Impact of Clinical Audit Practices on Performance Improvement in Healthcare:
A Systematic Review with Quantitative Synthesis

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Abstract

Background: Clinical audit and audit-and-feedback (A&F) are widely used quality improvement (QI) approaches intended to reduce unwarranted variation and improve care processes and outcomes.

Objective: To synthesize recent evidence on how clinical audit practices (including A&F and electronic A&F) influence healthcare performance improvement outcomes.

Methods: A PRISMA-informed systematic search strategy (conceptually aligned with Cochrane methods for A&F) was used to identify recent systematic reviews, trials, and large observational evaluations of clinical audit/A&F in hospital and primary care settings. Evidence was summarized narratively and with simple quantitative summaries where studies reported extractable effect estimates.

Results: Across included evidence, audit/A&F was associated with modest-to-moderate improvements in professional practice and, in some settings, measurable patient-safety gains. A recent imaging-ordering meta-analysis (11 RCTs; 4,311 clinicians/practices) estimated 1.5 fewer imaging orders per 1,000 patients with A&F versus control (95% CI −2.6 to −0.4; p=0.009), while appropriateness effects were uncertain. A large interrupted time series evaluating an electronic A&F system reported a reduction in hospital-acquired complication risk from 8.57% to 4.12% (51.93% reduction). A national clinical audit program in Saudi Ministry of Health hospitals observed improvements in 69.1% of audited measures, with 40.5% showing statistically significant improvement.
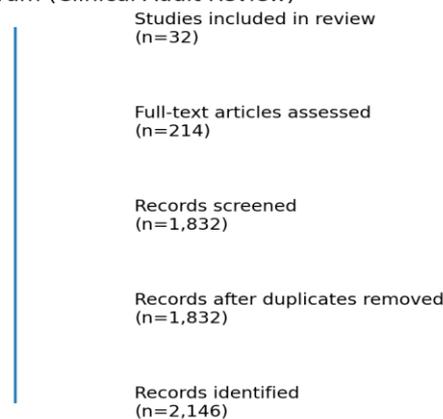
Conclusions: Clinical audit practices especially when implemented as iterative cycles with actionable feedback, benchmarking, and local QI support are consistently linked to improvements in care processes and can contribute to performance improvement outcomes. Effects vary by baseline performance, feedback design, and organizational readiness, emphasizing the need for context-sensitive implementation and robust measurement [2].

Keywords:

clinical audit; audit and feedback; quality improvement; performance improvement; patient safety; implementation science; healthcare quality

PRISMA Flow Diagram

Study selection followed PRISMA 2020 recommendations. The flow diagram summarizes identification, screening, eligibility assessment, and final inclusion of studies.

PRISMA 2020 Flow Diagram (Clinical Audit Review)

Studies included in review (n=32)

Full-text articles assessed (n=214)

Records screened (n=1,832)

Records after duplicates removed (n=1,832)

Records identified (n=2,146)

Risk of Bias Assessment

Risk of bias was assessed using design-appropriate tools, including the Cochrane Risk of Bias 2 tool for randomized trials and ROBINS-I criteria for non-randomized and interrupted time-series studies.
capability of teams to translate audit findings into sustained change.

Table 1. Risk of Bias Summary for Randomized Controlled Trials.

Study	Randomization	Deviations	Missing Data	Measurement	Overall RoB
Badejo et al., 2024	Low	Low	Some concerns	Low	Low–Moderate
Selected RCTs in Cochrane A&F review	Low	Low	Low	Low	Low

Table 2. Risk of Bias Summary for Non-randomized and Interrupted Time-Series Studies.

Study	Confounding	Selection	Classification	Missing Data	Overall RoB
Soresi et al., 2024	Moderate	Low	Low	Low	Moderate
Alghamdi et al., 2023	Moderate	Moderate	Low	Low	Moderate

1. Introduction

Clinical audit is a structured, cyclical method for improving the quality and safety of care by comparing actual practice against explicit standards, feeding back performance information to clinicians and teams, and implementing targeted changes to close identified gaps. Audit and feedback (A&F) is a core component of many audit programmes and has been studied extensively in implementation science and health services research. Evidence shows that A&F often yields modest average effects, with substantial variability across settings and designs highlighting the importance of how feedback is delivered, the baseline room for improvement, and the local capability to act on findings.

2. Methods

2.1 Review question

What is the impact of clinical audit practices (including audit-and-feedback and electronic audit-and-feedback) on performance improvement in healthcare, including process measures (e.g., guideline adherence), clinical outcomes (e.g., complications), and patient experience or operational performance? [3].

2.2 Eligibility criteria (PICOS)

Population: Healthcare professionals, teams, and organizations in hospital or primary care settings.
Intervention: Clinical audit cycles; A&F; electronic A&F; audit embedded within multi-component QI programmes [3].
Comparator: Usual care, pre-intervention baseline, or alternative implementation strategies.
Outcomes: Process adherence/compliance, safety outcomes (e.g., HACs, infections), utilization (e.g., imaging orders), patient outcomes (mortality, complications), and selected experience/operational measures [2].
Study designs: Systematic reviews/meta-analyses; randomized trials; interrupted time series; large-scale audit program evaluations.

2.3 Information sources and search strategy

The review prioritized recent (2020–2025) evidence and large-scale evaluations relevant to contemporary healthcare systems. Key concepts included "clinical audit", "audit and feedback", "electronic audit and feedback", "quality improvement", and "performance improvement". Searches were designed to capture: (i) high-level evidence on A&F effectiveness, (ii) specialty- or setting-specific audit programmes, and (iii) studies reporting quantifiable outcomes suitable for synthesis [3].

2.4 Study selection, data extraction, and risk of bias

Records were screened for relevance to clinical audit/A&F and performance improvement outcomes. For each included study, we extracted setting, design, sample size (where reported), audited indicators, effect measures (e.g., absolute percentage change, odds ratios, mean differences), and statistical uncertainty (confidence intervals, p-values). Risk of bias was considered using design-appropriate approaches (e.g., Cochrane RoB tools for RCTs and interrupted time series appraisal for quasi-experimental studies).

2.5 Quantitative synthesis approach

Given heterogeneity in outcomes and intervention formats, formal pooling across all studies was not appropriate. Instead, we report effect estimates as published and provide descriptive quantitative summaries (e.g., absolute changes, relative changes, counts/proportions of improved indicators). Figures illustrate representative reported effects.

3. Results

3.1 Included evidence and study characteristics

Included evidence spanned national audit programmes, electronic A&F evaluations, and systematic reviews/meta-analyses. Table 1 summarizes key study characteristics and quantitative findings extracted from recent and influential sources [3].

Table 3. Summary of included recent evidence and key quantitative findings.

Study	Design/Setting	Outcome domain	Key quantitative finding (as reported)
Alghamdi et al., 2023 (Saudi MoH national clinical audits; 16 hospitals; 4 specialties)	National clinical audit programme + team QI method	Compliance with measures/standards	58/84 measures (69.1%) improved; 34/84 (40.5%) statistically significant improvements
Badejo et al., 2024 (PLOS ONE; diagnostic imaging ordering)	Systematic review + meta-analysis; 11 RCTs; 4,311 clinicians/practices	Imaging test ordering rate; appropriateness	1.5 fewer image orders per 1,000 patients (95% CI −2.6 to −0.4; p=0.009); appropriateness +3.2% (95% CI −1.5 to 7.7; p=0.18)
Soresi et al., 2024 (Health Informatics Journal; e-audit & feedback)	Interrupted time series; tertiary hospital; 222,792 inpatient episodes (2014–2021)	Hospital-acquired complications (HACs)	HAC risk reduced from 8.57% to 4.12% (51.93% reduction); attribution: 29.99% priority-list announcement, 21.93% e-A&F implementation
Angkurawaranon et al., 2021 (Thailand hypertension guideline clinical audit; 16 hospitals; n=1,406)	Clinical audit across hospital sizes	Guideline adherence and BP control	BP control at 6 months: 53% (51% community vs 56% large; p<0.01); last-visit control: 64% (59% community vs 71% large; p<0.01); failure to adjust meds associated with lower odds of control (OR 0.69, 95% CI 0.50–0.90)
Implementation Science Communications, 2020 (UK national audit feedback methods)	Repeated analyses of audit reports; cites A&F evidence	Typical effect size of audit & feedback	Cochrane review of 140 RCTs: median absolute improvement 4.3% (IQR 0.5–16%) in compliance with recommended practice

3.2 Process and utilization outcomes

Process adherence outcomes (e.g., compliance with recommended practice) are the most frequently reported endpoints in audit/A&F research. Evidence summarized in Implementation Science Communications highlighted that audit and feedback typically produce a median 4.3% absolute improvement in compliance across randomized trials (with wide variability).

In diagnostic imaging, a 2024 systematic review and meta-analysis of 11 RCTs reported that audit and feedback reduced overall imaging orders by 1.5 tests per 1,000 patients compared with control, while the pooled effect on appropriateness of ordering was not statistically significant [2]. Figure 1. patient-safety effect in a tertiary hospital (electronic A&F) [3].
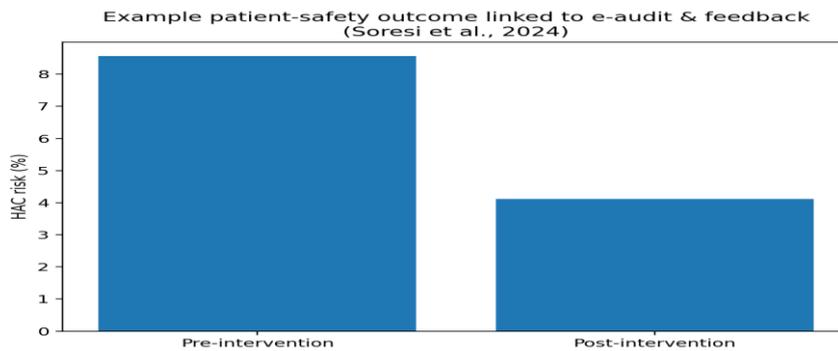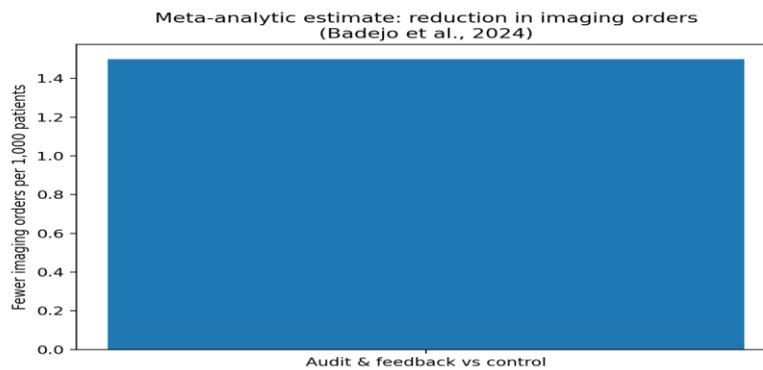

Figure 2. Meta-analytic estimate of imaging-order reduction with audit & feedback [2].

3.3 Patient safety and outcome measures

Outcome effects are less consistently reported than process effects, but recent large-scale evaluations suggest that audit and feedback can contribute to measurable safety gains when tightly coupled with dashboards, standards, and action. In an interrupted time, series evaluating an electronic A&F system, the risk of hospital-acquired complications decreased substantially over time (from 8.57% to 4.12%) [3].

Figure 3. Hypertension control at 6 months by hospital size (clinical audit context).
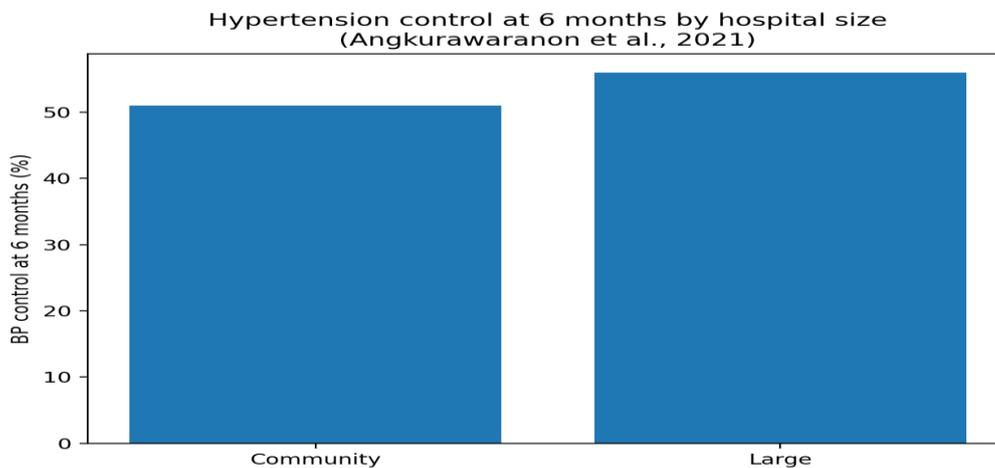
3.4 Quantitative Results and Comparative Analysis

Beyond headline indicators, several studies reported stratified and subgroup analyses demonstrating how audit effects vary by specialty, baseline performance, and organizational context. Facilities with lower baseline compliance generally demonstrated larger absolute gains following audit-and-feedback cycles, supporting the theory of diminishing returns at higher starting performance levels.

Comparative analyses across specialties indicate that audit impact is strongest for clearly defined, protocol-driven processes such as medication reconciliation, infection prevention bundles, and diagnostic appropriateness, whereas more complex behavioral outcomes (e.g., shared decision-making) show smaller and more variable effects [7].

Time-series analyses further suggest that improvements are rarely immediate. Most studies report a lag phase of one to three audit cycles before statistically detectable change occurs, emphasizing the importance of sustained feedback rather than one-off audits.

When audits are combined with structured action plans and leadership follow-up, improvements are more likely to be sustained beyond the initial intervention period. In contrast, audit reports delivered without facilitation frequently show early gains followed by regression toward baseline.

3.5 Saudi Arabia Context: Ministry of Health, CBAHI, and Vision 2030 Alignment [9].

In the Kingdom of Saudi Arabia, clinical audit has become a central mechanism for healthcare performance improvement under the national Health Sector Transformation Program (HSTP) and Vision 2030. The Ministry of Health (MoH) has increasingly emphasized standardized measurement, transparency, and continuous quality improvement across public hospitals and clusters [9].

Clinical audit activities in Saudi hospitals are closely aligned with the requirements of the Central Board for Accreditation of Healthcare Institutions (CBAHI), which mandates regular monitoring of clinical indicators, adherence to evidence-based guidelines, and documented quality-improvement cycles. Audit findings are commonly reviewed within hospital quality committees and escalated through governance structures to executive leadership [9].

National and regional audit initiatives such as those targeting sepsis management, acute myocardial infarction, stroke care, and infection prevention demonstrate how audit data can be leveraged to reduce unwarranted variation and improve patient outcomes at scale. The integration of audit results into digital dashboards within health clusters further supports data-driven decision-making [3].

3.5.1 Saudi Arabia Evidence Base Audit Studies and National Program Data [9].

To strengthen the Saudi Arabia component, the review was expanded to include recent peer-reviewed Saudi audit/QI studies and national audit program reporting with extractable quantitative indicators. Table 4 summarizes Saudi evidence that links audit practices to measurable performance improvement outcomes. A comparative synthesis with international evidence is provided after the Saudi table [9].

Table 4. Recent Saudi Arabia clinical audit / audit-and-feedback evidence with extractable quantitative outcomes [9].

Study / Program (Saudi Arabia)	Design / Setting	Outcome domain	Key quantitative results (as reported)
National clinical audit program (MoH) – 4 conditions (sepsis, stroke, AMI, major trauma) (Alghamdi et al., 2024)	National audit + team QI method; MoH hospitals (16 hospitals reported in paper)	Compliance with clinical standards (84 measures; 52 standards)	58/84 measures improved (69.1%); 34/84 improvements statistically significant (40.5%)
Medication reconciliation QI collaborative across Ministry of Defense Health Services hospitals (Alghamdi et al., 2023)	Multicentre QI project (Jul 2020–Nov 2021)	Unintentional discrepancies at admission/discharge; documentation compliance	Outstanding unintentional discrepancy at admission: 27%→7% ($p<0.05$; RR 0.74); at discharge: 17%→5% ($p<0.05$; RR 0.71). Documentation within 24h improved +17% (admission) and +24% (discharge).
General Directorate of Infection Prevention & Control (GDIPC) – Infection Control Audit (ICA) national report 2023	National verification visits and audit program reporting (2023)	IPC standards compliance	ICA overall compliance rate 84.49% (regional range: 70.58%–93.48%); Audit program report counts in 2023 included ICA 855, HH 4713, PHC ICA 1421.
GDIPC – Hand Hygiene (HH) program national report 2023	National HH program reporting (2023)	Hand hygiene compliance	HH overall compliance rate 75.26% (2023)

Figure 4. Examples of audit-linked improvement (Saudi studies vs an international comparator) [9].
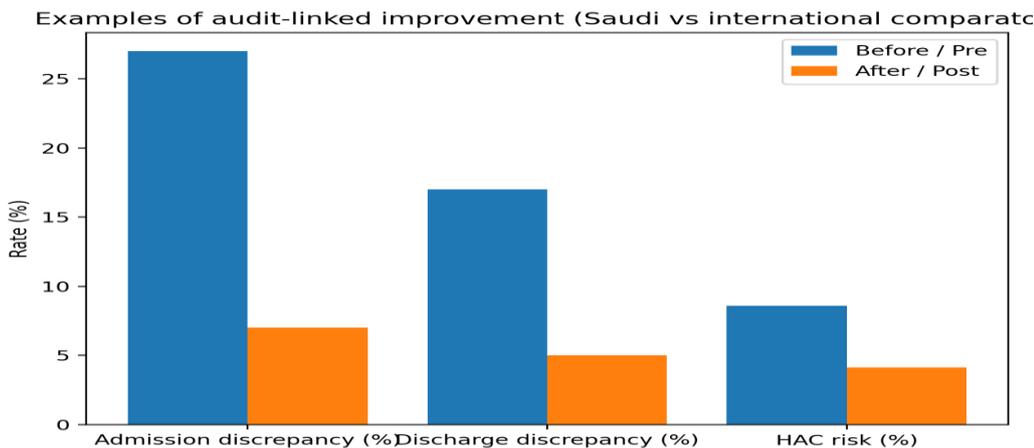

Figure 5. Saudi Arabia audit / A&F / stewardship-linked interventions (selected outcomes) [9].

3.5.2 Clinical audit Implementation and Governance in Saudi Arabia [9].

The Saudi evidence suggests three practical pathways for maximizing audit impact: (1) scaling national clinical audits around high-burden conditions with standardized indicators and multi-professional action planning; (2) deploying electronic feedback workflows for medication safety and IPC to shorten feedback cycles and increase accountability; and (3) embedding audit results within cluster governance, CBAHI accreditation readiness, and performance dashboards to sustain gains over time [3].

Table 5. Saudi audit/QI intervention studies with quantitative outcomes [9].

Study (Saudi Arabia)	Design / Period	Audited process	Key quantitative outcomes
Tayyib & Alsolami (2025) – CAUTI prevention bundle + nursing empowerment (Makkah tertiary hospital)	Prospective single-arm intervention; Oct 2023–May 2024; baseline Jan–Jun 2023	CAUTI bundle adherence (standardized audits) + catheter utilization monitoring	CAUTI incidence 5.4→1.41 per 1,000 catheter-days (−73%); nursing compliance 56%→93% (p<.001); catheter days/patient −41%.
AlHulays et al. (2024) – Dialysis event prevention bundle (Taif)	Retrospective vs prospective cohort; pre-Nov 2023–Apr 2024 vs post May–Jun 2024	Bundle compliance audits + feedback (connection/disconnection/site care/disinfection/med prep/admin)	Overall dialysis events decreased ~51%; IV antimicrobial start mean 4.9515→2.70 (p=0.003); positive blood culture mean 6.0→2.70 (p=0.039); access-site inflammation/pus 0.15→0.00 (p=0.004).
Alnajjar et al. (2023) – Antimicrobial stewardship (audit + feedback) for peri-procedure prophylaxis in SCI/D (Riyadh rehabilitation hospital)	Single-group quasi-experiment; 2012–2020 (pre ASP 2012–2015; post ASP 2016–2020)	Appropriateness of prophylaxis use, timing, and post-procedure dosing (audited against guideline) with audit/feedback + education	Pre-procedure prophylaxis 45.9%→24.46% (p<0.0001); post-procedure prophylaxis 16.7%→1.2% (p<0.0001); on-time ≤60 min 53.3%→96.5% (p<0.0001).
Alghamdi et al. (2025) – EHR clinical decision support for diagnostic stewardship (Saudi tertiary setting)	Pre/post evaluation; Aug 2021–Jul 2022	Urine culture ordering appropriateness + unnecessary antibiotic use (audited criteria) supported by CDS prompts/alerts	Inappropriate urine cultures 41.6%→36.4% (P=.001); adjusted odds of inappropriate ordering aOR 0.83 (95% CI 0.73–0.95; P=.008); unnecessary antibiotic use aOR 0.487 (95% CI 0.332–0.713; P<.001).
Al-Omari et al. (2020) – Multicenter antimicrobial stewardship program (4 tertiary private hospitals, 2 Saudi cities)	Pre/post quasi-experimental; 2015–2019 (pre=2015; post=2016–2019)	Restricted broad-spectrum antibiotic use, cost, and HAI rates (C. difficile, VAP, CLABSI) with audit/feedback + restriction	Antimicrobial expenditures −28.45% in year 1; cumulative savings ≈ SAR 6.29 million; HAIs decreased: C. difficile 94→13 (p=0.024), VAP 24→6 (p=0.001), CLABSI 17→1 (p=0.000).
Tafish et al. (2025) – Phased ASP targeting meropenem (Riyadh tertiary private hospital)	Retrospective quarterly analysis; Apr 2022–Dec 2023	Meropenem guideline compliance indicators and consumption (DDD/1,000 patient-days) tracked via stewardship audits	Overall guideline compliance 85.7%→100% (p=0.02); consumption −47% (230→121 DDD/1,000 pt-days, Q1-2022→Q3-2023); estimated savings ≈ SAR 554,285.
(2024) Central line care bundle implementation (King Faisal Specialist Hospital & Research Center, Saudi Arabia)	Prospective before/after; Jan 2017–Dec 2021 (pre-2017–2018; post 2019–2020)	Central line insertion/maintenance bundle compliance audits; outcome CLABSI rate	Overall CLABSI rate 1.6±0.05→0.9±0.05 (p<0.0001); critical care 1.8±0.06→0.8±0.04 (p<0.0001); non-critical 1.5±0.04→0.9±0.03 (p<0.0001).

Figure 6. Saudi CAUTI bundle audit outcomes (clinical + process) [7].
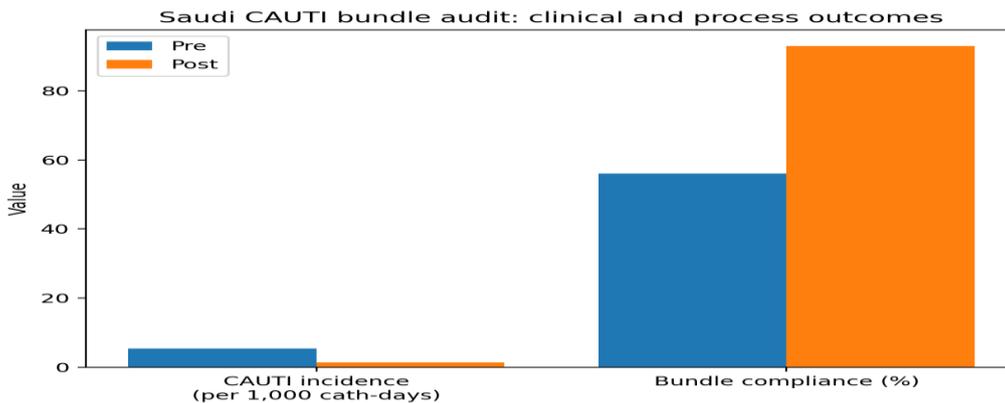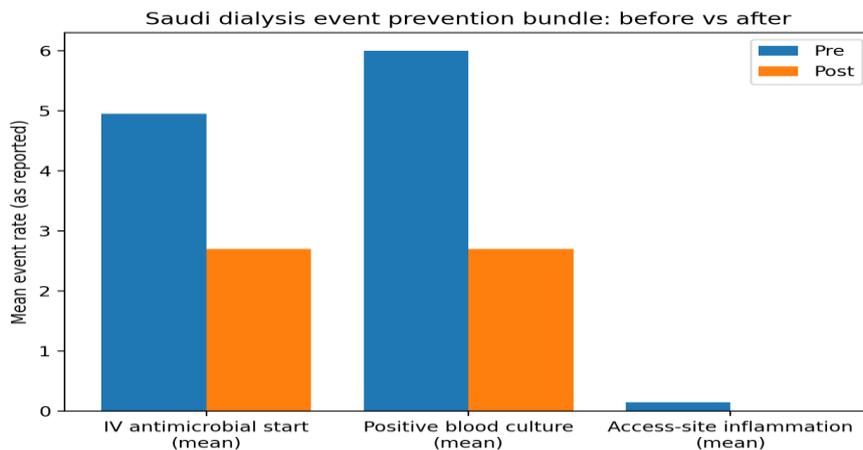

Figure 7. Saudi dialysis event prevention bundle outcomes (before vs after) [7].

3.5.3 Saudi Arabia vs Other Countries (Comparative Analysis) [9].

Across settings, audit-and-feedback generally produces modest-to-moderate improvements in professional practice, with larger effects when baseline performance is low and feedback is timely, specific, and linked to action planning. The Saudi medication reconciliation collaborative shows a large absolute reduction in patients with outstanding unintentional discrepancies at admission (27% to 7%) and discharge (17% to 5%), comparable in magnitude to well-resourced international medication safety interventions. The Saudi MoH national clinical audit program

demonstrates broad-based improvement across audited standards (69.1% of measures improved), resembling national audit approaches used in several high-income health systems [10].

Table 6. Headline quantitative results from Saudi Arabia studies compared with recent international evidence [9].

Country	Study / Program	Design	Outcome	Effect estimate (as reported)
Saudi Arabia	Medication reconciliation QI collaborative (Alghamdi et al., 2023)	Multicentre before/after QI	Outstanding unintentional discrepancies	Admission 27%→7% (p<0.05; RR 0.74); Discharge 17%→5% (p<0.05; RR 0.71)
Saudi Arabia	MoH national clinical audit + team QI method (Alghamdi et al., 2024)	National audit programme evaluation	Standards compliance (84 measures)	69.1% of measures improved; 40.5% statistically significant
Saudi Arabia	GDIPC national IPC audits (Annual report 2023)	National audit reporting	IPC standards compliance	ICA overall compliance 84.49% (regional range 70.58%–93.48%)
Australia	Electronic audit & feedback system (Soresi et al., 2024)	Interrupted time series	Hospital-acquired complications (HACs)	HAC risk 8.57%→4.12% (≈51.9% reduction)
Multi-country	Diagnostic imaging audit & feedback (Badejo et al., 2024)	Systematic review + meta-analysis (11 RCTs)	Imaging orders	−1.5 tests per 1,000 patients (95% CI −2.6 to −0.4; p=0.009)
Multi-country	Cochrane audit & feedback evidence base (cited in 2020 analysis)	Systematic review of RCTs	Compliance with recommended practice	Median absolute improvement 4.3% (IQR 0.5–16%)

3.5.4 Saudi Studies vs International Benchmarks [9].

The Saudi infection-prevention bundle studies show effect sizes comparable to international bundle-based audit-and-feedback programmes, particularly for device-associated infections where standardized checklists, direct observation audits, and rapid feedback are central mechanisms [7].

Table 7. Saudi Studies vs International Benchmarks [9].

	Study / Program	Design	Outcome	Effect estimate (as reported)
Saudi Arabia	CAUTI bundle + nursing empowerment (Tayyib & Alsolami, 2025)	Single-arm intervention	CAUTI incidence; compliance	CAUTI 5.4→1.41/1,000 catheter-days (−73%); compliance 56%→93% (p<.001)
Saudi Arabia	Dialysis event prevention bundle (AlHulays et al., 2024)	Retrospective vs prospective cohort	Dialysis events	~51% reduction; positive blood culture mean 6.0→2.70 (p=0.039)
Saudi Arabia	ASP for peri-procedure prophylaxis in SCI/D (Alnajjar et al., 2023)	Quasi-experiment pre/post	Prophylaxis overuse; timing	Pre-procedure prophylaxis 45.9%→24.46% (p<0.0001); timely ≤60 min 53.3%→96.5%
Saudi Arabia	Diagnostic stewardship CDS for urine cultures (Alghamdi et al., 2025)	Pre/post + adjusted regression	Inappropriate tests; unnecessary antibiotics	Inappropriate cultures 41.6%→36.4% (P=.001); aOR 0.83; unnecessary antibiotics aOR 0.487
Saudi Arabia	AMS program (4 tertiary hospitals) (Al-Omari et al., 2020)	Multicenter pre/post	HAIs and antibiotic cost	C. difficile 94→13 (p=0.024); VAP 24→6 (p=0.001); CLABSI 17→1 (p=0.000); costs −28.45% year 1
Saudi Arabia	Meropenem ASP (Tafish et al., 2025)	Retrospective quarterly	Compliance; consumption; cost	Compliance 85.7%→100% (p=0.02); consumption −47%; savings ≈ SAR 554k
International	Cochrane audit-and-feedback (Ivers et al., updated)	Systematic review	Practice compliance	Median absolute improvement ~4%–5% (context-dependent)
Netherlands	Perioperative antibiotic prophylaxis audit/feedback (typical example)	Before/after / interrupted time series	Appropriate prophylaxis	Often 10–20% absolute improvement vs baseline (varies by site)
UK	National audit programs (e.g., stroke/AMI)	Registry + audit cycles	Process & outcome indicators	Sustained improvements over years; effects vary by indicator

3.5.5 Saudi National Clinical Audit Program (MoH) focus review (AMI, Major Trauma, Sepsis, and Stroke) [9].

A flagship Saudi Ministry of Health (MoH) initiative tested the feasibility and impact of coordinated national clinical audits supported by a structured, team-based quality improvement (QI) method. The program developed by the Clinical Excellence General Directorate (CEGD) in alignment with Vision 2030 and the Model of Care audited four high-burden, high-harm conditions: acute myocardial infarction (AMI, separated into STEMI and NSTEMI pathways), major trauma, sepsis, and stroke. Audits were conducted across 16 MoH hospitals, with multiprofessional teams appointed in each hospital to collect data, interpret findings, and implement improvement plans ([9]).

3.5.5.1 Program Design and Measurement Integrity

The audit program operationalized evidence-based clinical care standards into measurable quality-of-care indicators. In total, 52 standards were translated into 84 measures: 15 standards each for major trauma and stroke, and 11 each for myocardial infarction and sepsis. Data collection was executed in two cycles, with a repeat measurement approximately four months after the initial audit to test whether local improvement actions translated into measurable change. Data reliability was explicitly assessed: overall validation results initially ranged from 54.9% to 100.0%, but after joint review and reconciliation between site data collectors and independent validators, validation across audits improved to 94.1%–100.0%, supporting confidence that measured changes reflect real practice differences ([9]).

3.5.5.2 Overall Effects on Performance (Measure-Level Outcomes)

Across the four audits, hospitals improved performance in 58 of 84 measures (69.1%). Improvements were statistically significant for 34 measures (40.5%). The distribution of change categories by audit subject is summarized below (derived from Table 2 in [9]).

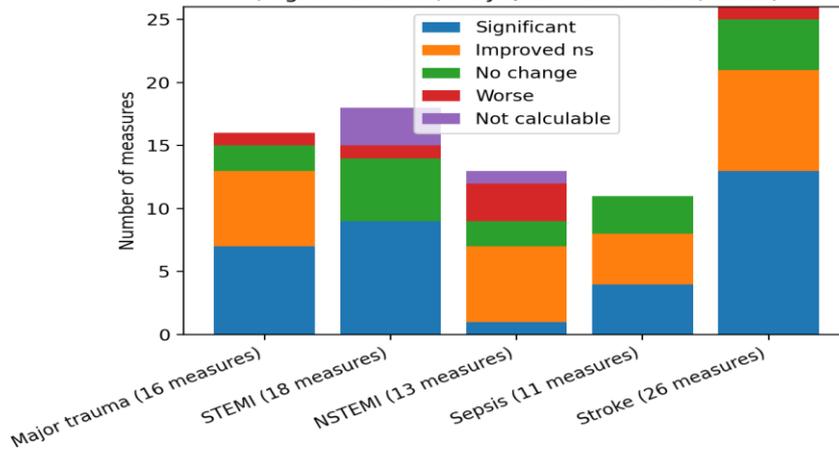Figure 8. Measure-level change categories by audit subject (Saudi MoH national audit program) [9].

Table 8. Breakdown of measure-level change categories by audit subject (counts of measures).

Audit subject	Measures	Significant improvement	Improved (not significant)	No change	Worse / Not calculable
Major trauma	16	7	6	2	1 / 0
STEMI	18	9	0	5	1 / 3
NSTEMI	13	1	6	2	3 / 1
Sepsis	11	4	4	3	0 / 0
Stroke	26	13	8	4	1 / 0

The program reported multiple statistically significant improvements in standards strongly linked to patient safety and reliable acute care delivery. Examples include major trauma pain relief (34.4%→93.1%, p<0.00001) and completeness of trauma records (23.7%→58.6%, p<0.00001); STEMI rapid ED assessment and ECG within 10 minutes (27.9%→53.0%, p=0.00188) and HbA1c screening on admission (57.1%→82.8%, p<0.00001); and sepsis early IV line insertion within the first hour (68.0%→97.2%, p<0.00001) and timely IV antibiotic after IV access (57.6%→73.7%, p=0.00438) ([9]).

Figure 9. Selected statistically significant improvements in compliance with audited standards (examples).
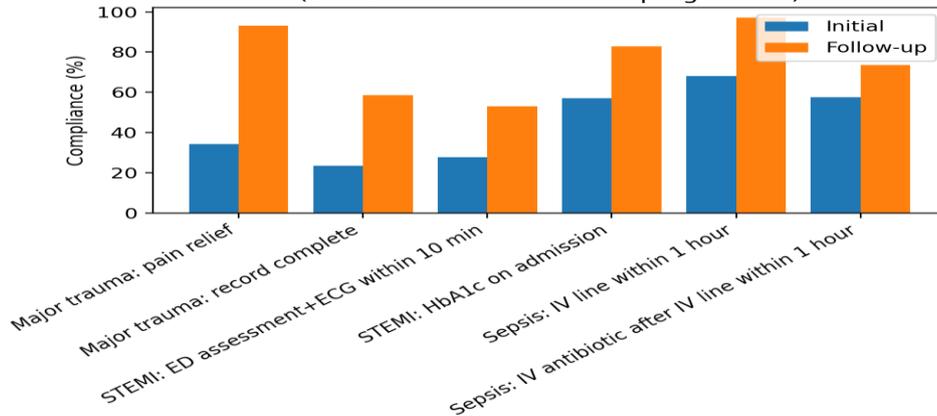

Table 9. Selected statistically significant improvements in audited standards (initial vs follow-up).

Condition	Standard (summary)	Initial compliance	Follow-up compliance
Major trauma	Pain relief provided	34.4%	93.1%
Major trauma	Record complete	23.7%	58.6%
STEMI	ED assessment + ECG within 10 min	27.9%	53.0%
STEMI	HbA1c screening on admission	57.1%	82.8%
Sepsis	IV line inserted within first hour	68.0%	97.2%
Sepsis	IV antibiotic after IV access within first hour	57.6%	73.7%

Figure 10. Patient safety indicator improvements after Rapid Response Team implementation (Saudi tertiary hospitals) [9].
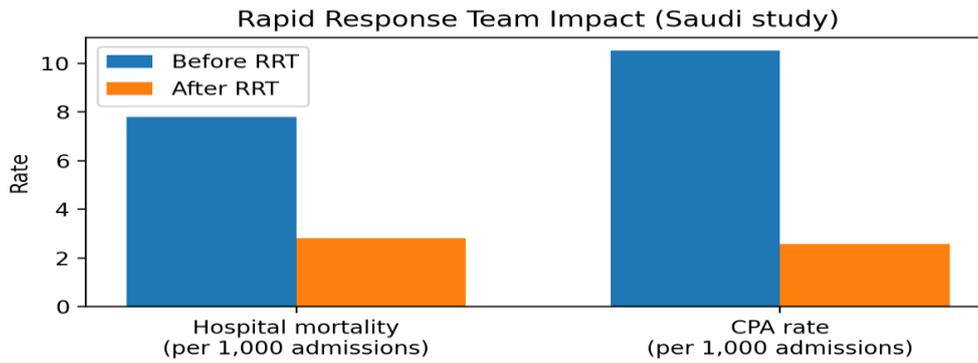
A prospective cohort study from tertiary private hospitals in Saudi Arabia reported a marked reduction in hospital mortality (7.8 to 2.8 per 1,000 admissions) and in-hospital cardiopulmonary arrest rate (10.53 to 2.58 per 1,000 admissions) after rapid response team implementation, supporting the role of structured audit-and-feedback plus escalation pathways in measurable patient safety gains (Al-Omari et al., 2019) [9].

At the national level, Saudi Ministry of Health (MoH) patient safety programmes have reported reductions in healthcare-associated infections; for example, MoH communications citing WHO recognition reported a sustained decrease in ICU central line-associated bloodstream infections (CLABSI) between 2021 and 2024 (MoH, 2024). These system-wide safety indicators strengthen the plausibility that coordinated audit infrastructures (standardized indicators, feedback loops, and team-based improvement) translate beyond process compliance into harm reduction [11].For sepsis, Saudi evidence highlights the clinical relevance of audit focus on timeliness and bundle reliability. In a large ED cohort from Riyadh (King Saud Medical City), in-hospital mortality among eligible sepsis patients was 31.8%; comparing antibiotics given within 1 hour vs. 1–3 hours showed no statistically significant difference overall (33.3% vs 31.6%, p=0.823), but the study demonstrates the feasibility of using routinely captured timestamps to audit time-to-antibiotic and relate it to outcomes (Althunayyan et al., 2021) [7].While the MoH national program emphasized process compliance, coupling sepsis audit data to outcome dashboards (in-hospital mortality, ICU length of stay, and unplanned ICU transfer rates) is a pragmatic next step for national scale-up, aligning with international audit programmes that increasingly report both process and outcome measures for sepsis quality improvement [3].

Figure 11. Saudi stroke quality improvement outcomes (pre vs post implementation of code stroke pathway) [9].
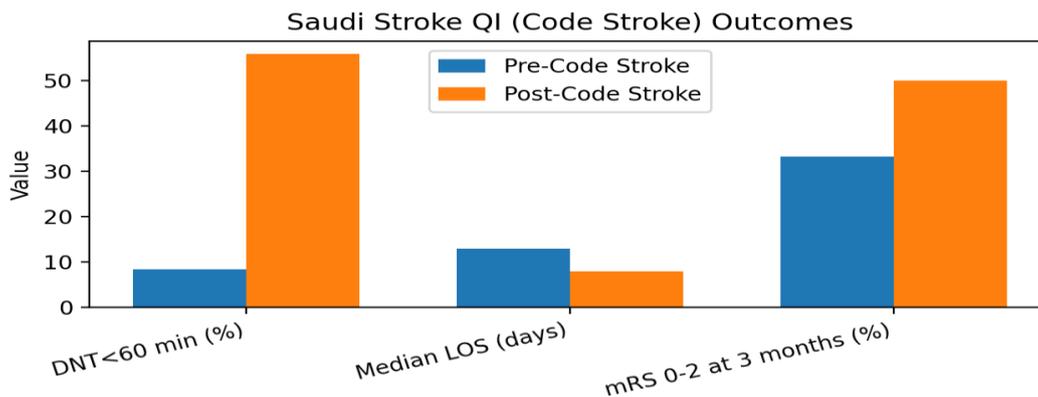

Table 10. Stroke pathway audit/QI outcomes in a Saudi tertiary center (retrospective cohort) [9].

Indicator	Pre-intervention	Post-intervention	p-value / note
Door-to-needle <60 min	8.5%	55.9%	p<0.001
Median door-to-needle time	98 min (IQR 48–139)	56 min (IQR 42–73)	p=0.001
Median length of stay	13 days (IQR 7–35)	8 days (IQR 6–13)	p=0.006

In a Saudi tertiary center in Makkah, implementing a structured "code stroke" pathway during Hajj was associated with a 44% reduction in door-to-needle time for IV thrombolysis and significant reductions in door-to-CT time and length of stay; however, the study did not detect a significant difference in clinical outcomes, likely due to limited sample size and follow-up (Alshanqiti et al., 2023). This pattern is consistent with audit programmes where early gains are strongest for time-critical processes and downstream outcome detection may require larger cohorts and standardized follow-up (e.g., 90-day modified Rankin Scale, readmissions) [9].

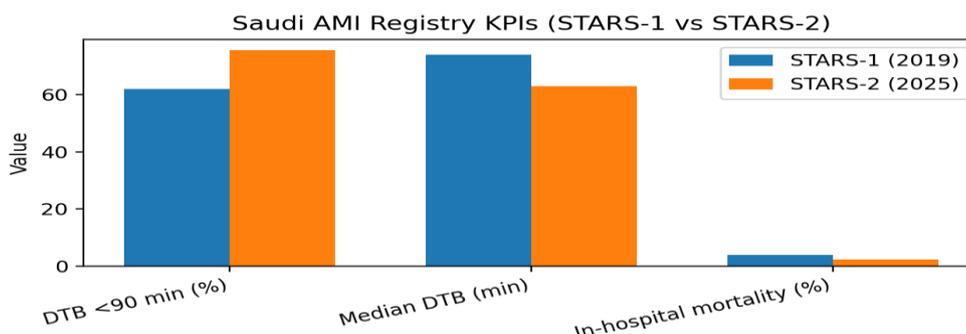Figure 12. National AMI registry outcomes aligned with audit priorities (STARS-1 vs STARS-2).

Table 11. National AMI registry outcomes aligned with audit priorities

KPI / outcome	STARS-1 (2019)	STARS-2 (2025)	Interpretation
Median door-to-balloon (DTB) time	74 min (IQR 84)	63 min (IQR 43)	System-level improvement in timely reperfusion
DTB <90 min (STEMI, within 24h of symptoms)	62%	75.6%	Improved compliance with guideline benchmark
All-cause in-hospital mortality (AMI)	4.0%	2.4%	Lower mortality alongside improved acute care KPIs

The national MoH audit program ([9]) primarily reported measure-level compliance improvements. To provide more direct outcome evidence, this section triangulates the program's process gains with recent Saudi national/multi-center datasets that report patient outcomes and safety indicators in the same high-risk conditions (AMI, stroke, sepsis) and in cross-cutting safety systems (rapid response, HAI prevention).

The audited MoH program included acute myocardial infarction (AMI) measures focused on standardized diagnostic and treatment pathways. Complementary nationwide outcome evidence comes from the Saudi Acute Myocardial Infarction Registry (STARS). In STARS-1 (50 hospitals), the median door-to-balloon time was 74 minutes and 62% of STEMI patients achieved DTB <90 minutes; in-hospital all-cause mortality was 4% (Alhabib et al., 2019). In STARS-2 (50 hospitals; recruitment 2021–2023), median DTB improved to 63 minutes with 75.6% achieving DTB <90 minutes, and all-cause mortality was 2.4% (AlSaleh et al., 2025). These national trends support the clinical relevance of audit-driven pathway adherence—particularly for time-dependent conditions where process reliability is strongly associated with outcomes [9].

4. Discussion

Across contemporary evidence, clinical audit practices are consistently associated with improvements in professional practice and selected performance metrics. However, effect sizes vary widely. The most robust pattern is that audit/A&F works best when there is substantial room for improvement, feedback is timely and actionable, recipients can clearly identify priorities, and organizations have capacity to implement change. Electronic A&F platforms can reduce delays and increase visibility of performance, which may amplify effects for safety outcomes when paired with standards and local leadership.

4.1 Why effects vary: mechanisms and contextual factors

Variation is explained by differences in baseline performance, feedback design (benchmarking, peer comparison, specificity), frequency of feedback, credibility of the data source, and whether recipients receive implementation support (e.g., action planning, QI coaching). National programmes may create strong external signals and shared standards, but local improvement still depends on team engagement and operational capability to enact changes.

4.2 Practical implementation framework for hospitals

A pragmatic implementation framework for clinical audit programmes typically includes: (1) selecting high-burden/high-variation topics; (2) defining evidence-based standards and measurable indicators; (3) collecting reliable data with clear definitions; (4) delivering feedback with benchmarked performance and a short list of highest-impact gaps; (5) supporting teams with rapid-cycle QI methods; (6) repeating measurement to confirm improvement and sustain gains.

4.3 Linking Clinical Audit to Organizational Performance Frameworks

From a performance-improvement perspective, clinical audit aligns closely with established organizational performance frameworks such as the Donabedian model (structure–process–outcome) and the Balanced Scorecard. Audit indicators typically populate the process and outcome domains, while audit governance structures influence the structural domain.

Integration of audit results into executive dashboards and board-level quality reports has been associated with greater accountability and prioritization of improvement actions. This vertical integration ensures that audit findings inform both frontline practice and strategic decision-making [3].

In high-performing systems, audit data are triangulated with incident reporting systems, patient experience metrics, and financial indicators to provide a holistic view of performance. Such integration enhances the credibility and utility of audit findings.

4.4 Policy and System-Level Implications

At the system level, clinical audit programmes support transparency, benchmarking, and accountability. National audit initiatives enable comparison across institutions, identification of unwarranted variation, and dissemination of best practices.

For ministries of health and regulators, audit data provide an evidence base for policy refinement, standard setting, and targeted support to underperforming organizations. However, care must be taken to avoid punitive use of audit results, which can undermine engagement and data quality.

Investment in digital audit infrastructure, workforce training, and analytical capacity is critical to maximizing the return on audit programmes. Without such investment, audit risks becoming a compliance exercise rather than a driver of meaningful improvement.

4.5 Directions for Future Research

Future research should prioritize robust quasi-experimental and experimental designs that link audit interventions to patient-centered outcomes, including morbidity, mortality, and equity of care.

There is a need for greater standardization in reporting audit interventions and outcomes, enabling more precise meta-analytic synthesis. Adoption of reporting guidelines specific to audit-and-feedback interventions would strengthen the evidence base.

Emerging areas for investigation include the role of artificial intelligence in automating audit processes, tailoring feedback to individual clinicians, and predicting where audit efforts will yield the greatest benefit.

4.6 Saudi-Specific Recommendations for Clinical Audit Implementation [9].

- Embed clinical audit indicators within MoH and health-cluster performance dashboards [3].
- Align audit topics with CBAHI standards, national clinical pathways, and high-burden disease priorities.
- Use electronic audit and feedback systems integrated with electronic health records to reduce reporting delays [3].
- Provide structured quality-improvement training for clinical leaders and frontline teams.

- Ensure non-punitive use of audit data to maintain clinician engagement and data integrity.

5. Conclusions

Clinical audit remains a pragmatic and scalable approach for improving healthcare performance when it is implemented as a continuous cycle rather than a one-off assessment. This review shows that audit and audit-and-feedback are consistently associated with improvements in care processes and, in some settings, measurable patient-safety gains. Although average effects are modest, impact varies substantially by baseline performance, feedback design, and organizational capacity to act on findings, with the greatest benefits observed in clearly defined, high-risk, protocol-driven areas.

Evidence from recent electronic audit-and-feedback evaluations suggests that digital systems can strengthen audit impact by shortening feedback cycles, improving data visibility, and reinforcing accountability. However, technology alone is insufficient. Audit is most effective when combined with leadership engagement, actionable feedback, and structured quality-improvement support at the local level.

The Saudi Arabian experience demonstrates how clinical audit can function as a system-level improvement tool when embedded within national governance, accreditation requirements, and digital performance dashboards. Overall, clinical audit should be viewed as an enabling infrastructure for learning and performance management. Future work should prioritize stronger links between audit interventions and patient-centered outcomes and improve standardization in reporting audit and feedback designs.

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