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Precision medicine: the right therapy

By Peush Prasannan

Mobile health, remote health monitoring, telehealth, telerobotics, connected health etc are healthcare trends of the recent past. The latest addition to this list is 'precision medicine'–an emerging science for disease diagnosis, treatment and prevention with the use of individual 'omics' data.

The 'Precision Medicine Initiative' was assigned $215 million by then US president Barack Obama, China's PMI is expected to be funded with $9.2 billion till 2030 and to facilitate precision medicine while in Qatar, a population-specific genome has been constructed.

Thus, it is evident that governments and institutions around the globe have devoted time and money towards precision medicine to keep up with this latest trend in healthcare. At the same time, IT companies have heavily invested in technologies like cognitive computing to provide innovative solutions in precision medicine for the providers.

Personalised therapy found its roots in oncology in the 1980s when multiple relapse cases of cancer were reported. Researchers realised that they should move away from the "one-treatment-fits-all" mindset. They started measuring key tumour characteristics and created an optimum therapy regimen tailored for each patient to treat cancer leading to the advent of precision medicine.

A typical precision medicine process consists mainly of two steps: Step 1 is where individuals are classified into subpopulations under the following scenarios: Susceptibility to a particular disease; prognosis of any disease an individual may develop; and, response to specific treatment.

To stratify population in every scenario, precision medicine relies on various biological phenomena to obtain 'omics' information. Step 2 is to integrate the molecular and clinical information to understand the biological basis of disease and accordingly develop targeted medical therapies for the patients.

Precision medicine generates a large amount of big data from bio specimens, health records, med-imaging and sensors. From these data, disease-specific factors, patterns and association can be identified and used to customise medical treatment.

From this data, a long-term goal should be set to create a continuous learning infrastructure with real-time knowledge, and using this platform a system should be created that is preventive, predictive and participatory. To improve the computational infrastructure and analytics tools the following technologies can be used:

*Computational algorithms: There are various projects that generate large genomics database to specifically link genomics biomarker and drug sensitivity. These databases can be used to predict drug sensitivity. Based on genomics profiles and drug response data, algorithms can be developed to predict drugs for individual cell lines.

*eMERGE: Electronic Medical Records (EMRs) and Genomics (eMERGE) network used to integrate genomic data from multiple sites, addressing issues such as missing data and quality control.

*GWAS: Genome wide association study connects big genomic data to phenotype. They depend on different statistical model like logistic regression or linear mixed model. The GWAS was useful in detecting thousands of variants associated with diseases and traits, many of these variants were found in non-coding regions of the genome and for whom only a few therapies and/or diagnostics.

*Data interoperability: The precision medicine environment is surrounded by a very heterogeneous, compartmental data sources like EHRs, genomic data, EMRs, server data, specimen banks, public health records and lot of technologies are used to store and transect these datasets.

A centralised database model will face difficulties like duplication. Many technology companies are solving these data interoperability problems by creating a federated or distributed data integration platform.

Clinical trial

According to BIS Research, the global precision medicine market is expected to grow to over $88 billion by 2022 at an estimated CAGR of 12.60% from 2015. Furthermore, remote monitoring and patient engagements are emerging models in healthcare and clinical trial which passively and directly affect their outcomes. Providing technology to support, manage and enhance the participant's involvement, engagement and to achieve the desired outcome in the cohort programme is an opportunity to look for.

And thus, in conclusion, healthcare IT companies with their advancements and innovations, now have to learn to simplify technology to provide new IT solutions that amplify possibilities across all precision medicine touch-points.

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