Doctors and Hospitals Are Losing Patients...to Cell Phones

Increasingly, the handheld technologies that power our electronic world are being put to use in healthcare. The engineers are taking over from the biochemists – giving a new wave of medical innovation.

Today, we're looking at how these new engineering technologies are being applied to medicine. The result is a revolution – enabling diagnosis and treatment that's cheaper and faster. All the devices and approaches we're covering today are small, inexpensive and non-invasive. Therefore, they can take healthcare out of the hospital, and into the home or clinic. That potentially makes healthcare much more accessible – especially in poorer and more rural areas.

As usual, we're giving our special *Exponential Investor* treatment to recent news from the sector. We pick out the most important, trend-setting stories – then put our analysis on top, to help guide your investments. We'll help you to spot the firms and sectors that are tearing up the rule book – ready to become the breakout investments of the coming decade.

(Don't) call the midwife

As fertility rates fall, an increasing proportion of pregnancies are to first-time mums. These women don't have the experience to know what each sensation means. One particularly confusing feature of pregnancy can be Braxton Hicks contractions. These don't signify labour – but can easily confuse mums-to-be. When the baby isn't on its way, there's no reason to call the midwife. Unnecessarily ing to hospital ties up valuable beds, as well as stressing patients.

Bloomlife helps avoid this. By tracking contractions, its wearable womb-monitor can reassure pregnant women. This helps ensure they seek medical help only when it's needed. At present, the device is observational, not diagnostic. However, it doesn't take a genius to see that there's a huge commercial incentive to improve and regulate the device – naturally by using machine learning, as more data is gathered. That way, only pregnant women who really are about to give birth will end up in hospital. (TechCrunch)

AI – outsmarting the doctors

You probably think that a specialist doctor would be a dab hand at predicting disease outcomes. However, machines are rapidly overtaking clinicians' diagnostic abilities. One way they're winning, is in predicting survival rates. A team from the Medical Research Council recently trained a machine learning system on pulmonary hypertension. (That's high blood pressure in the lungs, and it can cause heart failure.) Its approach enabled a significant improvement in estimating patients' prognosis, compared to conventional methods. That means treatment can be planned better – with scarce transplant organs being directed only to those who will best benefit. (*Radiology*)

Another AI example is from **Canary Speech**. The firm is working on voice analysis software to listen for the tell-tale signs of Parkinson's disease – a condition where early diagnosis is critical. Naturally, people listen to what others are saying – and usually "tune out" subtle, progressive changes in the voice. Accordingly, we ordinarily miss the chance to use this shift in speech as a means of diagnosis. Machines don't make this error – so this is likely to be a promising diagnostic approach. One day soon, a smartphone app could passively listen to all your speech – and spot early signs of a range of conditions. I've personally looked at developing a similar machine-learning analysis of gait – to much the same ends. (BBC News)

Bring on the biosensors

Beating disease isn't just about finding cures. Often, diagnosis and screening is half the battle. One such approach is being pioneered by Professor Cathy Holt of Cardiff University. Her team is adapting a cheap, disposable audio sensor from the aircraft industry. This was originally designed to listen for abnormal noises from aircraft components. The team discovered that it's also a promising technology for detecting ultrasonic creaks and cracks from failing knees. This alerts medics, and their patients, to the accumulating damage. As a result, the right combination of life and medical interventions can be brought to bear – controlling this debilitating and costly condition. (BBC News)

Similarly, stroke is a condition that's not only tricky to diagnose – but also extremely urgent to treat. Stroke symptoms can easily be confused with other conditions – such as migraine, or even drunkenness. Any resulting delay in treatment can result in death, or major disability. **Sarissa**'s SMARTchip detects one of the first identified biomarkers of stroke: purines. These double-ringed chemicals are found in a wide variety of processes in the – but elevated blood levels indicate a probable stroke. Faster detection means faster treatment – and that means more people survive, recover, and can continue in work. The public

health benefits are obvious, as stroke is an extremely debilitating condition. (Graun)

DNA testing? There's an app for that…

Once the preserve of billion-dollar budgets, DNA analysis can now be performed on a humble smartphone. Two different approaches are available – each using a hardware add-on. One method combines a microscope adaptor for the camera – plus a tiny chemistry kit, for spotting the relevant genes. This costs around the same amount as the phone itself. **Oxford Nanopore Technologies** has an alternative approach – and its SmidgION hardware doesn't rely on the camera. Potential clinical applications are broad – including testing biopsy samples for cancer, and identifying bacteria presence and type. (BBC News/ *Nature Communications*)

These new waves in technology are exactly what *Exponential Investor* is all about. If you've spotted some crucial firms – or even entirely new trends – please do let us know: andrew@southbankresearch.com.

Best,

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