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Perceived Usability of a Ferritin Rapid Diagnostic Test Among Primary Healthcare Professionals: A Simulation-Based Evaluation

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ABSTRACT

Introduction: Early identification of iron deficiency remains challenging in many primary healthcare settings because conventional ferritin testing requires laboratory infrastructure that may be limited in resource-constrained settings. A Ferritin Rapid Diagnostic Test (Ferritin RDT) has been developed as a point-of-care approach to facilitate ferritin assessment. Evaluating its perceived usability among intended healthcare users is an important preliminary step before field-based evaluation. To evaluate the perceived usability of a newly developed Ferritin Rapid Diagnostic Test among primary healthcare professionals following standardized training and supervised simulation.

Methods: A descriptive quantitative evaluative study was conducted among 20 healthcare professionals from primary healthcare facilities in Mataram City and West Lombok Regency, Indonesia. Participants received standardized training and independently performed a supervised simulation using the Ferritin RDT, a lateral flow immunoassay for qualitative ferritin assessment. The test used serum specimens and provided visual results based on purple-colored control and test lines. After the simulation, participants completed the 10-item System Usability Scale (SUS). One participant did not complete the SUS questionnaire and was excluded from the usability analysis; therefore, 19 complete SUS responses were analyzed. Descriptive statistics were used to summarize participant characteristics and SUS scores, and brief open-ended comments were reported as preliminary user feedback.

Results: Among the 19 participants with complete SUS responses, the mean SUS score was 78.68 (SD = 13.52), with a median of 77.50 (IQR = 71.25–88.75) and a range of 50–100. Sixteen participants (84.2%) had SUS scores ≥68, whereas three (15.8%) scored below this benchmark. The overall score corresponded to a good adjective rating, Grade B, and an Acceptable usability classification. Item-level responses generally indicated favorable perceptions of ease of use, learnability, functional integration, and confidence during use. Brief open-ended comments were generally positive, although one participant suggested reducing the testing time.

Conclusion: The Ferritin RDT demonstrated favorable perceived usability among primary healthcare professionals following standardized training and supervised simulation. These findings provide preliminary evidence of usability under simulated conditions but do not establish diagnostic accuracy, technology acceptance, implementation readiness, or routine adoption. Further field-based studies are needed to evaluate the Ferritin RDT under real-world primary healthcare conditions.

Keywords: Ferritin Rapid Diagnostic Test; Perceived Usability; System Usability Scale; Lateral Flow Immunoassay; Point-of-Care Testing; Primary Healthcare

INTRODUCTION

Iron deficiency remains one of the most prevalent micronutrient deficiencies worldwide and continues to pose a major public health challenge, particularly among adolescent girls. During adolescence, rapid physical growth, increased iron requirements, and menstrual blood loss substantially increase the risk of depleted iron stores before anemia develops. Early identification of iron deficiency is therefore important for preventing adverse consequences, including impaired cognitive performance, reduced physical capacity, poorer educational achievement, and compromised reproductive health outcomes (1–6).

Serum ferritin is widely recognized as a key biomarker for assessing body iron stores and detecting iron deficiency before hemoglobin concentrations decline. Compared with hemoglobin testing alone, ferritin measurement can enable earlier identification of iron depletion and support timely preventive interventions before clinical anemia develops. International guidance therefore recommends ferritin assessment when evaluating iron deficiency, particularly in high-risk populations (3,7,8).

Despite its clinical relevance, access to ferritin testing remains limited in many primary healthcare settings, particularly in resource-constrained environments. Conventional laboratory-based ferritin assays generally require specialized analytical equipment, trained laboratory personnel, appropriate infrastructure, controlled storage conditions, and operational resources. These requirements may restrict ferritin testing at the primary healthcare level, where preventive and screening services are commonly delivered, thereby limiting opportunities to identify iron deficiency before anemia develops (3,7–10).

Point-of-care testing has been proposed as an approach to decentralize diagnostic services and improve access to testing where conventional laboratory infrastructure is limited. The Ferritin Rapid Diagnostic Test (Ferritin RDT) evaluated in this study was developed as a portable point-of-care device intended to provide rapid ferritin assessment without reliance on conventional laboratory analyzers. Its potential usefulness in primary healthcare depends not only on analytical and diagnostic performance but also on whether intended users can understand and operate the device appropriately in its intended context (10–13).

Usability is an important early consideration in health-technology evaluation because it concerns the extent to which intended users perceive a system or device as easy to learn, efficient to operate, and satisfactory to use in a specified context. The System Usability Scale (SUS) is widely used to assess perceived usability across healthcare technologies, including point-of-care and diagnostic systems. SUS assesses perceived usability rather than broader constructs such as technology acceptance, organizational readiness, workflow integration, or long-term adoption. Accordingly, a favorable SUS score should be interpreted as evidence of perceived usability within the evaluated context, not as evidence of implementation readiness or routine adoption (14–18).

Previous studies have examined the diagnostic performance, analytical validity, and laboratory applications of ferritin assays and other point-of-care diagnostic technologies; however, evidence on user-centered evaluation of Ferritin RDTs among frontline primary healthcare professionals remains limited. In particular, little is known about how intended users perceive Ferritin RDT usability after standardized instruction and direct performance of the testing procedure. This gap is important because a device may demonstrate technical potential while still presenting practical difficulties during use. Evaluating perceived usability can therefore provide an initial user-centered assessment to inform subsequent field-based evaluation, whereas technology acceptance, workflow compatibility, organizational readiness, cost, sustainability, and long-term adoption require separate investigation using appropriate implementation methods and frameworks.

This study aimed to evaluate the perceived usability of a newly developed Ferritin Rapid Diagnostic Test among healthcare professionals working in primary healthcare settings using the System Usability Scale following standardized training and supervised simulation. Brief open-ended participant comments were also collected to identify initial perceptions and potential areas for improvement. The findings are intended to provide preliminary evidence of perceived usability and to inform further evaluation under routine primary healthcare conditions.

METHODS

Study Design

This study employed a descriptive quantitative design with an evaluative approach to assess healthcare professionals' perceived usability of a newly developed Ferritin Rapid Diagnostic Test (Ferritin RDT). The evaluation was conducted immediately after participants completed standardized training and supervised simulation using the device. Perceived usability was assessed using the System Usability Scale (SUS), a validated instrument that has been applied to healthcare technologies and point-of-care diagnostic devices (15,19). The study was designed to evaluate perceived usability under supervised simulation conditions and was not intended to assess diagnostic accuracy, clinical effectiveness, technology acceptance, organizational readiness, workflow integration, or long-term adoption.

Study Setting and Participants

The study was conducted in primary healthcare facilities in Mataram City and West Lombok Regency, West Nusa Tenggara Province, Indonesia, between April and May 2026. Participants were purposively recruited because they were directly involved in adolescent health services, anemia screening programs, or laboratory diagnostic activities.

Eligible participants included physicians, midwives, nutritionists, nurses, and laboratory analysts who (1) routinely worked in primary healthcare services, (2) attended the Ferritin RDT training program, (3) completed the simulation session, and (4)

voluntarily agreed to participate by providing written informed consent. A total of 20 healthcare professionals participated in the training and supervised simulation. One participant did not complete the SUS questionnaire in full. Because a complete response set was required to calculate the SUS score using the standard scoring procedure, this participant was excluded from the usability analysis. Consequently, 19 participants were included in the final SUS analysis. Given the exploratory and descriptive nature of this preliminary study, no formal sample size calculation was undertaken. Participants were purposively recruited from among healthcare professionals who had participated in a previous focus group discussion (FGD) exploring the need for rapid ferritin testing in primary healthcare settings. Their prior involvement in discussions related to the proposed diagnostic device provided relevant contextual experience for the present study.

Ferritin Rapid Diagnostic Test

The Ferritin Rapid Diagnostic Test (Ferritin RDT) evaluated in this study was a lateral flow immunoassay (LFIA) developed as a point-of-care test for the qualitative assessment of ferritin status. Serum specimens and Ferritin RDT devices were stored and handled at room temperature during the supervised simulation. Testing was performed according to the standardized operating procedure provided for the device.

The testing procedure consisted of applying the serum specimen to the test cassette, adding the designated buffer, allowing the reaction to proceed for approximately 15 minutes, and visually interpreting the result (20,21). The test provided a qualitative visual result based on the development of purple-colored lines on the cassette.

The Ferritin RDT used in this study was a research prototype developed by the research team using lateral flow immunoassay (LFIA) and manufactured at Hepatika Laboratory, Mataram. For each test, 20 µL of serum was applied to the sample pad, followed by 2–3 drops of buffer. The assay was designed to detect ferritin concentrations above 15 ng/mL through an antigen–antibody reaction. Results were read visually at 15 minutes (21).

The device uses a reverse test-line interpretation. In the presence of a valid control (C) line, absence of a visible test (T) line is interpreted as positive for iron deficiency, indicating ferritin below the device threshold, whereas a visible T line is interpreted as negative for iron deficiency, indicating ferritin at or above the device threshold. If the C line is absent, the result is invalid and the test must be repeated using a new device. Figure 1 illustrates these interpretations.

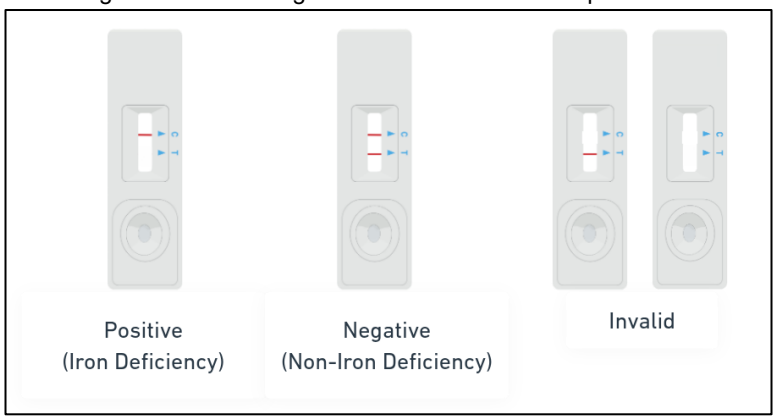


Figure 1. The interpretation of the results

Each participant performed the Ferritin RDT procedure individually under supervision during the simulation session. The assessment focused on device usability and participants' ability to follow the testing procedure and interpret the displayed result. The simulation was not intended to assess the diagnostic accuracy or clinical performance of the Ferritin RDT.

Training and Simulation Procedure

Before the usability assessment, all participants received standardized training conducted by the Faculty of Medicine, Universitas Mataram. The training covered the basic principles of ferritin testing using lateral flow immunoassay, Ferritin RDT components and operation, serum-specimen handling, biosafety procedures, testing procedures, result interpretation, and troubleshooting of invalid results.

Following the training, each participant independently performed a supervised simulation of the Ferritin RDT procedure. Participants followed the prescribed testing steps, including specimen application, buffer addition, observation of the reaction, and visual interpretation of the result according to predefined device criteria. A standardized procedural checklist was used during supervision to document adherence to the prescribed testing steps.

The checklist was used to document adherence to the testing procedure and was not intended to establish diagnostic accuracy or formal operator competency. Following the supervised simulation, participants completed the 10-item System Usability Scale (SUS) questionnaire to evaluate perceived usability of the Ferritin RDT. The questionnaire was administered in Indonesian. For this study, the original English-language SUS was translated into Indonesian and contextually adapted to refer to the Ferritin RDT; the 10-item structure, five-point response scale, and standard scoring procedure were retained. The SUS assessment focused exclusively on users' perceptions of usability and was not intended to measure diagnostic accuracy, technical performance, or formal user competency.

Data Collection

Data collection comprised three components. First, participants completed a questionnaire on demographic characteristics, including profession and years of experience. Second, perceived usability was assessed using the 10-item System Usability Scale (SUS) with a five-point Likert scale. SUS scores were calculated using the standard scoring method, yielding total scores from 0 to 100, with higher scores indicating better perceived usability. Nineteen of the 20 participants provided complete SUS responses and were included in the usability analysis; one participant was excluded because the questionnaire was incomplete and a total SUS score could not be calculated. Third, participants provided brief open-ended comments about their experience using the Ferritin RDT. These comments were treated as preliminary user feedback and were not subjected to formal qualitative analysis.

Data Analysis

Descriptive analyses were performed using jamovi version 2.6.45. Continuous variables are presented as the mean, standard deviation, median, minimum, and maximum. For the 19 participants with complete SUS responses, total SUS scores were summarized using the mean, standard deviation, median, minimum, and maximum. Item-level SUS responses were summarized using the mean and standard deviation for each of the 10 items. SUS scores were interpreted using established interpretation guidance, with 68 used as a commonly applied benchmark for above-average usability (22). Open-ended participant comments were summarized descriptively to identify recurring remarks about ease of use, perceived applicability, and suggested improvements. Because the comments were brief and were not subjected to systematic qualitative coding or thematic analysis, they were treated as preliminary user feedback rather than formal qualitative findings.

Ethical Considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Negeri Semarang on 14 February 2025 (Approval No. 591/KEPK/FK/KLE/2024). This study is part of a broader research project entitled “Development of a Rapid Ferritin Detection Test for Iron Deficiency Screening Among Adolescent Girls in Primary Healthcare Settings.” All participants received written information about the study objectives and procedures before providing written informed consent. Participation was voluntary, and all responses were anonymized before analysis to maintain participant confidentiality.

RESULTS

Participant Characteristics

A total of 20 healthcare professionals from primary healthcare facilities in Mataram City and West Lombok Regency participated in this study. Participants represented a range of professional backgrounds, including physicians, midwives, nutritionists, nurses, and laboratory analysts. Their professional experience varied, providing perspectives from healthcare workers with different levels of familiarity with diagnostic procedures in primary care. Table 1 summarizes participants’ demographic and professional characteristics. All 20 participants completed the supervised simulation. However, one participant did not complete the SUS questionnaire in full. Because complete responses to all 10 SUS items were required to calculate a standard SUS score, this participant was excluded from the SUS analysis. Therefore, the final SUS analysis included 19 participants.

Table 1. Characteristics of Healthcare Professionals Participating in the Training and Supervised Simulation (n = 20)

Characteristic	n (%)
Profession	
Physicians	7 (35.0)
Midwives	5 (25.0)
Nutritionists	3 (15.0)
Nurses	2 (10.0)
Laboratory Analysts	3 (15.0)
Healthcare Facility	
Primary Healthcare Center (Puskesmas)	20 (100.0)
Years of Experience	
Mean ± SD	**10.70 ± 7.82 years**
Median (min–max)	**8 (2–30) years**

Participant characteristics are presented for all 20 healthcare professionals who completed the training and supervised simulation. The SUS analysis included 19 participants with complete questionnaires; one participant was excluded because of incomplete responses.

System Usability Scale (SUS) Scores

The perceived usability of the Ferritin Rapid Diagnostic Test (Ferritin RDT) was assessed using the System Usability Scale (SUS) after the supervised simulation. Complete SUS responses were available for 19 of the 20 participants. Scores ranged from 50.0 to 100.0, with a mean of 78.68 (SD = 13.52) and a median of 77.50 (IQR = 71.25–88.75). The mean score exceeded

the commonly used benchmark of 68 and corresponded to a good adjective rating, Grade B, and an Acceptable usability classification.

Table 2. Descriptive Statistics and Distribution of SUS Scores (n = 19)

Indicator	Value
Number of participants	19
Mean SUS score	78.68
Standard deviation	13.52
Median	77.50
Minimum	50.00
Maximum	100.00
SUS ≥ 68, n (%)	16 (84.2%)
SUS < 68, n (%)	3 (15.8%)
Adjective rating	Good
Grade	B
Acceptability	Acceptable

Note: The terms “Good,” “Grade B,” and “Acceptable” describe the SUS usability interpretation and should not be interpreted as evidence of broader technology acceptance, implementation readiness, or routine adoption.

The distribution of individual SUS scores showed variability in perceived usability. Sixteen participants (84.2%) had SUS scores of 68 or higher, whereas three participants (15.8%) scored below 68. Scores ranged from 50.0 to 100.0. Two participants scored 50–59, one scored 60–69, seven scored 70–79, four scored 80–89, and five scored 90–100.
Although most participants evaluated the device favorably, perceived usability was not uniform. The minimum score of 50.0 indicates that at least one participant reported substantially lower usability than the group average. Because the study was not designed to investigate determinants of individual SUS scores and did not collect sufficient participant-level qualitative data, the reasons for this lower rating cannot be determined. The observed variation should therefore be interpreted descriptively rather than as evidence of specific usability barriers.

Item-level Analysis of the System Usability Scale

To provide a more comprehensive evaluation, descriptive statistics were calculated for each of the 10 SUS items (Table 3).

Table 3. Item-Level System Usability Scale Responses

SUS Item	Mean	SD
Q1. I think that I would like to use this system frequently.	4.26	0.45
Q2. I found the system unnecessarily complex.	1.68	0.75
Q3. I thought the system was easy to use.	4.42	0.61
Q4. I think that I would need the support of a technical person to use this system.	2.26	1.15
Q5. I found the various functions in this system were well integrated.	4.37	0.60
Q6. I thought there was too much inconsistency in this system.	2.05	0.91
Q7. I would imagine that most people would learn to use this system very quickly.	4.42	0.51
Q8. I found the system very cumbersome to use.	1.68	0.75
Q9. I felt very confident using the system.	4.32	0.58
Q10. I needed to learn a lot of things before I could get going with this system.	2.63	1.38

Note: Means and standard deviations represent participants' raw responses to each five-point Likert-scale SUS item. The overall SUS score was calculated using the standard SUS scoring procedure.

Item-level analysis showed consistently high scores for positively worded statements (Table 3). The highest mean scores were observed for Q3 (mean = 4.42, SD = 0.61) and Q7 (mean = 4.42, SD = 0.51), indicating that participants generally perceived the Ferritin RDT as easy to use and easy to learn. Similarly, Q5 (mean = 4.37, SD = 0.60) and Q9 (mean = 4.32, SD = 0.58) suggested favorable perceptions of functional integration and confidence during use. Conversely, negatively worded items received relatively low scores, including Q2 (mean = 1.68, SD = 0.75), Q6 (mean = 2.05, SD = 0.91), and Q8 (mean = 1.68, SD = 0.75), indicating that most participants did not perceive the device as unnecessarily complex or cumbersome. The greatest variability was observed for Q10 (SD = 1.38) and Q4 (SD = 1.15), suggesting greater differences among participants regarding the amount of prior learning and technical support required.

Preliminary User Feedback

After completing the SUS questionnaire, participants were invited to provide brief open-ended comments about their experience with the Ferritin RDT. These comments were collected as supplementary feedback immediately after the supervised simulation and were not subjected to formal qualitative analysis. Overall, the comments reflected positive initial impressions. One physician stated that the device “can be implemented in practice,” a midwife described it as “easy to use,” and another physician stated that it “can be applied in community health posts.” One participant suggested that “the test should be faster,” indicating that testing time may warrant further consideration.

These brief comments were consistent with the overall favorable SUS results but provided limited contextual information. They should therefore be interpreted as preliminary user remarks rather than formal qualitative findings or evidence of technology acceptance, implementation readiness, clinical utility, or routine adoption.

DISCUSSION

This study evaluated the perceived usability of a newly developed Ferritin Rapid Diagnostic Test (Ferritin RDT) among primary healthcare professionals following standardized training and supervised simulation. Among the 19 participants with complete SUS responses, the mean SUS score was 78.68 (SD = 13.52), exceeding the commonly used benchmark of 68 and corresponding to a good adjective rating, Grade B, and an Acceptable usability classification. These findings indicate that the Ferritin RDT was generally perceived as usable under supervised simulation conditions. They should not be extended to broader technology acceptance, implementation readiness, or routine adoption.

The favorable SUS score is consistent with previous evaluations of healthcare technologies in which SUS has been used to characterize users' perceptions of usability. Studies of clinical decision-support and other healthcare technologies have shown that SUS can provide a practical measure of perceived usability from the user's perspective (15,17). The present findings therefore suggest favorable perceived usability of the Ferritin RDT among the healthcare professionals who participated in the simulation. Nevertheless, usability is only one dimension of successful implementation and should be distinguished from technology acceptance, organizational readiness, workflow compatibility, and sustained adoption. Implementation-oriented studies have emphasized the importance of organizational and workflow factors in determining whether healthcare technologies can be integrated successfully into routine services (18,23,24).

The item-level SUS findings provide additional information about the aspects of usability perceived most favorably by participants. The highest mean responses concerned ease of use and rapid learning (Q3 and Q7), followed by functional integration and confidence during use (Q5 and Q9). This pattern suggests that, after standardized instruction, participants generally experienced limited difficulty understanding and operating the Ferritin RDT. This finding is relevant to primary healthcare settings, where diagnostic technologies may be used by professionals with different backgrounds and varying experience with point-of-care technologies. Point-of-care testing may expand diagnostic access in primary care, particularly where conventional laboratory infrastructure and specialized personnel are limited (10,25).

The greater variability in Q4 and Q10 indicates differences in participants' perceptions of the need for technical support and the amount of learning required before using the device. These findings do not establish a specific training deficiency because the study was not designed to determine the factors underlying individual SUS responses. Rather, they suggest that standardized instructions, clear operating procedures, and appropriate initial supervision may remain important when introducing the Ferritin RDT to users with different levels of experience. This interpretation is consistent with literature emphasizing practical implementation conditions and user-related factors in the uptake of point-of-care technologies (10,25).

The range of SUS scores from 50 to 100 indicates that perceived usability was not uniform across participants. The minimum score of 50 reflects a substantially less favorable perception in at least one participant. However, the study did not collect sufficient participant-level information to determine the reasons for lower scores. Potential explanatory factors were not directly evaluated; therefore, the variation should be interpreted descriptively rather than as evidence of specific usability barriers.

The brief open-ended comments were broadly consistent with the quantitative findings. Participants described the Ferritin RDT as easy to use and potentially applicable in practice or community health posts, while one participant suggested that testing should be faster. These remarks provide contextual information about initial impressions but should not be interpreted as formal qualitative findings because no systematic qualitative analysis was conducted. Statements about possible implementation represent individual perceptions after supervised simulation, not evidence that the technology is ready for routine deployment.

The distinction between supervised usability and real-world implementation is important when interpreting these findings. Participants performed the test after standardized training and under supervision, which may have provided support not routinely available during service delivery. In primary healthcare settings, professionals must also manage patient flow, documentation, clinical responsibilities, quality assurance, supplies, and other operational demands. Evidence from healthcare-technology implementation studies indicates that workflow compatibility, organizational support, infrastructure, and workload can affect integration into routine practice (18,23,24). The favorable SUS score should therefore be interpreted as preliminary evidence of perceived usability under supervised conditions rather than confirmation of real-world implementation feasibility.

From a diagnostic-access perspective, the Ferritin RDT represents a potentially useful approach because lateral flow-based technologies can offer simpler procedures than conventional laboratory-based testing. Previous research has explored rapid diagnostic platforms for iron deficiency and ferritin-related testing, including lateral flow and other rapid approaches (20,21,26,27). However, this study did not evaluate diagnostic accuracy against a laboratory reference standard. The observed usability therefore cannot be interpreted as evidence that the Ferritin RDT accurately identifies iron deficiency in clinical practice. Diagnostic performance and usability are complementary but distinct dimensions of diagnostic-technology evaluation.

This study should not be interpreted as an evaluation of the overall implementation feasibility of the Ferritin RDT. It assessed perceived usability following standardized training and supervised simulation but did not assess diagnostic accuracy, analytical performance, clinical utility, workflow compatibility during routine service delivery, organizational readiness, cost,

supply-chain sustainability, or sustained user adoption. The favorable SUS score therefore represents an initial user-centered usability signal rather than evidence of readiness for routine implementation.

The potential public health relevance of the Ferritin RDT should also be interpreted cautiously. Conventional laboratory-based ferritin assessment may be constrained in settings with limited infrastructure, equipment, or specialized personnel, whereas point-of-care testing may improve access to diagnostic information (3,25). However, whether the Ferritin RDT can improve screening coverage or clinical decision-making among adolescent girls cannot be determined from this usability study. Adolescents were not included, and screening uptake and clinical outcomes were not evaluated. The role of the Ferritin RDT in adolescent screening should therefore be considered a potential future application requiring diagnostic validation and field-based evaluation, rather than a demonstrated programmatic impact.

Several limitations should be considered. First, the sample was small: 20 healthcare professionals completed the training and supervised simulation, and 19 provided complete SUS responses for the usability analysis. Participants were recruited from primary healthcare facilities in Mataram City and West Lombok Regency, which may limit generalizability to other settings. Second, usability was assessed immediately after standardized training and under supervised simulation rather than during routine patient care; this may have produced more favorable perceptions than would be observed under routine operational conditions. Third, the study relied primarily on the SUS and brief open-ended comments, so technology acceptance, organizational readiness, workflow compatibility, cost-effectiveness, supply-chain sustainability, and long-term adoption were not assessed. Fourth, diagnostic accuracy and agreement with an established laboratory reference method were outside the study scope. The findings should therefore be considered an initial user-centered assessment rather than a comprehensive evaluation of the Ferritin RDT.

Future research should extend this work through larger and more diverse field-based studies under routine primary healthcare conditions. Further evaluation should include diagnostic accuracy against an appropriate laboratory reference standard, invalid and repeat-test rates, workflow integration, quality assurance requirements, training needs, and operational feasibility. Economic evaluation and assessment of supply-chain and organizational requirements would also be important before wider implementation. Longitudinal follow-up could determine whether favorable initial usability perceptions are maintained with repeated use and translate into sustained use in routine primary healthcare services. Where broader implementation questions are addressed, validated frameworks for technology acceptance and implementation outcomes should complement usability assessment.

CONCLUSION

The Ferritin Rapid Diagnostic Test demonstrated favorable perceived usability among primary healthcare professionals following standardized training and supervised simulation, with a mean SUS score of 78.68 among 19 participants with complete responses. Trained users generally perceived the device as usable under the evaluated conditions. However, these findings represent preliminary evidence of perceived usability and do not establish diagnostic accuracy, broader technology acceptance, clinical utility, implementation readiness, or routine adoption. Further field-based research should include diagnostic validation, routine workflow assessment, quality assurance, cost and supply-chain evaluation, and longitudinal assessment of user adoption before broader implementation is supported.

DECLARATIONS

Author contributions: IAL: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft Preparation, Visualization, Project Administration; OWKH: Conceptualization, Methodology, Supervision, Validation, Writing – Review & Editing; MA: Methodology, Formal Analysis, Validation, Writing – Review & Editing, Supervision; EF: Investigation, Resources, Data Curation, Validation, Writing – Review & Editing.

All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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