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Research Article

BARRIERS TO THE ADOPTION OF DIGITAL HEALTH TECHNOLOGIES AMONG HOSPITAL AND COMMUNITY PHARMACISTS IN YENAGOA, BAYELSA STATE, NIGERIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Despite growing awareness and partial utilisation of digital health technologies (DHTs) among pharmacists in Nigerian settings, adoption remains constrained by multiple barriers. Identifying and quantifying these barriers in a localised context is essential for designing effective, context-specific interventions. **Objective:** To identify and characterise the barriers to the adoption of digital health technologies among hospital and community pharmacists practising in Yenagoa, Bayelsa State, Nigeria. **Methods:** A descriptive cross-sectional study was conducted among 161 licensed practising pharmacists in Yenagoa. Barriers to DHT adoption were assessed using a nine-item instrument rated on a four-point scale (1 = not a barrier to 4 = major barrier). Descriptive statistics were used to summarise findings, reported as frequencies and percentages of respondents rating each item as a moderate or major barrier. **Results:** The most frequently cited barriers at the moderate-to-major level were lack of government policy or guidelines (84.5%), poor availability of digital devices (77.6%), and cost of digital tools (78.3%). Limited technical support (73.9%), lack of management support (73.9%), poor internet connectivity (72.0%), and lack of training (69.6%) were also commonly reported. High workload and time constraints (65.2%) and resistance to change (60.2%) were cited at lower but still substantial rates. The dominant barrier profile was systemic and infrastructural rather than individual or attitudinal. **Conclusion:** Barriers to DHT adoption among pharmacists in Yenagoa are predominantly systemic, external, and policy-level in nature, rather than stemming primarily from individual resistance or lack of motivation. Effective strategies must address the enabling environment — through policy development, infrastructure investment, and institutional support — alongside individual capacity building. Coordinated action by government, professional bodies, and healthcare institutions is essential.

KEYWORDS: digital health technologies; adoption barriers; pharmacists; internet connectivity; government policy; Nigeria; Bayelsa State; TAM.

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1. INTRODUCTION

Digital health technologies (DHTs) offer transformative potential for pharmacy practice: they can reduce medication errors, streamline workflow, support real-time clinical decision-making, and extend pharmaceutical care to underserved populations (Baines et al., 2020; Sutton et al., 2020). Yet the translation of this potential into practice — particularly in low- and middle-income countries (LMICs) — is consistently impeded by a complex constellation of systemic, infrastructural, organisational, and individual barriers (Adebayo et al., 2021; Odukoya & Chui, 2020; Zayyad & Toycan, 2018).

The Technology Acceptance Model (TAM), first articulated by Davis (1989) and subsequently applied extensively in health informatics research (Holden & Karsh, 2010), predicts that perceived usefulness and perceived ease of use are the primary determinants of technology adoption

intentions. In practice, however, the antecedents of these perceptions — particularly in resource-constrained settings — include structural factors well beyond individual cognition: the reliability and cost of internet infrastructure, the availability and affordability of devices, the quality of technical and management support, the clarity of regulatory and policy frameworks, and the capacity of training systems to equip practitioners with the skills needed to use digital tools effectively. When any of these systemic preconditions are absent or deficient, even willing and informed practitioners are unable to adopt DHTs effectively.

Bayelsa State, and Yenagoa in particular, exemplifies this dynamic. Despite a reasonably high awareness of DHTs among practising pharmacists (reported in the companion awareness paper) and moderate utilisation of administrative digital tools (reported in the companion utilisation paper), full clinical integration of DHTs remains limited. This study was designed to systematically identify and quantify the barriers to DHT adoption among hospital and community pharmacists in Yenagoa, to determine their relative magnitude, and to draw policy and practice implications.

2. METHODS

2.1 Study Design and Setting

A descriptive cross-sectional study was conducted in Yenagoa, Bayelsa State, Nigeria, between October and December 2025. Yenagoa is the urban state capital with government and private healthcare facilities at primary, secondary, and tertiary levels.

2.2 Population, Sampling, and Sample Size

Licensed, currently practising pharmacists in hospital and community settings in Yenagoa were eligible for inclusion. The sample size was calculated using the Yamane (1967) formula (n = 133, population = 200, error = 0.05); 170 questionnaires were distributed. Purposive sampling ensured representation across hospital and community settings.

2.3 Instrument and Data Collection

Data were collected using a structured, self-administered questionnaire. Section D assessed nine barrier factors rated on a four-point scale: 1 = not a barrier, 2 = minor barrier, 3 = moderate barrier, 4 = major barrier. The nine barrier domains were: poor internet connectivity; cost of digital tools; lack of training; limited technical support; resistance to change; high workload/time constraints; lack of management support; lack of government policy/guidelines; and poor availability of digital devices. The instrument was pre-tested on ten pharmacists outside the main sample.

2.4 Data Analysis

Data were coded and entered into IBM SPSS Statistics version 21.0. Descriptive statistics (frequencies and percentages) were used to summarise barrier ratings. The principal outcome measure for each barrier was the proportion of respondents rating it as a moderate or major barrier (i.e., scores of 3 or 4 combined), which is the standard approach used in DHT adoption barrier studies (Odukoya & Chui, 2020; Zayyad & Toycan, 2018). Barriers are presented in descending order of their moderate-to-major combined frequency. Results are discussed with reference to the TAM framework and the published LMIC literature.

2.5 Ethical Approval

Ethical approval was obtained from the Research Ethics Committee, Faculty of Pharmacy, Niger Delta University. Written informed consent was obtained from all participants. Participation was voluntary and anonymous.

3. RESULTS

3.1 Sample Characteristics

Of 170 questionnaires administered, 161 were valid and returned (response rate 94.7%). Table 1 presents socio-demographic and practice characteristics. The majority of respondents were aged 25–34 years (53.4%), female (57.1%), B. Pharm graduates (65.8%), and early-career practitioners (1–5 years, 45.3%). Hospital pharmacists constituted 63.4% of the sample; 59.6% practised in government facilities. Access to digital devices at the workplace was reported by 82.0% of respondents.

Table 1. Socio-demographic and practice characteristics of respondents (n = 161).

Variable	Category	n	%
Age group (years)	<25	29	18.0
	25–34	86	53.4
	35–44	30	18.6
	45–54	14	8.7
	≥55	2	1.2
Gender	Male	69	42.9
	Female	92	57.1
Highest qualification	B.Pharm	106	65.8
	Pharm.D	15	9.3
	M.Sc.	25	15.5

	Fellowship	14	8.7
	Other	1	0.6
Years of practice	<1	36	22.4
	1–5	73	45.3
	6–10	36	22.4
	>10	16	9.9
Practice setting	Hospital pharmacy	102	63.4
	Community pharmacy	59	36.6
Facility type	Government	96	59.6
	Private	65	40.4
Access to DHT at workplace	Yes	132	82.0
	No	29	18.0

DHT = digital health technology.

3.2 Barriers to Adoption of Digital Health Technologies

Table 2 presents the distribution of barrier ratings across nine barrier domains. The most frequently cited moderate-to-major barrier was lack of government policy or guidelines: 57.8% of respondents rated it a moderate barrier and 26.7% a major barrier, giving a combined proportion of 84.5%. Poor availability of digital devices was rated moderate-to-major by 77.6% (42.9% moderate; 34.8% major). Cost of digital tools was rated moderate-to-major by 78.3% (54.7% moderate; 23.6% major).

Limited technical support and lack of management support were each rated moderate-to-major by 73.9% of respondents (47.2% and 46.6% moderate; 26.7% and 27.3% major, respectively). Poor internet connectivity was rated moderate-to-major by 72.0% (38.5% moderate; 33.5% major). Lack of training was rated moderate-to-major by 69.6% (45.3% moderate; 24.2% major). High workload and time constraints were rated moderate-to-major by 65.2%, and resistance to change by 60.2% — the lowest-rated barrier of the nine, and the only one in which more than 15% of respondents reported it to be no barrier at all (16.8%).

Table 2. Barriers to the adoption of digital health technologies among respondents (n = 161).

Barrier	Not a barrier n (%)	Minor barrier n (%)	Moderate barrier n (%)	Major barrier n (%)
Lack of government policy / guidelines	5 (3.1)	18 (11.2)	93 (57.8)	43 (26.7)
Poor availability of digital devices	6 (3.7)	29 (18.0)	69 (42.9)	56 (34.8)
Cost of digital tools	8 (5.0)	27 (16.8)	88 (54.7)	38 (23.6)
Limited technical support	8 (5.0)	33 (20.5)	76 (47.2)	43 (26.7)
Lack of management support	13 (8.1)	28 (17.4)	75 (46.6)	44 (27.3)
Poor internet connectivity	12 (7.5)	32 (19.9)	62 (38.5)	54 (33.5)
Lack of training	14 (8.7)	34 (21.1)	73 (45.3)	39 (24.2)
High workload / time constraints	21 (13.0)	35 (21.7)	67 (41.6)	38 (23.6)
Resistance to change	27 (16.8)	35 (21.7)	54 (33.5)	43 (26.7)

Barriers are ordered by descending combined moderate-to-major proportion. Percentages may not sum to 100% due to rounding.

4. DISCUSSION

This study systematically quantifies the barriers to DHT adoption among practising pharmacists in Yenagoa, Bayelsa State. The dominant finding is that barriers are predominantly systemic, infrastructural, and policy-level in character, rather than primarily individual or attitudinal. This has critical implications for the design of effective adoption-promotion strategies.

4.1 Policy and Regulatory Vacuum as the Leading Barrier

The identification of lack of government policy or guidelines as the single most prevalent barrier (84.5% moderate-to-major) is consistent with findings from multiple LMIC settings. Zayyad and Toycan (2018), in a review of e-health adoption in developing countries, identified regulatory and policy frameworks as foundational enablers of technology adoption; their absence creates ambiguity about data standards, liability, reimbursement, and scope of practice that inhibits both institutional investment and individual use. In Nigeria, the Federal Ministry of Health's National Health Management Information System policy and the WHO's Global Strategy on Digital Health 2020–2025 (WHO, 2021) provide national-level frameworks, but their operationalisation at state level — including in Bayelsa State — has been inconsistent. The implication is that the Bayelsa State Ministry of Health, working with the PCN and hospital management, should develop and disseminate a state-level

digital health policy framework specifically addressing pharmacy practice.

4.2 Infrastructural and Cost Barriers

Poor availability of digital devices (77.6%) and cost of digital tools (78.3%) were the second and third most prevalent barriers. Together, these findings indicate that even pharmacists who are aware of DHTs and motivated to use them are frequently unable to do so because the physical and financial preconditions are absent. This is characteristic of the 'infrastructure trap' documented in LMIC health technology adoption literature (Adepoju et al., 2017): without devices, reliable internet, and affordable software, adoption cannot occur regardless of awareness or willingness. Poor internet connectivity (72.0%) reinforces this picture: Bayelsa State's riverine geography and variable telecommunications infrastructure make reliable broadband access a persistent challenge, particularly in peri-urban and community pharmacy settings. Addressing this will require coordinated investment from government, telecommunications providers, and health facility management — a multi-sector challenge that no single actor can resolve alone.

4.3 Institutional and Organisational Barriers

Limited technical support (73.9%) and lack of management support (73.9%) reflect organisational-level barriers that are, in principle, more immediately addressable than infrastructural constraints. Sampson et al. (2018) identified management championship of digital health transformation as one of the most critical enablers of successful DHT adoption in healthcare settings, noting that visible leadership commitment signals organisational priority and enables resource allocation. The fact that nearly three-quarters of Yenagoa pharmacists identified lack of management support as a barrier suggests that digital health integration has not yet been adopted as a strategic priority by many hospital and community pharmacy managers. Structured advocacy to hospital administrators, professional body engagement, and DHT-integration targets in facility accreditation standards could address this gap.

4.4 Training as a Modifiable Barrier

Lack of training was rated moderate-to-major by 69.6% of respondents. This finding is consistent across the LMIC pharmacy literature (Adebayo et al., 2021; Odukoya & Chui, 2020) and points to a specific, actionable intervention: structured digital health training programmes embedded in continuing professional development. Training addresses both the practical skills deficit (how to use the tools) and the perceived ease-of-use barrier that the TAM identifies as a key determinant of adoption intention (Davis, 1989; Holden & Karsh, 2010). Pre-service exposure during pharmacy training programmes at Niger Delta University and other Nigerian pharmacy schools should also be reviewed to ensure adequate DHT literacy is developed before graduation.

4.5 Workload, Time Constraints, and Resistance to Change

High workload and time constraints (65.2%) and resistance to change (60.2%) were the least prevalent barriers in relative terms, yet they remained substantial. Importantly, resistance to change was the only barrier for which a notable proportion of respondents (16.8%) reported it as no barrier — suggesting that attitudinal or cultural barriers to DHT adoption are less universal than systemic barriers, and that individual willingness to adopt is not the primary limiting factor. This is consistent with the finding that administrative DHT use (documentation and inventory) is already high among this sample (reported in the companion utilisation paper), suggesting that pharmacists are not inherently resistant to digital tools when the enabling conditions — reliable devices, connectivity, training, and management support — are present. Workload barriers, by contrast, reflect a genuine operational challenge in settings where pharmacy staffing is limited and patient volumes are high; without additional human resources or workflow redesign, new digital systems can increase rather than reduce perceived burden during the transition period.

4.6 Implications for Policy and Practice

Drawing these findings together, four priority recommendations emerge. First, the Bayelsa State Ministry of Health should develop a state-level pharmacy digital health policy framework, specifying minimum infrastructure standards, data protection requirements, and professional scope-of-practice guidance for DHT use. Second, government and private-sector investment should target device provisioning and internet infrastructure improvement in pharmacy facilities, with particular attention to community pharmacies that currently lack these resources. Third, the PCN should mandate structured DHT training as a component of its continuing professional education requirements, and pharmacy faculties should review pre-service curricula. Fourth, hospital and community pharmacy management should be engaged through professional bodies to champion digital health integration, establish DHT adoption targets, and provide time and resources for staff training and system onboarding.

4.7 Limitations

The cross-sectional design precludes causal inference and does not capture change over time. Self-reported barriers may be subject to social-desirability and recall bias. The study was conducted in a single urban LGA; findings may not generalise to rural Bayelsa State, where infrastructural constraints may be more severe. Future research should use mixed-methods designs to explore the mechanisms through which systemic barriers translate into individual adoption decisions, and should include healthcare administrators and policymakers as key informants.

5. CONCLUSION

Barriers to DHT adoption among pharmacists in Yenagoa are predominantly systemic and external: lack of enabling government policy (84.5%), poor device availability (77.6%), high cost of digital tools (78.3%), limited technical and management support (both 73.9%), and poor internet connectivity (72.0%) collectively constitute a formidable institutional and infrastructural barrier set that cannot be addressed through individual awareness or training initiatives alone. Individual-level factors — particularly resistance to change — are comparatively less prevalent and should not be treated as the primary target for intervention. Effective strategies must address the enabling environment through coordinated policy development, infrastructure investment, institutional support mechanisms, and structured capacity building. Only through this systemic approach can the gap between DHT awareness and active clinical use be meaningfully closed among pharmacists in Bayelsa State.

Declarations

Ethics approval: Obtained from the Research Ethics Committee, Faculty of Pharmacy, Niger Delta University. Written informed consent was obtained from all participants.

Data availability: Dataset available from the corresponding author on reasonable request.

Competing interests: None declared.

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