Interaction and service design of a virtual health hub for patients with cardiovascular disease

Interaction and Service Design of a Virtual Health Hub for Patients with Cardiovascular Disease

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Abstract. Interaction and Service Design research was applied to synthesise the complex issues associated with cardiac assessment. A design demonstrator prototype was produced to rationalise how a virtual assistant might enable objective assessments clinical assessment questioning and vital signs monitoring. This led to a concept design prototype called Heart Hub, developed from a telephone triage service for patients with cardiovascular disease.

Through a co-design framework and the positive design methodology, a series of user experience techniques were used including clinician contextual laddering video interview, user personas, empathy-journey mapping, user interviews and task analysis. Secondly, we will report on the various design phases from sketching, wireframes, high resolution mock-ups to prototypes. Lastly, we report on the challenges of working on design within a healthcare setting in times of public health crisis and the effects of that). This ongoing research demonstrates the application of design c to tackle wicked problems within a healthcare context.

Keywords: Cardiology, Cardiovascular Disease, Interaction Design, Service Design, User Experience, Co-design, Digital Healthcare

1 Introduction

During the COVID-19 pandemic the delivery of healthcare in hospitals changed dramatically over a relatively short space of time. Many health resources were stretched and reorganisation of resources was necessary [1]. This has had a significant impact on cardiology care services, where risk of substantial and avoidable excess deaths occurred [2]. There is a rising epidemic of heart failure within the ageing population in the UK [3]. The elderly required shielding from normal hospital environments because of their vulnerability, especially during the pandemic.

Building upon an innovative Cardiology Triage Telephone system, which achieved over 1000 beneficial engagements [4], it was identified that a more immersive experience was desirable. This potentially could provide additional benefits in tackling the burden of travel, parking, and long walking distances for elderly patients leaving

patients feeling breathless. Furthermore, the NHS NetZero strategy [5] identifies that carbon emissions from travel accounts for 14% overall, with 10% directly from patient travel (5%), staff (4%) and visitor travel (1%). Clinicians were further concerned about 'did not attend' rates (DNA) and the opportunity to give patients more options for personalised virtual healthcare.

To tackle this wicked problem [6] we applied design thinking with a cardiologist co-investigator and their Cardiac Assessment Unit (CAU) team, using positive design [7] and user experience techniques to synthesise the problem. The aim was to provide an effective cardiac patient monitoring service through a NetZero adaptation approach.

2 User Experience Research

Healthcare design presents unique challenges due to the complex and sensitive nature of healthcare environments. One major difficulty is balancing the needs of patients, medical professionals, and staff while effectively and safely delivering services. Healthcare spaces must be designed to meet the specific needs of each user group, while also ensuring that medical equipment is easily accessible and can be effectively operated.

Co-design is evidenced as having significant benefit as a healthcare improvement tool [8]. Here, we provide examples of the practical ways in which applied design facilitates co-design. The Design Council's Double Diamond framework (2004), was applied to discover and define problems more clearly. User experience (UX) research can visually define the needs, goals, and behaviors of healthcare users. The methods used included contextual laddering video interview, task analysis and empathy-journey mapping, providing insights into diverse user needs and pain points (patient, family, clinical professionals). This information is critical in creating digital healthcare solutions that are tailored to personalised care.

2.1 Understanding the patients needs

A series of user personas were created to assimilate indicative patients who would use a virtual heart hub. A range of ages, conditions, lifestyles, needs, and goals were considered, from discussion with clinical staff. These were then used to create a series of empathy maps to model patients' experiences and emotions. Within a healthcare context, these allows clinicians to gain a deeper understanding of their patients' needs and perspectives informing personalized care. This can lead to better patient outcomes and satisfaction. A hybrid empathy-journey map (Fig 1) was created to try and visualize the process a patient goes through to get to a cardiology appointment specifying the high and low points of that experience.

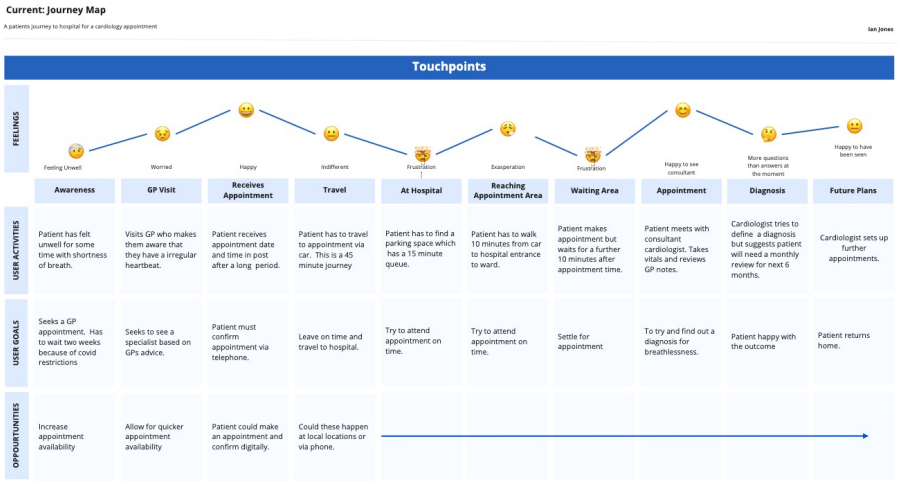

Fig. 1. An empathy-journey map documenting the current process of a patient experience for a cardiology appointment.

2.2 Personalised healthcare, positive design and task analysis

During the 'Discover' phase it was critical to get the insights of the healthcare professionals who deliver the primary care. We conducted a contextual laddering video interview using a Socratic approach, with a cardiologist investigating their current approaches, workflows, procedures and discourse used during patient assessment. Thereafter, a Positive Design workshop, using the happiness deck tool, helped shape our understanding of how Cardiologists envisaged values for a digital support product. Retrospective analysis of the interview informed the co-creation of design wireframes and initial prototypes of the proposed system. This was then visualised as a task analysis (Figure 2).

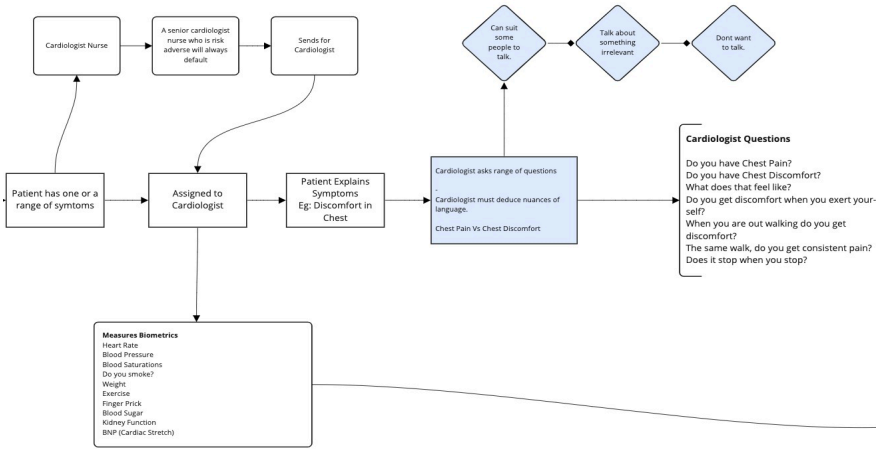

Fig. 2. A task analysis which highlights the workflow of a cardiologist when a patient is referred to them from a GP surgery.

The cardiologist interviews highlighted two main points:

1. There is significant opportunity for different clinicians to ask different questions, repeat questions or sequenced differently during health checks such as weight, lifestyles questions and kidney function, which are supported with routine vital signs monitoring. A digital tool could provide consistency and sequential flow.
2. Patients value the opportunity to talk with their cardiologist. This need not be face-to-face, it may be a phone or video call, reaffirming patient confidence. A digital tool affords multimedia interventions for simulated interpersonal communication.

3 Heart Hub

The ‘Define’ stage, in response to the research discovery involves conceptual design for what has been called a ‘Heart Hub’ providing a support tool to order clinical information and store vital signs data. Sketches were progressed to lo-fi prototypes created in the software Figma (Fig 3). The locational context for the product would be within a public space in the heart of the community, such as a health centre, a pharmacy or public building. Following secure sign-in, patients would be guided through vital signs measurements, using existing medical IoT technology. Design fiction was used here to imagine and explore possible futures and to stimulate discussion around other ideal technologies, currently under developed. Following data collection, a clear summary would be visualized for the doctor and patient. The patient would then wait a few minutes (virtual waiting room) while the cardiologist makes a diagnosis or health status update, comparing previous serial monitored data. They then meet the patient on a video call to discuss the results. Visual brand guidelines were developed with a

component library considering typography, color, and information architecture. This was then applied to an iterative design as a hi-fi prototype (Figure 4). This simulated the real system for future usability testing.

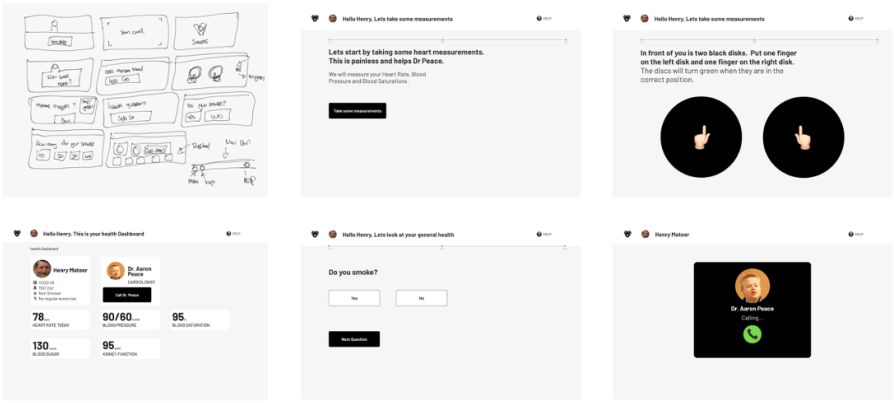

Fig. 3. A series of low and mid fidelity user interfaces for the heart hub

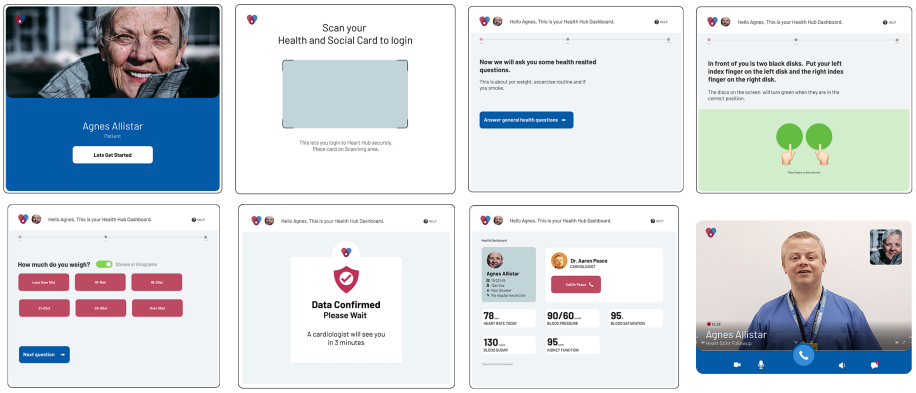

Fig. 4. The high-fidelity user interface that was developed for Heart Hub

4 Conclusion

This design demonstrator provokes further discussion and considerations about the potential of digital healthcare in a changing healthcare system. Research challenges within clinical settings during times of crisis were amplified between busy clinical teams and academic staff, where each operated under different delivery adaptions and human resourcing issues. This meant that timing and synchronizing meetings to discuss prototypes for feedback and testing was limited or the duration of collaboration elongated. Nevertheless, Heart Hub shows the role of design thinking, user experience

design and speculative design for clinical problem solving. Its potential affords patient engagement with the consultant without the need to physically visit a hospital, and has applications beyond cardiology.

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