Design and Feasibility Evaluation of a Prototype Automated Kiosk for Hospital Pre-Check-In and Preliminary Vital Sign Capture

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Abstract

Objective: evaluate whether a prototype kiosk could combine NFC identification, structured intake, staged preliminary measurements, patient-flow management, and export preparation. Method: controlled feasibility testing with system-generated evidence. Results: 25 intake records, 21 workflow records, 59 audit logs, and 16 analyzed cases were produced, including 6 fallback and 5 sensor-limited cases. Conclusion: the strongest result was engineering feasibility and workflow continuity under incomplete capture.

Introduction

Hospital intake depends on identity confirmation, symptom capture, and early measurements before staff review. This work explored whether a self-service kiosk could gather preliminary data while preserving incomplete cases for staff follow-up instead of blocking the workflow.

Background and Gap

Prior work supports self-check-in kiosks, digital triage, and automated vital-sign stations, but these functions are often presented separately. Fewer platforms combine secure identification, active patient-flow visibility, auditability, and vendor-neutral export in one operational prototype.

Problem and Objectives

- ❑ Research question: Can a prototype self-service kiosk support secure pre-check-in, staged measurements, and workflow-ready record generation in a simulated environment?
- ❑ Integrate NFC identification, questionnaire intake, and staged measurements.
- ❑ Preserve workflow continuity under hardware failure or incomplete data.
- ❑ Produce management-ready, audit-ready, and export-ready records.

Prototype Automated Kiosk

Figure 1. Prototype Automated Kiosk model.

System Design and Architecture

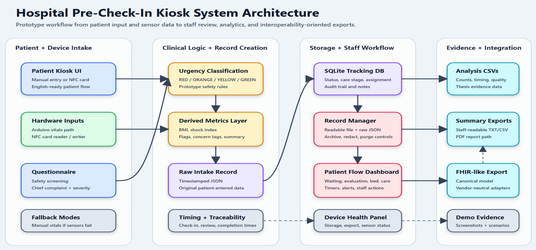

Figure 2. Implemented system architecture from kiosk intake to storage, workflow management, and export preparation.

The implemented architecture links kiosk intake, staged measurements, staff review, local storage, patient-flow management, and export preparation within one workflow.

NFC > **Intake** > **Measure** > **Flow** > **Export**

Methodology

Study design
Controlled design-and-feasibility evaluation.

Sources
JSON exports, SQLite records, workflow logs, and summaries.

Dataset
25 intake records, 21 workflow records, 59 audit logs, 16 analyzed cases.

Metrics
Record creation, care-stage progression, fallback use, completeness, and export generation.

These measures tested whether the platform preserved continuity, traceability, and useful outputs when automatic capture remained incomplete.

Equipment and Materials

Touch workflow stages

Questionnaire | Measurements | Review

Technical stack and field-readiness

- ❑ Raspberry Pi kiosk host
- ❑ NFC reader and token workflow
- ❑ Arduino-assisted measurement path
- ❑ Touch display with on-screen keyboard
- ❑ SQLite local storage
- ❑ JSON / FHIR-like export layer

Large touch targets, staged screens, and manual fallback kept the kiosk usable on compact Raspberry Pi hardware.

Results and Discussion

25 Intake records	**21** Workflow records	**59** Audit-log entries
16 Analyzed records	**6** Manual fallback cases	**5** Sensor-failure missing-data cases

- ❑ Record generation: 25 intake records, 21 workflow records, and 59 audit logs showed repeated end-to-end operation.
- ❑ Fallback pressure: in the 16 analyzed cases, 6 required manual fallback and 5 showed sensor or missing-data limitations.
- ❑ Strongest interpretation: engineering feasibility, workflow continuity, auditability, and export readiness were demonstrated more clearly than clinical accuracy.
- ❑ **Main takeaway: the stronger result was operational continuity and record preparedness, not clinical-grade sensing accuracy.**

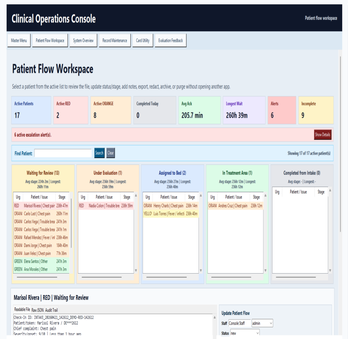

Figure 3. Patient-flow workspace used for active case review and stage management.

Patient-Flow Snapshot

- ❑ Waiting 17
- ❑ Assigned 2
- ❑ Evaluation 1
- ❑ Treatment 1

Active cases remained visible by care stage, showing that intake records moved into the management layer rather than remaining isolated forms.

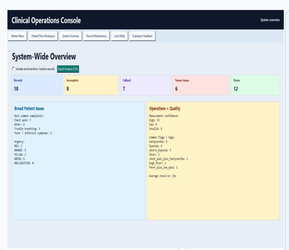

Figure 4. Staff-facing overview supporting broader census-style monitoring.

Export Evidence

- ❑ 18 JSON exports
- ❑ 30 interoperability exports
- ❑ 5 readable summaries

These artifacts show that the prototype prepared structured records for staff review and future adapter-based exchange rather than storing isolated kiosk-only forms.

Conclusions

The prototype integrated NFC identification, structured intake, staged preliminary capture, patient-flow tracking, and data export within one controlled system. Across testing, the platform preserved continuity, auditability, and staff visibility even when capture was incomplete.

The strongest result is engineering feasibility and operational continuity under imperfect capture, not validated clinical accuracy or deployment-ready performance.

Future Work

- ❑ Improve sensor reliability and calibration.
- ❑ Expand end-to-end timing instrumentation.
- ❑ Conduct formal usability and acceptance studies.
- ❑ Continue adapter-specific integration and field testing.

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References

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Workflow and Access

Scan the QR code to open the final article, poster, screenshots, and supporting evidence folder used during EXPO. The linked material helps the judge review the implemented platform beyond the poster itself.

Engineering feasibility prototype only; not a diagnostic or deployment-ready clinical system.