

Project Proposal

Designing a Patient-Centered Appointment and Medication Management System for the UM-Flint Heart Clinic

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1. Introduction

The University of Michigan-Flint HEART clinic is a student and faculty-run, collaborative pro bono health-based health service based in the College of Health and Science, aimed at improving health and healthcare access for uninsured and underinsured residence of Flint and Genesee County. The clinic offers services such as physical therapy, occupational therapy, and community health activities designed to support individuals with a range of health needs. A large portion of the clientele includes elderly adults and people with long-term medical conditions who require regular, well-organized appointments for ongoing care.

These patients frequently experience physical, cognitive and emotional challenges that complicate routine healthcare tasks such as managing medical appointments. Conditions such as reduced vision, memory impairment, fatigue and limited motor control can significantly increase the cognitive load required to interact with conventional appointment scheduling systems particularly those not designed with accessibility in mind. At the UM-Flint HEART Clinic, missed or improperly managed appointments can disrupt treatment plans, delay care and negatively affect patient outcomes.

Existing appointment scheduling systems include paper-based records and phone-based scheduling often fails to adequately support patients. Paper-based and telephone-based scheduling can be prone to human error, misplaced records and physical ability that many HEART patients do not possess. Poor interface design, small text, complex navigation flows, unclear feedback and limited accessibility features can cause confusion and frustration, increase patient anxiety and reduce trust in digital healthcare systems as a result, heart patients may avoid using these systems altogether, leading to higher rates of missed appointments and reduced continuity of care.

From a Human-Computer Interaction (HCI) perspective, this problem highlights the critical need for patient-centered design approaches in healthcare technology. HCI research emphasizes designing systems that align with users' abilities, limitations and contexts of use, particularly in high-risk environments such as healthcare. For heart patients and other users of the system, including elderly patients, caregivers, and healthcare staff, an effective appointment management system must minimize cognitive load, provide clear and consistent feedback, and support accessibility features such as readable text, simple workflows and error-prevention mechanisms.

This project proposes the design and evaluation of a patient-centered mobile application that enables heart patients at the UM-Flint HEART Clinic to book, reschedule and cancel appointments easily and confidently. By applying human-centered design principles and incorporating feedback from both clinic administrators and heart patients, the proposed solution aims to improve usability, reduce stress and enhance overall patient satisfaction while supporting better healthcare outcomes.

2. Related Work

Research in mobile health (mHealth) and HCI has increasingly focused on improving usability, accessibility and trust in healthcare applications particularly for older adults and individuals with chronic illnesses. This section synthesizes prior work relevant to appointment management, accessibility, cognitive load and patient trust in mobile health systems and identifies the research gap this project seeks to address.

2.1 Mobile Health Application for HEART Clinic at UM-Flint

Mobile health applications have been widely adopted to support appointment scheduling, medication management and health monitoring for patients with chronic conditions. Studies indicate that mHealth tools can improve engagement and self-management when designed appropriately. However, many existing applications prioritize functionality over usability, resulting in interfaces that are difficult for patients with cognitive or physical limitations to navigate.

For heart patients specifically, missed appointments pose a serious risk to continuity of care and treatment effectiveness. While some scheduling systems offer basic booking

features, they often lack personalization, clarity and accessibility tailored to cardiac patients' needs. This highlights the necessity of designing appointment systems that are sensitive to users' health conditions and interaction constraints.

2.2 Accessibility and Inclusive Design Goal for the UM-Flint HEART Clinic

Accessibility is a core concern in HCI research, particularly for older adults and patients with impairments. Gomez-Hernandez et al., (2023) emphasize that mobile applications frequently fail to meet accessibility standards, citing issues such as small font size, poor contrast, complex gestures and inconsistent navigation. These barriers disproportionately affect patients with visual impairment or reduced motor control which are common among heart patients.

Inclusive design guidelines suggest simplifying navigation, reducing the number of interaction steps and providing clear visual and textual feedback to support task completion. Despite these guidelines, many healthcare apps still lack practical implementation of accessibility principles, revealing a gap between research recommendations and real-world systems.

2.3 Cognitive Load and Usability in Healthcare Systems

Cognitive load theory has been applied extensively in HCI to evaluate how system complexity affects user performance and satisfaction. High cognitive load can lead to errors, slower task completion and user frustration particularly in healthcare contexts where users may already be under stress. Appointment management tasks such as selecting dates, confirming availability and receiving feedback can become overwhelming if poorly designed.

Research suggests that reducing cognitive load through clear layouts, minimal text, predictable workflows and error prevention significantly improves usability for patients with chronic illnesses. While many studies examine usability challenges for chronic-illness populations broadly, few studies focus specifically on appointment scheduling for patient groups like those served by the UM-Flint HEART Clinic, indicating a need for targeted research in this area.

2.4 Trust, Privacy and Adoption of mHealth Systems

User trust is a critical factor influencing the adoption and sustained use of mobile health applications. Concerns about privacy, data security and transparency can deter patients from engaging with digital healthcare tools. Alhammad et al. (2024) found that patients are more likely to use mHealth apps when interfaces clearly communicate privacy policies and provide feedback that reassures users about data protection.

In appointment management systems, trust is particularly important because patients must rely on the system to accurately schedule and confirm critical healthcare visits. This project addresses a gap in existing work by integrating usability, accessibility and trust considerations into a single patient-centered appointment management solution for heart patients. Prio work of appointments scheduling systems address usability and some accessibility channelings, but many current exiting solutions do not adequately support the needs for patients with complex or long-term conditions.

3. Methodology

This project will adopt a qualitative research methodology, we will be using semi-structured interviews while shadowing and surveys to gather in-depth insights into user needs, challenges and expectations. Interviews are well-suited for HCI research as they allow researchers to explore user experiences, perceptions and contextual factors that influence interaction with technology.

3.1 Participants

The study will involve a total of thirty participants, consisting of:

- One clinic administrator from UM-Flint HEART Clinic and
- Five heart patients who receive care at the clinic

HEART patient participants will be adults diagnosed with a long-term condition and who have experience scheduling or managing medical appointments. Inclusion criteria include being 18 years or older and able to provide information consents. Exclusion criteria include individual who do not manage their own appointment or are unable to participate in an interview or

communication limitation. Efforts will be made to include participants with varying levels of digital literacy to capture a diverse range of perspectives.

3.2 Data Collection semi- structured interviews will be conducted either in person or remotely, depending on participants availability and health considerations. Each interview is expected to last approximately 30 - 45 minutes.

Interview questions will focus on:

- Current appointment scheduling experiences
- Challenges with existing systems
- Accessibility and usability concerns
- Emotional responses such as stress or frustration
- Desired features and improvements in a mobile appointment app.

The clinic administrator interview will additionally explore workflow requirements, scheduling constraints and integration considerations from an organizational perspective.

3.3 Data Analysis

Interview data will be transcribed and analyzed using thematic analysis. recurring themes related to usability, accessibility, cognitive load and trust will be identified and synthesized into design requirements. These findings will directly inform the design of the proposed mobile appointment management systems ensuring alignment with real user needs and clinical constraints.

4. Project Outcome

The expected outcome of this project is the design of a patient-centered mobile appointment management application tailored specifically for heart patients at the UM-Flint HEART Clinic.

The proposed system will enable patients to:

- Book appointment with minimal steps
- Reschedule or cancel appointments easily
- Receive clear confirmations and reminders
- Interact with an accessible and low-stress interface

By applying human-centered design principles, the system is expected to reduce missed appointments, lower patient anxiety and improve satisfaction with healthcare services. For the clinic, the system may also streamline administrative workflows and improve communication between patients and healthcare providers.

Ultimately, this project contributes to HCI research by demonstrating how qualitative user insights can inform the design of accessible, trustworthy and unstable healthcare technologies for vulnerable patient populations.

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