

# VIEW

## Disruptive Transformation in US Healthcare - A VC Perspective

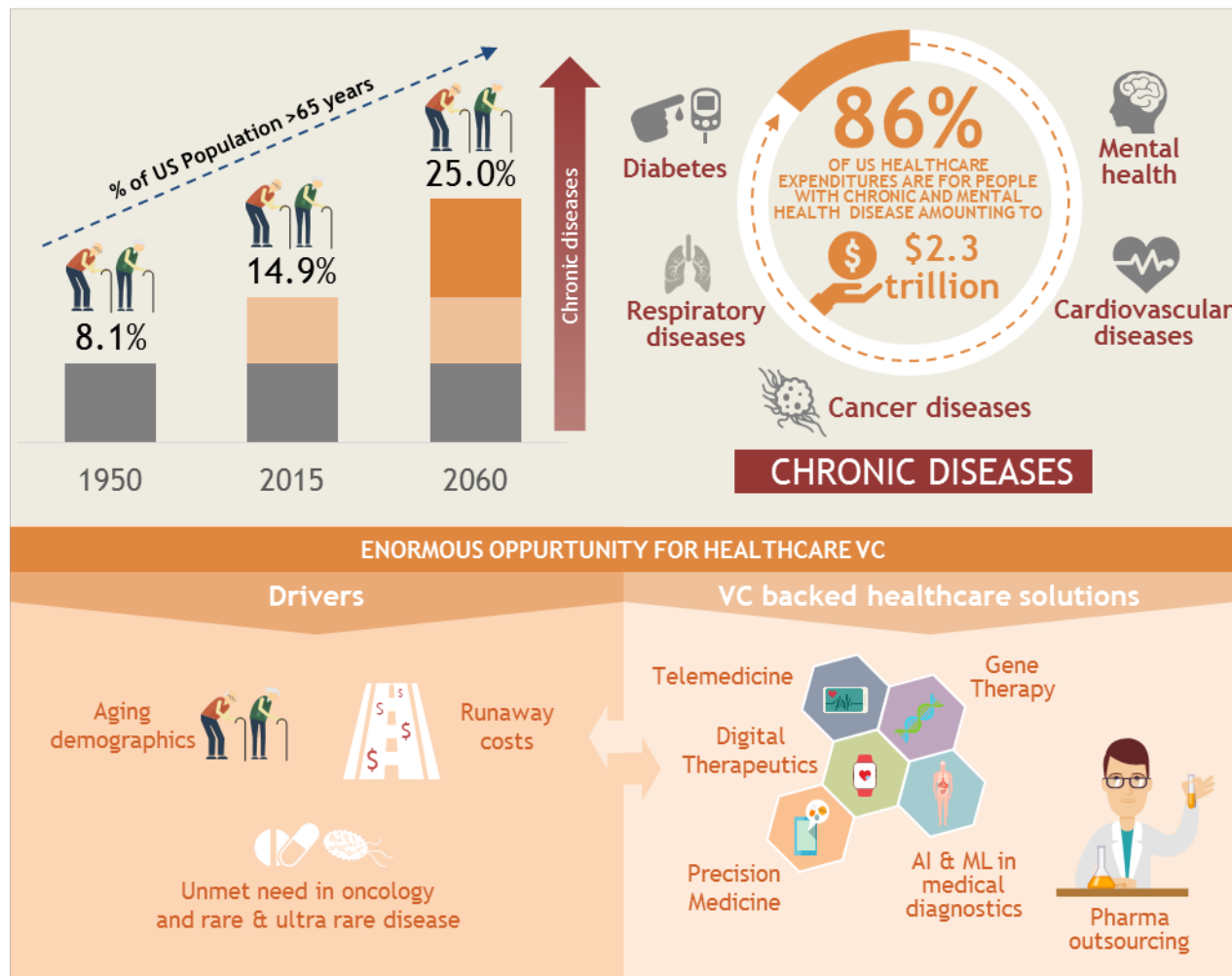
The pace of innovation in healthcare has accelerated in the last decade due in large part to an aging, active and relatively wealthy population, the significant morbidity and unmet need in major disease areas like cancer, neurodegenerative diseases and serious rare diseases, and the demands of an information savvy population for more transparent and efficient healthcare delivery.

On the supply side, evolving technology (e.g. genomic science and information technology) and industry dynamics have driven cutting edge research and investments in diverse areas like gene therapy, early detection/diagnostics, personalized medicine and

telemedicine, to better meet the demand for cost efficient and accessible healthcare.

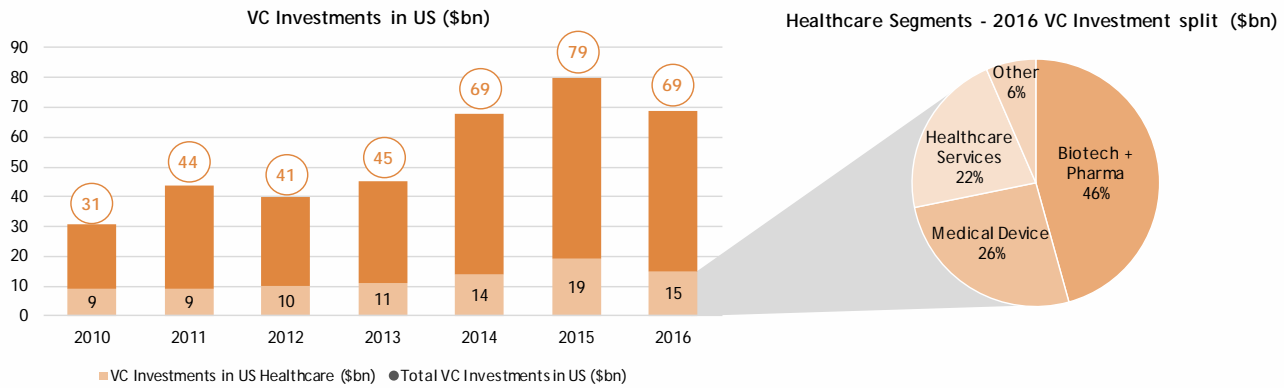
Furthermore, ever increasing R&D costs and inefficient internal processes are forcing the pharma sector to effectively "outsource" early discovery to smaller biotech companies, which are often venture-backed.

Venture capitalists are keenly aware of this extant opportunity to disrupt significant parts of the healthcare ecosystem across a myriad of themes including, though not limited to, biotechnology and pharmaceuticals, digital medicine, devices, telemedicine and artificial intelligence.



Source: United States Census Bureau, Centers for Disease Control and Prevention

“ This confluence of factors has created a perfect storm within the investment landscape, with VCs taking note of the opportunity to disrupt one of the largest sectors in the US. Since 2013, around 20-25% of all US venture investment dollars per year have gone to the healthcare sector which represented an investment of ~ \$15 billion per year over the last three years. ”



Source: National Venture Capital Association, Pitchbook

## Biotechnology is the innovation and investment hotspot within Healthcare

Biotechnology and pharma are clearly leading the way in terms of innovation as well as investments within the healthcare realm and attracted 46% of the total US Healthcare VC investment in 2016. Medical science is paving the way for the creation of new treatment paradigms that address large areas of unmet therapeutic need.

“ Interesting developments are coming up every day within the biotech space, with new leaps being taken in oncology, immunotherapy, gene sequencing and gene editing. ”

Immunotherapy involves using the body’s own immunity system to fight diseases, often cancer. In the second half of 2017, the United States Food and Drug Administration (FDA) approved two immunotherapies that use genetically engineered T cells (CAR-T cell therapy) to fight cancer. One of the two companies that developed these treatments, Kite Pharma (now part of Gilead), was a venture-backed company. Several other venture-backed companies such as Juno Therapeutics are developing other promising compounds in this space.

The biotech breakthrough named CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) - a system dubbed as a “search and replace function” for DNA - is attracting great interest and investment. This technology, in what is known as the CRISPR/Cas9 form,

allows permanent modification of genes. The promise of this technology to treat, indeed cure, diseases caused by gene mutation, like sickle cell and thalassemia, can hardly be overstated. Many of the leading companies in this area such as EDITAS (NASDAQ: EDIT), CRISPR Therapeutics (NASDAQ: CRSP) and Intellia Therapeutics (NASDAQ: NTLA) were venture backed.

The move towards precision medicine within the biotech/biopharma space is a firm step in the early detection/diagnostics area. Monitoring the biomarkers of individuals over time, when combined with an individual’s family history and genetic code, could help spot trouble signs years or decades before actual onset of clinical disease. As one indication of interest, Guardant Health, Freenome and Grail Inc. - three venture-backed firms, each working in their individual capacities to come up with early stage cancer detection through simple blood tests - have attracted investments of close to \$2 billion between them.

## Digital Therapeutics and Diagnostics - the app driven wave is here to stay

Digital therapeutics is a medium of treatment wherein mobile apps and devices work as agents to treat diseases by modifying patient behavior and providing remote monitoring to improve long-term health outcomes. Given the smartphone revolution and the way phones have become an integral part of our lives, it comes as no surprise that the app economy driven movement has caught the interest of investors - a trend evident from

Data sourced from:  
Pitchbook, Forbes, Fairview Analysis

the \$1.3 billion global funding (bulk of it being early stage seed funding) Digital Therapeutics attracted in 2016, which is an increment of 1.3x from 2015.



*Digital therapeutics implements treatment programs tailored to specific ailments, especially major chronic diseases such as diabetes, heart disease, and high blood pressure. Digital health programs driven by monitoring apps prompt patients to strike the right balance between nutrition, exercise and medication, which subsequently helps in achieving improved health outcomes.*



Further, access to reams of data generated by these apps holds the promise to lead the predictive health analytics revolution and eventually strengthen the prevention regime.

From a digital diagnostics aspect, many predict a future where the point of care will move to patients' homes. Imagine an app that calculates the risk of developing a particular condition on the basis of your motion, voice, and behavior among other patterns measured over a specified period of time. Presumably, real-time tracking of such data over a measurable period, say a few weeks/months, should lead to more representative diagnostic results than those from more conventional one-off tests/measurements.

In another interesting development, the FDA recently approved a drug named Abilify Mycite which carries a sensor that emits information to caregivers about adherence to medication. While this is a big step and a positive sign towards tracking patient progress, there will be a few challenges from a regulatory standpoint as well as concerns about accuracy, security and privacy as the digital future in healthcare unfolds.

### Medical Devices - the future holds promise

The medical device industry is in a phase of consolidation with a decent level of deal activity happening on the M&A front. Additionally, Corporate Venture Capital (CVC) plays an increasingly important role in this area.

A strict regulatory environment, longer time to market and the shift to value-based outcomes has deterred VC interest and the sector seems to be struggling as compared to biotech; at least when it comes to funding and investments. In 2016, the aggregate amount of medical devices VC investments in the US fell to around

Data sourced from:  
Silicon Valley Bank, NVCA, Pitchbook, Accenture Research Report, Fairview Analysis

\$3.8 billion from \$5.4 billion in 2015. Further, medical devices attracted just over 5% of the total VC funding in the year 2016, which is a decline of around 50% from its share in 2010.



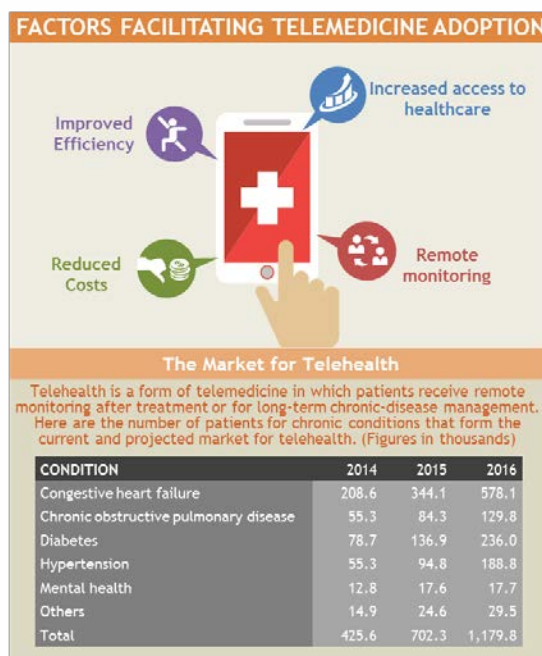
*Corporate Venture Capital (CVC) interest in the sector is enduring and CVC funding in the subsector grew by almost 50% in the year 2016.*



Experts believe that the future of the sector lies in connected devices, which will move beyond apps to Artificial Intelligence, Machine Learning and Internet of Things. These include newly approved equipment such as miniature implants, vital signs tracking devices, remote monitoring biosensors, and non-invasive diagnostics.

### Telemedicine - A new healthcare delivery model

Enabled by increasing patient awareness, growth in the use of technology, and better access to vast amounts of information on the Internet, there has been a gradual shift in the healthcare industry as patients have evolved to become active and engaged consumers of healthcare.



Source: CB Insights

The consumer demand for cost containment and improved access to care is helping drive the adoption of telemedicine as an important channel for healthcare service delivery.

“ *The National Business Group on Health estimates that 9 in 10 large employers will provide telehealth services to their employees by the end of 2017.* ”

It is estimated that \$2.2 billion a year could be saved if patients use retail and virtual clinics instead of physician offices. As a result, telemedicine is attracting a lot of interest and activity both from an innovation and investment perspective.

Telemedicine helps improve overall system efficiency and enables patients in remote areas, or in areas with a low physician to patient ratio, to get better access to healthcare. Conditions that can be treated through Telemedicine run the gamut from simple things like the common cold to chronic diseases like diabetes that require frequent monitoring.

Examples of leading venture-backed companies in this space include Teladoc (NYSE: TDOC) and American Well, which are both undergoing strong growth trajectories as physicians and patients embrace the platforms.

#### Future Trends - Data Analytics; Artificial Intelligence; and... who pays for all this?

Businesses around the world use data analytics to drive operational excellence, inform their strategy, and as a new competitive differentiator. The laggard in this

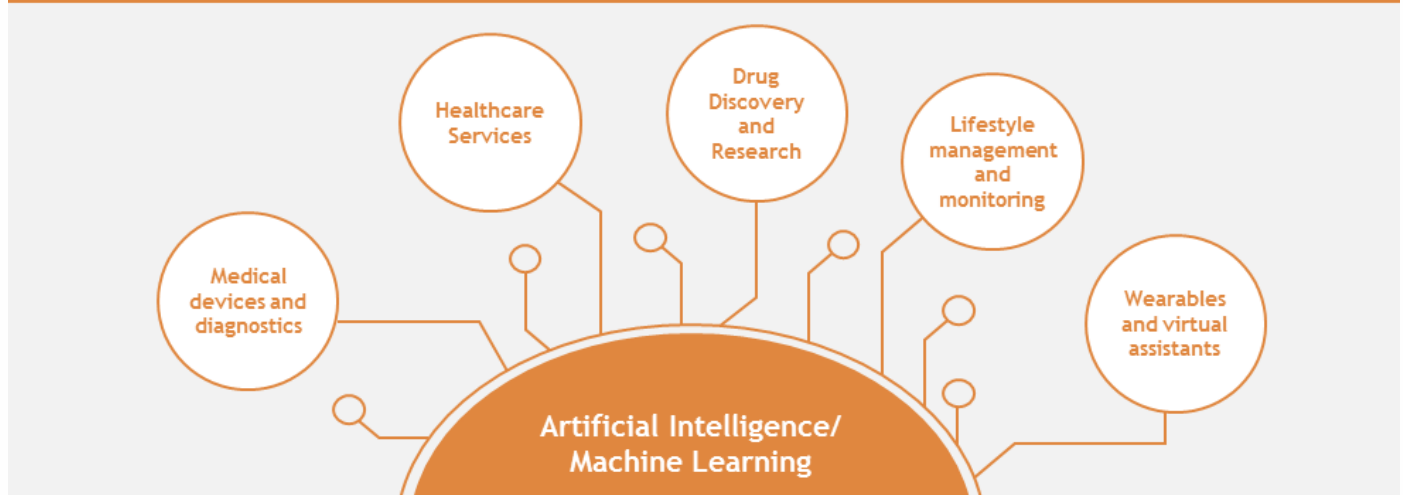
transformation has been the healthcare industry which has been slow to embrace big data and analytics, till now. The indications are that the trend may be changing, with the future of healthcare likely reliant on analytics and technology to drive new forms of patient care while also reducing the costs.

The American Medical Informatics Association (AMIA) recently highlighted the need to focus on data standards that could support plug and play analytics accentuating the scope of work that remains to be done in this space. A focus on improving the collection of data from patients and providers as well as storing the data in formats that are interoperable is the first step towards allowing big data to have a real impact on the healthcare industry.

Innovators and investors alike have begun to recognize the size of the opportunity, reflected in growing investment and investor interest in HealthTech startups. Global HealthTech funding reached \$5 billion in 2016, which has already been surpassed in the first half of 2017 (\$6.5 billion in digital health funding). However, despite excitement over the potential of this new and developing ecosystem, there remains work to be done in the adoption of big data in the healthcare industry.

Another area of interest is the adoption of Artificial Intelligence (AI) in the provision of healthcare. Going forward, as we develop machines that can sense, comprehend, act and learn, Artificial Intelligence will perform a range of administrative and clinical health functions. AI and machine learning could disrupt major portions, if not all, of the healthcare value chain. Some estimates indicate that the adoption of clinical health AI applications would provide \$150 billion in annual savings to the US healthcare economy by 2026.

### Artificial Intelligence / Machine Learning applications cut across the overall healthcare spectrum



Data sourced from:  
Accenture Research Report, Business World, Deloitte, Silicon Valley Bank Report, Fairview Analysis

In one interesting example, researchers at Indiana University recently developed a machine learning algorithm that could correctly predict relapse rates for acute myelogenous leukemia (AML) with 90% accuracy - and remission rates 100% of the time - providing a snapshot into a future where AI and machine learning revolutionize the healthcare industry.

With all the new science, technology, disruption and transformation happening in the sector, healthcare spending will in all likelihood continue to rise for the foreseeable future - and the big question is, who will pay for it? With a shift to value-based care, payers and government agencies seem to be in the driver's seat to define new payment structures within the sector.

Venture-backed startups like Bright Health, Clover Health, and Oscar Health (Bright Health and Clover Health locked in approximately \$290 million in VC funding this year) are looking to bring a change in the health insurance space by using patient data around their health and lifestyle to provide customized offerings that focus on patient care and further by rewarding lower premiums to individuals who stick to a preventive and healthy regimen.

As more rare and ultra-rare diseases become treatable, they become less rare and indeed common in the collective sense leading to push back from payers. Looking ahead, as diseases with significant morbidity and mortality, often affecting children and people in their prime working years, get cured with gene therapy and other new therapeutic modalities, the net present values of these cures to society at large will be astronomical. The current payment structures, with annual open enrollment for individual/employer insurance coverage, are ill-equipped to handle these payments and new ways of thinking will be needed.

On a moral and ethical note, many of the new developments in healthcare are not affordable to large segments of the world's population - often those who have the most need. It is incumbent that policy makers and those at the forefront of these breakthroughs, find ways to extend the benefits to as many people as possible.

Venture capital is at the vanguard of this transformative movement in healthcare, developing new therapies, novel ways of care delivery, and mechanisms for helping to control the cost for care. Fairview Capital has a multi-decade history of investing in leading healthcare venture capital funds. We believe the next decade or two will lead to profound transformations of healthcare, along multiple axes, and in ways we can only begin to imagine. The idea that many of these changes will derive directly from companies in our current and future portfolio is one we find tremendously exciting.

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