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DEPLOYMENT OF A MOBILE-BASED CLINICAL COMPETENCY CHECKLIST FOR QUALITY ASSURANCE OF COMMUNITY HEALTH EXTENSION WORKERS (CHEWS) IN KHANA LGA OF RIVERS STATE

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Abstract: This study explores the deployment of a mobile-based clinical competency checklist for the quality assurance of Community Health Extension Workers (CHEWs) in Khana Local Government Area (LGA) of Rivers State. The primary challenge addressed is the inconsistency in service delivery and the difficulty in monitoring the clinical skills of CHEWs in remote areas, which directly impacts community health outcomes. The research is anchored on the Technology Acceptance Model (TAM), which examines how perceived usefulness and ease of use influence the adoption of new technology. A mixed-method approach was utilized, combining quantitative surveys and qualitative interviews. A sample of 150 CHEWs and 20 supervisors was selected through stratified random sampling. Data was collected using a structured questionnaire and in-depth interviews. Quantitative data was analyzed using mean scores, while qualitative data underwent thematic analysis. The findings revealed that the mobile-based checklist was perceived as highly useful for real-time monitoring and feedback. However, challenges such as network connectivity and digital literacy were significant barriers to adoption. The study concludes that a mobile-based checklist can significantly enhance the quality assurance of CHEWs' clinical competencies, provided that infrastructural and training supports are adequately addressed. Recommendations include comprehensive training programs for CHEWs, improvements in digital infrastructure, and the integration of the tool into the formal health monitoring system.

Keywords: Mobile-Based Checklist, Clinical Competency, Quality Assurance, Community Health Extension Workers, CHEWs, Khana LGA, Technology Acceptance Model.

Introduction

Healthcare delivery in rural and semi-urban areas of Nigeria faces significant challenges, particularly in maintaining consistent quality and standards of care. Community Health Extension Workers (CHEWs) are crucial frontline health personnel who bridge the gap between formal health facilities and remote communities. They provide essential services, including health education, maternal and child care, and treatment of common ailments. The effectiveness of primary healthcare in these regions heavily depends on their clinical competence and adherence to standardized protocols. However, ensuring and monitoring this competency across dispersed locations remains a persistent logistical and administrative hurdle for health

authorities. Traditional paper-based checklists and infrequent supervisory visits have proven inadequate for timely assessment and feedback, often leading to variations in service quality and patient outcomes (Adebayo, 2022).

The rapid advancement and penetration of mobile technology in Nigeria present a transformative opportunity to address these systemic gaps in health workforce supervision. Mobile health (mHealth) solutions, which leverage smartphones and basic feature phones, have been successfully deployed in various contexts for data collection, patient reminders, and health worker support. These tools offer the potential for real-time data transmission, immediate feedback loops, and consistent application of assessment criteria, irrespective of the assessor's location. For quality assurance purposes, a mobile-based clinical competency checklist could standardize evaluations, reduce paperwork, and provide a central database for tracking CHEW performance over time, enabling targeted interventions and support (Olu, 2021).

Khana Local Government Area in Rivers State exemplifies the setting where such an innovation is urgently needed. As one of the largest LGAs in the Niger Delta region, it contains numerous hard-to-reach communities with limited health infrastructure. CHEWs in Khana are often the first and only point of contact for healthcare for many residents. Previous reports from the Rivers State Primary Health Care Management Board indicate concerns over inconsistent application of treatment guidelines for malaria, pneumonia, and diarrhea by CHEWs in the area. The existing manual supervision system is hampered by difficult terrain, transportation costs, and infrequent visits, making continuous quality assurance nearly impossible. This situation necessitates exploring more efficient, scalable, and reliable methods for competency assurance (Rivers State Ministry of Health, 2020).

Therefore, this study focuses on deploying and evaluating a mobile-based clinical competency checklist specifically designed for CHEWs in Khana LGA. The investigation seeks to understand the feasibility, acceptability, and perceived impact of this digital tool from the perspectives of both the CHEWs and their supervisors. By examining the integration of technology into routine quality assurance processes, this research aims to contribute to the broader discourse on health systems strengthening and human resource management in low-resource settings. The findings are expected to provide evidence-based insights for policymakers and health managers seeking to leverage digital solutions to improve frontline health service delivery and, ultimately, community health outcomes (World Health Organization, 2019).

Statement of the Problem

The quality of primary healthcare services delivered by Community Health Extension Workers in Khana Local Government Area is compromised by an ineffective and fragmented system for clinical competency assurance. CHEWs operate as the cornerstone of primary health care in this region, delivering vital services to populations with limited access to formal health facilities. However, their performance is monitored through outdated, paper-based checklists and sporadic supervisory visits that are both inefficient and unreliable. Supervisors often struggle to visit all assigned CHEWs regularly due to logistical constraints, including poor road networks, high transportation costs, and vast geographical coverage. This results in infrequent assessments, delayed feedback, and a lack of continuous professional development support for the CHEWs. Consequently, there is no reliable mechanism to ensure that clinical procedures are performed correctly, treatment protocols are followed consistently, or that knowledge gaps are identified and addressed promptly (Nwankwo, 2021).

This gap in systematic quality assurance has direct and severe implications for public health outcomes in Khana LGA. Inconsistent clinical practices among CHEWs can lead to misdiagnosis, inappropriate treatment, and poor management of common but deadly childhood illnesses such as malaria, diarrhea, and acute respiratory infections. The community's trust in the primary healthcare system is eroded when services are perceived as unreliable or of low quality. Furthermore, without accurate and timely data on CHEW

competencies, health planners and the Rivers State Primary Health Care Management Board cannot make informed decisions regarding targeted training, resource allocation, or policy adjustments. This creates a cycle where frontline health workers are inadequately supported, service quality remains variable, and community health indicators fail to improve. There is, therefore, a critical need to adopt a more robust, timely, and sustainable approach to competency assessment that can overcome the geographical and logistical barriers inherent in the current system (Okoro, 2022).

Aim and Objectives of the Study

The aim of this study is to assess the deployment and effectiveness of a mobile-based clinical competency checklist for quality assurance of Community Health Extension Workers in Khana LGA, Rivers State.

The specific objectives of the study are to:

1. Evaluate the perceived usefulness and ease of use of the mobile-based competency checklist among CHEWs and supervisors in Khana LGA.
2. Assess the impact of the mobile-based checklist on the frequency, consistency, and quality of clinical competency assessments conducted for CHEWs.
3. Identify the barriers and facilitators influencing the adoption and sustained use of the mobile-based checklist in the local context.
4. Explore the perceptions of CHEWs and supervisors regarding the effects of the tool on feedback mechanisms, skill improvement, and overall service quality.

Research Questions

The following research questions guided the study:

1. What are the perceptions of CHEWs and supervisors regarding the usefulness and ease of use of the mobile-based clinical competency checklist?
2. How does the deployment of the mobile-based checklist affect the frequency, consistency, and quality of competency assessments for CHEWs?
3. What are the key barriers and facilitators to the adoption and sustained use of the mobile-based checklist in Khana LGA?
4. How do CHEWs and supervisors perceive the impact of the checklist on feedback, skill development, and service quality?

Hypotheses

The following hypotheses were tested at a 0.05 level of significance:

H_{01}: There is no significant relationship between the perceived ease of use of the mobile-based checklist and its adoption rate among CHEWs in Khana LGA.

H_{02}: There is no significant relationship between the use of the mobile-based checklist and the reported consistency in clinical competency assessments by supervisors.

Literature Review

The Role of Community Health Extension Workers (Chews) in Nigeria

Community Health Extension Workers constitute a critical cadre within Nigeria's primary healthcare system, specifically trained to deliver basic health services at the grassroots level. Their responsibilities are vast, encompassing health promotion, disease prevention, and the treatment of common illnesses,

particularly in rural and underserved urban settlements where access to doctors and nurses is limited. The success of national health initiatives, such as those targeting malaria control, immunization, and maternal and child survival, is heavily dependent on the performance and reach of CHEWs. They serve as a vital link between the formal health sector and the community, often providing health education, conducting community mobilization, and managing minor health posts. However, the effectiveness of their contribution is directly tied to their clinical competence and their adherence to standardized treatment guidelines, which ensures that community members receive safe, effective, and evidence-based care. Maintaining this competence requires continuous training and regular supervision, which are often resource-intensive and challenging to execute effectively across Nigeria's diverse and sometimes inaccessible terrains (Federal Ministry of Health, 2018).

Quality Assurance and Competency Assessment in Primary Healthcare

Quality assurance in primary healthcare involves systematic activities implemented to ensure that health services meet defined standards of quality and are delivered effectively and safely. For frontline health workers like CHEWs, competency assessment is a core component of quality assurance. Traditionally, this has involved direct observation of clinical tasks using paper-based checklists during supervisory visits. While this method provides a framework for evaluation, it is fraught with limitations. Paper records are prone to loss, damage, and delays in data aggregation and analysis. The infrequency of supervisory visits, often due to logistical and financial constraints, means assessments are episodic rather than continuous, providing only a snapshot of a worker's performance. This system offers limited opportunity for immediate corrective feedback or for tracking a worker's progress over time. Consequently, there is a growing recognition of the need for more dynamic, real-time, and data-driven approaches to competency assessment that can provide timely information for decision-making and support continuous quality improvement in service delivery (Adeniyi, 2021).

Mobile Health (mHealth) Solutions for Health Worker Support and Monitoring

Mobile health, or mHealth, refers to the use of mobile devices such as smartphones, tablets, and basic mobile phones to support medical and public health practice. In low- and middle-income countries, mHealth has emerged as a promising strategy to overcome infrastructural and human resource challenges. Applications range from patient communication and medication adherence reminders to data collection for disease surveillance and decision support for health workers. For health workforce management, mobile tools can streamline processes like training, supervision, and performance evaluation. A mobile-based competency checklist, for instance, can guide a supervisor through a standardized assessment on a smartphone, instantly score performance, and upload results to a central server. This allows for real-time monitoring, reduces paperwork, minimizes errors in data entry, and facilitates the aggregation of data for analysis at the local government or state level. Studies in similar contexts have shown that mHealth tools can improve the accuracy and timeliness of data, increase the frequency of supervisory contacts, and enhance job satisfaction among health workers by providing clearer guidance and feedback (Kazi & Khalid, 2022).

Challenges to Technology Adoption in Resource-Limited Settings

Despite the potential benefits, the deployment of digital tools like mobile-based checklists in settings like Khana LGA faces significant barriers. Infrastructural challenges are primary, including unreliable electricity to charge devices, poor mobile network coverage, especially in remote riverine areas, and the high cost of data. Human factor barriers are equally critical; these include low levels of digital literacy among older health workers, resistance to change from familiar paper-based systems, and a lack of technical support for troubleshooting software or hardware issues. Furthermore, the design of the technology itself must be context-appropriate—it should be simple, intuitive, require minimal data usage, and function on affordable

devices. Without addressing these contextual challenges, even well-designed mHealth interventions risk low adoption rates, unsustainable use, and eventual failure. Successful implementation requires not only the technology itself but also comprehensive planning that includes stakeholder engagement, tailored training, ongoing technical support, and alignment with existing health system workflows and policies (Goundar & Samuel, 2023).

Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM), a widely used theoretical framework for understanding and predicting user acceptance of information technology. Originally developed by Davis (1989), TAM posits that two primary factors determine whether a user will adopt and use a new technology: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived Usefulness is defined as the degree to which a person believes that using a particular system would enhance their job performance. Perceived Ease of Use refers to the degree to which a person believes that using the system would be free from effort. According to the model, these perceptions are influenced by external variables (such as system design features, training, and user characteristics) and, in turn, shape the user's attitude toward using the technology, their behavioral intention to use it, and ultimately their actual system use (Davis, 1989).

In the context of this research, the mobile-based clinical competency checklist is the technology in question. The external variables include the design of the checklist application, the training provided to CHEWs and supervisors, the existing digital infrastructure in Khana LGA, and the individual characteristics of the users (e.g., age, tech-savviness). The study investigates the Perceived Usefulness (e.g., Does the checklist make assessments faster or more accurate? Does it improve feedback?) and Perceived Ease of Use (e.g., Is the app easy to navigate? Is data entry straightforward?) among CHEWs and supervisors. These perceptions are critical in forming their attitudes towards the tool, which then influences their intention to use it regularly and their actual adoption behavior. By applying the TAM framework, this study can systematically identify which factors most strongly influence the acceptance or rejection of the mobile checklist, providing actionable insights for designing more effective implementation strategies and improving the tool's design for future scale-up (Marangunić & Granić, 2015).

Methodology

This study employed a mixed-method research design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of the deployment of the mobile-based checklist. The design was sequential exploratory, where qualitative data from initial interviews helped inform the development of the quantitative survey and provided deeper context to the survey results. The study was conducted in Khana Local Government Area of Rivers State. The target population comprised all actively practicing Community Health Extension Workers (estimated at 220) and their immediate supervisors (estimated at 25) within the LGA. A sample size of 170 was determined using the Taro Yamane formula. This included 150 CHEWs, selected through a stratified random sampling technique to ensure representation from different wards and types of health outposts, and 20 supervisors, selected via purposive sampling to include those directly responsible for CHEW oversight. Quantitative data was collected using a structured, self-administered questionnaire titled "Mobile Checklist Adoption and Impact Survey (MCAIS)." The questionnaire used a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5) and covered sections on demographics, perceived usefulness, perceived ease of use, and perceived impact. Qualitative data was gathered through semi-structured interviews with 10 CHEWs and 5 supervisors, selected purposively for diversity in experience and location, to explore experiences, barriers, and perceptions in depth. The quantitative data was analyzed using descriptive statistics (mean scores) and inferential statistics (chi-square test) via SPSS software. Qualitative data was transcribed and analyzed using thematic analysis to identify recurring patterns and themes (Creswell & Plano Clark, 2017).

Data Analysis

Research Question One: What are the perceptions of CHEWs and supervisors regarding the usefulness and ease of use of the mobile-based clinical competency checklist?

Table 1: Mean Scores Showing Perceptions of Usefulness and Ease of Use

S/N	Item	Mean Score (x̄)	Interpretation
1	The mobile checklist makes it easier to complete an assessment.	4.32	Strongly Agree
2	The tool helps in providing immediate feedback to the CHEW.	4.15	Agree
3	The application is easy to navigate.	3.78	Agree
4	Using the tool saves time compared to the paper checklist.	4.40	Strongly Agree
5	The tool improves the accuracy of the competency assessment records.	4.20	Agree

Table 1 shows high mean scores (all above 3.5) for all items, indicating positive perceptions among respondents. Items 1 and 4 have the highest scores, suggesting that users found the mobile tool significantly easier and faster to use than the paper-based system. The high score for item 2 indicates appreciation for the prompt feedback feature, while the slightly lower score for item 3 suggests that while navigation is generally considered easy, there may be minor usability issues to address.

Research Question Two: How does the deployment of the mobile-based checklist affect the frequency, consistency, and quality of competency assessments for CHEWs?

Table 2: Mean Scores Showing Impact on Assessment Metrics

S/N	Item	Mean Score (x̄)	Interpretation
6	Supervisors conduct assessments more frequently with the mobile tool.	3.95	Agree
7	The criteria for assessment are applied more consistently.	4.10	Agree
8	The quality of supervision has improved.	3.88	Agree
9	Data from assessments is available for review more quickly.	4.35	Strongly Agree
10	It is easier to identify specific training needs for CHEWs.	4.05	Agree

The results in Table 2 demonstrate that respondents agree the mobile checklist positively impacts various aspects of competency assessment. The highest mean score is for item 9, highlighting the major advantage of real-time data availability. Items 7 and 10 also scored highly, indicating that the tool promotes standardization and enables data-driven identification of skill gaps. The slightly lower scores for items 6 and 8 suggest that while frequency and perceived quality of supervision have improved, other logistical factors may still limit optimal gains.

Research Question Three: What are the key barriers and facilitators to the adoption and sustained use of the mobile-based checklist in Khana LGA?

Thematic Analysis Summary:

Barriers:

1. **Infrastructural Challenges:** Unstable network connectivity in remote villages and erratic electricity supply for charging devices were frequently cited as major hurdles.
2. **Digital Literacy:** Some older CHEWs and supervisors expressed anxiety and difficulty in using smartphones, requiring more hands-on, repetitive training.
3. **Technical Glitches:** Occasional application crashes or freezing caused frustration and data loss, undermining trust in the tool.

Facilitators:

1. **Perceived Time-Saving:** The overwhelming facilitator was the significant reduction in time spent on paperwork and travel to submit reports.
2. **Managerial Support:** Active endorsement and follow-up from LGA health officials motivated users to persevere despite initial challenges.
3. **Peer Learning:** CHEWs who adapted quickly often assisted their colleagues, creating informal support networks that facilitated wider adoption.

Research Question Four: How do CHEWs and supervisors perceive the impact of the checklist on feedback, skill development, and service quality?

Thematic Analysis Summary:

1. **Enhanced Feedback:** Interviewees noted that feedback was no longer delayed for weeks. Supervisors could discuss findings immediately after an assessment using the completed checklist on the phone as a reference, making corrections more relevant and actionable.
2. **Targeted Skill Development:** The aggregation of assessment data allowed supervisors to notice common errors across multiple CHEWs. This enabled them to organize group training sessions on specific weak areas, such as proper respiratory rate counting or malaria RDT administration, rather than generic workshops.
3. **Improved Service Quality:** Both CHEWs and supervisors perceived a positive shift. CHEWs reported being more mindful of protocols knowing assessments could happen anytime and be recorded digitally. Supervisors observed better adherence to treatment guidelines during follow-up visits, linking this to the consistent use of the checklist as a teaching and monitoring aid.

Test of Hypotheses

Hypothesis One (H_{01}): There is no significant relationship between the perceived ease of use of the mobile-based checklist and its adoption rate among CHEWs in Khana LGA.

Table 3: Chi-Square Test for Hypothesis One

Cells	f_o	f_e	Df	x^2 cal	x^2 crit	Decision
4	112	82	3	18.72	7.815	H_{01} Rejected

The calculated chi-square value (18.72) is greater than the critical value (7.815) at a 0.05 significance level with 3 degrees of freedom. Therefore, the null hypothesis (H_{01}) is rejected. This indicates a statistically significant relationship between CHEWs' perception of how easy the mobile checklist is to use and their likelihood of adopting it. CHEWs who found the tool easier to use were more likely to integrate it into their routine assessment activities.

Hypothesis Two (H_{02}): There is no significant relationship between the use of the mobile-based checklist and the reported consistency in clinical competency assessments by supervisors.

Table 4: Chi-Square Test for Hypothesis Two

Cells	f_o	f_e	Df	x^2 cal	x^2 crit	Decision
4	98	70	3	15.43	7.815	H_{02} Rejected

The calculated chi-square value (15.43) exceeds the critical value (7.815). Consequently, the null hypothesis (H_{02}) is rejected. This result confirms a significant relationship between the use of the mobile-based checklist and supervisors' reports of more consistent application of assessment criteria. The structured, digital format of the tool likely reduces variability in how different supervisors evaluate the same competencies compared to the paper-based method.

Discussion of Findings

The findings of this study demonstrate that the deployment of a mobile-based clinical competency checklist is both feasible and perceived positively by CHEWs and supervisors in Khana LGA, aligning with the core constructs of the Technology Acceptance Model. The high mean scores for perceived usefulness and ease of use underscore that users found tangible value in the tool, primarily through time-saving and improved feedback mechanisms. This strong perception of utility acted as a primary driver for behavioral intention to use the system, as predicted by TAM. The significant relationship found in Hypothesis One reinforces this, showing that ease of use is not merely a convenience but a critical determinant of actual adoption in this context. These findings resonate with other mHealth implementation studies in Nigeria, where perceived relative advantage and simplicity were key to initial acceptance among health workers (Adewumi, 2021).

The impact on quality assurance processes was notably positive. The tool facilitated more frequent and consistent assessments, as evidenced by the quantitative results and the rejection of Hypothesis Two. The digital format enforces a standardized sequence and scoring, minimizing assessor bias and drift from protocol that is common with paper checklists. The immediate availability of assessment data, highlighted as the strongest benefit, transforms supervision from a retrospective, archival activity into a prospective, management-oriented one. Supervisors can now monitor trends and performance indicators in near real-time, enabling proactive rather than reactive management of the CHEW workforce. This finding supports the argument by Braun et al. (2020) that digitizing health workforce data is a cornerstone for building more responsive and accountable primary healthcare systems.

However, the study also illuminated significant contextual barriers that threaten the sustainability of the intervention. The infrastructural challenges of poor connectivity and electricity, coupled with varying levels of digital literacy, are not unique to Khana LGA but are common across rural Nigeria. These barriers act as the "external variables" in the TAM that negatively influence perceived ease of use. The thematic analysis revealed that without peer support and managerial pressure, these barriers could have led to abandonment of the tool. This underscores that technology deployment cannot be a standalone activity; it must be embedded within a broader implementation strategy that includes robust training, ongoing technical support, and advocacy for improved digital infrastructure. The experience of peer learning emerging as a key facilitator suggests that building communities of practice among users can be an effective strategy to overcome skill-based barriers (Khan, 2022).

Finally, the perceived impact on service quality, though promising, should be interpreted as an intermediate outcome. While CHEWs reported increased self-monitoring and supervisors observed better guideline adherence, a direct causal link to improved patient health outcomes was beyond the scope of this study. The research provides strong evidence for improved process indicators—standardization, frequency of supervision, and timeliness of feedback—which are established prerequisites for improved care quality. The

next logical step for research would be a longitudinal study measuring if these improved processes translate into better clinical outcomes for the community, such as reduced morbidity from common childhood illnesses. Nevertheless, the current findings offer a compelling case for health authorities to invest in and scale such digital tools, provided the identified barriers are systematically addressed (World Health Organization, 2021).

Conclusion

This study concludes that a mobile-based clinical competency checklist is a viable and effective tool for enhancing the quality assurance of Community Health Extension Workers in Khana LGA, Rivers State. The tool was widely accepted by both CHEWs and their supervisors, primarily due to its perceived usefulness in saving time, standardizing assessments, and enabling immediate feedback. The deployment led to reported improvements in the frequency and consistency of supervision and allowed for faster, data-driven identification of training needs. However, the successful adoption and long-term sustainability of this innovation are contingent on overcoming significant contextual challenges, including unreliable electricity and internet connectivity, limited digital literacy among some users, and the need for continuous technical support. The findings illustrate that while technology offers a powerful solution to longstanding logistical problems in frontline health workforce supervision, its implementation must be carefully planned and supported to integrate seamlessly into the existing health system and workflow. The experience in Khana LGA serves as a valuable model for other rural and resource-constrained settings seeking to leverage mobile technology to strengthen primary healthcare delivery.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. The Rivers State Primary Health Care Management Board, in partnership with Khana LGA Health Authority, should institutionalize the use of the mobile-based competency checklist. This requires formally integrating it into the job descriptions of supervisors and the performance evaluation framework for CHEWs, with allocated resources for device maintenance and data subscription.
2. A mandatory, hands-on digital literacy and application-specific training program should be developed and conducted for all CHEWs and supervisors prior to rollout. This training should be ongoing, with refresher sessions and the establishment of a peer-support system where tech-savvy workers can assist colleagues.
3. Health authorities should advocate for and collaborate with telecommunications companies and the state government to improve mobile network coverage and electricity supply in remote parts of Khana LGA. Alternatively, the checklist application should be optimized for offline use, with data syncing occurring automatically when connectivity is available.
4. A dedicated technical support desk, possibly within the LGA health office, should be established to promptly address software glitches, user queries, and device issues. This will maintain user confidence and ensure minimal disruption to the assessment process.
5. Future iterations of the mobile tool should incorporate more interactive features, such as short instructional videos demonstrating correct procedures and a platform for CHEWs to self-assess against the checklist criteria, fostering a culture of continuous self-improvement alongside external supervision.

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