A Study on the regulatory oversight of Direct-to-consumer Genetic Testing in USA

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Abstract - In recent years, direct-to-consumer genetic testing via multiple media was forming a growing market and attracted more consumers to predict risks of diseases or other healthcare and understanding ancestral origins for individuals, families, or populations. It has affected not only on healthcare industry, but also on entire national potential economy. This paper reviewed relevant regulatory affairs and provided pharmaceutical business decisions with future development considerations. It gave a ongoing essay on the past and present regulatory oversight of Direct-to-consumer Genetic Testing in the United States. Through overall discussion on the industry, companies, regulatory history, and future overlook, the paper suggested that our government and society be working together toward a reasonable and fair approach to regulation that can give consumers confidence in direct-to-consumer genetic testing and facilitate progress in personalized healthcare.

Keywords: direct-to-consumer genetic testing, healthcare industry, regulation, government regulation oversight

1 Direct-to-consumer Genetic Testing Industries

The purpose of genetic testing (GT) includes predicting risks of diseases, screening newborns, directing clinical management, identifying carriers, and establishing prenatal or clinical diagnoses or prognoses in individuals, families, or populations[1]. Direct-to-consumer (DTC) genetic testing (GT) refers to genetic tests that are marketed directly to consumers via television, print advertisements, and the Internet mostly today[2]. As a prime mover, diagnosing genetic diseases drives DTC GT preponderantly to growing public awareness. Meanwhile, healthcare and understanding ancestral origins play an instigation part on DTC GT in personal ongoing life. With gaining prominence over the past couple of years, DTC GT production from many companies shows the major source of revenue in healthcare market and contributes to our economy as an indicator of the relevant industries. DTC GT provides only one piece of information about a person’s body system but applies in a broad range, from single-gene disorders to complex, multifactorial diseases. Family medical history, lifestyle changes, and the other genetic and environmental factors also result in a person’s risk of developing potential diseases but in many cases are not mentioned by DTC GT. In 2001, the Secretary’s Advisory Committee on Genetic Testing recommended that the Food and Drug Administration (FDA) be involved in the review of all new GT regardless of how they were formulated and provided. In 2008, the Secretary’s Advisory Committee on Genetics, Health, and Society recommended that FDA address all GT using a risk-based approach. In 2010 and afterwards, the expenses of GT solutions dropped sharply in prices and the market is mostly shared by a few players. The use of genetic data is yet not explored in depth, however both the demand of increasing researches and the solutions of growing availability will pave way for upcoming improvements around the business context. Meanwhile, high risks to the market growth posed by improper health advices and decisions sans involvement of physician assistance and the associated repercussions, like vulnerability to misleading results from unproven or invalid diagnosis. Another challenge that may hold back the pace of this market is potential risk of invasion of genetic privacy through unauthorized use of consumer data. According to the report data[3], DTC GT market was valued at US$ 70.2 Mn in 2015, and is expected to reach US$ 340 Mn by 2022, expanding at a Compound Annual Growth Rate (CAGR) of 25.1% from 2016 to 2022. Andelka M. Phillips from University of Oxford provides a brief introduction to the DTC GT industry and the issues it raises for the law [4].

2 Direct-to-consumer Genetic Testing Companies

The DTC GT market is highly concentrated, with a few companies offering testing solutions, including 23andMe[5], GeneByGene[6], Genenewtable[7], Myriad Genetics[8], Genecodebook Oy[9], MD Revolution[10], and so forth. Many others work in relevant businesses, like Ancestry[11] providing DTC DNA tests for genealogy purposes, and Navigenic[12] staffing a physician and offering genetic counseling[13]. Though there are more than 700 tests
available, only a handful are approved by the FDA. For GT industry, DTC GT is an emerging market segment. The companies were eager to advertised and popularize GT through a variety of channels, such as the Internet-based social media. The FDA has been aware of these companies marketing to consumers for years. In 2006, Government Accountability Office (GAO) investigated DTC testing and found that most of the diagnostics were nutritional genetic tests to assess what kinds of foods individual consumers should eat and dietary supplements they should take. The FDA followed up with the companies. FDA, CDC, and FTC published a cautionary statement on DTC GT. After that time, more and more DTC GT companies subsequently came into the market. Since 2007, the FDA’s Center for Devices and Radiological Health (CDRH) have met with the companies continuously and had a better understanding of what the companies were actually doing or going to do. Initially their business models were not clear and well-designed. Moreover, in many cases the link between the genetic results and the risk of developing a disease has not been well-established. Recently, companies more aggressively marketed DTC GT. Pathway Genomics corporation (PGC) was poised to offer its Genetic Health Report by using a saliva collection kit DTC GT[14] which was announced to be sold at many of Walgreens’ nearly 7,500 stores nationwide[15][16]. 23andMe was marketing DTC GT online and partnering with retailing industry companies. AncestryDNA [17] was partnering with Amazon.com. Based on the Federal Food, Drug, and Cosmetic Act, from 2003 on, the FDA has removed lots of GT companies. Six years ago, the FDA informed to confine a few test-manufacturing companies and restrict their marketing behaviors, such as PGC; Knome, Inc. which was taken over by Tute Genomics in 2015; then acquired by PierianDX in 2016; Navigenics; deCODE Genetics headquartered in Reykjavik, Iceland[18]; 23andMe; and Illumina Inc.[19]. They generally have not lodged data on the analytical and clinical validity of their tests to the FDA for approval or clearance. Inter alia, many companies that have left the DTC GT market are an indication that hyped products and unrealistic expectations may not create the expected ROI. Further regulatory oversight may well make it impossible for DTC GT companies to operate by using the same business model in the future[20]. Presently, some companies who stopped their Internet-based DTC GT delivery but yet continued the DTC marketing are working through the public healthcare system. This system should deter collaboration with retailing industry companies while offering tests sans clinical utility and be used for testing implementation.

3 Direct-to-consumer Genetic Testing Regulatory History

The growing market for DTC GT may provide a way for consumers to be aware of their ancestral origins and explore, advise them to undertake a precautionary preparation for their healthcare, and promote knowledge of genetic diseases. Therefore, a variety of DTC GT range from alleles testing linked to breast cancer to mutations testing linked to cystic fibrosis. DTC GT benefits encompass respectively promotion of proactive healthcare, approachability to consumers, and privacy of genetic information obtained. Possible attached risks of DTC GT are the lack of governmental regulation, the potential misinterpretation of genetic information, issues related to testing minors, privacy of data, and downstream expenses for the public healthcare system[20]. As far as GT and its data use are concerned nationwide, the Genetic Information Nondiscrimination Act prevents health insurance companies from refusing insurance coverage to a healthy consumer if his or her genetic predisposition to developing a disease in forthcoming years. At the same time, the legislation prevents employers from using individuals’ genetic information when making hiring, firing, job placement, or promotion decisions[21]. The legislation was passed by the United States Senate on April 24, 2008 and was signed into law by President George W. Bush on May 21, 2008[22]. It took effect on November 21, 2009. If GT is only designed for use in establishing clinic diagnoses, directing management of cures, mitigating risks of diseases, and other treatment activities, it is subject to FDA oversight. For GT testing, there currently are two ways used in clinical patients’ management, as is the case for other In Vitro Diagnostic tests (IVD). One is through the development of a test by labs for use only by those labs themselves. The other is through development of a business purposed test kit by an IVD device manufacturer for distribution to labs. The agency has some of genetic factors authorized from national governmental regulatory departments over these products and has the relevant tests approved. The former usually is called lab-developed tests (LDT). The FDA has the authority to regulate IVDs as it does all LDTs. FDA oversight of an IVD is rooted in the possibility of an erroneous test result. In 1976, the device law was passed. It now makes the FDA exercise enforcement discretion. In early years, tests made by labs were used as simple and easy-to-use ones for rare diseases’ diagnoses and lowered prognostic risks. The accuracy of the results had much to do with interpreter’s intelligence than to the test design technically. And now, most genetic tests being offered are LDTs. The FDA’s oversight of GT has generally been stared at commercial test kits. Also, for the use of IVDs as well as LDTs, The FDA’s oversight is focusing on making both of them a legitimate, consistent, and impartial approach to GT and ensuring their safety and innovation. By 2010, 353 U.S. labs offering GT were formally listed but actually more than 700 [1]. Making significant improvements of regulation requires a sense of urgency and strong leadership. DTC GT Companies should comply with the Heath Insurance Portability and Accountability Act (HIPAA) and maintain the privacy of all individuals’ genetic data and disclose their privacy protection policies.
4 Future Overlook

As an advertisement for a BRCA-predictive GT for breast cancer stated: “There is no stronger antidote for fear than information”[23], the FDA has observed the following problems with DTC GT and stressed on relevant solutions in forthcoming years: Faulty data analysis, Exaggerated clinical claims, Fraudulent data, Lack of traceability/change control, Poor clinical study design, Unacceptable clinical performance, and so forth. The FDA insists on that DTC GT used for consumer care should have the same assurances of safety and efficacy regardless of being manufactured for distribution to labs or created for use in a lab. Prior to market, by the review of moderate and high risk, analytical validity and clinical validity of DTC GT are well-evaluated and ensured in light of their intended use. It presents standalone data assessment reports to backup analytical and clinical claims for those DTC GT. Non-validated tests produce higher occurrence of erroneous results and generate wrong diagnoses and poor treatment decision-making. Therefore, on the one hand, a reasonable regulation demands a pre-market review to ensure test labeling containing the test claims, the supporting data, the interpreted process, and the limitations. On the other hand, the post-market surveillance and enforcement tools from regulation perspective are required to keep tests safety and efficacy.

Regulations would greatly influence the DTC GT market with exerting governmental power. In the current regulatory frameworks, many companies run their businesses in USA and confront the country regulatory oversight deficiencies in the future. As PGC and Walgreens planed to join forces to sell DTC GT, the FDA decided to investigate the DTC GT companies with discretion. The report Direct-to-consumer genetic tests: Misleading test results are further complicated by deceptive marketing and other questionable practices by the GAO is still expected to show its efficacy[24]. The FDA does require that most LDTs be reviewed for clinical validity [1]. With no regard to regulation clauses changed, it is always anticipated that regulatory oversight will be enhanced in upcoming years. For regulatory framework, its principles should be developed, updated, and improved by task forces including experts in regulation, representatives from the DTC GT industry, specialists in clinical disciplines, and molecular geneticists in biological science, genetic counselors in healthcare fields, and so on. From perspective of ISO standardized context, self-regulation of the DTC GT market is crucial to global GT standards promotion for commercial operators. The regulation establishment may not only protect consumers from hurts, but also expedite the industry growth. Additionally, federal, state & local governments will be working toward a reasonable and fair approach to regulation that can give individuals and organizations confidence in the DTC GT and facilitate progress in personalized healthcare. DTC GT are commonly used to improve the detection and treatment of diseases earlier, which results in market expansion gradually and regulation requirement urgently. Moreover, it is necessary for extensive regulatory means made by the industry experts to validate the data analysis of market size. According to GlobalData[25], regulatory annualized revenues data on the United States Genetic Testing market involved value in dollars, upcoming years' forecast, and the key market players’ profiles, like Hologic, Inc.[26], Transgenomic, Inc.[27] , Bio-Rad Laboratories, Inc.[28] and PerkinElmer, Inc.[29]. Meanwhile, for the sake of market evaluation, there is a need to segment them into different groups, including acquired gene, inborn gene and other GTs, even for global key companies operating within the United States Genetic Testing market, like F. Hoffmann-La Roche Ltd.[30]. By meeting the requirements of regulation framework, those companies in the relevant industries should setup business strategic goals, be aligned with business market-entry and market expansion strategies, identify the key market segments posed for strong growth, and construct competition mechanism against the market in the near future.

5 Acknowledgement

This paper was supported by 2016’ University Graduate Students’ Practice Innovation Projects of Jiangsu Province, China (SJZZ16_0110).

6 References


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