IBM Institute for Business Value

The evolving promise of genomic medicine

How advanced technologies are transforming healthcare and life sciences

Overview

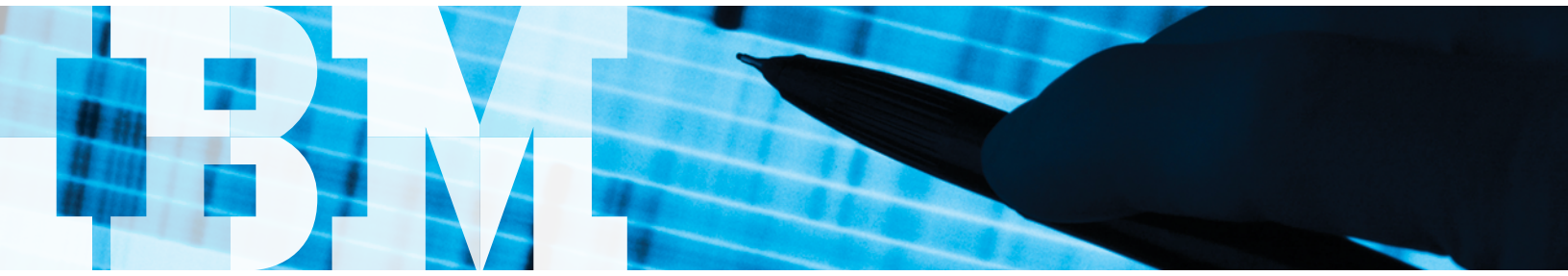
After the Human Genome Project was completed in 2003, early successes in genomic medicine fell short of the initial high expectations. But today, a potent mix of influences—including innovation in biology and technology, market demand and consumerism—is furthering an evolution that crosses industries.

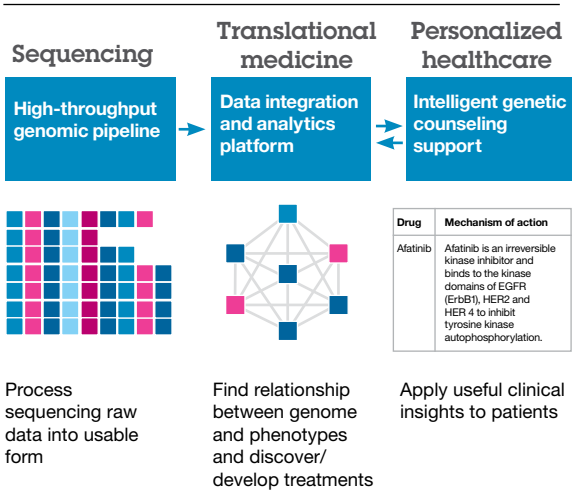
Healthcare providers can now personalize care plans thanks to lower sequencing costs that allow genomic data to be combined with electronic health data. Life sciences companies can develop targeted therapies that prevent and alleviate disease symptoms. To capitalize on new advances in science, cognitive computing, analytics and drug discovery, senior leaders across the ecosystem should act quickly to: make genomic medicine a key component of enterprise strategy; address relevant skill gaps; and determine how partnering can bolster critical capabilities.

Since 2001, when the first draft of the Human Genome Project was announced, hope surged for genomic medicine to be a panacea for many health conditions from diagnosis to treatment. Soon after the project was complete in 2003, the early tangible examples of success did not match the high expectations of that time. But today, there is renewed confidence in the healthcare and life sciences industries that the hype could indeed match the hope. Consider what is different now:

- In the healthcare industry, the decreased cost of whole-genome sequencing—coupled with new advances in cognitive computing and drug discovery—has created a new paradigm where genomic data will soon be combined with electronic health data. Care providers are increasingly relying on genomic data to add a unique level of personalization to an individual's care plan. Cognitive computing and other analytics technologies can provide for precision care where decision support enables a reliable diagnosis and care plan, including treatment options.
- In the life sciences industry, the stage is set for a radical transformation. New medical and technological capabilities will increasingly lead to innovative clinical trials, the development of targeted therapies and a focus on health outcomes to prevent and alleviate disease symptoms.

We believe that genomic medicine is at a unique inflection point in medicine's history due to three major forces: *innovation in biology and technology*; *market demand*; and *consumerism*.





Source: Adapted from IBM Global Technology Outlook, 2014.

Figure 1: **Three cornerstones of genomic medicine can operate in the cloud: sequencing, translational medicine and personalized healthcare.**

Exploring major changes ahead from genomic medicine

Genomic medicine will be a "game-changer" for important stakeholders that include patients, providers, researchers, payors, diagnostic companies, policy makers, life sciences and governments. Three significant impacts are underway:

(1) The growing use of a new genomic health record. In the next three to five years, it is likely that an individual who interacts with the healthcare system will have a genome-based electronic record or "genomic health record."

(2) Greater benefits for stakeholders in the three genomic medicine cornerstones:

- *Sequencing*—Processing raw data into usable form
- *Translational medicine*—Finding relationship between genome and phenotypes and discovering/developing treatments
- *Personalized healthcare*—Applying useful clinical insights to patients.

(3) Opportunities for radical industry transformation across healthcare and life sciences.

All of these cornerstones will work in a cloud-based model that adds new dimensions of data sharing, collaboration and efficiency (see Figure 1). As genomic medicine continues to proliferate, the importance of a solid privacy, ethical and legal framework to support the complexity of genomic medicine will also become vital.

Considerations for industry executives

A new genomic health record will become a reality as genomic information gets combined with relevant data extracted from the traditional EMR. Rapid, precision oncology decision support is expected to expand on a larger scale by performing sophisticated genome/proteome/RNA analysis coupled with cognitive computing. The capabilities and technologies associated with cognitive computing are critical to the ongoing genomic medicine evolution by enabling much more sophisticated decision support, innovative clinical trials, new targeted therapies, and a focus on health outcomes to prevent and alleviate disease symptoms.

To benefit from the far-reaching industry transformation that has begun, forward-thinking executives can: verify that genomic medicine is part of their enterprise vision and strategy; assess and plan to fill existing and future skill gaps; and look closely at how and when partnering will help their organizations succeed in meeting stakeholder needs.

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