Entering the Era of Cognitive Computing

The concept of digital health is not new; a pioneer in radio and publishing, Hugo Gernsback, first put forward the concept in the 1920s proposing a device called the "teledactyl" which would allow doctors to not only see their patients through a viewscreen, but also touch them from miles away with 'spindly robot arms'. The premise behind the concept was not too dissimilar to the issues we face today. In 1925, Gernsback predicted that *"the busy doctor, fifty years hence, will not be able to visit his patients as he does now"* so technology could provide the conduit to allow patients to come to him.

This visionary concept was clearly ahead of its time, and since then we have, of course, come a long way. Digital health solutions are on the cusp of becoming commonplace in healthcare delivery, in part due to the advances in recent years enabled by the significant advances in technological capabilities, combined with their availability across the globe. This has allowed us to develop solutions that utilise cognitive algorithms to assess a wide variety of data, enabling systems to learn at scale, reason with a clear purpose and interact with users naturally, which has been termed the 'cognitive computing era' by IBM.

Through this era of cognitive computing, the age of digital health is set to spiral. International Data Corporation (IDC) predicts that by 2020 there will be over 44 zettabytes (10^{21}) of data collected from 20bn connected sensors via the internet of things each year. With this quantity of data collection options, the possibilities for health data are almost endless, giving rise to the concept of the 'internet of medical things', the ability for each of us to be connected via a raft of sensors, from wearable technology through to biomedical sensors that report back on physiological data such as medication release, body temperature and heart rate. This will enable people to monitor their health as they walk around their home, with sensors continually reporting key measures to track progress.

So what does this mean for pharmaceutical companies seeking to enter the digital health arena? The challenge will be to develop programmes that are able to take this level of data and use it to provide meaningful feedback to patients, their caregivers and healthcare professionals. This requires a paradigm shift away from the relatively basic, consumer-driven health apps that we see today, towards interactive programmes that use a variety of source data (for example medication tracking, medical devices or biometric sensors) alongside patient assessments – diaries and questionnaires – to create a complete picture of patient progress. It is essential to tailor personalised responses, for example, progress feedback, automated alerts to care teams, relevant content and encouragement, in order to make the service interactive and personalised to each individual.

Through this approach, digital health programmes can be designed to engage users over extended periods of time, which is key to long-term health improvement. However, we should always be aware that people are fallible, and no matter how interactive and engaging a programme is, life will get in the way so adherence to the programme may fall from time to time. In that sense we should accept that patients are allowed to fail; in fact, we should plan for them to fail and build in mechanisms to help them come back on board and re-engage, even after significant periods of inactivity.

We have come a long way from the original telehealth concept proposed by Gernback in the 1920s; technology is now widely accessible across the globe and sufficiently advanced to make a valuable contribution to modern healthcare. The challenge, and enormous opportunity for pharma, is how we harness this level of health data and yet still develop mHealth programmes for individual users. To me, the answer is to start from the insights into users' lives, then develop health programmes that incorporate features which address their needs. Through this approach we can make programmes simple, make them relevant, but most of all, make them enjoyable to use.

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