# *Revolutionising health*

## Predicting patient health using blockchain and wearable technology

March 2018

**pwc**

# Content

# *Introduction*

*Wearable technology has taken the world by storm over the past number of years. Members of the public have been liberated, finally able to take control over their health, wellbeing and lifestyle. More so now than ever, lifestyle has become a major factor in the success of many sectors. If we look at retail, experiential shopping has become the latest trend, where people are learning new skills or are able to buy and also have a memorable store experience, whether through an event or masterclass or perhaps through the use of technology. Finance is almost dictated by lifestyle. People no longer want to queue in the bank to deal with their finances. They want to access account information from the comfort of their home or whilst commuting to work. Healthcare is no different. People want to know how their body works and how they can live healthier, happier and longer lives. Wearable technology has opened to door to many people where we are finally able to monitor our fitness levels and sleeping patterns. This has normally been used for the leisure sector, however it can extend further and help those with long term health conditions that need to be managed on a daily basis by patients.*

# *Wearable technology applications*

Take for example a patient that has a heart rhythm disorder. Instead of this patient wearing a heart monitor that records and stores data that is then downloaded onto a computer, the patient could wear a discrete device that transmits the heart rhythm in real time to a consultant. This can be worn for an extended period of time and hence all the data collected can be stored on the patient's health records. Currently the security of the data, when transmitting to mobile applications is poor and could be a potential risk and opportunity for hackers to attack.

Wearable technology offers many options to improve the quality of life in conditions that require long term management. Already there are diabetic monitors that test blood sugar levels and transmit results direct to a consultant in real time. Patients with unstable blood glucose can greatly benefit from this as patients can gain better control of their blood sugar levels.

A patient could potentially use wearable devices to monitor blood pressure, pulse, sleep apnea, narcolepsy, epileptic seizures and diabetes. Another area that it could be used is in dementia. This disease is growing at a fast rate in today's society and is affecting younger generations. Quality of life can deteriorate and it is hard for patients to survive independently. Wearable technology offers patients the window of opportunity to live an independent life for longer. If patients were to wear, for example, a dementia necklace that would detect pulse and also if a medication has been swallowed, a patient's quality of life could be improved. Pulse detection is important as if heart rate increases it could mean that the patient is under stress and potentially their condition is deteriorating. The same applies to the swallowing of medication. Generally patients lose the ability to swallow as they forget how to or do not trust the medicine. This triggers the use of liquid medicines by prescribers. If the necklace were to detect swallowing issues, this would trigger a step up in therapy and potentially slow down the deterioration process, extending the patients quality of life. Carers could monitor how patients are in real time and be alerted to any abnormalities or if the dementia sufferer is leaving the premises. Not only could the data collection be disease preventative, it could improve patient safety.

All of this data is highly sensitive as it incorporates a patient's identity. This needs to be kept secure. Current procedures have been reported as not appropriate and better security is needed, especially in light of recent cyber security attacks. If security is improved, prescribers could have valuable data to help in diagnosis and monitoring of treatment.
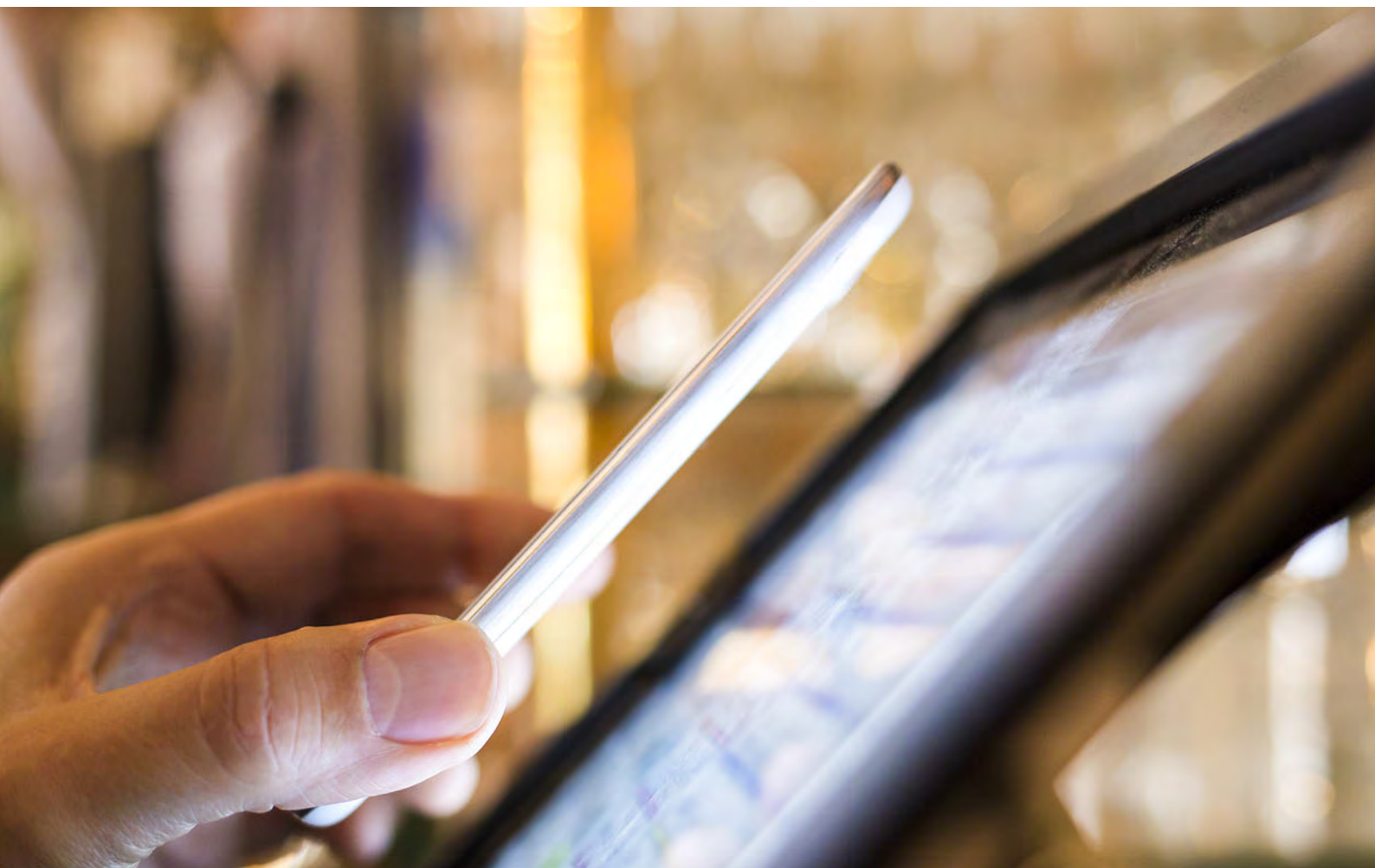
# Imagine a blockchain solution

Every wearable device and mobile application, with the aid of blockchain, could link to a patient hub with all of the patient's health records. This would allow health professionals to access a new level of visibility and a new set of data on the patient's health. A wearable device could update to the ledger system, at specified time intervals, such as hourly, and hence data can be collated to give a better overall image of a patient's health or condition. Consultants and/or prescribers can prescribe with more accuracy and also can be triggered to look at patient data if it is abnormal.

By having this data accessible it is easier for paramedics to prepare for treatment whilst travelling to the patient. They can see if pulse or blood pressure is stable or if the rate at which the patient is deteriorating.

# Meeting the criteria

There are six blockchain criteria that must be met for successful implementation.

- Multiple parties need to share data
    - All prescribers must be able to access the health data in order to prescribe and monitor patients accurately.
- Multiple parties need to update data
    - Wearable devices need to be able to update automatically to the platform to allow real time data to be collated.
- Verification is needed to ensure information can be trusted
    - Data is highly sensitive and needs to be accurate and secure in order to be trusted as clinical decisions depend on it.
- Intermediaries add complexity
    - The more people involved in the process, the more risk of breaches in security and potential theft of data.

- Interactions are time sensitive
    - Real time data is needed for accurate monitoring and prescribing to occur;
    - Quick access is needed in emergency situations; and
    - Real time monitoring allows patients to be monitored at a closer level, alerting relevant medical staff of potential issues if data is obscure.
- Transactions interact and are dependent on each other
    - Without the real time health data, prescribers have to make assumptions in regard to a patient's health;
    - Each party must be able to interact with the data and access it in real time; and
    - Health professionals must be alerted of abnormalities in data to identify health issues at a faster rate.
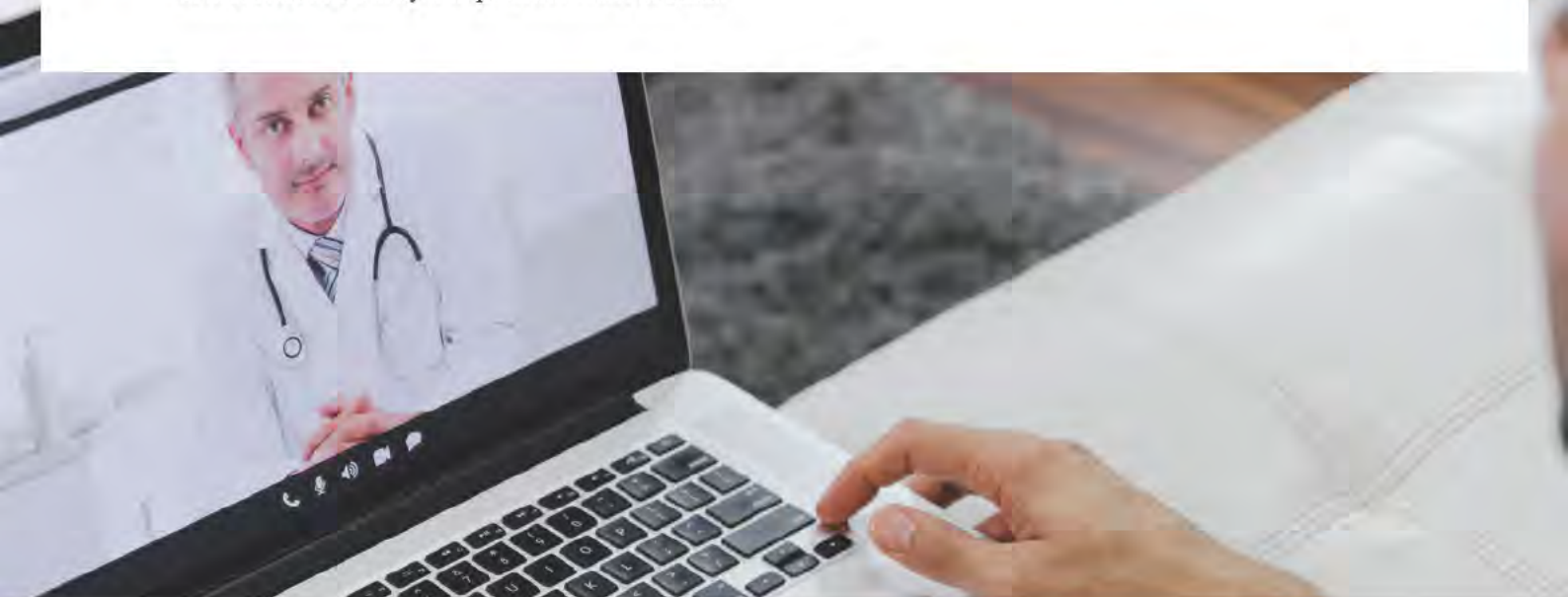
# *The benefits*

- Reduced complexity and cost
  - The process becomes simpler. Less time is spent in review appointments as doctors can access data in real time and therefore may not have to see the patient face to face. This also has cost efficiencies for the health service, and allows medical professions to focus on other areas of health protection and improvement.
- Reduced errors
  - More accurate prescribing can occur as prescribers can access health data that allows them to prescribe with precision.
  - Precise monitoring of the patient can occur and gives light to potential life threatening conditions at an earlier stage.
- Enhanced security
  - Health data is highly sensitive. Through the use of blockchain, information can be securely stored and accessed by relevant authorised individuals.

- Proven resilience
  - Only authorised individuals are able to access the relevant data.
- Shared trusted transactions
  - Information is updated onto the secure ledger system and accessed by authorised parties.
- Creation of an audit trail
  - Data is time and date stamped allowing it to be traceable and used to form graphical representation of the patients health.
  - Factors can be identified through the use of the audit trail, identifying triggers for stress, etc.
- Enhanced transparency between authorised parties
  - Health becomes more transparent allowing patients to take more responsibility over their own health, in keeping with health policies developed by government.
  - Prescribers can see data and prescribe accordingly.

# Revolutionising health

Through the use of wearable technology, a patient's health is completely revolutionised:

- The patient has had high blood pressure. Their GP receives an alert to notify him of the patient's dangerously high blood pressure levels and a message is sent to the patient that he needs to make an appointment.

- A patient has a heart attack. Through the access to his health records via blockchain and the wearable technology data, the paramedic is able to analyse his health status and get a better picture as to the patient's condition and can decide on what level of treatment is needed. This time saving activity can be the difference between life and death.

- The patient is discharged from hospital and is being monitored by the consultant. Through wearable technology, patient's are able to be monitored at a closer level than ever before.

This is just a small example of what could be achieved through the use of blockchain and wearable technology. In this one scenario, this patient may have extended and improved their quality of life. They are now able to take responsibility over their own health and hence can start to make adjustments and become healthier overall. By accessing health data we can achieve more accurate prescribing and reduce drug wastage. Better monitoring can improve the overall health of the public as issues are identified at an earlier stage allowing us to see treatments becoming more precise and healthcare becoming a more tailored experience for all.

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