinical review process, number of specific referrals from clinicians); and numbers of cases reviewed, system issues identified, recommendations made to the hospital board, and ensuing actions. RESULTS: A multidisciplinary CRC with 34 members established a robust clinical review process and identified 5925 cases for initial case review. Of these, 2776 (46.8%) fulfilled one or more of the specified criteria for adverse events and progressed to detailed review; 342 of these (12.3%) were classed as serious or major. A total of 317 staff (11%) were interviewed, and 881 system issues were identified, resulting in 98 specific recommendations being made to the Clinical Board and implementation of 81 practice changes (including seven hospital-wide projects) to improve patient care. CONCLUSION: A robust, multidisciplinary clinical review process with strong links to managers and policymakers can influence an organisation's response to adverse patient outcomes and underpin a clinical governance framework.

Moore, J. (2008). "Survey of service user involvement in clinical audit." Clinical Governance **13**(3): 192-199.

Purpose - The purpose of this paper is to undertake a survey of the level and quality of service user involvement in clinical audit in NHS trusts currently, in order to identify perceived drivers and barriers, and factors to increase meaningful involvement. Design/methodology/approach - A cross-sectional descriptive survey was conducted with clinical audit leads in NHS trusts in two Strategic Health Authority regions (South East Coast and London). Findings - There has been an increase in the presence of relevant policies and structures related to user involvement in clinical audit since previous research a decade ago. However, similar barriers are identified and the role of users is still mainly providing feedback, with little meaningful involvement in the audit cycle, and few examples of improvements to clinical care. Practical implications - An organisational culture of user involvement needs to continue to be developed in the NHS generally, and the rationale and benefits of this need to be fully understood by all health professionals. Support needs to be provided at a national and trust level. Originality/value - Previous research on this topic was conducted ten years ago and there is no evidence to demonstrate how practice has changed since. This paper provides contemporary evidence regarding the implementation of user involvement in clinical audit.

Muffler, N., M. E. H. Trabelssi, et al. (2007). "Scaling up clinical audits of obstetric cases in Morocco." Tropical Medicine & International Health **12**(10): 1248-57.

OBJECTIVES: To follow-up on the process of implementing clinical audits of obstetric cases in Morocco as recommended by the Ministry of Health (2001) and to explore both the barriers to and factors facilitating sustainability of clinical audits. METHOD: Questionnaires were sent to heads of all 61 Moroccan health provinces (response rate 69%) to ask if their maternity units had implemented clinical audits between 1998 and 2003. Twenty of the 42 public maternities which responded had performed so. Thirteen of these 20 hospitals were visited and 56 semi-structured interviews held with administrators and health professionals. Locally available audit registers were consulted to triangulate data. RESULTS:

Eleven of 13 maternities visited conducted an average of 6.8 case reviews per year with a total average of 16.7 cases per hospital (range 4-38). Although interviewees confirmed that audits resulted in better quality of care, five hospitals had ceased performing audits altogether and the remainder did them less frequently, because of audit teams encountering staff resistance, insufficient understanding of the audit concept, difficulties in organizing sessions, and lack of administrative support. Insufficient training and external assistance hindered the implementation of complete audit loops, resulting in a loss of staff motivation. CONCLUSION: Implementing clinical audits as a means to improving quality of care requires a significant investment in training and various kinds of on-going assistance--factors which decision-makers should be aware of.

Nahm, M. L., C. F. Pieper, et al. (2008). "Quantifying data quality for clinical trials using electronic data capture." *PLoS ONE [Electronic Resource]* **3**(8): e3049.

BACKGROUND: Historically, only partial assessments of data quality have been performed in clinical trials, for which the most common method of measuring database error rates has been to compare the case report form (CRF) to database entries and count discrepancies. Importantly, errors arising from medical record abstraction and transcription are rarely evaluated as part of such quality assessments. Electronic Data Capture (EDC) technology has had a further impact, as paper CRFs typically leveraged for quality measurement are not used in EDC processes. METHODS AND PRINCIPAL FINDINGS: The National Institute on Drug Abuse Treatment Clinical Trials Network has developed, implemented, and evaluated methodology for holistically assessing data quality on EDC trials. We characterize the average source-to-database error rate (14.3 errors per 10,000 fields) for the first year of use of the new evaluation method. This error rate was significantly lower than the average of published error rates for source-to-database audits, and was similar to CRF-to-database error rates reported in the published literature. We attribute this largely to an absence of medical record abstraction on the trials we examined, and to an outpatient setting characterized by less acute patient conditions. CONCLUSIONS: Historically, medical record abstraction is the most significant source of error by an order of magnitude, and should be measured and managed during the course of clinical trials. Source-to-database error rates are highly dependent on the amount of structured data collection in the clinical setting and on the complexity of the medical record, dependencies that should be considered when developing data quality benchmarks.

National Institute for Health and Clinical Excellence (2002). Principles for best practice in clinical audit. Oxford, Radcliffe Medical Press.

Neuhauser, D. (2002). "Ernest Amory Codman MD." Quality & Safety in Health Care **11**(1): 104-105.

Nightingale, F. (1859). Notes on hospitals. London, John W. Parker & Son.

Novo, A., Z. Ridanovic, et al. (2006). "Clinical audit as method of quality improvement of healthcare in patients with diabetes, stroke and in cesarean section." Medicinski Arhiv **60**(3): 185-9.

INTRODUCTION: Clinical audit is used as a term for any kind of audit led by professionals in health care, and should not be complicated or unpleasant job. AIM: The aim of this work is to demonstrate the variations in practice between doctors working in a health care organization and the institutions (health centers - DZ and hospitals). Variations in practical work show the difference in quality of work between the doctors and the institutions, as well as variations in the use of resources and expenditure costs. METHODS: Three different questionnaires had been developed for three different clinical entities: diabetes, cesarean section, and stroke. The questionnaires had been created in collaboration with experts from each of those medical entities and based on research of literature, and valorized by the questionnaire for creating audits and calculations of ACQ (Audit

Criteria Questionnaire) score. RESULTS: Diabetes--The hugest disproportion is in not measuring (none evidencing) regular annual screenings for retina and foot, but albumin and creatinin are being controlled in very high percentage. Stroke: In hospital A in checked medical records side of cerebral lesion was evidenced regularly, what was different in hospital B, while in hospital B 100% of swallowing disorders were evidenced. Cesarean section: In hospital A the average period of preoperative length of stay is four days, while in hospital B it is 0.4 days, while the postoperative length of stay for both hospitals is 6 days. DISCUSSION: Clinical audit is a systematic analysis of quality of health care and as per the Accreditation standards for hospitals, published by the Federal Agency for Health Care Quality and Accreditation-AKAZ; it is mandatory to perform the clinical audit in 3-5 areas twice, in the year precedes the accreditation survey. CONCLUSION: Using small sample, authors proved big variations in practice among doctors and among health institutions as well. It has direct consequence on quality and costs and can be solved using AKAZ accreditation standards. It is very difficult to improve the quality of health care without regularly performed and documented clinical audits.

O'Riordan, S., J. Mackson, et al. (2008). "Self-reported prescribing for hypertension in general practice." Journal of Clinical Pharmacy & Therapeutics **33**(5): 483-8.

OBJECTIVE: To describe the self-reported management of hypertension in general practice and how this compares to national guidelines for hypertension. DESIGN: Analysis of self-reported cross-sectional clinical audit data. SETTING: Australian general practice for the years 1999, 2001, 2003 and 2004. Study POPULATION: A total of 5247 general practitioners who voluntarily participated in one of four hypertension clinical audits and provided data for 105,086 adult patients with a previous diagnosis of hypertension. MAIN OUTCOME MEASURES: Selection of blood pressure targets consistent with recommendation of hypertension guidelines, percentage of patients achieving target blood pressure and percentage of patients with selected co-morbidities treated with the preferred class of antihypertensive medications. RESULTS: In 2001, target blood pressures of 140/90 mmHg and 130/85 mmHg were being used for 38% and 55% of patients, respectively. In 2004, target blood pressures were 140/90 mmHg (39%), 130/85 mmHg (49%) and 125/75 mmHg (0.5%). In 2003 and 2004, 58% and 70% of patients were reported to have achieved a target blood pressure that was consistent with guidelines according to patient age and co-morbidities. However, only 54-62% of hypertensive patients with heart failure were prescribed an ACE inhibitor and 52% of patients with a history of myocardial infarction were receiving a beta-blocker or ACE inhibitor. CONCLUSIONS: The self-reported data from general practitioners participating in clinical audits show that these general practitioners are using blood pressures targets consistent with guideline recommendations for most patients and that more patients are reaching their target blood pressure. However, drug selection based on co-morbidities could improve.

Park, J., C. McAlaney, et al. (2008). "Improving patient care and clinical governance through the utilisation of a clinical information system." Clinical Governance **13**(4): 254-260.

Purpose - This paper seeks to provide an overview of how the involvement of clinicians in the design and implementation of an electronic clinical information system has contributed towards more effective clinical governance, while improving the care of patients with a diagnosis of psychosis. Design/methodology/approach - A data collection form was designed by a consultant in public health and a group of consultant psychiatrists to facilitate and standardise the data to be collected and stored on the information system. Two research nurses conducted a retrospective case note audit to record specified data on all existing patients from an inclusive diagnosis list in contact with CMHTs. Findings - The establishment of PsyCIS has increased the understanding of the nature and prevalence of psychosis in Greater Glasgow for

patients aged 18-65. As well as giving some insight into how the needs of this patient group are being addressed, it has also provided clinicians with the ability to benefit from their collective experience on the treatment and support of this patient group. Practical implications - To ensure excellent data quality and information management systems, it is essential to involve clinicians in their design and validation. The primary goal of information should be to aid clinical practice and patient care. Well designed datasets will also provide information that can inform clinical governance as well as the management of services and resources. Originality/value - This paper supports the view that clinical audit and electronic clinical information systems are imperative for effective clinical governance.

Perrone, E., M. S. Padula, et al. (2009). "Computerized-based clinical recording in monitoring hypertension in a primary care setting of Modena, Italy." Recenti Progressi in Medicina **100**(1): 4-8.

This study aims at evaluating the effectiveness of a computerized-based Clinical Record in monitoring hypertension in a Primary Care Setting. Blood pressure (BP) recording increased by 62% to 70% in the years 2004 to 2006. No improvement, however, was noticeable in the achievement of gold-standard targets in BP control (62% in all period). At the end of 2006 BP was recorded in 65% of patients. Among them, 2/3 of the non diabetics reached < 140/90 mmHg standard, while only 23% of diabetics reached < 130/80 mmHg standard. In conclusion, using a computerized clinical record appears not to be sufficient to obtain good clinical performances, yet it is a necessary first step to clinical audit.

Perry-Woodford, Z. (2008). "A clinical audit of the ileo-anal pouch service at St Mark's Hospital." Gastrointestinal Nursing **6**(2): 36-39.

Improving the quality of health care requires a range of evidence-based activities, such as clinical audit and feedback (Foy et al, 2005). This incorporates the foundations of clinical governance in supporting staff to deliver safe care of the highest quality. Agencies such as the National Institute for Health and Clinical Excellence (NICE) advance and encourage audit and feedback in order to set guidelines for future practice and development of specific services. Clinical audit was introduced in the NHS in 1993 and is defined as 'a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change' (NICE/CHI, 2002). This article outlines an audit to provide feedback on the current pouch care service, and to revise practice in line with a changing NHS.

Plesk, P. E. (1999). "Quality improvement methods in clinical medicine." Pediatrics **103**: 203-14.

Polkinghorne, K. R., M. Seneviratne, et al. (2009). "Effect of a vascular access nurse coordinator to reduce central venous catheter use in incident hemodialysis patients: a quality improvement report." American Journal of Kidney Diseases **53**(1): 99-106.

BACKGROUND: Starting hemodialysis therapy with an arteriovenous fistula (AVF) is associated with improved patient survival. Clinical audit showed that less than 50% of our patients started hemodialysis therapy with an AVF. STUDY DESIGN: Quality improvement report, prospective before and after study. SETTING & PARTICIPANTS: Tertiary referral hospital with 184 patients starting hemodialysis therapy in 2005 and 2006. QUALITY IMPROVEMENT PLAN: Situational analysis showed poor overall coordination of surgical waiting lists. Multifaceted intervention included vascular access nurse coordinator and an algorithm to prioritize surgery. OUTCOMES: Vascular access used at first hemodialysis treatment in patients with pre-end-stage renal disease in the 12 months before and after the intervention. MEASUREMENTS: Proportions of patients starting hemodialysis therapy with an AVF. RESULTS: Overall, 65% of patients started hemodialysis therapy with an AVF; 2%, with an arteriovenous

graft; and 33%, with a catheter. The proportion of patients starting hemodialysis therapy with an AVF increased from 56% preimplementation to 75% postimplementation (P = 0.007). After adjustment for age, sex, late referral, cause of renal failure, and presentation type, patients starting dialysis therapy in the implementation phase were twice as likely to start treatment with an AVF (odds ratio, 2.85; P = 0.008). The total number of catheter-days in the implementation phase was half that of the preimplementation phase (2,833 v 4,685 days). LIMITATIONS: Nonrandomized study. CONCLUSIONS: Implementation of a multifaceted intervention including a vascular access nurse and an algorithm to prioritize surgery significantly increased the proportion of patients starting dialysis therapy with an AVF by improving the overall coordination of the surgical waiting list.

Porter, R. (1997). The greatest benefit to mankind: a medical history of humanity from antiquity to the present. London, Harper Collins.

Powell, J., R. Lovelock, et al. (1994). "Involving users in assessing service quality: benefits of using a qualitative approach." Quality in Health Care 3: 199-202.

Ravindran, V., I. Logan, et al. (2008). "Septic arthritis: clinical audits would help optimise the management." Clinical Rheumatology 27(12): 1565-7.

We audited management of septic arthritis (SA) in our institution comparing them with the British Society for Rheumatology (BSR) guidelines and also ascertained awareness regarding these guidelines among trainee doctors. All adult patients who were admitted to our institution between January 2005 and December 2006 with symptoms and signs of SA and had positive synovial fluid culture were included, and a structured proforma was used to extract the relevant information from the case notes and laboratory tests. Management of 21 patients with SA was audited. In several areas (such as appropriate samples for cultures prior to initiation of antibiotics and use of inflammatory markers in monitoring the response to treatment), management of both native and prosthetic joint SA fell short of compliance with the BSR guidelines. A total of 58% trainee doctors surveyed were unaware of these guidelines. Our audit identified deficiencies in standards of care of SA. Lack of awareness regarding these guidelines contributes to the suboptimal care of patients with SA. Wider dissemination of the BSR guidelines with similar audits being a starting point would help in optimising the management of SA.

Rehmani, R. and A. F. Amatullah (2008). "Quality improvement program in an emergency department." Saudi Medical Journal 29(3): 418-22.

OBJECTIVE: To describe the quality assurance/improvement program in our emergency department ED. METHODS: This program involved monthly data collection and analysis, data-driven process change, staff education in the core concepts of quality, and data reanalysis from the years 2003 to 2006 at the King Abdul-Aziz Hospital, Al-Ahsa, Kingdom of Saudi Arabia. Data captured during the program included census data, chart review, and focused clinical audits. Continuous quality improvement measures collected at the beginning of the program and quarterly included: 1) quality indicators (length of stay [LOS] and rates of left against medical advice [AMA] or left without being seen [LWBS]), 2) percentage of patients that stay > or =3 hours in ED, unscheduled returns within 48 hours, inter-hospital transfer data, sentinel events tracking rates, and 3) nature of patient complaints. RESULTS: During the study period, the program demonstrated improvement in all measured areas. Despite an increase in patient volume of 47% to 51,698 visits/year, the mean monthly LOS remained static, the unscheduled returned visits dropped by 50% (2% to 1%), and patients leaving AMA decreased from 1.5% to 1.2%, and LWBS decreased from 1.6% to 0.8%. The rate of complaints dropped by 5 fold (1.3 per 1000 patients to 0.25). CONCLUSION: Our program demonstrated improvement in all the measured parameters.

Rome, K., P. J. Gow, et al. (2009). "Clinical audit of foot problems in patients with rheumatoid arthritis treated at Counties Manukau District Health Board, Auckland, New Zealand." Journal of Foot & Ankle Research **2**: 16.

ABSTRACT: BACKGROUND: At diagnosis, 16% of rheumatoid arthritis (RA) patients may have foot joint involvement, increasing to 90% as disease duration increases. This can lead to joint instability, difficulties in walking and limitation in functional ability that restricts activities of daily living. The podiatrist plays an important role in the multidisciplinary team approach to the management of foot problems. The aim of this study was to undertake a clinical audit of foot problems in patients with RA treated at Counties Manukau District Health Board. **METHODS:** Patients with RA were identified through rheumatological clinics run within CMDHB. 100 patients were eligible for inclusion. Specific foot outcome tools were used to evaluate pain, disability and function. Observation on foot lesions were noted and previous history of foot assessment, footwear/insoles and foot surgery were evaluated. **RESULTS:** The median age of the cohort was 60 (IQR: 51-64) years old with median disease duration of 15 (IQR: 7.3-25) years. Over 85% presented with foot lesions that included corns and callus over the forefoot region and lesser toe deformities. Moderate to high disability was noted. High levels of forefoot structural damage were observed. 76% had not seen a podiatrist and 77% reported no previous formal foot assessment. 40% had been seen at the orthotic centre for specialised footwear and insoles. 27% of RA patients reported previous foot surgery. A large proportion of patients wore inappropriate footwear. **CONCLUSION:** This clinical audit suggests that the majority of RA patients suffer from foot problems. Future recommendations include the provision of a podiatrist within the current CMDHB multidisciplinary rheumatology team to ensure better services for RA patients with foot problems.

Scott, R. (2009). "Liability of mental health services for injuries incurred during community treatment." Australasian Psychiatry **17**(2): 134-40.

OBJECTIVES: The aim of this paper is to examine the recent decision of the NSW Supreme Court, which considered a personal injuries action brought by a patient treated in the community following a 6 day voluntary hospital admission. **CONCLUSIONS:** The judicial reasoning in Walker v Sydney West Area Health Service provides some comfort to mental health professionals practising in other jurisdictions whose legislative provisions are similar to those contained in the Civil Liability Act (NSW). In applying the Bolam principle, rather than the higher common law standard previously imposed by the High Court in Rogers v Whitaker, the decision is encouraging for mental health professionals whose management accords with accepted current good practice. The infrequent scrutiny by courts and coroners of management practice and systems in mental health is a further incentive to maintain continuous improvement of quality of care (by clinical audits, active risk management, professional development and supervision, and patient/family participation) consistent with the principles of clinical governance.

Seddon, M., J. Buchanan, et al. (2006). "Quality improvement in New Zealand healthcare. Part 3: achieving effective care through clinical audit." New Zealand Medical Journal **119**(1239): U2108.

In this third article in the Series on quality improvement, we examine the effectiveness of dimension of healthcare quality. To satisfy this dimension, two equally important facets must be attended to. First the best available evidence must be sought through research, and second that evidence must be applied--this second function is the domain of quality improvement activities generally and clinical audit in particular. Clinical audit is one of the main tools to establish whether the best evidence is being used in practice, as it compares actual practice to a standard of practice. Clinical audit identifies any gaps between what is done and what should be done, and rectifies any deficiencies in the actual processes of care. In this article, the steps involved in a clinical audit, how it is different to research, and the question of whether clinical audit requires ethical

approval are explored.

Shekelle, P. G., J. P. Kahan, et al. (1998). "The reproducibility of a method to identify the overuse and underuse of medical procedures." New England Journal of Medicine **338**: 1888-95.

Siddiqi, K., A. Volz, et al. (2008). "Could clinical audit improve the diagnosis of pulmonary tuberculosis in Cuba, Peru and Bolivia?" Tropical Medicine & International Health **13**(4): 566-78.

OBJECTIVES: To assess the effectiveness of clinical audit in improving the quality of diagnostic care provided to patients suspected of tuberculosis; and to understand the contextual factors which impede or facilitate its success. **METHODS:** Twenty-six health centres in Cuba, Peru and Bolivia were recruited. Clinical audit was introduced to improve the diagnostic care for patients attending with suspected TB. Standards were based on the WHO and TB programme guidelines relating to the appropriate use of microscopy, culture and radiological investigations. At least two audit cycles were completed over 2 years. Improvement was determined by comparing the performance between two six-month periods pre- and post-intervention. Qualitative methods were used to ascertain facilitating and limiting contextual factors influencing change among healthcare professionals' clinical behaviour after the introduction of clinical audit. **RESULTS:** We found a significant improvement in 11 of 13 criteria in Cuba, in 2 of 6 criteria in Bolivia and in 2 of 5 criteria in Peru. Twelve out of 24 of the audit criteria in all three countries reached the agreed standards. Barriers to quality improvement included conflicting objectives for clinicians and TB programmes, poor coordination within the health system and patients' attitudes towards illness. **CONCLUSIONS:** Clinical audit may drive improvements in the quality of clinical care in resource-poor settings. It is likely to be more effective if integrated within and supported by the local TB programmes. We recommend developing and evaluating an integrated model of quality improvement including clinical audit.

Simmons, J. M., P. Matteucci, et al. (2006). "Variations in clinical audit collection: A survey of plastic surgery units across the British Isles." Annals of the Royal College of Surgeons of England **88**(2): 196-198.

Introduction: Clinical audit is a requirement of good medical and surgical practice and is central to the UK Government's plans to modernise the NHS. **Materials and methods:** A survey was conducted to assess clinical audit data collection and collation within plastic surgery departments across the UK. The survey identified a variety of different data collection and collation methods, with extensive differences between plastic surgery departments. Those responsible for data collection and its funding were also identified by the survey. **Results:** Results were obtained from 45 plastic surgery departments. Of the 45 departments surveyed, 12 collect data prospectively, whereas 26 units collect data retrospectively. The remaining departments collect data using a combination of methods. Of the units surveyed, 28 collect data on paper-based systems, with only 13 units using electronic applications. The personnel responsible for data collection were identified as being junior doctors. Departments collecting data prospectively do so from a greater number of sources than those collecting data retrospectively. **Conclusions:** This survey has focused on plastic surgery. The authors believe that similar results would be obtained from a survey of other surgical specialties. A huge variation in all parameters relating to the collection and collation of clinical audit data is seen. There are few standards within this specialty for data collection. Much work must be done in order to reach targets set by the UK Government.

Snooks, H., M. Halter, et al. (2005). "Hearing half the message? A re-audit of the care of patients with acute asthma by emergency ambulance crews in London." Qual Saf Health Care **14**(6): 455-458.

Problem: An initial audit of the care provided to emergency asthma patients by the ambulance service was carried out in 1996. Some under-recognition and

under-treatment of severe asthma was found as well as a lack of documentation of patient condition on scene. A re-audit was undertaken in 1999. Design: A multidisciplinary advisory group was reconvened. The same method was adopted as for the first audit. Patients included were those administered nebulised salbutamol by crews in the catchment areas of four hospitals and those diagnosed with asthma at the Accident Emergency (A&E) departments of those hospitals between January and March 1999. Setting: London Ambulance Service. Key measures for improvement: (1) Accuracy of diagnosis and appropriateness of treatment, and (2) adherence to protocol. Strategies for change: Following the first audit, treatment protocols were widened and brought into line with the British Thoracic Society guidelines for care of acute asthma patients. The results were widely disseminated within the service and training was initiated for all operational staff. Effects of change: The number of patients included in the re-audit more than doubled (audit 1: n = 252, audit 2: n = 532). The increase occurred exclusively in those administered nebulised salbutamol by ambulance crews but diagnosed with conditions other than asthma in A&E (audit 1: n = 15, audit 2: n = 161). The proportion of patients diagnosed with asthma in A&E who were administered nebulised salbutamol by their attending crew rose from 58% to 75%. However, 43 asthma patients were not treated; several of these were not recognised as suffering from asthma and others fell within the changed protocols for treatment. Adherence to protocol for administration of salbutamol remained high. Pre-hospital documentation of key observations did not improve. Lessons learnt: Messages from the first audit seem to have been acted upon selectively. Implementing change is complex, and re-audit is necessary to understand the effects of the changes made.

Stubbs, B. and N. Alderman (2008). "Physical interventions to manage patients with brain injury: an audit on its use and staff and patient injuries from the techniques." *Brain Injury* **22**(9): 691-6.

PRIMARY OBJECTIVE: To report the use of physical interventions (PI) used to manage aggressive behaviour in a neurobehavioural unit and any injuries that were sustained to patients and staff during its implementation. **RESEARCH DESIGN:** A retrospective audit was adopted utilizing a standard accident and incident recording database. **METHODS AND PROCEDURES:** Records of PI utilized to manage the aggressive behaviour of 75 adults with acquired brain injury were analysed over the course of one calendar year. In addition duration PI, frequency of use and injuries sustained to staff and patients from its application were investigated. **MAIN OUTCOMES AND RESULTS:** During the 12 month period records were audited, PI was used on 1427 occasions. The majority (90.1%) lasted less than 10 minutes. Injury rates to patients (0.98%) and staff (6.5%) were both considerably lower than those rates reported for other clinical populations. **CONCLUSION:** Use of PI with people who have an acquired brain injury is particularly challenging due to complex patterns of physical impairment that can be an outcome of this condition. This study describes how a multidisciplinary approach to the application of PI and the contribution of the physiotherapist in particular can result in comparatively low injury rates.

Ugolini, G., G. Rosati, et al. (2009). "An easy-to-use solution for clinical audit in colorectal cancer surgery." *Surgery* **145**(1): 86-92.

BACKGROUND: Clinical audit has been increasingly required for the accreditation process in every modern healthcare system. Data collection and analysis are excessively time-consuming in everyday practice. The primary aim of our study was to evaluate the effectiveness of an innovative database to assist surgeons in monitoring clinical practice outcomes in colorectal cancer surgery. The second purpose was to compare observed mortality rates to 3 risk-predicting operative scoring systems. **METHODS:** Data were evaluated from 208 consecutive patients undergoing elective and emergency surgery for colorectal cancer over a 2-year period (2003-2004). A new database was developed with specific queries to compare the observed and the expected mortality rates according to 3 scoring systems: the Portsmouth-Physiological and Operative

Severity Score for enUmeration of Mortality and morbidity (P-POSSUM), the ColoRectal-Physiological and Operative Severity Score for enUmeration of Mortality and morbidity (CR-POSSUM), and the Association of ColoProctology or Great Britain & Ireland (ACPGBI) score. Results were discussed at regular intervals. Surgeons' satisfaction with each system was evaluated with a questionnaire. RESULTS: The observed mortality rate was 6.25%, which was significantly lower than the values predicted by CR-POSSUM and ACPGBI colorectal scores (9.14% and 19.42%, respectively; $P < .05$). P-POSSUM was the most accurate predictor of mortality, with a value of 7.93%. A total of 80% of the surgical staff considered this type of surgical audit activity as clinically useful. CONCLUSION: The study confirms the usefulness of a dedicated database in a surgical audit activity. The ACPGBI colorectal score largely overestimated 30-day mortality in our experience.

van Dillen, J., F. Lim, et al. (2008). "Introducing caesarean section audit in a regional teaching hospital in The Netherlands." European Journal of Obstetrics, Gynecology, & Reproductive Biology **139**(2): 151-6.

OBJECTIVE: The increase in caesarean section rates is considered a reason for serious public health concern. With the objective to create awareness and initiate local discussion, obstetric audit was introduced in a regional teaching hospital in The Netherlands. STUDY DESIGN: Caesarean section audit was introduced during the existing daily reports meetings from August 1, 2005 to June 1, 2006 in The Haga hospital, a large teaching hospital in The Hague, The Netherlands. All caesarean sections were discussed with regard to indication, classification and audited for 'lack of necessity'. For comparing intervention rates with the period prior to audit, Chi-square test with Yates correction for 2 x 2 tables was used. RESULTS: Of 1221 deliveries, 228 were caesarean sections (18.7%) while prior to the audit period there were 1216 deliveries with 284 were caesarean sections (23.4%). The caesarean section rate is significantly lower during the audit period. Assisted vaginal deliveries, neonatal outcome, and induction of labor rates were comparable. Concerning the audit question 'could caesarean section have been prevented', there was discussion in 24.4% of cases. In 6.7% of caesarean sections, consensus about lack of necessity was achieved. CONCLUSION: Introducing caesarean section audit during the existing structure of daily report meetings in a regional teaching hospital is both feasible and practical. It creates awareness and encourages discussion among staff members concerning indications for caesarean sections and lack of necessity. Furthermore, there was a significant decrease in caesarean section rate during the audit period.

Ved, P. and T. Coupe (2007). "Improving prescription quality in an in-patient mental health unit: Three cycles of clinical audit." Psychiatric Bulletin **31**(8): 293-294.

Aims and method: We undertook three cycles of clinical audit of prescription charts to improve the quality of the prescriptions written in an in-patient unit. Pharmacy and medical staff reviewed a total of 1466 prescriptions on 242 prescription charts against local guidelines and provided feedback to medical staff. The pharmacist also regularly reviewed prescription charts on the wards between audits. Results: After three cycles of audit, 99.5% of prescriptions written were legible. The recording of drug allergies, section 58 status and patient age remained poor. Clinical implications: A combination of clinical audit and continual pharmacist review of prescription charts can improve the quality of prescriptions written by medical staff in an in-patient unit.

Walshe, K. and P. Spurgeon (1997). Clinical audit assessment framework. Birmingham, University of Birmingham