

## Health-Tech Startups – On the Road to reversing the Antibiotic Resistance crisis

14 June 2019 | Features | By Dr Sudeshna Adak

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A farmer in a village in India is spiking fever. He goes to the local health center and gets a few pills. When the fever does not go away after two weeks and his condition has badly deteriorated, his family brings him to a private hospital in the city, where he is admitted to ICU. The patient dies – the diagnosis is drug resistant infection. The impact – a bill of lakhs to the family that may push it into debt and poverty. Such anecdotal stories and single site studies reporting alarming rise of drug resistance in India are becoming extremely common.

In 2017, the Indian Council of Medical Research (ICMR) published a surveillance report, which confirms this looming crisis. Susceptibility to common antibiotics like ciprofloxacin was 20-30% and 80% for the “harsher” antibiotics like meropenem and 99-100% for the “last resort antibiotics” like colistin. A study from the Centre for Disease Dynamics, Economics and Policy reported that 58000 neonates die each year in India from drug resistant infections. But this is not just India. Reports from the US Centre for Disease Control (US CDC) show an incidence of 2 million drug resistant infections and 23000 deaths. The European Centre for Disease Control (ECDC) reported an incidence of nearly 1 million cases across 31 countries and 33000 deaths. In a first of its kind, ECDC also reported on disability adjusted life years from drug resistant infections which was found to be 170, comparable to the combined burden of influenza, tuberculosis and HIV.

There is no doubt we are at the edge of a global crisis and India is its epicentre. As we use more and more of the higher generation and last resort antibiotics, susceptibility to these will also erode. With no new antibiotics on the horizon, we could be returning to a pre-antibiotic era. The key message from ICMR, US CDC and ECDC has been to be more prudent in prescribing the current antibiotics. The only real hope is to be able to offer “personalized antibiotics” for the infection that the patient presents with. With this need for personalized antibiotics in mind, diagnostics for drug resistant infections need to be rapid and go beyond the traditional point of care tests that say yes/no to presence of infections. They need to tell the doctor: 1) What is the infection causing pathogen (s)? and (2) What is their susceptibility to the different classes of antibiotics?

Healthcare Tech startups across the world have been actively working on creating such new age diagnostics.

To impact the millions of infection cases and antibiotic prescriptions, solutions such as personalised antibiotics need to be adopted at scale. There is a need, there is a supply and the price is right.

But the road to large scale impact is a tough one - the challenges are in awareness, acceptance, and adoption of a technology solution at scale.

Awareness of antimicrobial resistant infections and the need to be prudent in the choice of antibiotics has already been started with campaigns by ICMR and laws to prevent over the counter selling of antibiotics. Awareness campaigns need to be at the scale of what was done for family planning in the 1960s and 1970s to reach every person in the country. Patient awareness is key for the patient to ask for that personalization of the antibiotic being prescribed.

Acceptance of any potential solution at scale requires intervention jointly by the government, hospitals and solution providers. For the large scale assessment that is needed to create widespread acceptance of this or any other solution, partnership with the government, hospitals across the country and the company is needed.

Deployment at scale of a technology solution for a diagnostic requires for scale up of manufacturing, sales, training and services - a daunting task for any startup company. Partnerships with large diagnostic and pharmaceutical manufacturers, and with information technology powering sales, training and services are needed to deploy at scale. Finally, the role of policy makers will be crucial in driving how such solutions are assessed, bought and adopted by healthcare professionals, hospitals and clinics.

Today, it is reported that 750,000 people die of drug resistant infections and this number will progressively increase. Between 2000 and 2015, the usage of antibiotics has gone up 65% and antibiotic resistance has climbed to alarming proportions in the same period. For us to change the course of the crisis of antimicrobial resistance, we must change the way antibiotics are prescribed, bought and sold. Several companies have created technologies that offer this option of "personalized antibiotics" that can help reverse the situation. However, the solution must be deployed every time an antibiotic is prescribed and that scale is going to be achieved through partnerships between the consumer, the prescriber, the policy maker and the solution provider.

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