Dr Michelle Tempest, partner at strategy consultancy Candesic, explores how private equity is investing in everything from digital diagnostics to AI tertiary care

Injecting capital into health tech

The recently published book *Bad Blood* is an expose into how 'not to invest' in the healthcare sector. It follows brave journalist, John Carreyrou, as he investigates the finger prick blood diagnostic Silicon Valley start-up company Theranos.

Elizabeth Holmes, founder and CEO, was named by Forbes in 2015 as the youngest and wealthiest self-made female billionaire in America on the basis of a $9bn valuation of Theranos.

A year later, following allegations of fraud, Forbes revised her net worth down to zero. Holmes is now facing charges for falsifying or exaggerating claims about both the technological capabilities and accuracy of her blood-testing company.

The book is a jaw dropping insight into how marketing spin seemed to outweigh the requirement for expert due diligence into basic science, laboratory evidence or even patient results. Holmes' personal support listed the great and the good including Henry Kissinger, Bill Clinton George Shultz, James Mattis and Betsy DeVos. Her rise and fall story is being made into a 2020 Hollywood movie.

But this is not to suggest that health and social care investors should be scared of the healthcare market.

Change is happening fast. Digital disruption has arrived. And big wins are on the horizon.

In the US, physicians are increasingly turning to private equity for injections of capital. Specialties including, orthopaedics, urology, pain management, ophthalmology, radiology, gastroenterology and dermatology, are forming branded chains. Going head to head, in competition, with traditional secondary care offerings.

There were 45 physician practice transactions announced in the first quarter of 2019, a pace set to surpass the 181 deals reported last year by Bloomberg.

Investment is spent on expanding clinical services to more patients, recruiting top staff and automation and digitisation to help drive up standards and efficiencies. Schweiger Dermatology Group used private equity money in the USA and, in the UK, August Equity invested in an England-wide dermatology roll-out.

The results of these evolving care pathways will also help supercharge digital change.

The NHS has been on a well-trodden path of digital pilot projects, however, results (positive and negative) have often stalled at the single site phase, limiting the spread of knowledge and know-how across the NHS landscape.

To be fair to the public sector, this is not down to lack of good will, but rather the distractions of firefighting budgets, crumbling estates, moving political targets and haemorrhaging staff. It's not conducive to innovation, but make no mistake, digital is here to stay.

> IT'S WELL KNOWN THAT THE PRIMARY CARE SETTING IS UNDERGOING A DIGITAL TSUNAMI

The newly formed government body 'NHS X' will play a vital role in overseeing digital, data and technological transformation, although it is private money that is most likely to come to the rescue with a 'spend to save' investment digital thesis.

World of change

Change, for now, is happening a bit like a sandwich with tertiary specialist and community primary care settings seeing the biggest bread and butter digital shifts. Take the example of Intensive Care Units (ICU). These have always required patients to be under continuous monitoring with large multi-nodal data collections. It therefore makes sense for AI to help guide clinical decisions - a partnership known as 'augmented intelligence'.

Take the example of global medical technology company, Medtronic, which operates in over 140 countries. In ICUs across the world, Medtronic has been collecting and analysing data to help form a full overview of what is going on with mechanically ventilated patients. It has developed a clinical protocol-driven weaning tool to help patients off a ventilator earlier and reduce ICU length of stay by 11%.

It's this kind of large real time data collection that can really make a difference in highly complex care and move clinical decisions into real time rather than having to wait for the traditional doctor-led ward round.

Sensyne, listed on London Stock Exchange (AIM) in 2018, is partnering with NHS hospitals and industry to provide AI-driven services for hospitals to identify high-risk patients and for the research, development and commercialisation of new medicines, medical devices and biomarkers.

At the other end of the acuity spectrum are homecare, community care and primary care. These areas are becoming increasingly 'consumerised', boosted by the realisation of population maths – there are just not enough clinically trained staff to look after the aging population. This is the journey health and social care is on – patients will require education to manage their own chronic

conditions, including the use of digital therapeutics in the home.

But there is a way to go; 76% of GPs polled in a recent survey expressed concern that the use of 'Dr Google' by patients does more harm than good with false or inadequate information. Some GPs have started using a new service offered by start-up Cognitant to allow patients to view information recommended or prescribed by their doctor, nurse or pharmacist.

It uses 3D graphics to provide explanations about health, disease and treatment and is available to view on smartphones and virtual reality headsets.

Dr Tim Ringrose, CEO of Cognitant said: 'Prescribed 3D health information enables patients with chronic conditions to better manage their own health enabling them to experience better outcomes and avoid unnecessary and costly complications.'

It's well known that the primary care setting is undergoing a digital tsunami. GPs now have the ability to offer consultations over smart phone rather than in the traditional bricks and mortar setting.

In the UK, Babylon frequently hits the headlines for offering this type of service to both private and public clients.

> THE NHS HAS BEEN ON A WELL-TRODDEN PATH OF DIGITAL PILOT PROJECTS... RESULTS HAVE OFTEN STALLED AT THE SINGLE SITE PHASE

Figure One illustrates some of the major players around the world. Even big Chinese companies, Tencent and Alibaba, are offering round-the-clock online consultations. Many are applying a 'blitzscale philosophy' – getting as many users signed up as fast as possible. But investors in unicorns are starting to fine tune and professionalise business models.

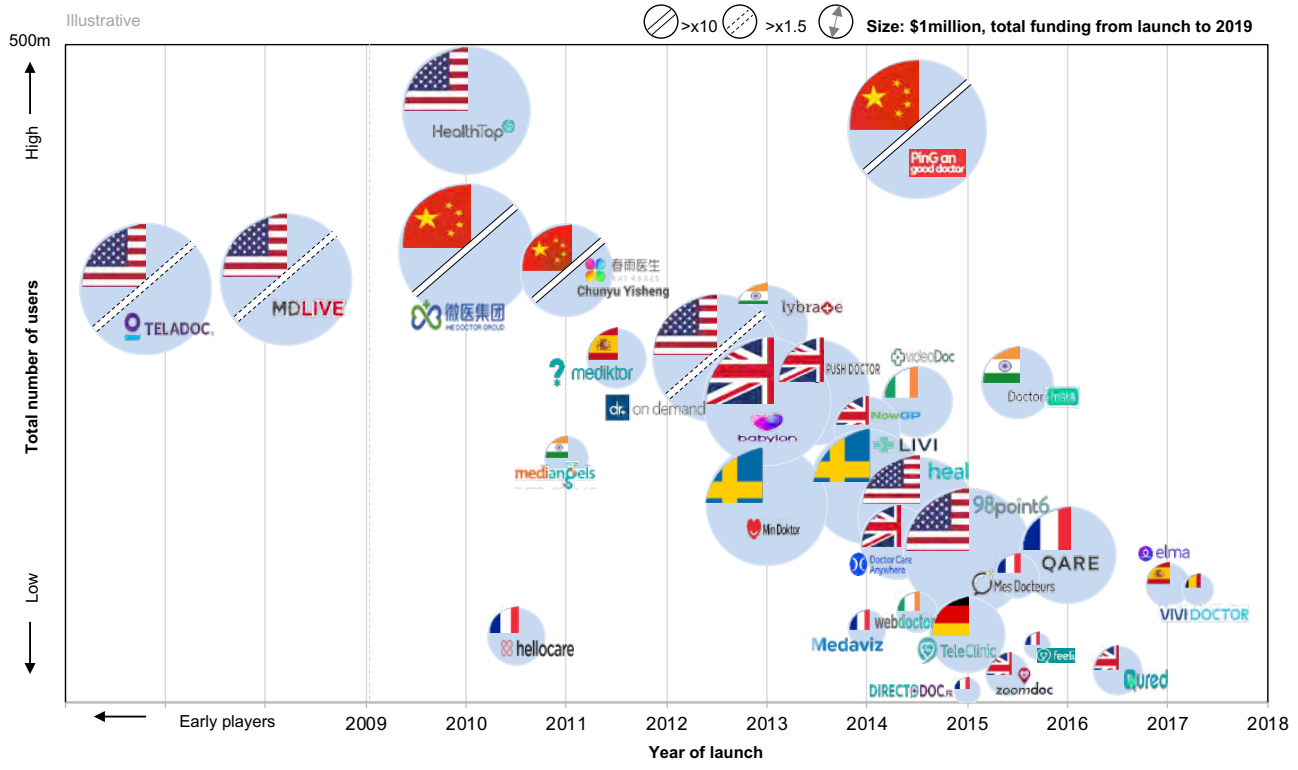
In the UK, Doctor Care Anywhere is differentiating itself by joining up its primary care platform with secondary care via an e-hospital (the meat in the digital sandwich analogy).

Its founder and CEO Dr Bayju Thakar and chief medical officer Dr Yvette Coldicott believe the prize in joining up primary and secondary care improves the care pathway and makes financial sense for payors (state, insurance and self-pay).

Delivering more secondary care in the home setting, rather than in expensive and overloaded acute hospitals should help reduce the backlog of outpatient appointments, expedite diagnosis and be more convenient for customers.

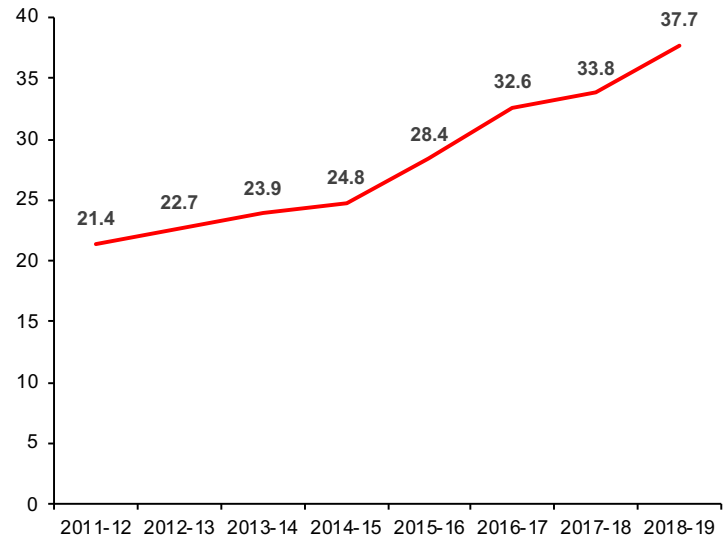
One potential win-win identified is in urological services where e-hospitals could offer care at home.

FIGURE ONE
GLOBAL DIGITAL PRIMARY CARE COMPANIES



NOTE COMPANIES INCLUSIVE OF VIDEO CONSULTATIONS. FLAGS:HQ OF COMPANY
SOURCE COMPANY WEBSITES; CANDESIC RESEARCH AND ANALYSIS

FIGURE TWO
UROLOGY WAITING TIMES - COMPLETED PATHWAYS (IN WEEKS)



SOURCE CANDESIC RESEARCH AND ANALYSIS

Figure Two highlights that urology is one of the specialties where hospital waiting lists are increasing and where it would make sense for more care to be delivered in the community.

Home diagnostics

This brings us back home diagnostics. Healthy.io recently raised $18m in a series B funding for an at-home urinalysis test. This Tel Aviv-based start-up has now raised $30m in total.

Its digital testing kit, Dip.io, enables people to collect and analyse urine samples with nothing more than a smartphone app, a dip stick, and a colour-coded slide.

The medical-grade CE and ISO 13485 certified-for-sale kit performs urinalysis specifically tests for: ketones, leukocytes, nitrates, glucose, protein, blood, specific gravity, bilirubin, urobilinogen and pH – markers that span pathologies for a range of infections, kidney disease and pregnancy-related complications.

Dip.io has been made available in a virtual clinic in Yorkshire with initial reports saying that 10% of patients who took the test were found to have elevated levels of protein – possibly indicating unknown kidney disease. Consultant urologist Heidi Tempest highlights that 'this an exciting start of how new technology can help reduce the number of visits to both GPs and hospitals.'

MICROSOFT, AMAZON AND GOOGLE ARE 'COMMITTED TO REMOVING BARRIERS'

Making the right moves

In summary, digital technologies and AI can rapidly spread to become ubiquitous.

Big tech platforms with global penetration are set to leverage their oligopoly. In 2014, Alphabet (the parent company of Google) handsomely invested $525m in machine learning company DeepMind. At the time of its investment, DeepMind was virtually unknown with no customers and only a handful of employees. Only later did the world understand the price tag when DeepMind demonstrated that it had developed a system which had learnt to play 49 arcade games from a 1980s video console by trial and error, 29 of which it managed at above-human-level performance.

In conjunction with London's Moorfields Eye Hospital, DeepMind has gone on to publish in *Nature*, describing how its AI system can interpret eye scans for over 50 sight-threatening eye diseases as accurately as world-leading expert ophthalmologists.

Moorfields' clinicians are now using it for free across all 30 of its UK hospitals and community clinics, serving over 300,000 people per year.

Apple has also filed multiple patents to turn its consumer products into medical devices which can monitor biometric data, such as blood pressure and body fat levels, as well as to develop algorithms to detect heart arrhythmia. The consumer tech giant is also looking into how to democratise medical records stored on mobile phones.

Tellingly, Microsoft, Amazon, Google and other IT companies released a joint statement saying they are 'committed to removing barriers for the adoption of technologies for healthcare interoperability, particularly those that are enabled through the Cloud and AI'.

Having an interoperable system to ingest, store, analyse and interact with personal and non-personal medical records in a secure end-to-end environment could revolutionise research and development into helping find answers to complex healthcare questions.

One thing is clear: we are living through the digital healthcare era. Winning healthcare investors are not going to be the bandwagon groupies, but will be those who take the time and effort to understand clinical relevance alongside academic rigour.


Dr Michelle Tempest, partner, Candesic