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## Commentary

## The Democratization of Diagnosis: Bringing the Power of Medical Diagnosis to the Masses

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We are in the midst of a revolution in medicine. As new diagnostic consumer devices emerge every day, the natural order of disease detection is shifting, and the clinical implications are profound.

In the novel study by Reed et al. – the first of its kind in the UK – we see the immense power of smartphone-based event recorders in augmenting traditional care models [1]. Their study reinforces the new truth that these devices not only accurately detect disease, but also do so more quickly, more cost-effectively, and at a grander scale. Though set in the Emergency Department, it introduces a paradigm that can be applied across specialties and workflows. Its findings foreshadow significant implications in clinical resource allocation. Consequently, it raises a fundamental question at the core of medicine – who shall have the power to make diagnoses?

We have seen an unprecedented number of health monitoring devices emerge and embed themselves into the fabric of medicine. The Apple Watch alone – which now has FDA-approved ECG sensors and algorithms – is rumored to have sold 50+ million units and is expected to sell another 30+ million in 2019 [2]. There are now medical-grade activity trackers, sleep monitors, glucose monitors, ECG monitors, and as of early 2019, wrist-worn continuous blood pressure monitors like the Omron HeartGuide [3]. With so many devices in the consumer space, they are destined to become an integral component of the doctor-patient conversation. And we are starting to witness the benefits.

They are, without a doubt, fundamentally changing the way we diagnose disease by promoting virtual diagnosis outside of the traditional brick-and-mortar clinic. Instead of waiting for a clinic visit for diagnosis, patients are coming with a diagnosis in hand. And the chance of them

being correct is becoming increasingly higher. With the AliveCor Kardia, a new diagnosis of Atrial Fibrillation is backed by a 96.6% sensitivity and 94% specificity chance of being right. As discussed by Reed et al., this leads to tremendous healthcare savings. In their study, it reduced the time-to-disease-detection by 78%. It increased cost-efficiency by eliminating expensive work ups (i.e. expensive Holter monitors) and reduced costs by 67% [1]. In the ED, where time and efficiency are essential, these devices are invaluable.

This efficiency also goes beyond the ED and promotes new virtual care models to replace inefficient traditional outpatient clinic models. It eliminates the need for standard routine appointments where patients inevitably find themselves asymptomatic. Instead, it allows patients to schedule visits only when they know something is awry. And if appointments are reserved for active patients, then it allows specialists to focus on those who require immediate assistance, thus liberating specialists' time and valuable appointment slots.

It has the power to elevate the sacred doctor-patient discussion to greater heights. Device data introduces concrete objective information into the discussion. Device sensors and apps bring context to symptoms and unveil new insights into what we were doing or where we were when the device detected an arrhythmia. Lastly, these platforms promote new opportunities in patient education. When a device detects atrial fibrillation for the first time, there is an opportunity for innovations like the Virtual Doctor avatar – a mobile-based virtual reality doctor developed by the USC Center for Body Computing – to explain the diagnosis and use artificial intelligence to answer FAQs about the disease [4]. This helps patients become better informed prior to their appointment, and it elevates the subsequent doctor-patient conversation to a higher plane.

The stage is set for a new natural order in the way we diagnose disease. However, we must ensure that these new clinical work flows are implemented safely. In a world that is increasingly virtual, data privacy

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is of the utmost importance. New ethical standards must be implemented to bring Hippocrates into the 21st century, as exemplified by the recent multidisciplinary effort to develop Stanford's "Guiding Principles for Ethics in Digital Health" [5]. True to the core of medicine, patients and their safety must come first.

As these devices and virtual care models become universally adopted, they will define a new universal truth. In the way social media redefined the way we view each other, these devices will define a new way to view our health. There is a proverb amongst Millennials – "*If it's not on Instagram, did it really even happen?*". Then devices like the Apple Watch will set a new standard of truth in Medicine – "*If it didn't capture the arrhythmia, did it really even happen?*"

This is a cultural revolution. The sacred power of diagnosis now lies in the literal hands of the everyman.

### Competing Interests

Nothing to declare.

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### References

- [1] Reed, et al. Multi-centre randomized controlled trial of a smartphone-based event recorder alongside standard care versus standard care for patients presenting to the Emergency Department with palpitations and pre-syncope: the IPEd (Investigation of Palpitations in the ED) study. *Trials* 2019. <https://doi.org/10.1016/j.eclinm.2019.02.005>.
- [2] Hall Zac. Apple watch business to grow 40% YOY in 2019 with 33M units shipped, UBS predicts. <https://9to5mac.com/2018/10/31/apple-watch-sales-5/>; 31 Oct, 2018.
- [3] Omron HeartGuide. <https://omronhealthcare.com/products/heartguide-wearable-blood-pressure-monitor-bp8000m/>.
- [4] Virtual care clinic. <https://www.uscbodycomputing.org/virtual-care-clinic>.
- [5] Statement of guiding principles for ethics in digital health. <https://library.stanford.edu/digitalhealthethics/guiding-principles>.