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Knowledge, attitudes and practices regarding the use of spirometry among healthcare professionals in South-south Nigeria: a cross-sectional study

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Abstract

Context: Spirometry is the gold standard pulmonary function test for diagnosing and monitoring obstructive and restrictive airway diseases. Despite its established utility, its use remains suboptimal in Nigeria. This study assessed the knowledge, attitudes and practices regarding spirometry among healthcare professionals and identified independent predictors of good spirometry practice.
Methods: A descriptive cross-sectional study was conducted among 210 healthcare professionals from tertiary, secondary, primary and private hospitals across Nigeria using purposive sampling. A structured, pre-tested, self-administered questionnaire assessed knowledge of spirometry indications and diagnostic criteria, attitudes towards its clinical utility across seven indications and self-reported practice frequency. Good spirometry practice was defined as using spirometry sometimes or often/always. Bivariate associations were examined using chi-square and Mann-Whitney U tests and independent predictors were identified by binary logistic regression. Data were analysed using IBM SPSS Statistics version 27.0.
Results: The mean age of respondents was 41.6 ± 8.5 years; 54.8% were males. Registrars constituted 59.0% and 60.5% practiced in tertiary hospitals. Medical school was the dominant knowledge source (81.0%). Self-assessed knowledge was good or excellent in 83.8%. Attitudes were strongly positive, with 94.8% rating spirometry very important for diagnosis. However, only 25.2% used spirometry often or always and 50.0% were only slightly confident in interpretation. Spirometers were unavailable in 65.2% of hospitals. On logistic regression, good or excellent self-assessed knowledge (AOR=11.60; 95% CI: 3.91–34.37; p<0.001) and registrar cadre (AOR=0.23; 95% CI: 0.09–0.61; p=0.003) were the independent predictors of good spirometry practice.
Conclusion: Nigerian healthcare professionals demonstrate positive attitudes but a significant practice gap in spirometry use. Self-assessed knowledge is the strongest independent predictor of good practice. Targeted post-qualification training and the urgent procurement of spirometers are essential.

Keywords: spirometry; knowledge; attitudes; practices; predictors; healthcare professionals; Nigeria

Introduction

Spirometry is the internationally recognised gold standard for the objective diagnosis, severity classification, prognostication and long-term monitoring of obstructive airway diseases.[1] The Global Initiative for Asthma (GINA) and the Global Initiative for Chronic Obstructive Lung Disease (GOLD) both mandate spirometry-confirmed diagnosis as the basis for accurate disease phenotyping and evidence-based pharmacological management.[2,3] Similarly, the World Health Organization (WHO) and the European Respiratory Society (ERS) have endorsed spirometry as an essential component of primary and secondary respiratory care,

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emphasising its role in reducing the global burden of preventable respiratory morbidity and mortality.[4,5] The ERS/ATS technical standard for spirometry further underlines that high-quality spirometry, performed under standardised conditions with appropriate interpretation criteria, remains irreplaceable in the clinical workup of any patient with suspected or established airflow obstruction.[6]

Globally, the burden of chronic respiratory disease is enormous and disproportionately concentrated in low- and middle-income countries (LMICs). The WHO estimates that asthma affects more than 235 million people worldwide, contributing to approximately 455,000 deaths annually, while COPD affects over 250 million individuals and represents the third leading cause of death globally.[7,8] In sub-Saharan Africa, epidemiological data consistently demonstrate a high prevalence of both conditions, compounded by unique regional risk factors including exposure to indoor air pollution from biomass fuel combustion, high rates of tuberculosis-associated lung disease and increasing tobacco use.[9–12] Pneumoconiosis, occupational lung disease and post-infectious obstructive defects further expand the population requiring spirometric evaluation.[13,14] Despite this significant burden, spirometry-based confirmatory diagnosis remains largely unavailable in routine clinical practice across the region.

In Nigeria specifically, respiratory diseases constitute a leading cause of outpatient consultation and hospital admission. COPD, asthma, pulmonary tuberculosis sequelae and occupational lung diseases collectively impose a substantial morbidity burden on the health system.[15,16] Yet clinical diagnosis continues to rely predominantly on symptom assessment and peak expiratory flow rate measurement, tools that, while accessible, lack the sensitivity and specificity of spirometry for definitive obstructive disease classification. This diagnostic deficiency leads to misclassification, with asthma frequently overdiagnosed and COPD chronically underdiagnosed, particularly in the early reversible stages when disease-modifying interventions are most effective.

Knowledge, attitudes and practices (KAP) studies provide a structured framework for identifying gaps between what clinicians know, what they believe and what they do in practice. Understanding where the greatest gaps exist and which factors independently predict good practice, is critical for designing targeted interventions.

This study was therefore conducted to assess the knowledge, attitudes and practices regarding spirometry among healthcare professionals in Nigeria and to identify the independent predictors of good spirometry practice. The findings are intended to inform the design of targeted CME programmes, equipment procurement advocacy and guideline dissemination strategies.

Materials and methods

Study Area

This study was conducted in Nigeria, recruiting respondents from healthcare facilities across four hospital tiers: tertiary (federal and state teaching hospitals and specialist hospitals), secondary (general hospitals), primary (primary healthcare centres) and private hospitals. Participating institutions were predominantly located in urban centres across Nigeria, consistent with the national distribution of formally trained healthcare professionals.

Study Design, Sampling Technique and Data Collection

A descriptive cross-sectional study design was employed. Participants were recruited from healthcare facilities across four hospital tiers in urban centres across Nigeria using purposive sampling targeting healthcare professionals in direct clinical management of respiratory patients; data collection was conducted physically using self-administered paper questionnaires. A structured, pre-tested, self-administered questionnaire was used for data collection. The instrument was developed following a review of the existing literature on spirometry KAP studies in comparable settings and was pre-tested among ten (10) clinicians at the University of Benin Teaching Hospital (UBTH), Benin City, not included in the main study to assess face validity, clarity and completion time.

Study Population, Selection Criteria and Sample Size

The study population comprised medical officers,

registrars and consultants/senior registrars in active clinical practice. Inclusion criteria were: possession of an MBBS degree or equivalent, current active clinical practice and written informed consent. Healthcare workers not directly involved in patient care and those who declined to participate were excluded. The sample size was calculated using the Cochran formula for proportions (p = 0.50 for maximum variability, precision d = 0.07, 95% confidence), yielding a minimum of 196; this was rounded up to 210 to account for non-response. Participants were recruited from tertiary, secondary, primary and private healthcare facilities across Nigeria, with allocation proportionate to the estimated number of eligible clinicians at each facility type. All questionnaires were self-administered and physically distributed and retrieved by the research team. A total of 210 participants were recruited.

Data Analysis

Data were entered and analysed using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as frequencies, percentages, means and standard deviations were computed for all study variables. For multiple-response items (knowledge sources and diagnostic tests), each response option was analysed independently as a binary variable. The knowledge section comprised five items assessing awareness of spirometry indications and diagnostic criteria, each scored as correct or incorrect; total knowledge scores ranged from 0 to 5. Self-assessed knowledge was rated on a four-point scale (poor, fair, good, excellent) for analytical purposes dichotomised into poor/fair versus good/excellent. Attitudes were assessed across seven clinical indications rated on a four-point scale (not important to very important; scores 1 to 4); total attitude scores therefore ranged from 7 to 28. Spirometry practice frequency for each of seven clinical indications was rated on a four-point scale (never, rarely, sometimes, often/always; scores 0 to 3). Good spirometry practice was operationally defined a priori as reporting use of spirometry sometimes or often/always in clinical practice (corresponding to scores of 2 or 3 on the four-point frequency scale), giving a dichotomous outcome variable (good practice vs. poor practice).

Bivariate associations between predictor variables and good spirometry practice were examined using Pearson's chi-square test for categorical predictors and the Mann-Whitney U test for continuous variables (age and years of practice), given non-normal distribution of the latter. Variables significant at $p<0.05$ on bivariate analysis, together with variables of a priori clinical relevance, were entered simultaneously into a binary logistic regression model. Model fit was assessed using the Hosmer-Lemeshow test and Cox-Snell R^2. Results are presented as adjusted odds ratios (AOR) with corresponding 95% confidence intervals (CI) and p-values. Statistical significance was set at $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the relevant institutional review board prior to data collection. Written informed consent was obtained from all participants. Confidentiality and anonymity of all study data were strictly maintained.

Limitations

Self-reported data may be subject to social desirability and recall biases. The predominantly urban and tertiary composition of the sample may limit generalisability to rural and primary care settings. Self-assessed knowledge was used as a surrogate rather than an objective knowledge score. Purposive sampling does not guarantee a nationally representative sample. These limitations notwithstanding, this study provides the most comprehensive multi-cadre, multi-institution KAP assessment of spirometry practice in the Nigerian context to date

Results

Sociodemographic and Practice Characteristics of Respondents (Table 1)

A total of 210 healthcare professionals participated in this study, all of whom completed the questionnaire in full, giving a response rate of 100%. The mean age was 41.6 ± 8.5 years (range: 28–76 years), with the largest proportions falling within the 30–39 years (84; 40.0%) and 40–49 years (84; 40.0%) age groups. There were 115 male respondents (54.8%) and 95 female respondents (45.2%), representing a male-to-female ratio of approximately 1.2:1. The mean years of clinical practice was 12.5 ± 8.0 years; the majority had

practiced for 10–19 years (79; 37.6%), followed by those with 5–9 years (58; 27.6%) of experience.

Regarding professional cadre, registrars constituted the majority (124; 59.0%), with medical officers (43; 20.5%) and consultants/senior registrars (43; 20.5%) comprising equal proportions of the remainder. Most respondents were attached to tertiary-level institutions (127; 60.5%), followed by secondary hospitals (41; 19.5%), private facilities (26; 12.4%) and primary health care centres (16; 7.6%). The overwhelming majority practised in urban locations (199; 94.8%), with only 11 respondents (5.2%) in rural settings. Given the non-normal distribution of workload variables, patient load data are reported as medians with interquartile ranges. The median number of patients seen per day was 22 (IQR: 15–30), of whom a median of 6 (IQR: 3–10) presented with respiratory diagnoses and a median of 3 (IQR: 1–6) were tobacco users. For reference, the corresponding means ± standard deviations were 24.8 ± 15.3, 8.0 ± 7.4 and 4.6 ± 5.9, respectively, reflecting right-skewed distributions.

Knowledge of Spirometry Among Respondents (Table 2)

Regarding tests recommended for diagnosing asthma and COPD, 147 respondents (70.0%) correctly identified peak flow rate, 144 (68.6%) identified bronchodilator spirometry and 131 (62.4%) identified reversibility testing as relevant investigations; 13 respondents (6.2%) reported not knowing which tests to use. Collectively, 83.8% of respondents self-assessed their spirometry knowledge as good (121; 57.6%) or excellent (55; 26.2%), while 30 (14.3%) rated it as fair and 4 (1.9%) as poor. Notably, only 23.8% of respondents simultaneously had good or excellent self-assessed knowledge and awareness of a specific spirometry guideline.

Medical school education was cited as the primary source of spirometry knowledge by 170 respondents (81.0%), followed by textbooks and medical

Table 1: Sociodemographic and practice characteristics of respondents (N = 210)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
< 30	18	8.6
30 – 39	84	40.0
40 49	84	40.0
50 – 59	18	8.6
≥ 60	6	2.9
Mean ± SD: 41.6 ± 8.5 years		
Sex		
Male	115	54.8
Female	95	45.2
Years of clinical practice		
< 5	42	20.0
5 – 9	58	27.6
10 – 19	79	37.6
≥ 20	31	14.8
Mean ± SD: 12.5 ± 8.0 years		
Current position		
Medical Officer	43	20.5
Registrar	124	59.0
Consultant/Senior Registrar	43	20.5
Type of hospital		
Tertiary	127	60.5
Secondary	41	19.5
Primary	16	7.6
Private	26	12.4
Location of hospital		
Urban	199	94.8
Rural	11	5.2
Patient load (mean ± SD)		
Patients seen per day	*24.8 ± 15.3*	
Patients with respiratory diagnosis/day	*8.0 ± 7.4*	
Tobacco users seen per day	*4.6 ± 5.9*	

Table 2: Knowledge of spirometry among respondents (N = 210)

Variable	Frequency (n)	Percentage (%)
Tests for Asthma/COPD diagnosis (multiple response)*		
Peak Flow Rate	147	70.0
Bronchodilator Spirometry	144	68.6
Reversibility Testing	131	62.4
Don't know	13	6.2
Self-assessment of spirometry knowledge		
Poor	4	1.9
Fair	30	14.3
Good	121	57.6
Excellent	55	26.2
Sources of spirometry knowledge (multiple response)*		
Medical School	170	81.0
Textbooks/Medical Journals	102	48.6
Websites	75	35.7
CME Programme	68	32.4
Last CME on spirometry attended		
< 1 year ago	145	69.0
1 – 2 years ago	42	20.0
3 5 years ago	7	3.3
> 5 years ago	11	5.2
Never attended	5	2.4
Awareness of any spirometry guideline		
Yes	51	24.3
No	138	65.7
Unsure	21	10.0
Awareness of GINA/GOLD guidelines		
Yes	136	64.8
No	54	25.7
Unsure	20	9.5

*Percentages exceed 100% due to multiple responses

journals (102; 48.6%), websites (75; 35.7%) and CME programmes (68; 32.4%). Regarding the recency of CME engagement, 145 respondents (69.0%) had attended a spirometry-relevant CME within the preceding year and a further 42 (20.0%) within the past two years; only 5 respondents (2.4%) had never attended any relevant CME. Awareness of any spirometry-specific clinical guideline was reported by only 51 respondents (24.3%), with 138 (65.7%) unaware and 21 (10.0%) uncertain. In contrast, awareness of the GINA or GOLD guidelines for asthma and COPD management was considerably higher, reported by 136 respondents (64.8%).

Attitudes Towards the Importance and Usefulness of Spirometry (Table 3)

Spirometry for diagnosis was rated very important by 199 respondents (94.8%) and important by the remaining 11 (5.2%), with no respondent rating it as not important or only slightly important. Confirming clinical diagnosis was similarly rated very important by 193 respondents (91.9%). High endorsement was also observed for surveillance (177; 84.3%), monitoring disease progression (174; 82.9%) and severity assessment (168; 80.0%).

Table 3: Attitudes towards the importance and usefulness of spirometry (N = 210)

Indication	Not Important n(%)	Slightly Important n(%)	Important n(%)	Very Important n(%)
Diagnosis	0 (0.0)	0 (0.0)	11 (5.2)	199 (94.8)
Severity Assessment	20 (9.5)	0 (0.0)	22 (10.5)	168 (80.0)
Prognosis	33 (15.7)	0 (0.0)	24 (11.4)	153 (72.9)
Monitoring Disease Progression	11 (5.2)	0 (0.0)	25 (11.9)	174 (82.9)
Confirming Clinical Diagnosis	0 (0.0)	0 (0.0)	17 (8.1)	193 (91.9)
Surveillance	7 (3.3)	0 (0.0)	26 (12.4)	177 (84.3)
Pre-operative Evaluation	60 (28.6)	5 (2.4)	35 (16.7)	110 (52.4)

Spirometry for prognostic purposes was rated very important by 153 respondents (72.9%), though 33 (15.7%) considered it not important for this indication, reflecting some divergence in views on its prognostic utility. Pre-operative evaluation generated the widest variation in attitudes: 110 respondents (52.4%) rated it very important, 35 (16.7%) important, 5 (2.4%) slightly important and 60 (28.6%) not important at all.

Spirometry Practices (Table 4, Table 5)

Despite broadly favourable attitudes, spirometry utilisation in clinical practice was substantially suboptimal. Overall, 53 respondents (25.2%) reported using spirometry often or always, 93 (44.3%) sometimes, 58 (27.6%) rarely and 6 (2.9%) never. COPD diagnosis was the indication most commonly associated with frequent spirometry use, with 127 respondents (60.5%) reporting often or always requesting it for this purpose and a combined often/sometimes rate of 81.0%.

Table 4: Frequency of spirometry use by indication (N = 210)

Indication	Never n(%)	Rarely n(%)	Sometimes n(%)	Often/Always n(%)
Overall spirometry use in practice	6(2.9)	58(27.6)	93(44.3)	53(25.2)
Monitoring asthma	136(64.8)	12(5.7)	56(26.7)	6(2.9)
Diagnosing COPD	23(11.0)	17(8.1)	43(20.5)	127(60.5)
Evaluation of other lung diseases	111(52.9)	36(17.1)	32(15.2)	31(14.8)
Evaluation of acute exacerbation	150(71.4)	33(15.7)	27(12.9)	0(0.0)
Pre-employment testing	141(67.1)	34(16.2)	7(3.3)	28(13.3)
Monitoring lung function	119(56.7)	36(17.1)	25(11.9)	30(14.3)
Monitoring chronic lung disease	145(69.0)	48(22.9)	16(7.6)	1(0.5)

In contrast, spirometry use for other clinical indications was markedly lower. Monitoring asthma was the indication with the lowest uptake: 136 respondents (64.8%) reported never using spirometry for this purpose and only 62 respondents (29.5%) reported using it sometimes or often. Spirometry for the evaluation of acute exacerbations was never requested by 150 respondents (71.4%) and monitoring of chronic lung disease was never performed by 145 (69.0%). For monitoring the lung function of specific high-risk patients, 119 respondents (56.7%) reported never using spirometry and for pre-employment testing, 141 (67.1%) never did so.

Regarding interpretive confidence, 20 respondents (9.5%) were not at all confident and 105 (50.0%) were only slightly confident in interpreting spirometry results, together representing 59.5% of the sample with limited self-rated interpretive competence. Only 27 respondents (12.9%) reported being very confident. In terms of equipment access, 137 respondents (65.2%) reported that their hospital did not have a functioning spirometer; 64 (30.5%) confirmed availability and 9 (4.3%) were unsure. Despite the widespread equipment deficit, 125 respondents (59.5%) expressed an intention to procure a spirometer for their facility, while only 25 (11.9%) had no such plans.

Associations and Predictors of Good Spirometry Practice (Table 6, Table 7, Figure 1)

Table 6 presents bivariate associations with good

Table 5: Confidence in interpretation and spirometer availability (N = 210)

Variable	Frequency (n)	Percentage (%)
Confidence in interpreting spirometry results		
Not confident	20	9.5
Slightly confident	105	50.0
Confident	58	27.6
Very confident	27	12.9
Spirometer available in hospital		
Yes	64	30.5
No	137	65.2
Don't know	9	4.3
Plan to procure a spirometer		
Yes	125	59.5
No	25	11.9
Don't know	60	28.6

Table 6: Bivariate analysis of associations of good spirometry practice (N = 210)

Variable	Good Practice n(%)	Poor Practice n(%)	p-value
Sex			
Male (n=115)	72 (62.6)	43 (37.4)	*0.025**
Female (n=95)	74 (77.9)	21 (22.1)	
Cadre			
Medical Officer (n=43)	36 (83.7)	7 (16.3)	*0.003***
Registrar (n 124)	75 (60.5)	49 (39.5)	
Consultant/SR (n 43)	35 (81.4)	8 (18.6)	
Type of hospital			
Tertiary (n=127)	84 (66.1)	43 (33.9)	*0.028**
Secondary (n=41)	26 (63.4)	15 (36.6)	
Primary (n=16)	16 (100.0)	0 (0.0)	
Private (n=26)	20 (76.9)	6 (23.1)	
Spirometry guideline awareness			
Aware (n=51)	44 (86.3)	7 (13.7)	*0.005***
Not aware (n=159)	102 (64.2)	57 (35.8)	
GINA/GOLD guideline awareness			
Aware (n=136)	105 (77.2)	31 (22.8)	*0.002***
Not aware (n=74)	41 (55.4)	33 (44.6)	
Self-assessed knowledge			
Good/Excellent (n=176)	137 (77.8)	39 (22.2)	*<0.001***
Poor/Fair (n=34)	9 (26.5)	25 (73.5)	
Interpretive confidence			
Confident/Very confident (n=85)	69 (81.2)	16 (18.8)	*0.004***
Not/Slightly confident (n=125)	77 (61.6)	48 (38.4)	
Spirometer availability			
Available (n 64)	53 (82.8)	11 (17.2)	*0.009***
Not available (n=137)	89 (65.0)	48 (35.0)	
Don't know (n=9)	4 (44.4)	5 (55.6)	
CME recency			
Recent <2 years (n=187)	128 (68.4)	59 (31.6)	0.469
Not recent (n=23)	18 (78.3)	5 (21.7)	
Age (median years)			
Good: 41.0 vs Poor: 40.5			0.726†
Years of practice (median)			
Good: 11.0 vs Poor: 12.0			0.796†

**p<0.05; **p<0.01; ***p<0.001; †Mann-Whitney U test; Chi-square for all other comparisons*

spirometry practice. Significant associations were found for sex (p=0.025), cadre (p=0.003), hospital type (p=0.028), spirometry guideline awareness (p=0.005), GINA/GOLD awareness (p=0.002), self-assessed knowledge (p<0.001), interpretive confidence (p=0.004) and spirometer availability (p=0.009). CME recency, age and years of practice were not significantly associated.

Table 7: Binary logistic regression — independent predictors of good spirometry practice

Variable	Adjusted OR	95% Confidence Interval	p-value
Female sex (ref: Male)	1.72	0.79 – 3.76	0.172
Registrar cadre (ref: Non-registrar)	**0.23**	**0.09 – 0.61**	**0.003****
Tertiary hospital (ref: Non-tertiary)	0.79	0.31 2.03	0.621
Recent CME: <2yrs (ref: Not recent)	0.50	0.15 1.73	0.276
Spirometry guideline aware (ref: Unaware)	1.97	0.70 5.55	0.198
GINA/GOLD aware (ref: Unaware)	1.69	0.82 – 3.48	0.154
Good/Excellent knowledge (ref: Poor/Fair)	**11.60**	**3.91 – 34.37**	**<0.001*****
Confident in interpretation (ref: Not)	1.10	0.45 2.66	0.840
Spirometer available (ref: Not available)	1.77	0.74 – 4.26	0.200

***p<0.01; ***p<0.001; AOR = Adjusted Odds Ratio; CI = Confidence Interval; Model χ^2=64.48, p<0.001; Cox-Snell R^2=0.25*

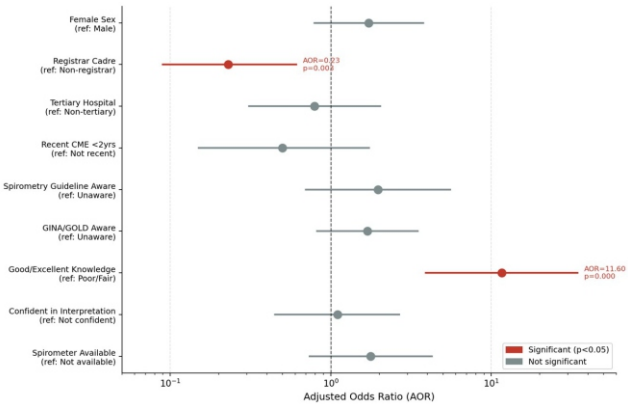

Figure 1: Forest plot of adjusted odds ratios for independent predictors of good spirometry practice (N = 210)

Binary logistic regression identified two independent predictors (Table 7 and Figure 1). The model was statistically significant (χ^2=64.48, p<0.001; Cox-Snell R^2=0.25). Good or excellent self-assessed knowledge was the strongest predictor (AOR=11.60; 95% CI: 3.91–34.37; p<0.001), with respondents rating their knowledge good or excellent being over eleven times more likely to report good practice. Registrar cadre was independently associated with lower odds of good practice (AOR=0.23; 95% CI: 0.09–0.61; p=0.003). All other variables were non-significant after adjustment.

Discussion

This study assessed spirometry knowledge, attitudes and practices among 210 Nigerian healthcare professionals and identified independent predictors of good spirometry practice. The principal finding was that despite broadly positive attitudes, a significant gap exists between what clinicians believe about spirometry and what they actually do in practice, driven primarily by equipment shortfalls and cadre-related differences in test-ordering responsibility.

The mean age of 41.6 years and the predominance of registrars (59.0%) is notable, as this cadre occupies the frontline of clinical decision-making while simultaneously being the least likely to independently order spirometry. The concentration of respondents in tertiary hospitals (60.5%) reflects the known maldistribution of trained physicians in Nigeria, leaving patients in secondary and primary care facilities, where undiagnosed respiratory disease is arguably more prevalent, with the least access to spirometry-competent clinicians.

Medical school was the primary knowledge source for 81.0% of respondents, consistent with other reports from Nigeria.[17,18] This is unsurprising but concerning, as undergraduate exposure rarely confers the practical competency needed for confident spirometry interpretation. Only 32.4% cited CME as a knowledge source and just 24.3% were aware of any specific spirometry guideline, indicating that post-qualification learning has largely failed to supplement foundational training. Ayuk et al.[19] showed that structured spirometry training significantly improved both knowledge and practice among general practitioners, reinforcing the need for targeted post-graduate engagement rather than reliance on what was learned at medical school.

A particularly telling finding was the discrepancy between self-assessed knowledge and interpretive confidence. While 83.8% rated their knowledge as good or excellent, half of all respondents described themselves as only slightly confident when actually interpreting results. This pattern, where perceived knowledge exceeds practical ability, has been documented elsewhere. Schermer et al.[20] found that self-rated spirometry competence routinely overestimates performance on objective interpretation assessments among primary care physicians.

Attitudes were strongly positive across almost all clinical indications, with over 90% rating spirometry very important for diagnosis and for confirming clinical diagnoses. This is clinically encouraging and suggests that attitudinal resistance is not a meaningful driver of underuse. The notable exception was pre-operative evaluation, where only 52.4% considered spirometry very important, reflecting genuine ongoing debate in the literature about its routine versus selective use in surgical risk stratification.[21,22]

In practice, however, only 25.2% of respondents used spirometry often or always. COPD diagnosis was the most frequently cited indication (60.5%), consistent with the GOLD guideline requirement for spirometry-confirmed diagnosis. Asthma monitoring showed the starkest gap, with 64.8% reporting that they never used spirometry for this purpose, despite GINA's explicit recommendation for regular objective lung function assessment. The most concrete structural explanation is equipment access: 65.2% of respondents practiced in facilities without a spirometer, consistent with multicentre African data from Masekela et al.[23] and Chima et al.[24] documenting critical spirometric deficits across the region.

On logistic regression, good or excellent self-assessed knowledge was the strongest independent predictor of good practice (AOR=11.60; 95% CI: 3.91 to 34.37; $p<0.001$). This finding aligns with the KAP framework, in which perceived competence acts as a gateway to clinical behaviour.[25] Registrar cadre was independently associated with lower odds of good practice (AOR=0.23; $p=0.003$), most plausibly because spirometry ordering in Nigerian hospitals tends to be the preserve of senior clinicians. Integrating spirometry ordering authority and competency assessment into registrar training programmes would directly address this gap.

The non-significance of spirometer availability in the regression model should not be misread as evidence that equipment access is unimportant. The bivariate data clearly show that facilities with spirometers have higher rates of good practice. The regression finding more likely reflects that among respondents with good knowledge and non-registrar status, equipment access is already embedded in

their clinical environment. At the system level, equipment availability remains the single most modifiable structural barrier to practice improvement.

Taken together, the data show that spirometry is not underused because clinicians doubt its value, but because they lack the equipment to perform it and the post-qualification training to interpret it confidently. Addressing these deficits in tandem, through spirometer procurement and structured competency training, offers a path to meaningful and sustained improvement in respiratory diagnostics in Nigeria.

Conclusion

Healthcare professionals in Nigeria hold strongly positive attitudes towards spirometry but demonstrate a significant practice gap, with only one in four using it often or always. Good self-assessed knowledge was the strongest independent predictor of good practice (AOR=11.60), while registrar cadre was associated with lower odds of good practice. Spirometer unavailability in 65.2% of hospitals represents the most critical structural barrier. Urgent investment in spirometer procurement, competency-based spirometry training within postgraduate curricula and targeted CME programmes aligned with GINA and GOLD guidelines are essential to optimise respiratory disease management in Nigeria.

Recommendations

Based on the findings of this study, the following are recommended: (1) Health facility administrators and policymakers should prioritise spirometer procurement and servicing at tertiary and secondary hospitals. (2) Postgraduate medical colleges should integrate structured, competency-based spirometry training with objective assessment into residency curricula. (3) Registrars should be explicitly granted spirometry ordering authority as part of clinical training. (4) CME programmes should be redesigned to emphasise practical spirometry interpretation using standardised scenarios. (5) National professional associations should disseminate GINA and GOLD guidelines through accessible local formats. (6) Future studies should employ objective spirometry knowledge assessments to validate self-reported findings.

Declarations

Conflict of Interest: The authors declare no conflict of interest.

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Data Availability: Data are available upon reasonable request from the corresponding author.

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