

Designing Remote Prostate Health Care

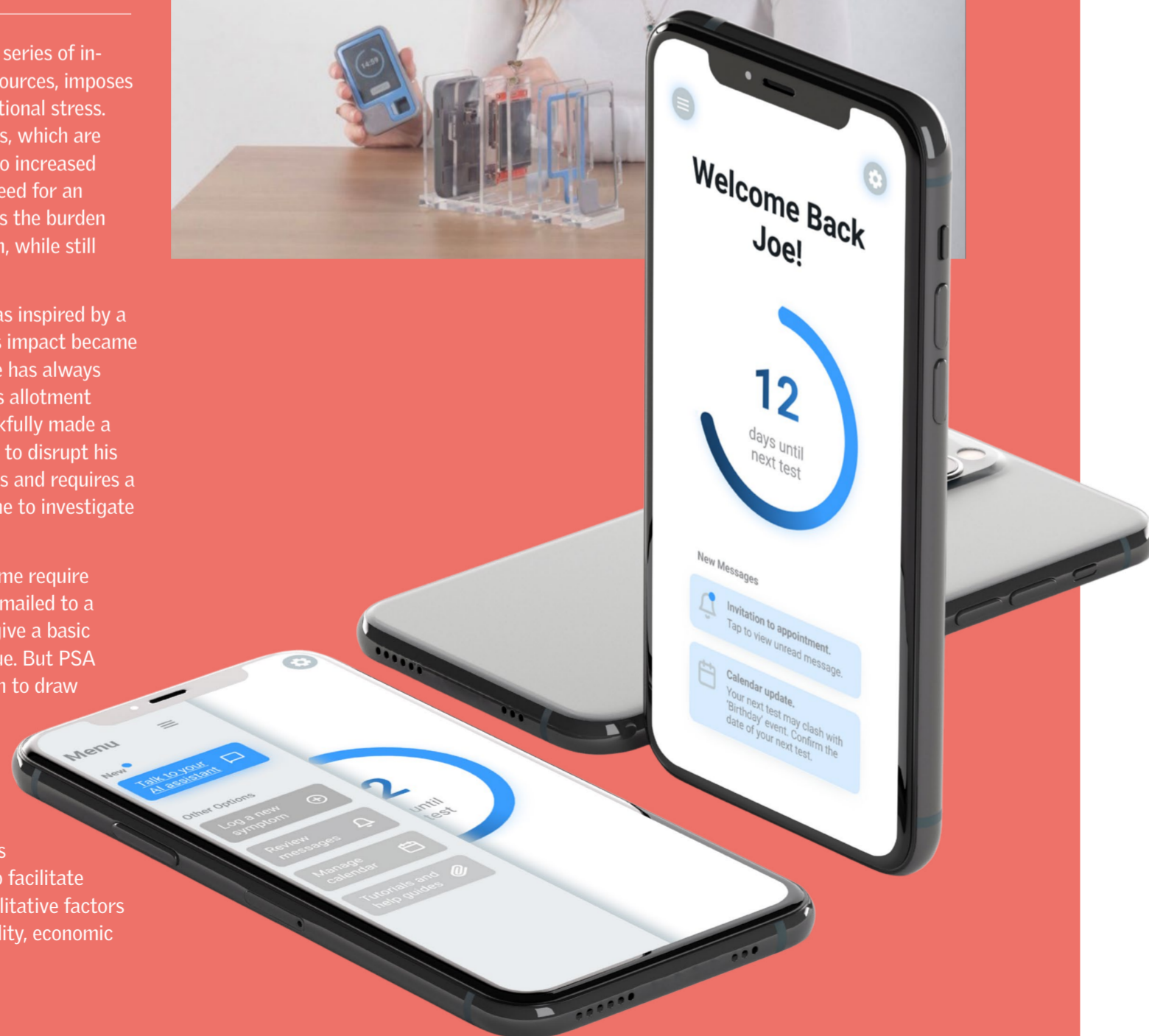
BY ANNA CHAPMAN | BRUNEL UNIVERSITY OF LONDON, BSC DESIGN STUDENT

As healthcare systems face increasing pressure, design has a growing role to play in improving access, usability and patient experience. The Remote Prostate Health Monitor is a design-led response to this challenge, exploring how product design, electronics and user-centred thinking can transform medical testing.

Prostate cancer affects 1 in 8 men and requires a long series of in-person hospital visits, which puts pressure on NHS resources, imposes inconvenience for the patient, and increases their emotional stress. Early detection of prostate diseases relies on PSA tests, which are typically performed in clinical settings. However, due to increased strain, targets are not being met. There is a growing need for an accessible and patient-friendly alternative that reduces the burden of hospital visits, particularly for the ageing population, while still providing effective monitoring and support.

The Remote Prostate Health (RPH) Monitor project was inspired by a real-life experience. My understanding of this disease's impact became personal when my Grandad was diagnosed in 2015. He has always led an active lifestyle, spending most days either on his allotment or enjoying time on the golf course. While he has thankfully made a full recovery, regular follow-up appointments continue to disrupt his routine. Regular PSA testing causes unnecessary stress and requires a near one-hour journey to the hospital. This provoked me to investigate why there were no remote solutions available.

Existing at-home PSA tests have major limitations. Some require third-party involvement, meaning the sample must be mailed to a lab, with results taking up to seven days. Others only give a basic 'high' or 'low' indication, rather than an exact PSA value. But PSA levels naturally fluctuate, so a single result isn't enough to draw conclusions, rendering widespread screening useless. What really matters is identifying a consistent rise across multiple tests within a six-week period and comparing these results against established health criteria to build a clearer picture of a patient's overall prostate health. My project addresses these limitations by providing quantifiable results, reusable hardware to facilitate retesting, and a comprehensive evaluation against qualitative factors that may affect PSA results. This improves test reliability, economic viability, and result interpretation.



How it Works

The biggest challenge was to make a functioning prototype. I explored many different methods of testing PSA before being able to produce a proof of function that could operate within a smaller, portable product. This device uses a colourimetric system, meaning the colour of the test correlates to the level of PSA in the sample. Users perform a finger-prick blood test and insert the strip into the device. Similar to COVID lateral flow tests, a coloured line appears if PSA is present. Extensive studies demonstrate that the intensity of the line's colour correlates with the concentration of PSA in the blood.

This device uses an RGB colour sensor to detect the precise colour composition of the line and translates that into an accurate PSA concentration. The result is automatically received by an AI framework that compares chemical results with qualitative health data from patient records to improve interpretation and enable a level of diagnostic insight that was only available through in-person testing. The system stores data in a companion app, allowing clinicians to monitor trends and respond to concerning results. This reduces the need for frequent hospital visits and eases pressure on healthcare services.

Design Process

At the start of this project, my goal was to design a remote PSA testing system that could be reused every six weeks to monitor health trends. However, as I explored existing solutions, I discovered key limitations, particularly the lack of integration with qualitative factors, that made them unsuitable as true alternatives to in-person appointments. This led me to redefine my scope and take a deeper look at the broader challenges of at-home testing. From there, I began conceptualising and rapidly prototyping device designs. My aim with the design's development was to be user-focused and ensure that it fulfilled all of the patient's needs, rather than taking on a clinical perspective.

I collaborated with a small focus group of potential primary users to evaluate ergonomics, user needs, and human factors, ensuring the design remained user-centred throughout. Empathising with users revealed key areas for development. Many associated remote care with feelings of anxiety and abandonment. To address this, I integrated an AI assistant that users can interact with, offering real-time answers to their questions and providing reassurance. I also tested app prototypes with participants to ensure the interface was accessible and intuitive for users of all ages and levels of tech proficiency. I then focused on refining the electronics, testing different sensors to optimise the accuracy and repeatability of PSA readings.

BSc Design

I have always had a passion for design through school, and my degree challenged me to think beyond aesthetics and consider how design can create genuine value. This final year project really shifted my perspective and taught me the importance of designing around real-life needs. Since graduating, I have started my professional journey as a designer for a women's well-being company, where I continue to focus on user-centric design solutions.

