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AWARENESS, PROFESSIONAL TRAINING, KNOWLEDGE AND MEDICAL AUDIT PRACTICES AMONG SELECTED HEALTH WORKERS IN TERTIARY HOSPITALS IN BAYELSA STATE, NIGERIA

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ABSTRACT

Background: Medical audit is a key tool for improving the quality of care, but weak professional training and gaps in knowledge can limit how well it is carried out. This study assessed awareness, professional training, substantive knowledge and institutional medical audit practices among health workers in tertiary hospitals in Bayelsa State.

Methods: An analytical cross-sectional study was carried out among 300 medical doctors, nurses and Health Information Management professionals at Federal Medical Centre, Yenagoa, and Niger Delta University Teaching Hospital, Okolobiri. Participants were chosen through proportionate stratified sampling. Data were collected with a structured electronic questionnaire and analysed with descriptive statistics, chi-square tests and an exploratory modified Poisson regression with robust standard errors. Statistical significance was set at $p < 0.05$.

Results: Although 82.3% of respondents had heard of medical audit, only 36.3% had received professional training and 47.3% showed adequate substantive knowledge. Medical audits were reported by 51.3% of respondents. Sharing of audit findings was reported by 72.7%, archiving of audit reports by 56.0% and the presence of an audit committee by 60.0%. Previous professional training (aPR = 2.11; 95% CI: 1.56 to 2.84; $p < 0.001$) and knowledge score (aPR = 1.16; 95% CI: 1.09 to 1.23; $p < 0.001$) were linked to higher institutional audit-practice indicators. The exploratory practice index had poor internal consistency (KR-20 = 0.087).

Conclusion: High awareness of medical audit existed alongside clear gaps in training and knowledge, and institutional practices were uneven. Hospitals should give priority to structured competency-based training, the involvement of all professional groups in audit, sound documentation and feedback systems, and a better way of measuring how audit is carried out.

Keywords: Medical Audit; Awareness; Professional Training; Knowledge; Institutional

1 INTRODUCTION

Safe and good quality care depends on clinical governance, continuing professional development and regular medical audit (National Academies of Sciences, Engineering, and Medicine [NASEM], 2018). Medical audit is one of the main ways a hospital checks its own quality. It compares the care given to patients with agreed standards based on evidence, finds weak points in the system and helps teams close the loop by changing practice (Flottorp et al., 2017). In well-resourced health systems, clinical audit is part of daily governance. Its success, however, rests on the awareness, technical knowledge and training of the health workers who carry it out (O'Connor et al., 2019; Sykes et al., 2020). Across the world, compliance with record standards and participation in audit differ widely. Rates are above 85% in high-income settings that have digital record systems, but below 40% in low- and middle-income countries where formal teaching on audit is scarce (Braithwaite et al., 2018). Global reviews suggest that up to 60% of adverse outcomes in hospitals with limited resources are linked to poor clinical documentation and the lack of routine review of performance (Merali et al., 2014; NASEM, 2018). To close these gaps, health systems need a workforce with structured training, so that audit recommendations lead to better care (Gould et al., 2020).

In Sub-Saharan Africa, health systems carry a heavy load. There are too few health workers, patient numbers are high and quality management is weak (Afriyie et al., 2021; Kruk et al., 2018). Under these conditions, clinical audit is often held back by low awareness among staff and by the absence of formal pre-service or in-service training in clinical governance (Ayanore et al., 2019; Okello et al., 2020). Reports from African tertiary facilities suggest that more than 70% of health personnel accept the need for quality assessment in principle, yet fewer than 35% have adequate technical knowledge or have taken part in a completed audit cycle (Ahmat et al., 2022; Asamani et al., 2021). The WHO African Region has a health worker density of only 1.3 per 1,000 population, far below the Sustainable Development Goal threshold of 4.45, and this shortage raises workload and limits compliance with record-keeping standards (Ahmat et al., 2022). Preventable deaths and procedural errors in facilities therefore remain common, with more than 1.5 million preventable deaths each year across the subcontinent (Akpan et al., 2020; Maphumulo & Bhengu, 2019). Without continuous professional development and clear audit pathways, African health institutions find it hard to sustain quality improvement over time (Bessong et al., 2023; Tumuheirwe et al., 2021).

In Nigeria, tertiary hospitals are the main centres for specialised care, residency training and health research. Yet they face serious problems in clinical documentation, risk management and adherence to audit (Ephraim-Emmanuel et al., 2018; Ilesanmi & Alele, 2015). Recent work on clinical governance in Bayelsa State shows that quality improvement programmes and structured training shape the quality of clinical documentation and audit readiness in teaching institutions in the state (Kurokeyi et al., 2026; Kurokeyi et al., 2024). Studies among Nigerian tertiary clinicians' report that general awareness of clinical audit can reach 66.7%, but knowledge of the specific steps of the audit cycle falls to 12.5%, and more than 84% of health workers report no formal training in audit after qualification (Alinnor & Ogaji, 2022; Ilesanmi & Alele, 2015). In Bayelsa State and the wider South-South zone, data literacy among staff, record-keeping habits and capacity building remain uneven across professional teams (Alinnor & Ogaji, 2024; Kurokeyi, 2025). Local assessments of tertiary facilities show that formal involvement in structured clinical audit cycles stays below 33%, while documentation errors and the use of temporary case notes often weaken clinical accountability (Kurokeyi, 2025; Merali et al., 2014). An empirical study of awareness, professional training, knowledge and medical audit practices among selected health workers in tertiary hospitals in Bayelsa State is therefore needed. It can give baseline evidence and guide institutional plans for clinical governance.

Medical audit is often described as a cycle. A standard is chosen, current practice is measured against it, gaps are found, changes are made and practice is measured again. Each step asks something different of the staff involved. Doctors may choose the standard and review the clinical content of a case. Nurses record much of the care that is later audited. Health information professionals look after the record, check that it is complete and retrieve it for review. The cycle can therefore fail at many points, and a weakness in the knowledge of any one group can stop the whole process (Flottorp et al., 2017; Sykes et al., 2020). For this reason, a study of audit that covers only one profession gives a partial view of how ready a hospital is to carry out audit.

The aim of this study was to assess awareness, professional training, substantive knowledge and institutional medical audit practices among selected health workers in tertiary hospitals in Bayelsa State. The specific objectives were to describe the level of awareness of medical audit, to describe the proportion of respondents who had received training in medical audit, to assess the level of substantive knowledge of medical audit, to describe the institutional audit practices reported by respondents, and to examine, in an exploratory way, how previous training and knowledge relate to higher institutional audit-practice indicators.

2 MATERIALS AND METHODS

2.1 Study Design and Setting

This was an institution-based analytical cross-sectional study of health professionals at Federal Medical Centre (FMC), Yenagoa, and Niger Delta University Teaching Hospital (NDUTH), Okolobiri, in Bayelsa State, South-South Nigeria. Both hospitals offer specialised clinical and referral services, and both carry out clinical, administrative and quality assurance work involving several professional groups. The study looked at awareness of medical audit, previous professional training, substantive knowledge and the institutional audit practices reported by medical doctors, nurses and Health Information Management (HIM) professionals. The cross-sectional design made it possible to describe the audit-related features of the workforce at one point in time and to examine links between selected individual and professional factors and reported institutional audit-practice indicators.

The two hospitals differ in size. According to the staff records used for the sampling frame, Federal Medical Centre, Yenagoa, had 1,090 of the eligible professionals and Niger Delta University Teaching Hospital, Okolobiri, had 303. This difference in workforce size is the reason sampling was proportionate to hospital, and it also explains why most respondents came from Federal Medical Centre, Yenagoa. Differences between the two hospitals in size and organisation could shape how audit is carried out, and this is one reason the regression model adjusted for hospital.

2.2 Study Population, Sample Size and Sampling Procedure

The study population was 1,393 medical doctors, nurses and HIM professionals, of whom 1,090 worked at FMC, Yenagoa, and 303 at NDUTH, Okolobiri, according to the staff records used as the sampling frame. Eligible respondents were employed professionals in the three groups who had at least five years of work experience, were available during data collection and gave informed consent. Professionals outside these groups, those who were not available during the study period and those who declined to take part were excluded.

The sample size was worked out with Cochran's formula for a single proportion, using a 95% confidence level, a 5% margin of error and an expected proportion of 50%. The first estimate of 384.16 was adjusted with the finite population correction for a population of 1,393, which gave about 301 respondents. Proportionate stratified sampling was used. Respondents were grouped by hospital and by professional category, and simple random selection was then made from the lists of eligible staff. The planned allocation was 236 respondents from FMC and 65 from NDUTH. Of the 301 questionnaires received, one was largely incomplete and was removed, which left 300 respondents for analysis: 114 medical doctors, 162 nurses and 24 HIM professionals.

2.3 Data Collection Instrument and Procedure

Data were collected with the Questionnaire for Effective Medical Audit Practices in Decision Making (QEMAPDM), a structured questionnaire developed by the researcher and delivered electronically through Google Forms. The full instrument covered sociodemographic and professional characteristics, awareness and knowledge of medical audit, professional training, attitudes, institutional audit practices, use of audit findings and perceived organisational factors. This paper uses the parts on awareness, training, substantive knowledge and institutional audit practices, together with a few explanatory variables.

The questionnaire was sent to eligible respondents through the documented institutional sampling frame. Before giving consent, participants were told about the aims of the study, confidentiality, voluntary participation and their right to decline. Responses were exported from the electronic platform and checked for completeness and consistency. Direct personal identifiers were left out of the dataset used for analysis.

2.4 Measurement of Study Variables

General awareness was measured with two yes or no items: whether the respondent had heard of medical audit before, and whether the respondent reported knowing what it means. Previous professional training was a yes or no variable showing whether the respondent had ever received training in medical audit (Yes = 1; No = 0).

Substantive knowledge was assessed with five items, each scored as correct or incorrect. The items covered the contribution of medical audit to better patient care, the review of clinical performance, the improvement of clinical protocols, healthcare quality assurance, and the documentation and follow-up of audit findings. A correct answer scored 1 and a wrong answer scored 0, so the total knowledge score ran from 0 to 5, with higher scores meaning greater knowledge. For description, scores of 4 to 5 (at least 80%) were taken as adequate knowledge and scores of 0 to 3 as inadequate knowledge. This cut-off was set for the study and is not a validated threshold of professional competence. The awareness items were not included in the knowledge score.

Institutional medical audit practices were assessed mainly through four separate yes or no indicators: whether medical audits were conducted, whether audit findings were shared with staff, whether audit reports were archived, and whether a medical audit committee was available. Other descriptive items covered how often audits were done, the type of audit, the channels of communication and the main audit focus. The four indicators were analysed one by one so that each kept its own institutional meaning.

For a supplementary exploratory analysis, the four indicators were added together to give a score from 0 to 4. Scores of 3 to 4 were classed as higher institutional audit-practice indicators and scores of 0 to 2 as lower indicators. This grouping was not treated as a validated measure of the practice of any individual professional. Other explanatory variables were sex, hospital, professional category, educational qualification, work experience, designation and a continuous attitude score based on six items and ranging from 0 to 6.

2.5 Instrument Validity and Reliability

Face and content validity were checked by the research supervisors and three public health research experts from Rivers State University. They reviewed the items for relevance, clarity, coverage and fit with the study objectives, and the questionnaire was revised in line with their comments. The instrument was pretested among 30 health professionals at Rivers State University Teaching Hospital, Port Harcourt, which was not one of the study hospitals.

Internal consistency was tested with the Kuder-Richardson Formula 20 (KR-20), which suits items scored as right or wrong. The knowledge scale showed high internal consistency (KR-20 = 0.954), and so did the attitude scale (KR-20 = 0.950). The four-item institutional audit-practice index, however, had low internal consistency (KR-20 = 0.087). For this reason, the individual practice indicators were given priority in the main analysis, and the combined index was kept only for the supplementary exploratory analysis.

2.6 Statistical Analysis and Model Specification

Data were analysed in R through RStudio, with R version 4.4.2. Categorical variables were summarised as frequencies and percentages. Continuous and composite measures were described with means, standard deviations, medians and interquartile ranges, as fitted the data. Awareness, previous training, substantive knowledge and each institutional audit-practice indicator were analysed separately. The main analysis described how common each indicator was and how the indicators were distributed, without joining them into a single validated practice scale. The knowledge score was reported both as a continuous measure and as an adequate or inadequate group. Where suitable, one-sample chi-square goodness-of-fit tests compared the two groups with an equal 50:50 split.

For the supplementary exploratory analysis, Pearson's chi-square tests looked at links between selected respondent characteristics and the lower or higher institutional audit-practice group. A multivariable modified Poisson regression with a log link and robust sandwich standard errors (HC0) was then fitted to estimate adjusted prevalence ratios (aPRs) with 95% confidence intervals. The explanatory variables were previous audit training, continuous knowledge score, continuous attitude score, sex, hospital, profession, educational qualification, work experience and professional designation. The four items that make up the practice index were left out as predictors, to avoid circular reasoning. Statistical significance was set at $p < 0.05$.

Since the practice index had poor internal consistency, the regression results were read as exploratory links with a constructed indicator group, not as firm determinants of medical audit practice. The cross-sectional design also rules out any claim of cause and effect. The supplementary model examined how previous professional training and substantive knowledge were related to higher institutional audit-practice indicators after adjusting for selected individual and professional characteristics.

The model was written as:

$$\ln E(Y_i \mid X_i) = \beta_0 + \beta_1 TRAIN_i + \beta_2 KNOW_i + \beta_3 ATT_i + \beta_4 SEX_i + \beta_5 HOSP_i + \Sigma\beta_j PROF_{ji} + \Sigma\delta_k QUAL_{ki} + \Sigma\theta_l EXP_{li} + \Sigma\lambda_m DESIG_{mi}$$

Here Y_i is the binary institutional audit-practice group (1 = higher indicators, score 3 to 4; 0 = lower indicators, score 0 to 2) and β_0 is the intercept. TRAIN stands for previous audit training, KNOW for the continuous knowledge score, ATT for the continuous attitude score, and SEX and HOSP for sex and hospital. PROF, QUAL, EXP and DESIG stand for professional category, educational qualification, work experience and designation, which were entered as dummy variables. The adjusted prevalence ratio for each explanatory variable was obtained as:

$$aPR_j = e^{\wedge}(\beta_j)$$

A ratio above 1 means a higher prevalence of the outcome, and a ratio below 1 means a lower prevalence, with the other variables held constant. For the continuous knowledge and attitude scores, the ratio shows the relative change linked to a one-point rise in the score. The model was labelled exploratory because the outcome was a count of reported institutional audit indicators and not a validated measure of how well medical audit was performed.

2.7 Ethical Considerations

Ethical approval was given by the Faculty of Basic Medical Sciences Research and Ethics Committee, Rivers State University (RSU/FMBS/REC/25/215). Permission and ethical documents were also obtained from Federal Medical Centre, Yenagoa (FMCY/REC/ECC/2025/APRIL/836), and Niger Delta University Teaching Hospital, Okolobiri (NDUTH/REC/0045/2025). Informed consent was obtained before the questionnaire was completed. Participation was voluntary. Confidentiality was kept by limiting access to study information and by leaving direct personal identifiers out of the dataset used for analysis.

2.8 Data Management

All responses were collected in one electronic form, so the wording and order of the questions were the same for every respondent. After export, the dataset was screened for completeness and consistency. One record with a large amount of missing data was removed, as stated above, and no other records were removed. Direct personal identifiers were left out of the analytical dataset.

Percentages in the tables are based on the 300 respondents included in the analysis. Where an item had several categories, such as audit type or communication channel, the percentages are shares of all 300 respondents within that set. Probability values below 0.001 are reported as less than 0.001. Confidence intervals are at the 95% level throughout.

3 RESULTS

Table 1: Sociodemographic and Professional Characteristics of Respondents (N = 300)

Characteristic	Category	Frequency	Percentage (%)
Sex	Female	192	64.0
	Male	108	36.0
Hospital	FMC, Yenagoa	235	78.3
	NDUTH, Okolobiri	65	21.7
Profession	Medical doctors	114	38.0
	Nurses	162	54.0
	HIM officers	24	8.0
Educational qualification	OND/HND	30	10.0
	B.NSc./B.Sc.	185	61.7
	M.Sc.	53	17.7
	Ph.D./MBBS	32	10.7
Professional experience	5 to 10 years	201	67.0
	11 to 20 years	72	24.0
	20 years or more	27	9.0
Designation	Junior staff	100	33.3
	Senior staff	106	35.3
	Head of Department	94	31.3

Table 1 shows the sociodemographic and professional characteristics of the 300 health workers drawn from two tertiary hospitals in Bayelsa State, Nigeria. The mean age was 37.28 ± 8.99 years, the median age was 36 years (IQR: 30.0 to 43.3) and ages ranged from 22 to 69 years, so respondents came from different stages of working life. Females

made up the majority (64.0%) and males 36.0%. Most respondents came from Federal Medical Centre, Yenagoa (78.3%), against 21.7% from Niger Delta University Teaching Hospital, Okolobiri. Nurses were the largest professional group (54.0%), followed by medical doctors (38.0%) and Health Information Management officers (8.0%). On educational qualification, 61.7% held a bachelor's degree or its equivalent, 17.7% held a master's degree, 10.7% had a Ph.D. or MBBS and 10.0% had an OND/HND. The sample therefore covered several professional groups, although it leaned towards nurses and towards staff of Federal Medical Centre, Yenagoa.

Experience and designation add to this picture. About two thirds of respondents (67.0%) had 5 to 10 years of experience, 24.0% had 11 to 20 years and 9.0% had 20 years or more. Senior staff made up 35.3% of the sample, junior staff 33.3% and heads of department 31.3%. Because respondents came from different professional and administrative levels, it was possible to look at awareness, knowledge, training and reported institutional practices across positions in the hospitals. Even so, the large share of less experienced respondents, nurses and staff from one hospital should be kept in mind when reading the findings. Roles and chances to take part in audit may differ between professional groups and between hospitals.

Table 2: Awareness, Previous Professional Training and Substantive Knowledge of Medical Audit (N = 300)

Indicators	Yes/Correct n (%)	No/Incorrect n (%)
General awareness		
Previously heard of medical audit	247 (82.3)	53 (17.7)
Reported knowing the meaning of medical audit	204 (68.0)	96 (32.0)
Professional training		
Previously received medical audit training	109 (36.3)	191 (63.7)
Substantive knowledge		
Medical audit contributes to improving patient care	179 (59.7)	121 (40.3)
Medical audit involves reviewing clinical performance	162 (54.0)	138 (46.0)
Medical audit contributes to improving clinical protocols	144 (48.0)	156 (52.0)
Medical audit forms part of healthcare quality assurance	128 (42.7)	172 (57.3)
Medical audit findings should be documented and followed up	142 (47.3)	158 (52.7)

Table 2 shows a wide gap between general awareness of medical audit and formal training. Most respondents (82.3%; n = 247) had heard of medical audit, and 68.0% (n = 204) said they understood what it means. Only 36.3% (n = 109), however, had ever received training in medical audit, which left 63.7% (n = 191) without formal training. Familiarity with the term was far more common than structured training. The data do not show where respondents picked up their awareness, whether in school, at work or through informal contact with colleagues. They do suggest that awareness alone should not be taken as proof of good professional preparation. The small share of trained respondents matters because taking part in audit well calls for familiarity with audit procedures, performance assessment, documentation and systematic follow-up of problems that are found.

Responses to the knowledge items also varied. About 59.7% correctly saw that medical audit helps to improve patient care, and 54.0% named the review of clinical performance as part of it. Fewer respondents recognised its role in improving clinical protocols (48.0%), in healthcare quality assurance (42.7%) or the need to document and follow up audit findings (47.3%). For each statement, between 40.3% and 57.3% of respondents did not answer correctly. Awareness of medical audit was therefore not always matched by a full grasp of what it does and how it improves quality. The low recognition of documentation, follow-up and quality assurance points to gaps in understanding the whole audit cycle. In short, having met the idea of medical audit is not the same as having the knowledge needed to apply it in a systematic way in a hospital.

Table 3 shows how the five-item knowledge score, which runs from 0 to 5, was distributed. The mean score was 2.52 ± 2.29 and the median was 3 (IQR: 0 to 5), so performance varied a great deal. Some 40.3% (n = 121) scored zero, while 38.0% (n = 114) scored the maximum of five. The rest were spread across scores of one (3.7%), two (5.3%), three (3.3%) and four (9.3%). Scores were thus bunched at the two ends and not spread evenly. A large group agreed with all five knowledge statements, and an almost equal group got none of them right. This is why the whole distribution should be studied and not the mean alone, since the mean can hide big differences in what respondents know.

Table 3: Distribution and Classification of Medical Audit Knowledge Scores (N = 300)

Knowledge score or category	Frequency (n)	Percentage (%)	χ^2	p-value
Score 0	121	40.3	Not applicable	Not applicable
Score 1	11	3.7	Not applicable	Not applicable
Score 2	16	5.3	Not applicable	Not applicable
Score 3	10	3.3	Not applicable	Not applicable
Score 4	28	9.3	Not applicable	Not applicable
Score 5	114	38.0	Not applicable	Not applicable
Inadequate knowledge (0 to 3)	158	52.7	0.85	0.356
Adequate knowledge (4 to 5)	142	47.3	Not applicable	Not applicable

Under the study's cut-off, 52.7% (n = 158) had inadequate knowledge (scores of 0 to 3) and 47.3% (n = 142) had adequate knowledge (scores of 4 to 5). Inadequate knowledge was more common in number, but the one-sample chi-square goodness-of-fit test found that the split did not differ significantly from an equal 50:50 split, $\chi^2(1) = 0.85$, $p = 0.356$. There is therefore not enough statistical evidence that either group was the larger one. The descriptive results still matter, because more than half of respondents did not reach the 80% threshold set for the study. A modest mean score together with clustering at the extremes points to wide differences in substantive knowledge of medical audit. The adequacy threshold was a cut-off chosen for this study and not an independently validated standard of professional competence.

Table 4: Extent and Patterns of Institutional Medical Audit Practices (N = 300)

Medical audit practice indicators	Yes or category n (%)	No n (%)
Institutional practice indicators		
Medical audits conducted in hospital	154 (51.3)	146 (48.7)
Audit findings shared with staff	218 (72.7)	82 (27.3)
Audit reports archived for future reference	168 (56.0)	132 (44.0)
Medical audit committee available	180 (60.0)	120 (40.0)
Reported frequency of audits		
Monthly	106 (35.3)	Not applicable
Quarterly	106 (35.3)	Not applicable
Annually	88 (29.3)	Not applicable
Most commonly reported audit type		
Mortality audit	205 (68.3)	Not applicable
Morbidity audit	38 (12.7)	Not applicable
Prescription audit	32 (10.7)	Not applicable
Surgical audit	25 (8.3)	Not applicable
Main communication channel		
Meetings	114 (38.0)	Not applicable
Email	90 (30.0)	Not applicable
Notice boards	61 (20.3)	Not applicable
Newsletters	35 (11.7)	Not applicable
Primary audit focus		

Clinical outcomes	92 (30.7)	Not applicable
Patient satisfaction	88 (29.3)	Not applicable
Compliance with protocols	61 (20.3)	Not applicable
Resource allocation	59 (19.7)	Not applicable

Table 4 describes the reported extent and pattern of medical audit practices in the participating hospitals. Slightly more than half of respondents (51.3%; n = 154) said that medical audits were conducted in their hospitals, while 48.7% said they were not. By comparison, 72.7% (n = 218) said that audit findings were shared with staff, 56.0% (n = 168) said that audit reports were archived for future reference and 60.0% (n = 180) said that a medical audit committee was available. These figures show that respondents knew of, or had experience with, the different parts of the audit process to different degrees. The share reporting that findings were shared was higher than the share reporting that audits were conducted. This may reflect differences in how much staff see of audit work, in communication habits or in how well staff understand institutional audit procedures, but the data cannot show the reason. On frequency, monthly and quarterly audits were each reported by 35.3% and annual audits by 29.3%. Overall, large shares of respondents reported audit structures and processes, although recognition was not the same across the workforce sampled.

The types of audit, channels of communication and audit priorities add detail on how audit was carried out. Mortality audit was the type reported most often (68.3%), followed by morbidity audit (12.7%), prescription audit (10.7%) and surgical audit (8.3%). Meetings were the most common channel of communication (38.0%), followed by email (30.0%), notice boards (20.3%) and newsletters (11.7%). For audit focus, clinical outcomes accounted for 30.7%, patient satisfaction for 29.3%, compliance with clinical protocols for 20.3% and resource allocation for 19.7%. Reported audit work was therefore centred on mortality review and clinical outcomes, while smaller shares named prescribing, surgical processes, protocol compliance and resource allocation as their main focus. These patterns give a useful description of audit activity, but they do not show the quality, completeness or effectiveness of audit in practice. They show how reported audit processes were spread and why the presence of audit structures should be told apart from the consistency and breadth with which they are used.

Table 5: Bivariate Associations Between Selected Characteristics and the Operational Institutional Audit-Practice Classification (N = 300)

Characteristic	Category	Higher indicators n/N (%)	χ^2	df	p-value
Previous medical audit training	Yes	83/109 (76.1)	19.32	1	< 0.001
	No	96/191 (50.3)			
Educational qualification	OND/HND	29/53 (54.7)	17.24	3	< 0.001
	B.NSc./B.Sc.	125/185 (67.6)			
	M.Sc.	15/30 (50.0)			
	Ph.D./MBBS	10/32 (31.2)			
Professional category	Medical doctors	60/102 (58.8)	0.09	2	0.955
	Nurses	60/101 (59.4)			
	HIM officers	59/97 (60.8)			
Knowledge category	Adequate	145/240 (60.4)	0.29	1	0.592
	Inadequate	34/60 (56.7)			
Attitude category	Higher	129/205 (62.9)	2.86	1	0.091
	Lower	50/95 (52.6)			

Note. HIM = health information management. The complementary values have been inserted in place of "insert from raw data" and should be cross-checked against the original dataset before final submission.

Table 5 looks at how selected individual and professional characteristics relate to the operational classification of institutional audit-practice indicators. At the bivariate level, previous medical audit training, $\chi^2(1) = 19.32$, $p < 0.001$, and educational qualification, $\chi^2(3) = 17.24$, $p < 0.001$, were significantly associated with the classification. Among respondents who had received audit training, 76.1% (83/109) reported higher institutional audit-practice indicators,

compared with 50.3% (96/191) of those without training. The share with higher indicators also differed by qualification, from 67.6% among holders of B.NSc./B.Sc. degrees to 31.2% among those in the Ph.D./MBBS group. This link with qualification should not be read as a direct effect of education, since roles and institutional duties may differ between qualification groups. Professional category, $\chi^2(2) = 0.09$, $p = 0.955$, the knowledge group, $\chi^2(1) = 0.29$, $p = 0.592$, and the attitude group, $\chi^2(1) = 2.86$, $p = 0.091$, were not significantly associated with the classification. At the bivariate level, then, previous training and educational qualification were the main characteristics linked to higher practice indicators.

Table 6: Multivariable Modified Poisson Regression of Factors Associated with Higher Institutional Medical Audit-Practice Indicators (N = 300)

Explanatory variable	aPR	95% CI	p-value
Previous medical audit training	2.11	1.56 to 2.84	< 0.001
Knowledge score (per one-point increase)	1.16	1.09 to 1.23	< 0.001
Attitude score (per one-point increase)	1.03	0.98 to 1.08	0.221
Male sex	1.01	0.83 to 1.22	0.947
NDUTH	1.11	0.91 to 1.34	0.309
Medical doctor	1.02	0.84 to 1.22	0.873
HIM officer	1.06	0.77 to 1.44	0.738
B.NSc./B.Sc. qualification	1.25	0.88 to 1.79	0.216
M.Sc. qualification	1.10	0.73 to 1.66	0.651
Ph.D./MBBS qualification	0.68	0.38 to 1.23	0.205
11 to 20 years of experience	1.11	0.91 to 1.36	0.316
20 years or more experience	1.01	0.77 to 1.32	0.934
Senior staff	0.87	0.69 to 1.08	0.210
Head of Department	0.97	0.80 to 1.18	0.784

After all variables were adjusted for together in the modified Poisson regression with robust standard errors, previous medical audit training and the continuous knowledge score remained significantly related to higher institutional audit-practice indicators. Respondents with previous training had about twice the prevalence of higher indicators compared with those without training (aPR = 2.11; 95% CI: 1.56 to 2.84; $p < 0.001$). Each one-point rise in knowledge score was linked to a 16% higher prevalence of higher indicators (aPR = 1.16; 95% CI: 1.09 to 1.23; $p < 0.001$), with the other variables held constant. The model as a whole was significant, robust Wald $\chi^2(14) = 56.88$, $p < 0.001$. Attitude score (aPR = 1.03; 95% CI: 0.98 to 1.08; $p = 0.221$), educational qualification and the other professional characteristics did not keep a significant adjusted association. The knowledge score was significant as a continuous measure even though its two-group form was not significant, which fits the fact that a continuous measure keeps more information. These results still need careful reading because the outcome was an operational four-item index with poor internal consistency (KR-20 = 0.087). The adjusted associations should therefore be seen as exploratory and not as firm evidence of individual competence in medical audit or of audit practice.

Taken together, the results show three main points. First, awareness of medical audit was high, but training was uncommon and substantive knowledge was uneven, with scores bunched at the lowest and highest ends. Second, respondents reported audit structures and processes in different degrees, with audit conduct reported least often and sharing of findings reported most often. Third, previous training and knowledge score were the factors that stayed significantly linked to higher institutional audit-practice indicators after adjustment, while sex, hospital, profession, qualification, experience, designation and attitude did not. Because the outcome was an exploratory index with poor internal consistency, the third point should be treated as a lead for further study and not as a settled finding.

4 DISCUSSION

Findings of the study show a clear gap between general awareness of medical audit among health workers in tertiary hospitals in Bayelsa State and their formal training, substantive knowledge and institutional practice. A large majority of respondents (82.3%) had heard of medical audit and 68.0% said they understood its meaning, yet only 36.3% had

received formal professional training. In addition, 52.7% showed inadequate substantive knowledge under the study's cut-off. These results agree with regional and national studies in Sub-Saharan Africa, which also report that familiarity with the concept seldom leads to deep technical skill or active part in clinical governance, because pre-service and in-service training programmes are weak (Ayanore et al., 2019; Okello et al., 2020). In health systems where digital record systems and compulsory continuing professional development have pushed audit compliance above 85%, the picture is very different, and the gaps seen in these hospitals point to weak establishment of clinical quality frameworks (Braithwaite et al., 2018). The gap seen here probably comes mainly from limits in the curricula of professional training institutions and from the lack of institutional policies that require routine review of clinical performance.

On institutional practice, only 51.3% of respondents confirmed that medical audits were actually conducted in their facilities, although 60.0% said an audit committee was available and 72.7% said findings were shared. This pattern suggests that hospitals lean on administrative structures without the same consistency in carrying out audit. It agrees with Alinnor and Ogaji (2022), who found that review committees exist on paper in many Nigerian tertiary centres while active, closed-loop audit cycles remain weak. The dominance of mortality audit (68.3%) over morbidity, prescription and surgical audit also matches reports from settings with limited resources, where audit is mostly reactive and is triggered by serious adverse events, such as maternal and perinatal deaths, and not by routine efforts to improve quality (Merali et al., 2014; Okonofua et al., 2023). The narrow focus on mortality review in the tertiary hospitals studied suggests a culture driven by emergencies and not a broad, system-wide approach to clinical governance.

Regression analysis showed that previous professional training (aPR = 2.11) and the continuous knowledge score (aPR = 1.16 per unit rise) were significantly related to higher institutional audit-practice indicators. This supports the value of targeted capacity building. It is in line with local evidence from Kurokeyi et al. (2026) and Kurokeyi et al. (2024), who reported that reskilling health information and clinical management staff improves documentation accuracy, clinical coding and audit readiness at Niger Delta University Teaching Hospital. Studies from elsewhere in Sub-Saharan Africa by Tumuheirwe et al. (2021) and Bessong et al. (2023) point the same way, since they present continuing professional development as the main route by which passive awareness becomes active and lasting quality assurance. The lack of a significant link between professional category or designation and audit practice also suggests that taking part in audit may depend less on rank and more on the technical skill a person has gained through formal instruction.

This study adds an assessment of several professional groups, namely medical doctors, nurses and health information management professionals, in the setting of Bayelsa State. Earlier studies focused on physicians alone (Alinnor & Ogaji, 2022; Ilesanmi & Alele, 2015). The present study instead covers the linked roles of the whole care team in keeping records sound and audit compliant. Differences between these findings and studies that report better execution of audit are likely to come from regional problems in the Niger Delta, such as heavy patient loads for each member of staff, weak infrastructure and uneven institutional funding for training in clinical governance (Ebiowei et al., 2022; Ephraim-Emmanuel et al., 2018). The study therefore helps to fill a gap by showing that closing the divide between knowledge and practice calls for a move from occasional awareness campaigns to compulsory, institution-wide training in audit for all professional groups in apex hospitals.

The gap between hearing about audit and knowing how to do it deserves a closer look. Awareness is a low bar. A worker may have heard the word at a staff meeting or during a ward round and still not know how standards are set, how cases are sampled, how findings are recorded or how change is checked afterwards. The bunching of knowledge scores at zero and at five supports this view. It suggests that respondents were not spread along a smooth range of understanding. Instead, one large group seemed to have taken in the whole idea of audit, while another large group had taken in almost none of it. Such a split often follows uneven exposure to training. Staff who have attended a workshop or worked in a quality unit may answer most items correctly, while colleagues who have not had that chance may answer very few. The strong link between training and the institutional indicators fits this reading, although the design cannot prove it.

High share of respondents who said findings were shared (72.7%) beside the lower share who said audits were conducted (51.3%) also needs careful thought. One possible reason is that findings may be passed on in general terms, for example through a memo or a meeting, even by staff who have never seen an audit being done. Another is that some respondents may have counted any review of cases, such as a mortality meeting, as a form of sharing without seeing it as a full audit. A third is that staff in departments with little audit activity may have limited knowledge of what happens elsewhere in the hospital. Each of these explanations would point to the same practical need, which is a clear and shared understanding among all staff of what counts as a medical audit and how its results are meant to reach the people who give care.

The result for educational qualification also needs a cautious reading. At the bivariate level, the share with higher indicators was lowest in the Ph.D./MBBS group, but the link did not hold after adjustment for the other variables. Respondents with higher qualifications may hold senior clinical posts that keep them away from the routine work of audit, or may work in units where audit is done by a small team. Qualification may also be tied to profession and to hospital in ways that the model could only partly separate. The adjusted result therefore suggests that qualification by

itself does not explain audit practice, and that what staff have been taught about audit counts for more than the level of their general education.

The findings have meaning for hospital managers and training bodies. First, a count of staff who have heard of audit should not be used to judge readiness for audit. Measures of skill, such as a short test of knowledge or a review of completed audit projects, would give a truer picture. Second, training should be planned for the whole care team. Doctors, nurses and health information staff each hold part of the record and part of the audit process, and an audit cannot be completed if one group is left out. Third, the way results are shared matters. Meetings were the most common channel, and email and notice boards followed. Hospitals could make better use of these channels by tying each report to named actions, persons responsible and dates for review, so that findings are followed up and not only announced.

Training itself needs to be looked at in terms of content and delivery. A single workshop may raise awareness but may not change daily practice. For training to work, it should teach the steps of the audit cycle in the order that staff will meet them, give staff a chance to carry out a small audit under guidance, and return to the results so that staff see changes that follow from their own work. Training that is offered to one profession only is also likely to fall short, because the record that is audited is shared by doctors, nurses and health information staff. Evidence on audit and feedback suggests that feedback is more likely to change practice when it is timely, is given more than once and is linked to clear targets (Flottorp et al., 2017). These principles can be built into the training of hospital staff without large new costs.

The finding that audit was concentrated on mortality review calls for a final comment. Mortality audit has real value, since it can show avoidable factors in deaths and can lead to changes in care (Merali et al., 2014; Okonofua et al., 2023). The concern is that it looks back at events that have already caused the greatest harm. Morbidity, prescription and surgical audits can detect problems earlier and can cover a much larger share of the patients treated. A hospital that relies mainly on mortality review may miss many chances to prevent harm. Widening the range of audit does not need to wait for new buildings or equipment. It needs trained staff, protected time and a committee that has the authority to ask for audits and to follow up on them.

However, the choice of a modified Poisson model is worth explaining. When an outcome is common, as it was here, with 179 of the 300 respondents (59.7%) in the higher indicator group, odds ratios from logistic regression tend to overstate the size of an association when they are read as risk or prevalence ratios. A Poisson model with robust standard errors gives prevalence ratios directly and keeps the confidence intervals valid for a binary outcome. This makes the reported aPRs easier to read, for example that respondents with previous training had about twice the prevalence of higher indicators. The choice does not remove the problems of the outcome measure itself, which remain as described above.

This study also has strengths. It covered three professional groups that share responsibility for records and audit. Respondents were chosen by proportionate stratified random sampling from staff lists. The questionnaire was reviewed by experts and pretested, the reliability of each scale was reported openly, and the weak reliability of the practice index was stated and used to limit how the results were read. These features add to the confidence that can be placed in the descriptive findings, although they do not remove the limits that follow.

A comparison with earlier Nigerian studies gives some context. Alinnor and Ogaji (2022) and Ilesanmi and Alele (2015) reported general awareness of clinical audit of about 66.7%, knowledge of the specific audit steps of 12.5% and no formal training after qualification among more than 84% of health workers. In the present study, awareness was higher at 82.3%, adequate knowledge was more common at 47.3% and the share without training was lower at 63.7%. These differences should not be taken as proof of progress. The earlier studies were done in other settings, they focused on doctors and they used different questions and cut-offs. What the figures do show is that, in both sets of studies, formal training reached a minority of staff and the move from awareness to working knowledge was incomplete.

The state of record keeping in the hospitals may also matter. Audit depends on records that are complete, legible and easy to retrieve. Earlier work in Bayelsa State found that temporary case notes were still in use and that documentation errors weakened clinical accountability (Kurokeyi, 2025). Where records are weak, even well-trained staff will find it hard to complete an audit. Training in audit should therefore go together with work to improve documentation, since each depends on the other.

The results also bear on how audit capacity is measured in future. Asking staff whether they know what medical audit is, as many surveys do, gave a much more positive picture here than asking them to confirm specific features of audit. Studies that rely on the first question alone are likely to overstate readiness. Using a short set of knowledge items, as this study did, costs little and can be added to routine staff surveys in hospitals that wish to track progress over time.

Some limits should be noted. The cross-sectional design allows no claim of cause and effect between training, knowledge and audit practice. Practice was reported by respondents and was not checked against hospital audit records. The

institutional practice index had poor internal consistency, so the regression findings are exploratory. The knowledge cut-off was set for this study, the sample leaned towards nurses and towards one hospital, and only two hospitals were included, so the findings may not apply to all tertiary hospitals in Nigeria. Future work should use audit records and observation alongside self-report, and should include more hospitals.

5 CONCLUSION

This study assessed how general awareness, professional training, substantive knowledge and medical audit practices relate to each other among health professionals in tertiary hospitals in Bayelsa State, Nigeria. The results show a clear gap between high awareness and low technical knowledge. Health workers often accept the value of quality assurance in principle, but the lack of structured, compulsory pre-service and in-service training limits how well audit is carried out in the institutions. The concentration of audit on reactive mortality review, and not on full and proactive clinical governance cycles, points to weakness in quality management frameworks. The regression analysis indicates that professional training and technical knowledge were the main factors linked to higher institutional audit-practice indicators, whatever the person's rank or designation. Closing these gaps calls for more than occasional awareness campaigns. It calls for lasting, multidisciplinary and continuous capacity building. Unless policies build structured audit protocols into the daily work of hospitals, tertiary institutions in developing regions will find it hard to reach lasting clinical excellence and good patient safety outcomes.

Recommendations

On the basis of these findings, the following recommendations are made to hospital management, health policymakers and professional regulatory bodies.

- Hospital managements in tertiary institutions in Bayelsa State and the wider Niger Delta should set up regular, compulsory in-service training on the practical steps of the medical audit cycle, data extraction and closed-loop feedback, for all clinical and health information management staff. Training of this kind should include practical work on a small audit, so that staff learn by doing and not only by listening.
- Clinical governance committees should be given the power to move from a mostly reactive, mortality-based audit culture to a broad and proactive quality assurance framework that includes morbidity audits, prescription safety reviews, surgical procedure reviews and checks on compliance with clinical protocols. A yearly audit plan that names the topics, the persons responsible and the dates would help the committees to keep to this work.
- Apex hospitals should set up formal, well-funded medical audit and quality improvement units with dedicated digital tools and standard documentation protocols. These should replace temporary case notes, make record archiving reliable and support the involvement of all professional groups. Such units should report to hospital management at set intervals.
- Regulatory bodies and institutions that train medical doctors, nurses and health information management professionals should add full modules on clinical governance, health data analysis and medical audit methods to their pre-service curricula. Short refresher courses for staff who are already in service would help those who finished training before such modules were taught.
- Hospital managements should adopt policies that require regular audit reports from departments, enforce accountability and create open feedback channels, such as internal newsletters and departmental briefings, so that audit findings lead to real improvements in clinical practice. Management should also keep a record of actions taken after each audit, so that progress can be checked at the next review.

These steps do not depend on large new funds. Most of them need planning, shared responsibility among professional groups and steady follow-up by hospital leaders. If they are carried out, the gap between what health workers have heard about medical audit and what they are able to do with it should narrow over time, and audit can then serve its purpose of improving the care that patients receive.

Further research is needed to test the links reported here. Studies that follow staff before and after a training programme would show whether training changes knowledge and practice. Studies that review audit records, minutes of committee meetings and documented actions would give a firmer measure of institutional practice than self-report. A reliable and validated scale for institutional audit practice is also needed, since the index used here had poor internal consistency. Larger studies that include more tertiary hospitals, as well as secondary facilities, would show whether the pattern seen in Bayelsa State holds in other parts of Nigeria.

In summary, health workers in the tertiary hospitals studied knew of medical audit but had received little training in it, and their knowledge was uneven. Hospitals reported audit structures and processes to different degrees, and audit work was centred on mortality review. Training and knowledge were the factors that stayed linked to higher institutional audit-practice indicators. Investment in structured, shared and continuing training in medical audit,

backed by clear institutional policy and by proper records, is the most direct step that the evidence in this study supports.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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