Imperial College London

P24 Patient

A project by:

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The Dementia Problem

- **1 in 4**[1] UK hospital beds are occupied by a dementia patient.
- **20%** of dementia patients are hospitalized due to easily preventable infections.
- **1.1 million**[1] people in the UK are projected to live with dementia by 2025.
- **£26 billion**[2] is spent on the care and treatment of dementia patients annually.

Given these figures it is vital that solutions are developed to provide more effective care for people with dementia.

1 NHS Long Term Plan. (2019). Technology helps clinicians monitor the health of dementia patients in their homes.
2 NHS UK (2019). NHS England - Dementia

Technology Integrated Health Management

TIHM is an award-winning study using cutting edge technology to improve the quality of life for people living with dementia at home.

The current solution consists of:

- A network of 21 devices to monitor the patient.
- Advanced algorithms to detect anomalous data, enabling early interventions by a clinical monitoring team.

Phase 1 (2016) of the study showed:

- A reduction in visits to A&E and GPs.
- Reassured carers and patients.

TIHM is run by the University of Surrey and the NHS Surrey and Borders Partnership

Client Requirements

The client wishes to extend TIHM to primary care by enabling more rapid deployment across a wider range of patients Specifically, the client requirements are:

- Simplify and streamline the reporting of key vital signs.
- Increase the frequency and ease of measurements.
- Transmit sensor data to the GP systems directly.
- Investigate additional signal processing algorithms to analyse data and provide deeper insights.

Vision & Future Work

In order to simultaneously make the product more suitable to the client and allow it to be commercially successful, the team endeavours to:

- Develop an algorithm for wrist blood pressure sensing.
- Test the device in a clinical environment at the TIHM Living Lab.
- Become part of the TIHM suite of monitoring devices.
- Develop a mass-producible casing and wristband.

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Next generation remote patient monitoring.

Bringing together newly released sensors and state-of-the-art self-charging technology to provide consistent and reliable vital signs.

Heart Rate: sensor released in March 2019; detection of QRS complex is performed using a wavelet-based algorithm.

Skin Temperature: a crucial indicator of patient health and well-being.

Blood Oxygen: sensor released in April 2019. Wrist-based blood oxygen sensing is not widely available in commercial wearables.

Step Count: determined using an advanced pedometer algorithm.

Self-Charging

Under ideal conditions, the device can be fully powered by the heat of the patient's skin.

Intelligent power management leverages the thermoelectric generator, built-in LiPo battery and USB-C charging.

Connectivity

Bluetooth Low Energy is used to enable frequent, reliable and energy efficient communication of sensor data to the base station.

NFC is used for seamless, secure pairing and launching of the app.

Ergonomics

- Ensures close sensor-skin contact.
- Maximises patient comfort.
- Minimises patient input through a buttonless design.
- For the patient, the device is no more than a bracelet accessory.

Set-Up & Accessibility

1. Download an app.
2. Slide the device over the wrist.
3. Tap the smartphone against the device to launch the app and pair.

There is absolutely no input required from the patient, they can soon forget about the device.

The P24 apps give patients and carers real-time information about their vital signs.

User Interface

The Android and iOS apps provide a base station that includes:

- Main Dashboard showing current measurements and visualised data.
- History Dashboard for in-depth analysis by patient or carer
- Settings Page allowing patient/carer to control the degree of alerting provided
- Quiet mode, which hides live data for simplicity.

NHS Integration

The base-station forwards data from the patient's home to the FHIR (Fast Healthcare Interoperability Resources) database, which is used by NHS GPs and hospitals.

Preventing Illness Using Machine Learning

Alerts are determined by using novel machine learning algorithms that detect anomalies in patient sensor readings.

Additionally, the device provides valuable data for the TIHM backend system.

No data is stored on the machine learning server - the device remains GDPR compliant.

Alerting System

The fully customisable alerting mechanism will keep a patients' carers or loved ones up to date via regular and emergency SMS updates.

Price:
£29.99