Article

Development and Preliminary Usability Evaluation of a Mobile Health Platform for Post-Discharge Monitoring of Diabetic Foot Ulcer Patients

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Abstract

Diabetic foot ulcer (DFU) management requires continued monitoring after hospital discharge to support continuity of care and timely clinical follow-up. This study presents a mobile health platform developed to support remote post-discharge monitoring of patients with DFU by enabling patient-side submission of clinical information and wound images and healthcare-professional-side review of longitudinal patient records. The platform was developed using HTML5, CSS3, JavaScript, Supabase, PostgreSQL, Supabase Storage, authentication services and HTTPS/REST communication. The platform is intended to facilitate monitoring and communication between patients and healthcare providers and does not participate in automated wound diagnosis, wound severity assessment, or AI-based deterioration detection. A preliminary evaluation was conducted with 30 healthcare professionals, comprising 16 residents and 14 interns, who assessed the developed platform using the System Usability Scale (SUS) and provided professional feedback regarding its usefulness and potential applicability within hospital-based DFU monitoring workflows. No real patient records or patient-identifiable clinical data were used during the evaluation. The platform reached an average of 81.08 ± 7.24 in the SUS, with a median of 80.0, and values between 65.0 and 92.5, disclosing a positive perceived usability among the healthcare professionals involved in the study. Expert evaluations suggested that the platform could support post-discharge surveillance and structured patient–clinician interactions. However, patient usability, clinical efficacy, patient outcomes, diagnostic accuracy, and real-world performance were not evaluated. Future studies involving prospective DFU patients, clinical data, standardized wound imaging, and clinical assessment are needed to validate its effectiveness in hospitals.

Keywords: Diabetic foot ulcer; mobile health; remote patient monitoring; post-discharge care; healthcare professional usability; System Usability Scale.

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1. Introduction

Diabetic foot ulcer (DFU) is a major complication of diabetes mellitus that requires regular wound evaluation, appropriate treatment and continuous clinical monitoring [1]. Diabetic foot ulcers are often neglected outside the hospital setting and post discharge care is an essential

element of patient management. However, maintaining regular communication and monitoring between patients and healthcare professionals can be challenging when follow-up depends primarily on scheduled face-to-face consultations. Remote healthcare approaches have therefore been investigated as a means of supporting monitoring and management of diabetes-related foot disease outside conventional clinical settings [1–3].

Mobile health (mHealth) and telehealth technologies provide opportunities to support remote DFU monitoring by enabling patients to submit clinical information and wound images for review by healthcare professionals. Previous studies have investigated telemedicine, digital photography, mobile applications, and other digital approaches for diabetic foot assessment and follow-up [2]–[4]. These approaches demonstrate the potential of digital technologies to improve communication, facilitate remote review, and support continuity of care [5]. However, the available evidence remains heterogeneous, and challenges related to usability, implementation, integration into clinical workflows, and validation in real-world settings remain [1],[6]– [8].

Existing digital approaches to DFU management have addressed different components of care, including remote consultation, wound-image assessment, monitoring, and automated image-based analysis [4], [7], [8]. Nevertheless, there remains a need for practical digital workflows that allow patients to submit relevant monitoring information and wound images after hospital discharge while enabling healthcare professionals to access and review these records longitudinally. Integrating patient-side data submission with a healthcare-professional-side review interface may provide a structured approach for supporting communication and continuity of monitoring between hospital visits. Such systems are intended to support clinical workflows and should not be considered a replacement for professional assessment.

In this study, a mobile health platform was developed to support remote post-discharge monitoring of patients with DFU. The platform incorporates a patient-side interface through which users can submit relevant monitoring information and wound images and a healthcare-professional-side interface through which submitted information can be reviewed longitudinally. The platform was designed to facilitate structured information collection, remote communication, and review within a hospital-associated DFU monitoring workflow. The current prototype does not perform automated wound diagnosis, wound-severity classification, or artificial-intelligence- or machine-learning-based deterioration detection. Instead, submitted information and wound images are intended to be reviewed and interpreted by healthcare professionals.

To preliminarily evaluate the developed platform, feedback was collected from 30 healthcare professionals, comprising 16 residents and 14 interns. The System Usability Scale (SUS) was used to assess the perceived usability of the platform, while feedback from the participating healthcare professionals was used to understand its perceived usefulness and potential applicability within a hospital-based DFU monitoring workflow. No real patient records or patient-identifiable clinical data were used during the evaluation.

Therefore, the objective of this study was to develop a mobile health platform for remote post-discharge DFU monitoring and to conduct a preliminary evaluation of its perceived usability and potential applicability from the perspective of healthcare professionals. The study was not designed to evaluate clinical effectiveness, diagnostic accuracy, patient outcomes, or real-world patient adherence. Instead, it provides an initial assessment of the usability of the developed digital workflow and healthcare professionals' perceptions of its potential use for supporting hospital-based post-discharge DFU monitoring. Further prospective studies involving DFU patients, real-world clinical data, standardized wound-image acquisition, objective usability and technical-performance measures, and clinical outcomes are required to establish the clinical applicability and effectiveness of the platform.

2. Problem Statement

Despite the growing use of digital technologies for diabetic-foot care, there remains a practical need for a structured approach to monitoring patients during the period between hospital discharge and subsequent clinical appointments. In particular, information reported by patients at home, including wound images and relevant monitoring parameters, may not be consistently available to healthcare professionals in a form that supports longitudinal review of the patient's condition. This creates a gap between routine hospital-based assessment and continued observation after discharge. A digital workflow that enables patients to submit relevant information remotely and allows healthcare professionals to review these submissions may therefore support continuity of post-discharge monitoring.

The problem addressed in this study is therefore the lack of a simple, structured, clinician-oriented mechanism for collecting and reviewing patient-reported and wound-related information during post-discharge DFU follow-up. The proposed mobile health prototype was designed to address this workflow gap by allowing patients to submit monitoring information and wound images and making these records available to healthcare professionals for longitudinal review. The system was developed with clinical expert input and was intended to support communication, information collection, and clinical review rather than replace conventional clinical assessment. The prototype does not perform automated wound diagnosis, wound-severity classification, or automated wound deterioration detection.

The present work focuses on establishing the perceived usability and potential applicability of this prototype from the healthcare-professional perspective. The study does not attempt to establish diagnostic accuracy, automated clinical decision-making, wound-healing improvement, reduction in hospital visits, patient outcomes, or other measures of clinical effectiveness. No real patient records or patient-identifiable clinical data were used in the evaluation. Instead, 30 healthcare professionals evaluated the developed platform using the System Usability Scale (SUS) and provided feedback regarding its usefulness and potential applicability within a hospital-based post-discharge DFU monitoring workflow. Accordingly, the primary research question addressed in this preliminary study is whether the developed platform provides an acceptable and usable interface for healthcare professionals involved in remote post-discharge DFU monitoring. Further evaluation involving DFU patients, real-world clinical data, objective technical and usability measures, and prospective clinical outcomes will be required to determine its applicability in routine clinical practice.

3. Methodology

We designed and developed a prototype mobile health (mHealth) platform for post-discharge monitoring of patients with diabetic foot ulcers (DFUs). The platform was developed as a single mobile application (APK) containing separate patient and healthcare-professional login interfaces and dashboards. The patient interface enables users to enter relevant clinical and self-reported information and upload wound photographs, while the healthcare-professional interface enables authorized users to review submitted information and longitudinal patient records. The development process included requirements analysis, system design, application development, database configuration, and implementation of a remote monitoring workflow. The prototype was developed with input from clinical experts to align the monitoring workflow with post-discharge DFU follow-up requirements.

The present study comprised prototype development followed by a preliminary usability evaluation from the healthcare-professional perspective. The evaluation was designed to assess perceived usability and potential applicability of the developed workflow rather than clinical effectiveness or diagnostic performance. Thirty healthcare professionals participated in the evaluation and provided feedback using the System Usability Scale (SUS) after interacting with the implemented functions of the platform. No real patient records, patient-identifiable clinical information, or patient clinical outcomes were used during the evaluation.

3.1. Requirement Analysis

A summary of the functional and non-functional requirements for the proposed platform was generated based on a review of current literature regarding telemedicine and mobile health solutions related to diabetic foot ulcer management, together with clinical requirements for post-discharge follow-up. The system was designed to facilitate routine post-discharge monitoring through patient submission of wound photographs and clinically relevant information, including blood glucose values, pain score, ulcer site, symptoms, medication adherence, and additional remarks. The platform was also designed to provide healthcare professionals with a centralized interface for reviewing submitted patient records and comparing monitoring information across follow-up entries. The requirements were therefore focused on supporting structured information collection, communication, and longitudinal clinical review rather than automated diagnosis or clinical decision-making.

3.2. System Architecture

The developed prototype follows a client–server architecture in which the patient and healthcare-professional interfaces are implemented within the same mobile application (APK) and communicate with the cloud backend. The application is a hybrid mobile application: its interface layer was developed using HTML5, CSS3, and JavaScript and packaged into a single installable Android application (APK); a dedicated native iOS build was not

developed for this prototype. Supabase was used as the cloud backend, with PostgreSQL used for structured user, patient, and monitoring information and Supabase Storage used for uploaded wound photographs. User authentication and account verification were managed using Supabase Authentication. Client requests were transmitted over HTTPS through the Supabase REST API using the authenticated session established at login. The source code was managed using Git, and Visual Studio Code was used as the development environment.

The system comprises three operational layers: (1) the mobile application interface, (2) backend and database services, and (3) cloud-based image storage. The mobile application provides separate patient and healthcare-professional workflows within the same APK. Following authentication, patient-submitted information is transmitted to the backend and associated with the corresponding patient record. Structured monitoring information is maintained in PostgreSQL, while wound photographs are stored separately in Supabase Storage and associated with the corresponding monitoring entry. The healthcare-professional workflow retrieves the submitted information through the authenticated application interface and presents the available monitoring records chronologically for longitudinal review.

At the data level, the principal relationships consist of an authenticated user profile associated with a patient profile, a patient profile associated with one or more monitoring records, and each monitoring record associated with the corresponding wound-image reference when an image is submitted, as illustrated in Figure 1. This one-to-many monitoring relationship allows multiple follow-up entries to be maintained for an individual patient. The healthcare-professional interface accesses these records through the authenticated workflow for patient search and longitudinal review.

Authentication establishes the identity of the application user, whereas authorization determines which patient records an authenticated healthcare professional is permitted to access. In the present prototype, patient-specific record retrieval is implemented using the selected patient identifier within the authenticated healthcare-professional workflow. However, a formal database-level patient authorization mechanism, such as row-level security linking individual healthcare-professional accounts to specifically authorized patient records, was not implemented or formally validated. Therefore, the prototype should not be interpreted as providing formally validated protection against unauthorized cross-patient access. Database-level authorization and systematic cross-patient access testing should be implemented before clinical deployment.

The prototype does not include an image-processing, machine-learning, automated wound-risk assessment, automated wound-deterioration detection, or automated clinical decision-support module.

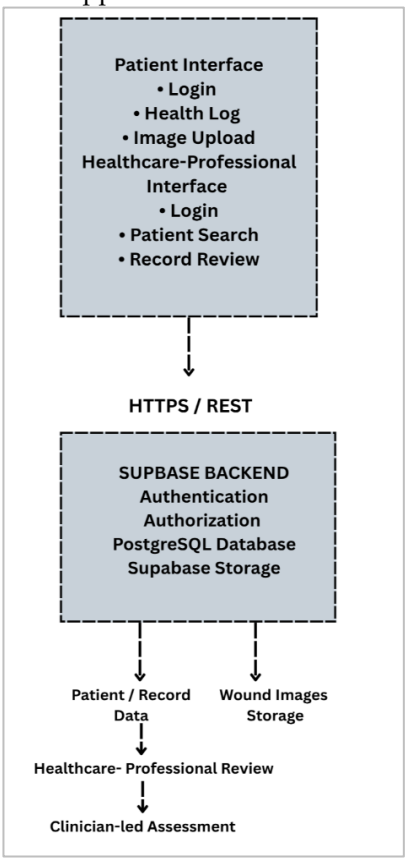


Figure 1. System architecture and data flow of the proposed mobile health platform.

3.3. Patient Module

The Patient Module provides a structured approach for patients to report information during follow-up after discharge. The patient enters the required account information and associated healthcare-provider information during registration. After authentication, the patient can create a monitoring entry by entering relevant clinical and self-reported information, including blood glucose level, pain score, ulcer site, symptoms, medication adherence, and additional remarks.

For wound documentation, the patient captures a photograph using the standard camera available on the mobile phone. The photograph is then selected and uploaded through the application. During the preliminary prototype evaluation, no fixed camera resolution, lighting condition, camera-to-wound distance, or standardized

viewing angle was imposed, and these parameters were not logged by the system. The wound images used during usability testing were simulated or illustrative entries rather than photographs of actual DFU wounds. Therefore, the image-upload component was evaluated as a functional part of the monitoring workflow and not as a method for assessing wound characteristics or image-based clinical performance. For future clinical evaluation, wound-image acquisition should use a predefined protocol specifying camera positioning, camera-to-wound distance, lighting conditions, image resolution, viewing angle, and objective image-quality criteria. These parameters should be recorded with each image to permit assessment of image adequacy and reproducibility [9]–[11].

The uploaded photograph is associated with the patient's monitoring record and made available for subsequent review by the healthcare professional. The purpose of the image-upload functionality at this stage was to support the collection and review of wound photographs as part of the remote-monitoring workflow. The prototype does not perform automated image processing, wound classification, wound deterioration detection, or wound-healing estimation. The patient-side workflow for account creation, authentication, health-log entry, wound-photograph upload, and submission of monitoring information is illustrated in Figure 2.

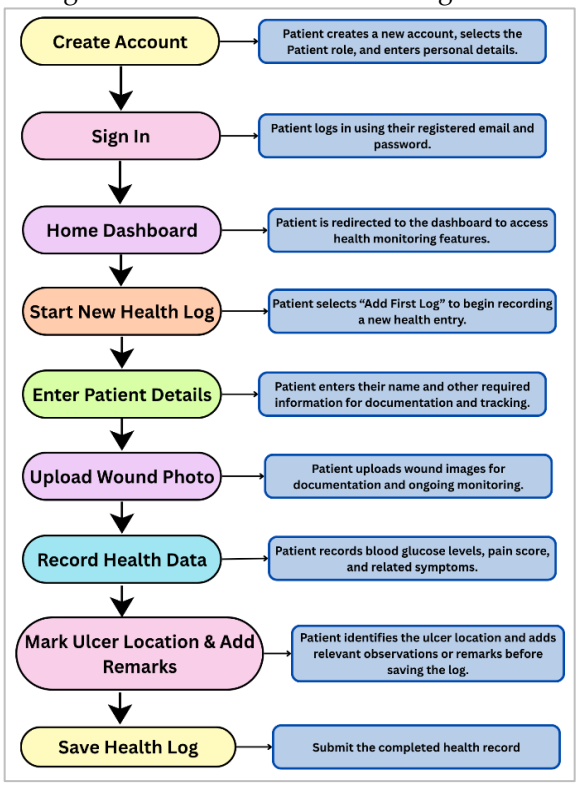


Figure 2. Workflow followed by the patient to create an account and submit a new health log

3.4. Healthcare-Professional Module

The Healthcare-Professional Module provides an authenticated interface for reviewing information submitted through the patient-side workflow. After authentication, healthcare professionals can search for registered patients and access their available monitoring records. The records are displayed chronologically to facilitate review of information submitted at different follow-up points. The healthcare-professional workflow for authentication, patient search, patient-specific record retrieval, wound-image review, and clinician-led assessment is illustrated in Figure 3.

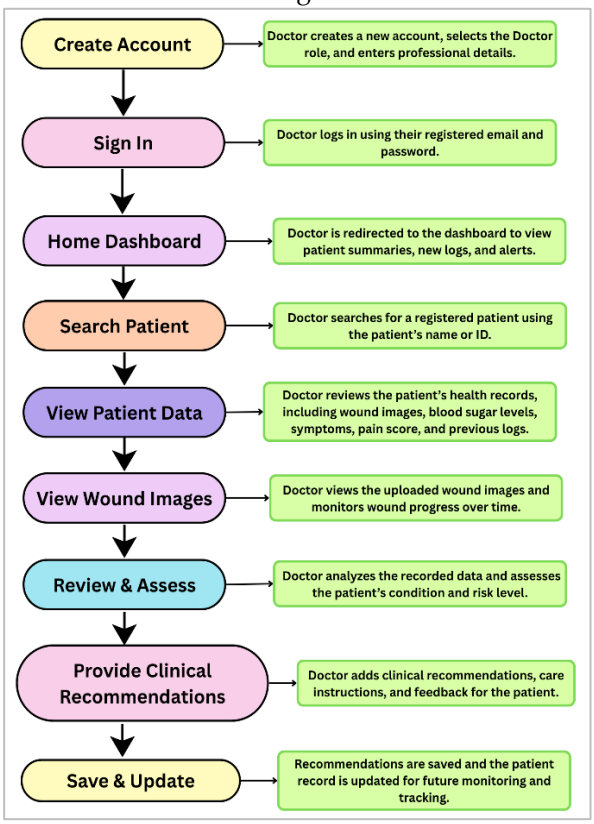


Figure 3. Healthcare-professional workflow for authentication, patient search, patient-record review, wound-image review, and clinical assessment.

For each monitoring entry, healthcare professionals can review the uploaded wound photograph, blood glucose level, pain score, ulcer location, reported symptoms, medication adherence, and additional clinical remarks. The chronological presentation allows healthcare professionals to review changes in patient-reported information across follow-up entries. The system does not automatically determine whether wound deterioration has occurred and does not generate automated clinical alerts. Any clinical interpretation of the wound photograph or associated patient information is performed by the

healthcare professional. Based on their professional assessment, the healthcare professional may determine whether continued remote monitoring, additional communication, or further clinical assessment is appropriate. Such decisions are clinician-led and are not generated by the application. If a healthcare professional identifies a potentially concerning finding during review, any communication, escalation, referral, or change in clinical management remains a manual clinical action outside the automated functions of the prototype.

Patient monitoring records are associated with a unique patient identifier in the database. After a healthcare professional search for and selects a registered patient within the authenticated healthcare-professional workflow, the selected patient identifier is used by the application to retrieve the monitoring records associated with that patient for review. This maintains the association between the selected patient and the monitoring records displayed in the healthcare-professional interface. However, this patient-identifier-based retrieval mechanism should not be interpreted as a formal patient-level authorization control. Database-level authorization linking individual healthcare-professional accounts to specifically authorized patient records were not implemented or formally validated in the present prototype.

Access to the healthcare-professional functions requires successful authentication through Supabase Authentication. The authenticated session establishes the identity of the healthcare-professional account before patient-search and record-review functions are made available. The patient identifier functions as a record-association mechanism within the authenticated workflow and is not intended to provide unauthenticated access to patient information. Patient records are not exposed through a publicly accessible interface and are retrieved through authenticated application requests.

However, formal role-based authorization testing, database-level access-control validation, systematic cross-patient access testing, and penetration testing were not conducted as part of this preliminary evaluation. Therefore, the present study does not claim formal security validation against deliberate manipulation of patient identifiers or unauthorized cross-patient access. The implemented workflow should consequently be interpreted as an authenticated prototype mechanism for patient-specific record retrieval rather than as a formally validated security or authorization framework. Dedicated security testing, authorization validation, and database-level access-control assessment will be required before large-scale clinical deployment.

3.5. Database with Cloud and Data Management

The prototype used Supabase as the cloud backend. User authentication was managed through Supabase Authentication, while patient information and monitoring records were stored in a PostgreSQL relational database. Uploaded wound photographs were stored using Supabase Storage. Monitoring records were associated with the corresponding authenticated user profile to allow retrieval of longitudinal monitoring information.

Patient monitoring records are associated with a unique patient identifier in the database. When a healthcare professional searches for and selects a patient, the application uses the selected patient identifier to retrieve the monitoring records associated with that patient. A patient may therefore have multiple monitoring records corresponding to different post-discharge follow-up entries. Wound photographs are stored separately in Supabase Storage and are associated with the corresponding monitoring record through the image reference maintained by the application. This structure supports patient-specific retrieval and longitudinal review of monitoring information.

Access to the application was controlled through authenticated user accounts and separate patient and healthcare-professional interfaces. Patient records were retrieved through the authenticated application workflow rather than being publicly accessible.

The present study focused on prototype development and preliminary usability evaluation. A dedicated cybersecurity assessment, formal penetration testing, quantitative encryption-performance evaluation, formal audit-trail assessment, and formal data-retention assessment were not conducted. Similarly, technical performance under concurrent multi-user conditions was not evaluated. These aspects require dedicated security, technical-performance, and deployment assessments before the platform can be considered for large-scale clinical implementation.

3.6. Remote Monitoring Workflow

Following hospital discharge, the patient is registered on the platform and provided access to the patient interface. After authentication, the patient can create a monitoring entry by entering the required clinical and self-reported information and uploading a wound photograph captured using a standard mobile-phone camera. The submitted information is transmitted to the Supabase

backend and stored in the corresponding patient record, while the uploaded photograph is stored in the associated storage location. Healthcare professionals can subsequently authenticate into the healthcare-professional interface, search for and select a registered patient, and review the submitted monitoring records and wound photographs chronologically. The selected patient identifier is used to retrieve the monitoring records associated with that patient, supporting longitudinal review. The use of telemedicine and digital technologies for diabetic-foot monitoring and follow-up has been previously reported as a potential approach for supporting care outside conventional hospital visits [2], [3], [12].

The prototype separates patient-facing and healthcare-professional workflows, and patient monitoring records are not publicly exposed but are retrieved through authenticated application requests. The current prototype does not generate automated alerts, wound-deterioration assessments, diagnostic outputs, or clinical decisions based on submitted information; interpretation and any subsequent clinical action remain the responsibility of the healthcare professional. Digital technologies have been reported as tools that can support diabetic-foot management while requiring appropriate clinical integration and healthcare-professional involvement [3], [7]. Formal penetration testing and systematic cross-patient authorization testing were not conducted as part of this preliminary evaluation. Therefore, the study does not claim formal validation of protection against deliberate manipulation of patient identifiers or unauthorized cross-patient access, and dedicated security and authorization testing will be required before large-scale clinical deployment.

3.7. Development Environment

Table 1 summarizes the principal technologies used for development, authentication, data management, image storage, version control, and the development environment.

Table 1. Development Environment

Component	Technology Used
Frontend	HTML5 and JavaScript, CSS
Backend	Supabase
Database	PostgreSQL (Supabase)
Authentication	Supabase Authentication
Image Storage	Supabase Storage
Version Control	Git
Development Environment	Visual Studio Code

3.8. System Usability Evaluation

The usability of the developed prototype was evaluated using the System Usability Scale (SUS), a 10-item questionnaire [13] widely used for assessing perceived usability of interactive systems and digital-health applications [14], [15]. Healthcare professionals who participated in the evaluation were provided with a brief orientation to the application before performing predefined tasks using the patient and healthcare-professional interfaces [16].

The evaluation tasks were defined according to the functions implemented in the prototype. Participants were asked to perform representative activities including user login, patient registration, creation of a patient monitoring record, entry of blood glucose values, recording of pain scores and symptoms, documentation of medication adherence, uploading wound photographs, searching for a patient record, and reviewing current and previous monitoring records through the healthcare-professional interface. These tasks were selected to represent the principal workflow of the developed platform.

After completing the assigned tasks, participants completed the 10-item SUS questionnaire. Each item was rated on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). SUS measures perceived usability through positively and negatively worded statements relating to ease of use, complexity, consistency, confidence, and overall user experience [13].

For SUS scoring, responses to positively worded items (1, 3, 5, 7, and 9) were adjusted by subtracting 1 from each response. For negatively worded items (2, 4, 6, 8, and 10), the response was subtracted from 5. The adjusted item scores were then summed to produce a total between 0 and 40 and multiplied by 2.5 to obtain the final SUS score ranging from 0 to 100 [13]. No division by 40 is required in the standard SUS calculation.

For the item-level SUS results, the mean response and standard deviation were calculated for each of the ten SUS items. The 95% confidence interval (CI) for each item-level mean was calculated using the t-distribution with 29 degrees of freedom, according to the expression mean ± $t_{0.975,29} \times (SD/\sqrt{n})$, where n = 30. These confidence intervals are presented descriptively in Figure 5 to indicate the uncertainty around the observed mean response for each SUS item.

The resulting SUS scores were summarized across the participants using descriptive statistics. The overall usability score was interpreted using established SUS benchmarks, with scores above approximately 68 generally considered above average and scores above 80 commonly interpreted as indicating a high level of perceived usability [17], [18].

For exploratory subgroup comparisons by gender and professional position, Welch's independent-samples t-test was used because the subgroup sizes were unequal and the analysis did not assume equal population variances. The analyses were treated as exploratory because of the small subgroup sizes, particularly the male subgroup (n = 8). Effect sizes and 95% confidence intervals were therefore reported alongside p-values, and non-significant findings were interpreted as descriptive results rather than evidence of equivalence between groups.

3.9. Study Participants and Population

The usability evaluation included 30 healthcare professionals who interacted with the developed prototype and completed the System Usability Scale (SUS) questionnaire. A convenience sampling approach was used to recruit participants from the healthcare-professional population available to the study team during the preliminary evaluation. Participants were eligible if they were healthcare professionals or trainees who completed the specified prototype interaction and SUS questionnaire, while participants who did not complete the required usability assessment were excluded from the final analysis.

The evaluation was conducted from the healthcare-professional perspective and did not include patients with diabetic foot ulcers. Prior to the evaluation, participants were briefed on the prototype and then carried out the predefined usability tasks as outlined in Section 3.8, followed by completing the SUS questionnaire. The evaluation was not concerned with clinical effectiveness, diagnostic accuracy, or patient outcomes, but rather with the perceived usability of the patient-facing and healthcare-professional workflows implemented in the prototype.

Previous experience with mHealth applications, previous experience with DFU-specific digital monitoring systems, exact mobile-device model and operating-system version, individual task-completion duration, and total interaction time were not systematically recorded during this preliminary evaluation. The patient-facing and healthcare-professional workflows were evaluated as implemented application functions; however, patient usability was not assessed because patients with DFU were not included. Task completion time, task-success rate, navigation errors, upload failures, and requests for assistance were not systematically recorded during this preliminary evaluation and therefore were not used as objective usability outcomes. Thus, the evaluation was mainly based on perceived usability as evaluated with SUS. Interpretation of the findings should be made in light of the methodological limitations. Future evaluations should include representative participants with DFU, standardize device conditions, collect information on previous digital-health experience, and include objective indicators of task performance.

4. Results

4.1. Participant Characteristics

A total of 30 healthcare professionals participated in the preliminary usability evaluation of the developed mobile health platform. The participant dataset included gender and professional position. Of the 30 participants, 22 were female and 8 were male. Sixteen participants were residents and 14 were interns. The evaluation was conducted from the healthcare-professional perspective; no patients with diabetic foot ulcers participated in this usability evaluation. The demographic and professional characteristics of the participating healthcare professionals are summarized in Table 2.

4.2. Overall System Usability Scale Results

The developed platform's usability was evaluated using the System Usability Scale (SUS). The 30 healthcare professionals reported a mean SUS score of 81.08 ± 7.24, a median of 80.00, and a range of 65.00–92.50. The 95% confidence interval was 78.38–83.79, indicating favorable perceived usability of the prototype among the evaluated healthcare professionals.

The distribution of individual SUS scores among healthcare professionals is shown in Figure 4, while Table 3 presents the overall descriptive statistics, including the mean, standard deviation, median, range, and 95% confidence interval.

Table 2. Participant characteristics

Characteristic	Category	n	Percentage (%)
Gender	Female	22	73.3
	Male	8	26.7
Professional position	Intern	14	46.7
	Resident doctor	16	53.3
Total		30	100

Table 3. Overall SUS Descriptive Statistics

Statistic	Value
Number of participants	30
Mean SUS score	81.08
Standard deviation	7.24
Median	80.00
Minimum	65.00
Maximum	92.50
95% confidence interval	78.38–83.79

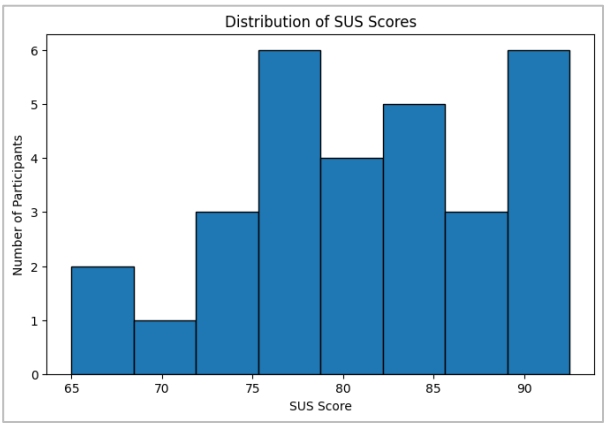


Figure 4. Distribution of System Usability Scale (SUS) Scores Among Participants.

4.3. Item-Level SUS Results

The individual SUS item responses were analyzed to further characterize participants' perceptions of the system. The ten SUS items assess aspects including system complexity, ease of use, consistency, learnability, and user confidence. The mean response and standard deviation for each SUS item are presented in Table 4. Figure 5 illustrates the corresponding mean responses across the ten SUS items.

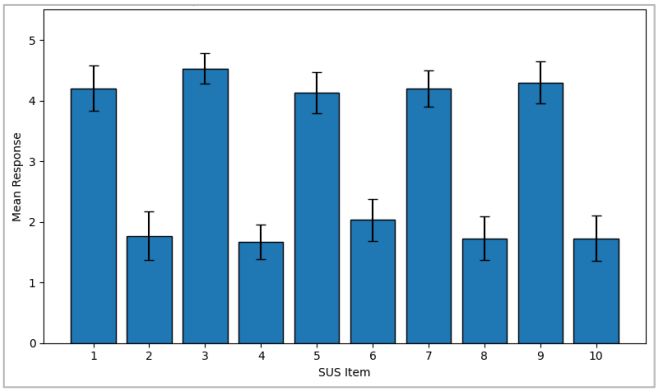


Figure 5. Mean SUS response and 95% confidence interval for each SUS item.

Table 4. Item-Level SUS Results

SUS Item	Mean	Standard Deviation (SD)
Q1	4.20	1.00
Q2	1.77	1.07
Q3	4.53	0.68
Q4	1.67	0.76
Q5	4.13	0.90
Q6	2.03	0.93
Q7	4.20	0.81
Q8	1.73	0.98
Q9	4.30	0.92
Q10	1.73	1.02

4.4. SUS Scores by Gender

SUS scores were summarized according to participant gender. Female participants (n = 22) had a mean SUS score of 82.27 ± 6.36, whereas male participants (n = 8) had a mean SUS score of 77.81 ± 8.91. Welch's independent-samples t-test showed no statistically significant difference between the groups (p = 0.223). The estimated mean difference was 4.46 SUS points (95% CI: −3.21 to 12.13), with a Hedges' g effect size of 0.61. Because the male subgroup was small (n = 8), the effect-size estimate has substantial uncertainty and should be interpreted cautiously. These findings are therefore considered descriptive and do not establish a gender-related difference or equivalence in usability. The mean SUS scores according to participant gender are illustrated in Figure 6.

4.5. SUS Scores by Professional Position

SUS scores were also summarized according to professional position. Resident doctors (n = 16) had a mean SUS score of 81.72 ± 6.44, whereas interns (n = 14) had a mean score of 80.36 ± 8.25. Welch's independent-samples t-test showed no statistically significant difference between the groups (p = 0.622). The estimated mean difference was 1.36 SUS points (95% CI: −4.27 to 6.99), with a Hedges' g effect size of 0.18. These results are interpreted as descriptive subgroup findings and should not be considered evidence of equivalence between professional groups. The distribution of SUS scores by professional position is illustrated in Figure 7.

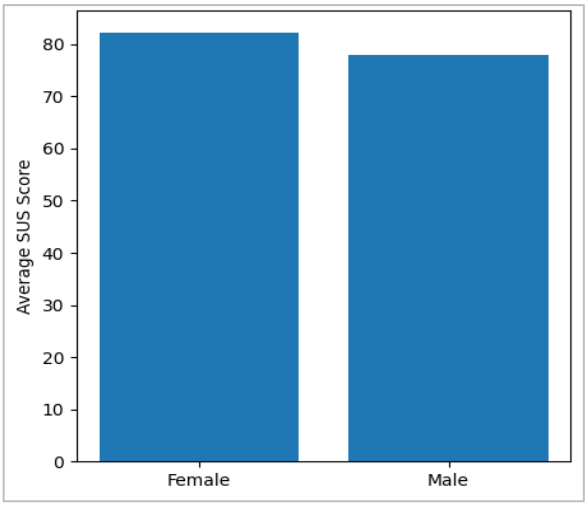


Figure 6. SUS by gender

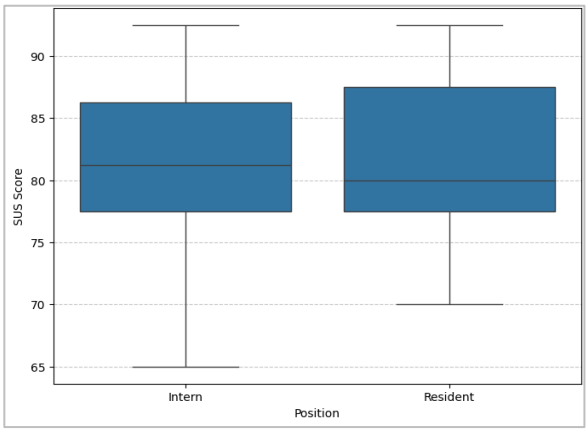


Figure 7. Distribution of System Usability Scale (SUS) Scores by Professional Position.

4.6. Individual SUS Score Distribution

Individual participant SUS scores ranged from 65.00 to 92.50, demonstrating variation in perceived usability across the participating healthcare professionals. Nevertheless, the overall mean SUS score was 81.08, indicating favorable perceived usability within the evaluated participant group. The individual SUS scores of the participating healthcare professionals are shown in Figure 8.

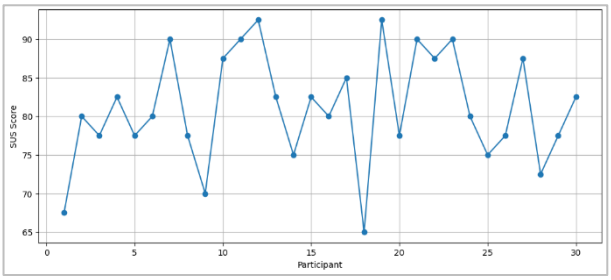


Figure 8. Individual System Usability Scale (SUS) Scores of Study Participants

Overall, the usability evaluation indicated favorable perceived usability of the developed prototype among the participating healthcare professionals. The findings represent a preliminary assessment of perceived usability and should not be interpreted as evidence of clinical effectiveness, wound-healing improvement, diagnostic accuracy, reduction in hospital visits, patient adherence, or other clinical outcomes.

5. Discussion

The mean SUS score of 81.08 ± 7.24 indicates favorable perceived usability among the healthcare professionals who evaluated the prototype. This result is consistent with previous research demonstrating the feasibility and acceptability of mobile health technologies and digital interventions for diabetic-foot self-management and remote monitoring [19]–[22]. The result also compares favorably with the broader usability literature for digital-health applications, where SUS has been widely used to assess perceived usability [17], [18]. However, the present finding should be interpreted as an initial usability assessment, rather than evidence of clinical effectiveness or superiority over existing diabetic-foot monitoring applications. The differences observed between gender and professional-position groups were not statistically significant and therefore do not support conclusions regarding subgroup-related differences in usability.

5.1. Comparison with Existing DFU Applications

The developed prototype can be positioned, at the feature level, against previously described DFU-focused mHealth systems rather than benchmarked against them empirically, since no head-to-head evaluation was performed in this study. The MyFootCare application supports patient-side self-tracking of foot symptoms and wound photographs but does not provide an integrated clinician-facing review dashboard within the same application [20]. The remote wound-monitoring system described by Keegan et al. [6] similarly centers on patient-submitted data for clinician review, without reporting a formal usability evaluation of the interface itself. A remote patient-facing wound-care smartphone application has also been described for supporting wound-care management, further demonstrating the potential role of smartphone-based tools in remote diabetic-foot care [23]. The INTELLIN® platform, evaluated within an NHS foot-care pathway in the UK, combines a patient application with a clinician dashboard, comparable in structure to the present prototype, and has been assessed for feasibility together with downstream clinical and cost outcomes such as re-ulceration rates [24], extending beyond the usability-only scope of the present study. Other digital interventions have also incorporated patient education and foot-care alerts, such as the MyU app, highlighting the broader role of digital tools in supporting diabetic-foot self-management [25]. Relative to these systems, the present prototype's combination of a single APK with distinct patient and clinician dashboards is broadly consistent with the direction of existing DFU mHealth tools, while its principal current gaps are the absence of automated wound-image analysis, of patient-side usability testing, and of any clinical-outcome evaluation, all of which more mature platforms in this space have begun to address to varying degrees [6],[26]. Broader reviews of AI-enabled mHealth applications similarly note that data privacy, security, and lack of standardized outcome measurement

remain open challenges across the field, not specific to this prototype [27]. A structured feature-level comparison of the proposed platform with selected existing digital DFU monitoring applications is presented in Table 5.

The contribution of the present work is primarily at the workflow and system-integration level rather than at the algorithmic level. The prototype integrates patient-side post-discharge health-log submission and wound-image upload with an authenticated healthcare-professional interface for patient-specific longitudinal review within a single mobile application. This integration provides a structured monitoring and communication workflow linking patient-submitted information with healthcare-professional review. The proposed platform is therefore intended as a preliminary digital monitoring framework and does not claim automated diagnosis, wound classification, or clinical decision support.

Table 5. Comparison of the proposed platform with selected digital DFU applications

Feature	MyFootCare [20]	Keegan et al. [6]	INTELLIN® [24]	Proposed Platform
Patient-side monitoring	✓	✓	✓	✓
Patient-reported information	✓	✓	✓	✓
Wound-image upload	✓	✓	NR	✓
Clinician dashboard	NR	✓	✓	✓
Longitudinal records	✓	✓	✓	✓
Automated wound-image analysis	—	✓	NR	—
Automated alerts	NR	✓	✓	—
Authentication	NR	NR	NR	✓
Patient usability	✓	✓	✓	NE
Healthcare-professional usability	NR	NR	✓	✓
Clinical outcome evaluation	NR	✓	✓	NE
Real patient data in cited evaluation	✓	✓	✓	—
Interoperability	NR	NR	NR	NE
Security assessment	NR	NR	NR	NE

Note: ✓ indicates that the feature was explicitly reported as present in the cited study; — indicates that the feature was explicitly reported as absent or not implemented; NR indicates that the feature was not reported in the cited study; and NE indicates that the feature was not evaluated in the present prototype. An NR designation was not interpreted as evidence that a feature was absent.

The findings should be considered within the preliminary scope of the study. As the assessment was conducted by healthcare professionals rather than patients, it is unclear how effective and accessible the patient-centered interface is for the target population. For this reason, the study did not analyze clinical outcomes, accuracy of diagnosis, improvement in wound healing, adherence of patients, frequency of visits to health facilities and cost-effectiveness. Although the platform supports wound-image capture using standard mobile-phone cameras, the preliminary evaluation used simulated or illustrative images without standardized acquisition conditions. Therefore, the current findings cannot confirm the reliability of image quality for clinical evaluation. In addition, the current prototype does not perform automated or AI-based wound-image analysis. Previous studies [28,29] investigated remote foot-temperature monitoring approaches, while another study [30] examined AI-powered thermography for detecting early plantar thermal abnormalities. These studies therefore represent related remote-monitoring and future technological directions rather than evidence of an AI-based capability implemented or evaluated in the present prototype. Further validation involving patients, larger and more diverse populations, standardized image acquisition, and prospective clinical evaluation will be required before the platform can be assessed for wider clinical implementation.

6. Conclusion

Thirty healthcare professionals evaluated the proposed mobile health platform and obtained a mean SUS score of 81.08 ± 7.24, indicating favorable perceived usability within the evaluated participant group. The findings provide preliminary evidence regarding the perceived usability of the prototype workflow from the healthcare-professional perspective. Because no DFU patients, real patient records, or clinical outcomes were included, the present study does not establish the effectiveness of the platform for post-discharge DFU monitoring in clinical practice. The results should therefore be interpreted as a preliminary usability evaluation rather than clinical validation of the platform.

Further evaluation involving patients with DFU, real-world clinical data, standardized wound-image acquisition, objective usability and technical-performance measures, and prospective clinical outcomes is required before wider clinical implementation. Future development may also investigate automated wound-image analysis and formal cybersecurity, scalability, interoperability, and clinical-performance validation.

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Data Availability Statement: The data were collected using hard-copy System Usability Scale (SUS) questionnaires, digitized, and analyzed using Python in Google Colab. The anonymized SUS response data and analysis code supporting the findings of this study are available from the corresponding author upon reasonable request. No patient data were collected or used in this study.

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Conflicts of Interest: The authors declare no conflicts of interest.

Institutional Review Board Statement: The study involved the development and preliminary usability evaluation of a mobile health prototype by healthcare professionals. No patients, real patient records, or patient-identifiable clinical data were involved. The Institutional Ethics Committee of Grant Government Medical College and Sir J.J. Group of Hospitals was consulted and determined that formal ethical approval was not required for this preliminary prototype evaluation. Future studies involving patients or clinical implementation will be subject to the applicable institutional ethical approval requirements.

Informed Consent Statement: Written informed consent was obtained from all 30 healthcare professionals who voluntarily participated in the usability evaluation.

Ethical Considerations: Participation was voluntary, and feedback was collected using hard-copy questionnaires following interaction with the prototype. The evaluation was limited to perceived usability and did not involve clinical interventions, patient treatment, or the assessment of patient outcomes.

AI Use Declaration: Generative AI tools and Grammarly was used solely for language editing and proofreading in the complete manuscript. The authors reviewed and approved all content and take full responsibility for the manuscript.

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