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Next-generation "smart" MedTech devices
Preparing for an increasingly intelligent future

Executive summary

Exponential technological progress is advancing scientific knowledge, reducing costs, and presenting the health care and life sciences marketplace with innovative medical devices and procedures that diagnose, monitor, and treat patient conditions. Five important building blocks of exponential technological progress are:

- Increased computing power
- Large data storage capacity
- Hardware miniaturization
- Network connectivity
- Advance software capability

Many industry players – both traditional medical technology (MedTech) organizations and new market entrants – are capitalizing on recent and emerging technological advancements and providing novel health care solutions using mobile health (mHealth) applications, sensor technology, data analytics, and artificial intelligence. Venture capital investments, which fuel development of innovative MedTech products, have grown steadily over the last decade, especially in the areas of bioinformatics and biosensors.

Four shifts will likely shape the new health care landscape and drive opportunities for "smart" MedTech:

- Shift from acute to preventive care, specialists to self-care, and hospital to home care. More services will likely take place in non-traditional health care settings. Consumers with remote access to data through smart devices can manage their own care conditions.
- Shift from monitoring single biometric indicators to multiple indicators, processed through artificial intelligence. This can provide true health insights.
- Shift from intuitive approaches based on empirical evidence for typical patients to precision-based health care rooted in the individual patient's characteristics. This can allow physicians to harness information from intelligent algorithms to inform treatment decisions.
- Shift from specialized silos of medical knowledge to more centralized and accessible knowledge centers. This can allow clinicians to provide sophisticated care without necessarily having specialized training.

Innovative smart MedTech device companies are anticipated to contribute to and capitalize on these market shifts. Traditional players, meanwhile, may lose revenue and market share if they do not develop consumer-centric products and end-to-end solutions with an eye to these shifts. MedTech companies should consider continuously monitoring and evaluating their competitors' activities, especially those which are driving technological innovation. They should consider leveraging large data pools in place of small data puddles to capture true insights Finally, MedTech companies should consider identifying partners, alliances, and other collaborative opportunities to acquire the capabilities and expertise they may need to develop next-generation MedTech devices and thrive in this new environment.

Introduction

Star Trek fans may fondly remember the Tricorder, a sophisticated, hand-held device used to sense, analyze, and record information. Dr. Leonard McCoy used his Tricorder to instantaneously diagnose disease and traumatic injuries, a process that might require today's health care professionals to engage in weeks of iterative assessments, interpretations, and discussions. Fortunately, nearly five decades after *Star Trek's* debut, the use of "futuristic" devices is moving from television screens to real-world care settings.

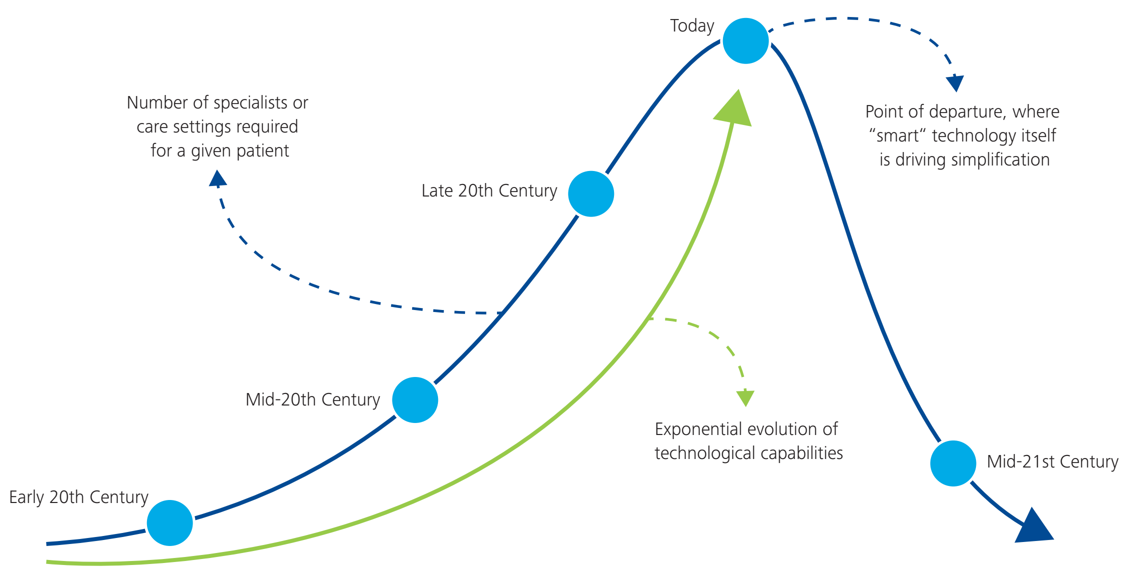
In the early 20th century, doctors and nurses traveled to patients' homes and provided personalized, bedside care. However, that care was limited to what the practitioner knew; prevailing knowledge of effective treatments was often anecdotal and unscientific. These were the "Florence Nightingale days," when one nurse did nearly everything for the patient. With the passage of time, practitioners' knowledge grew, the health care system became increasingly complex, physicians specialized, and academic medical centers generated new discoveries.

Today, the health care landscape features ever-increasing specialization and high costs. Numerous physician specialists and care settings typically are involved in a single patient's care (Figure 1). Physicians and other care providers often retain data in silos and do not or cannot share information, especially not in real time.[1]

The future scenario looks different. Technology that leverages scientific advances, the proliferation of low-cost sensors, and the power of the Internet may allow providers and patients to more efficiently gather and disseminate information. Data collected and run through intelligent algorithms might enable physicians and nurses to coordinate and integrate care delivery and provide real-time feedback and actionable information to their patients and other providers. We can imagine a future, as *Star Trek* creator Gene Rodenberry did, in which anyone can use a high-tech, all-in-one medical device – like a Tricorder – to diagnose, monitor, and treat disease. In this future reality, "smart" MedTech would simplify and improve medical care, harnessing information from intelligent algorithms built into devices to process biometric data and support treatment decisions. We might even go so far as to envision an updated version of the "Florence Nightingale days" – one person could handle all of a patient's care, but he or she would be armed with more insights into the patient's condition.

This future may not be very far away. Technology is evolving rapidly and evidence of work towards a Tricorder-like device already exists. The XPrize Foundation,[2] an organization that aims to spur innovation by offering cash incentives, has launched a large-scale effort to develop a consumer-friendly, all-inclusive MedTech device.

Figure 1. Health care complexity has grown exponentially; in the future, technology will likely support simplification



Source: Deloitte analysis

One example of a smart MedTech device that shows early promise and potential savings is the artificial pancreas, a technology that links an insulin pump with a continuous glucose monitor to provide automatic, real-time monitoring of glucose levels and insulin delivery. A study found that the artificial pancreas could generate potential Medicare program savings of $1.9 billion over twenty five years.[3]

Evolution of exponentials, accelerating returns will aid development

Moore's Law, authored in 1965 and updated in 1995 by Gordon Moore, co-founder of Intel Corporation, states that the number of transistors on a computer microchip would double every two years.[4] This law has become the guiding principle for the industry to deliver ever-more-powerful semiconductor chips at proportionate decrease in cost. Building on this concept, noted author and futurist Ray Kurzweil states in his law of accelerating returns that the pace of technological change and information embedded in the technology advances exponentially, not linearly.[5] Kurzweil also posits that the pace of exponential growth is itself growing exponentially; moreover, within the next few decades, he predicts machine intelligence will likely surpass human intelligence, leading to what is called The Singularity.

Moore's and Kurzweil's laws tell us that we should expect increasing returns from powerful supercomputers, such as IBM's Watson. Supercomputers are anticipated to lead the way towards personalized medicine, performing big-data analytics and helping physicians diagnose problems, target medications, and develop care plans based on a huge global knowledge base. As evidence, Watson's successful diagnosis rate for lung cancer is 90 percent, compared with 50 percent for human doctors.[6] In the future, remote access to supercomputers could be extended beyond physicians and other medical professionals to consumers, aiding their use of online resources (e.g., WebMD, PatientsLikeMe, and MedicineNet) to obtain information about their own conditions.

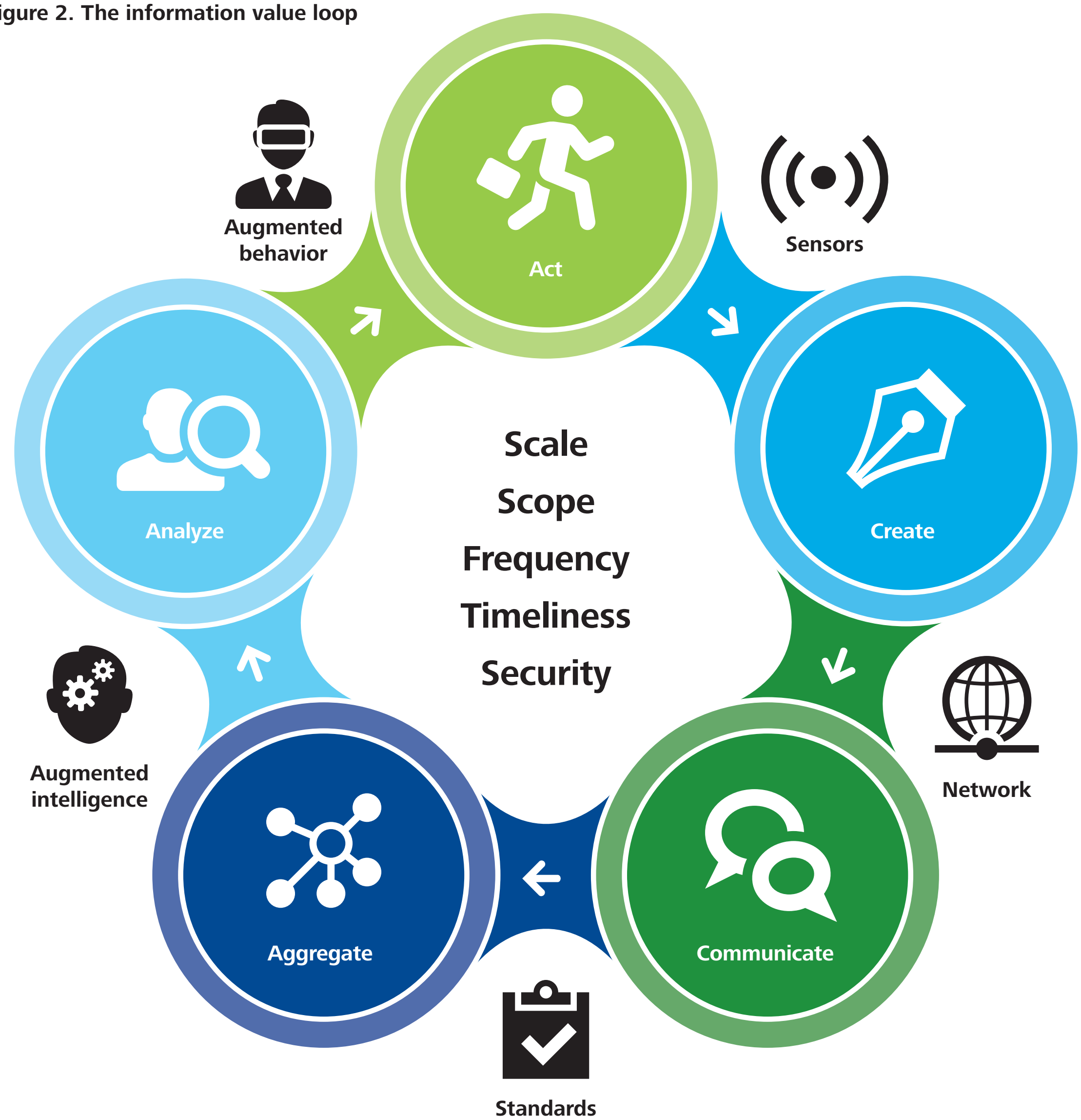
In another example of accelerating returns, sensor-enabled devices are getting faster, cheaper, and smaller, and being embedded into everyday activities. Sensors have automated high-end homes for years, but sensors for medical applications – called biosensors – can monitor biological and other processes. In addition to motion, light, pressure, temperature, moisture, and gas, biosensors may be able to monitor chemicals and biomarkers. For example, doctors may be able to use biosensors to determine how well a drug is metabolized and adjust the dosage and frequency accordingly. Biosensors can be placed in a watch, a patch on the skin (e.g., movement patch sensors from Gentag and Mayo Clinic),[7] implanted under the skin, or swallowed like a pill.

> As computing power continues to follow the path of Moore's Law, a personal computer of 2050 might have more processing capability than all of the human minds in the world combined.[8]

The frontiers of MedTech

Smart MedTech has the potential to increase the value of information in medical care. As illustrated (Figure 2), improved sensor technologies allow us to create information from previously unobserved actions in the human body, both chemical and mechanical, while better wireless technologies allow us to communicate it economically. We can aggregate data in almost limitless volumes over time and across data sources – although the absence of technical standards and the legal and regulatory frameworks governing data sharing limit who has access to what information. Cognitive technologies such as artificial intelligence allow us to analyze data in quantities and ways that reveal more effective responses. This can lead to changes in how we act – and the cycle repeats. The connection between action, information, and changes in action is captured in the graphic shown here.

Figure 2. The information value loop



Source: Deloitte analysis

Five building blocks of exponential technological progress

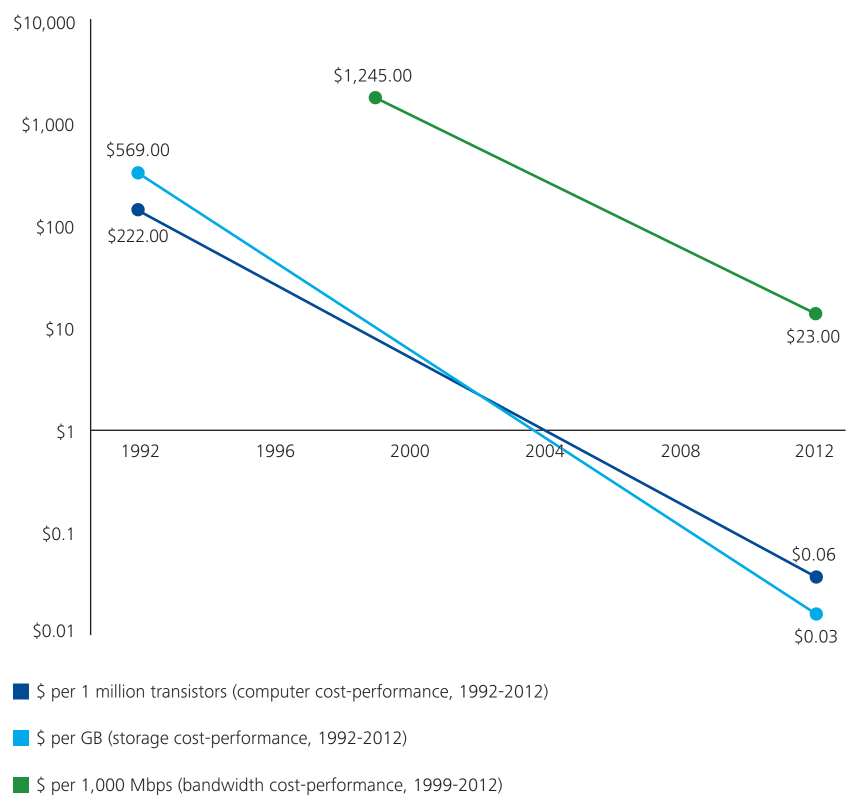
Five important building blocks of exponential technological progress are computing power, data storage, network connectivity, miniaturized hardware, and advanced software. As MedTech companies and other organizations experiment with these building blocks, the pace of technological development will likely increase. Moreover, the cost of technologies relative to their performance continues to shrink, as illustrated by Deloitte's analysis of the core technologies of computing power, data storage, and bandwidth.

Computing power – The cost of computing power has decreased significantly, from $222 per million transistors in 1992 to $0.06 per million transistors in 2012 (Figure 3). This cost-performance trend enables greater computational power at the core of the digital infrastructure.[9] Also, computing in three dimensions is beginning to emerge; for example, through 3D microchips. Inventors are developing three-dimensional circuits that can operate at the molecular level (e.g., carbon nanotubes, where hexagonal arrays of carbon atoms are organized to form electronic circuits).[10]

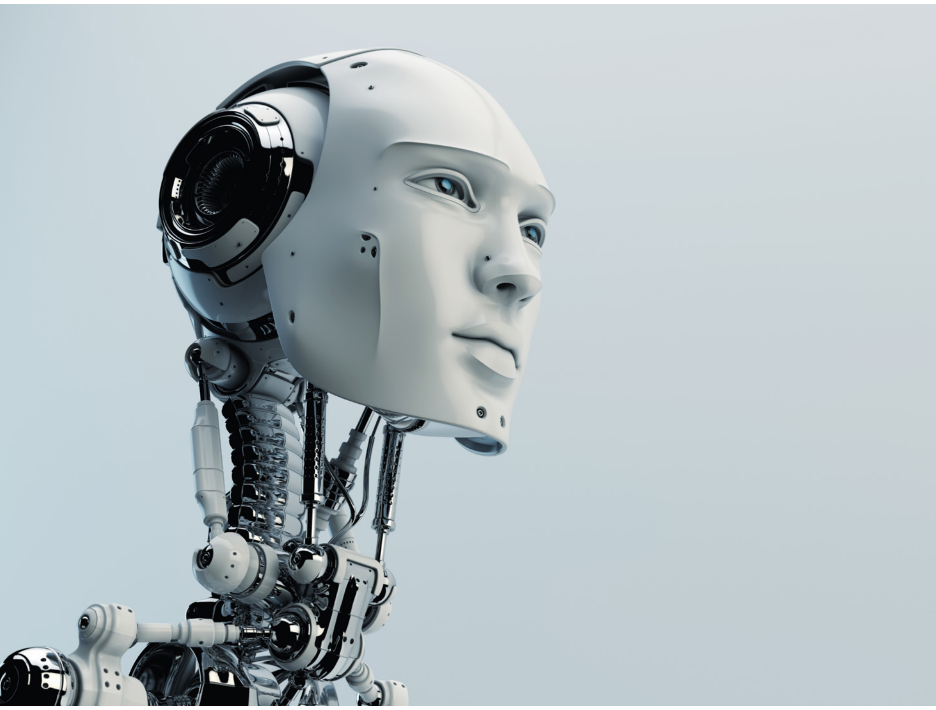
Data storage – Data storage capacity has grown by leaps and bounds over the last five decades and the cost of data storage has decreased considerably, from $569 per gigabyte (GB) of storage in 1992 to $0.03 per GB in 2012 (Figure 3). This cost-performance trend for digital storage may support richer digital information.[11] As evidence, the human brain's storage capacity is estimated at around one to 10 terabytes, and hard drives at this size are already available to consumers. With new, higher-density storage formats (e.g., carbon nanotubes, that arrange components atom-by-atom), devices can store large amounts of patient and population health data.

Bandwidth – The cost of Internet bandwidth has steadily decreased, from $1,245 per 1,000 megabits per second (Mbps) in 1999 to $23 per 1,000 Mbps in 2012 (Figure 3). Cheaper and faster bandwidth may enable much faster collection and transfer of data, facilitating richer connections and interactions.[12] Networks are also experiencing similar exponential advances. Advances include ultra-capacity fiber capable of more than one petabit per second,[13] heterogeneous networks of small cells (micro, pico, and femtocells),[14] terahertz radiation,[15] and balloon-powered broadband in rural and remote areas. Faster access to information may support real-time decision-making by clinicians at patients' bedsides.[16]

Figure 3. Computing, storage, and bandwidth cost-performance



Source: Deloitte analysis, Deloitte 2013 Shift Index series



Internet use continues to increase rapidly. From 1990 to 2012, the percentage of the US population accessing the Internet at least once a month has grown from near zero to 71 percent. Widespread use of the Internet enables more widespread sharing of information and resources. Wireless connectivity is further facilitated by smart devices, which made up 55 percent of total wireless subscriptions in 2012, compared to just one percent in 2001.[17]

Miniaturized hardware – We are making things smaller at a rate of 5.6 per linear dimension per decade. This trend is particularly rapid in the computer and mobile device sectors. Miniaturization may allow MedTech companies to develop small devices that can measure multiple parameters through integration of numerous biosensors.[18]

Advanced software – Moore's law also applies to software development. Fifteen years ago, for example, a $5,000 speech recognition system could barely recognize 1,000 words of vocabulary. Today, even a $50 system can accurately recognize 100,000 words.[19]

The continuing development of these five building blocks magnifies exponential advancement, offering opportunities for MedTech and other companies that are able to tap into the trends. The increasing affordability of digital technology, coupled with wireless networks and powerful mobile devices such as smartphones and tablets, has created an increasingly broad platform for users to connect and communicate anywhere and at any time. When technologies merge into open platforms and ecosystems, the investment becomes lower and lead time shorter since people and technologies can rapidly build on previous waves of development.[20]

MedTech applications of exponential technology

Already, the MedTech sector is beginning to see evidence that innovators are developing products that take advantage of the opportunities emanating from exponential technological progress; for example, in the areas of artificial intelligence and mHealth.

Artificial Intelligence

Artificial Intelligence refers to machines doing intellectual tasks at a level comparable to humans – e.g., reasoning, planning, learning, and using natural language to communicate at a high level. Artificial intelligence also includes sensing and interacting with the physical world. According to Hans Moravec, a pioneer in artificial intelligence, a thinking machine comparable to a mature human brain will likely be available by 2020.[21]

Artificial intelligence and machine learning have moved beyond experimental concepts in many industries, including MedTech. By harnessing the speed of the Internet, the scale of cloud storage, and increasing computing power, artificial intelligence has the potential to drive insights that may aid real-time medical analytics and clinical decision-making. Artificial intelligence technologies have the potential to make health care more efficient by combining the knowledge of physicians and intelligent software.

Three important trends in artificial intelligence are cognitive analytics, clinical decision support systems, and predictive modeling. Like the human brain, machines can now learn from experience and penetrate the complexity of data to identify associations. This is called *cognitive analytics*.[22] Cognitive analytics can bridge the gap between the future promise of big data – to enable new care insights gleaned through data aggregation – and the current need for practical decision-making and prompt diagnosis and response. Cognitive analytics has the potential to push past the limitations of human cognition, allowing for data processing and understanding in real time, and managing the challenge of exploding volumes of data with vastly different forms, structures, and quality.[23]

IBM has partnered with Carillion Clinic, a Virginia health system, to identify 8,500 patients at risk for developing heart failure. The project analyzes data in electronic health records (EHRs), including unstructured data such as clinicians' notes and discharge documents that are not often analyzed. Using IBM's natural language processing technology to assess and understand, these notes provide a more complete and accurate understanding of each patient.[24]

A *clinical decision support system* is data analysis software that analyzes patient data. It generates real-time, evidence-based recommendations to physicians, nurses, and other health care professionals, which allows them to quickly prepare a diagnosis or review the diagnosis in an effort to improve the final result. Such analysis can help to predict potential events, which can range from drug interactions to disease symptoms.

The Mayo Clinic tested clinical decision support systems that help physicians more accurately diagnose endocarditis, a type of heart infection. Tests for the condition are invasive and can be both painful and dangerous. An artificial intelligence-based system used in the study learned to correlate each patient's unique symptoms with a diagnosis and was able to determine that 50 percent of the patients did not have the infection, eliminating the need for an unnecessary and risky procedure.

Predictive modeling analyzes patterns and trends in historical data to develop predictions. Together with medical knowledge and precise decision aid tools, predictive modeling offers potential to simplify the diagnosis and treatment of numerous diseases. By knowing in advance that a group of patients are at low or high risk for a disease or condition, health care providers can create targeted treatment approaches.

IBM developed a predictive solution to analyze and monitor clinician signs in premature babies. It takes real-time biomedical readings and uses them to detect life-threatening infections up to 24 hours before they would normally be observed.

mHealth

mHealth applies the power and reach of mobile communication to health care services. It plays a key role in transforming health care into a more-efficient, patient-centered system of care in which individuals (and providers) have real-time access to information to support engagement. According to Deloitte's 2015 survey of US health care consumers, 13 percent used video, a computer program, or a mobile app to learn about treatment options and 17 percent are very interested in doing so in the future. The same survey also noted that 23 percent of those with major chronic conditions use mobile apps to refill prescriptions.[26] The Deloitte Center for Health Solutions report, *mHealth in an mWorld*, explores how the rapid growth of mobile technology, the widespread use of mobile devices, and increasing consumer demand is underpinning the shift to a mobile-device-enabled era in health care.[27] Use of mHealth spans a broad spectrum of capabilities, which can be classified into three levels:

1. Basic: mHealth app with limited features; data is captured manually. Users manually input dietary intake and the application compiles reports on daily calorie, sodium, fat, and carbohydrate intake (e.g., MyFitnessPal, Nutrition Menu, and MyNetDiary).

2. Intermediate: mHealth app with limited features; data is captured via biosensors with minimal manual efforts. While still nascent, examples include an inhaler from Propeller Health with a built-in asthma sensor to measure air quality, and Biostamp, a wearable device that can monitor and transmit vital signs.

3. Advanced: mHealth app with the ability to capture multiple inputs via biosensors, coupled with intelligent data-processing capabilities. These devices are not yet widely developed; however, one example is Scanadu Scout, a portable device that measures temperature, heart rate, blood oxygen levels, respiratory rate, ECG, and blood pressure. It transmits all this information to a mobile device.

Case study: mHealth solutions generate savings

Diabetes is a major health care issue; 9.3 percent of the US population suffers from diabetes, and the number of people diagnosed has grown from 1.5 million in 1958 to 21 million in 2012. Costs for treatment – hospital and emergency care, office visits, and medications – is about $176 billion annually.[28] Monitoring and controlling blood glucose prevents complications associated with diabetes and, hence, can save costs.

According to a 2013 study, use of a mHealth-based diabetes monitoring device can save $3,000 per person per year in employee health care costs.[29] Using a mHealth-enabled glucose meter with data collected through cloud-connected mobile devices and a disease management call center, a company identified 143 employees with abnormally high/low blood glucose values. Disease management personnel use artificial intelligence-based analytics to target outreach to the 50 percent of identified employees who actively participated in the monitoring program, as well as mobile devices to provide automatic coaching and guidance to patients.

The program resulted in an annual overall medical claims reduction of $1,595 per person. Yearly claims costs for the participating employees decreased by $3,384 compared with an increase of $282 among those who did not participate. Extrapolating the savings from this program to the total US diabetes population, Deloitte analysis found potential savings on the order of $34 billion annually in direct medical costs (Figure 4).

Figure 4. Extrapolating case study results to US diabetes population

Total US diabetes population (2012)	29 million
Diagnosed population (2012)	21 million
Total direct medical costs of diagnosed diabetes (hospital/emergency care/office visits/medications)	$176 billion
Per capita direct medical costs of diagnosed diabetes	$8,381
From case study: Decrease in direct medical costs due to mHealth patient monitoring solution	$1,595
Decrease in per capita direct medical cost of diagnosed diabetes	19 percent
Potential direct cost for the diabetes population with mHealth patient monitoring solution	$142 billion
Potential saving in total population cost by using mHealth patient monitoring solution	$34 billion

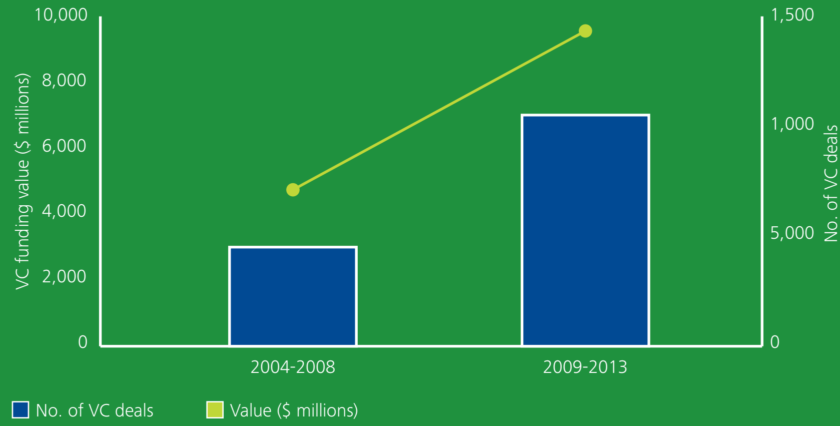
Source: Deloitte analysis; Centers for Disease Control and Prevention. National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014; Data for 2012.

VC funding trends in MedTech

Bringing innovative MedTech devices to market is challenging, complex, and competitive for startups and entrepreneurs. Venture capital (VC) investments support many of these fledgling companies' new product development. VC investments in this sector have grown steadily over the last decade (Figure 5), despite a few dips in recent years.

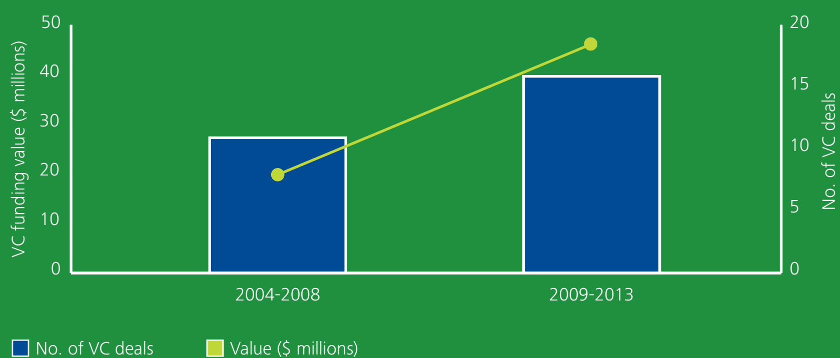
VC investments have grown rapidly in two areas: biosensors, an important component of advanced mHealth and other promising innovations (Figure 6); and bio-informatics, a field that involves software tools for understanding biological data (Figure 7). Thirty percent of mobile devices today have some form of sensors; this share is expected to grow to 50 percent by 2015.[30]

Figure 5. VC investments in MedTech have grown steadily since 2004



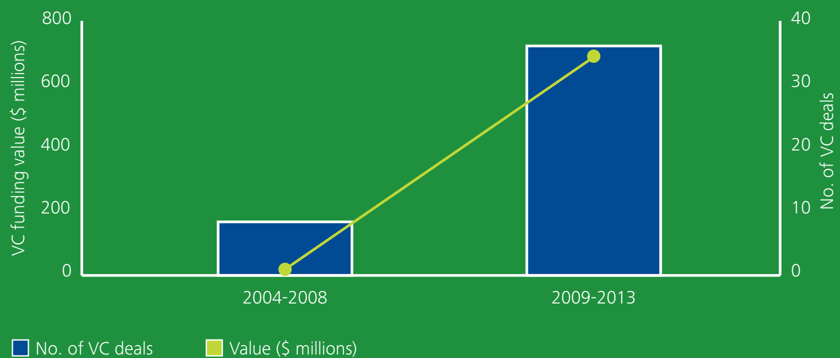
Source: Deloitte analysis; Dow Jones VentureSource

Figure 6. VC investments in biosensors have grown by over 120 percent and the number of VC deals has grown by over 45 percent from 2009-2013 compared with the previous five years



Source: Deloitte analysis; Dow Jones VentureSource

Figure 7. VC investments in bio-Informatics have grown by over 1,000 percent and the number of VC deals has grown by over 400 percent from 2009-2013 compared with the previous five years



Source: Deloitte analysis; Dow Jones VentureSource

Implications for the MedTech industry

The table below provides examples of opportunities for MedTech companies to demonstrate value through next-generation MedTech devices. Across episode types – from acute to chronic to preventive care – health systems and other purchasers are looking for solutions to help them achieve better results. Going forward, the new value proposition is for technologies that can help an organization reduce total costs of care – for example, by preventing complications or high-cost institutional care. Also valuable are technologies that can improve health outcomes and patient experience, as new value-based payment models reward health systems that are able to do this.

Episode type	Improved value	Technology application	Technology involved	Evidence
Acute care Example: Stroke care	• Improved cost efficiencies • Improved patient outcomes • Improved patient access to quality health care • Improved care coordination in an emergency situation • Reduced emergency room (ER) use by stabilizing patient at home	• Live and interactive consultations from remote location • Vital information sent to a receiving hospital before the patient arrives • Coordination with patients after discharged from ER or intensive care unit (ICU)	• Telemedicine for patient monitoring • 24/7 emergency response • Augmented and alternative communication system • Wireless technology	• ER visits in the US could exceed 200 million annually by 2020[31]
Post-acute care Example: Rehab after broken hip	• Reduced hospitalizations and readmissions • Increased patient satisfaction • Reduced costs • Improved patient health and quality of life • Improved identification of care setting and providers	• Medication adherence • Medical reconciliation • Remote patient monitoring (RPM) • Patient health information • Social support • Remote training and supervision	• Medical reminders and dispensers • Medication list software • In-home diagnostic devices • Problem-detection algorithms • Videoconferencing • Social networks	• 18 percent of US hospital readmissions are within 30 days of discharge; 76 percent of these are preventable[32] • Over half of the readmitted patients received no care or follow-up in the 30 days after hospitalization[33]
Chronic care Example: Congestive heart failure (CHF)	• Decreased hospital or nursing home admissions • Regular feedback, motivation, and education to help patients manage their conditions and engage in healthy behaviors • Easier access to care for existing patients	• Diffusion of communication technologies into the health care system • Self-care • Remote care • Remote lifestyle feedback • Interactive patient-provider online communication • Home monitoring	• Connected health • RPM • Sensors to capture quantitative data remotely • Network technologies • Secure storage and processing capabilities • Shared electronic health records and e-referral systems	• Use of RPM in the management of CHF had demonstrated a 60 percent decrease in hospital admissions; 81 percent decrease in nursing home admissions; 66 percent decrease in ER visits[34]
Preventive care and wellness	• Personalized alerts aimed at preventive services • Accurate diagnoses and proactive recommendations for preventive treatment by physicians	• Tools that combine physician and patient health records • Integration with insurers' large base of useful patient data • Patient-specific decision support and communication • Reliable technology in onsite kiosk for self diagnosis	• Mobile technology apps • Remote monitoring device • Interactive preventive health record • Onsite technology • Wearable sensors and personal genomics	• 25 percent of patients who had access to interactive preventive health records were up-to-date on all preventive services – double the rate of non-users[35]

New players are driving technological innovation

The global MedTech market is estimated to reach $513.5 billion by 2020, up from $363.8 billion in 2013, with a compound annual growth rate of 5 percent.[36] Traditional growth drivers include an aging population, increase in chronic disease, and emerging markets' ability to pay for MedTech. In addition, technology-specific advances – among them, computing power, data storage, network connectivity, miniaturized hardware, and software capability – have opened up other growth opportunities. New players, many from outside the MedTech space, are capitalizing on these advances and driving innovation at the rapid pace of technological change.

MedTech companies should consider equipping themselves to take advantage of opportunities arising from smart technologies or risk losing business to both traditional competitors and new market entrants. Leading technology companies (e.g., Google, Apple Inc., and IBM) are a considerable threat, appearing through their product introductions to be eager to claim a portion of this burgeoning market. In addition, agile startups (e.g., startups competing to win an XPrize) pursuing growth opportunities from a "think big" perspective may quickly carve out share in niche markets.

Ability to turn information into insights may improve outcomes

The ability to capture and process vast amounts of data and turn it into actionable insights is a crucial factor for success in the rapidly changing, technology-based health care environment. Going forward, MedTech devices may need to be intelligent and user-friendly, and make wider use of biosensors. Small "data puddles" (one or a few biosensors generating data) will likely not be sufficient to drive health insights. Instead, companies may need "data pools" that combine inputs from multiple biosensors. The resulting patient data could then be processed and presented more intelligently, resulting in better levels of patient monitoring, care advancements and, improved outcomes.

New environment, new innovations require new alliances

Smart MedTech operates in a rapidly changing, fast-moving environment requiring diligent and continuous monitoring of new innovations. A Deloitte University Press report, *The three rules in medical technology,*[37] provides a strategic framework that MedTech companies can use to anchor their innovation strategy. Among the framework's approaches are fostering innovation internally; buying and integrating innovators; and externalizing innovation by creating innovation ecosystems (via partnerships/alliances) with academic centers, venture capitalists, and startup entities.

Smart MedTech product development requires specialization and expertise in wide-ranging fields. New partnerships and alliances can augment or replace internal design and development efforts, and help commercialize and bring products to market. When identifying potential partnerships, MedTech companies should consider the type of solution they are planning to develop (e.g., data input device or decision-making device) and then identify areas where an alliance may generate cost-saving or revenue-generating opportunities (e.g., sensor manufacturing).

Consider solutions that address entire product value chain

MedTech companies should consider developing end-to-end solutions that are focused on differentiated sources of value, customer productivity, and patient disease management. These solutions should address all aspects of the MedTech product value chain:

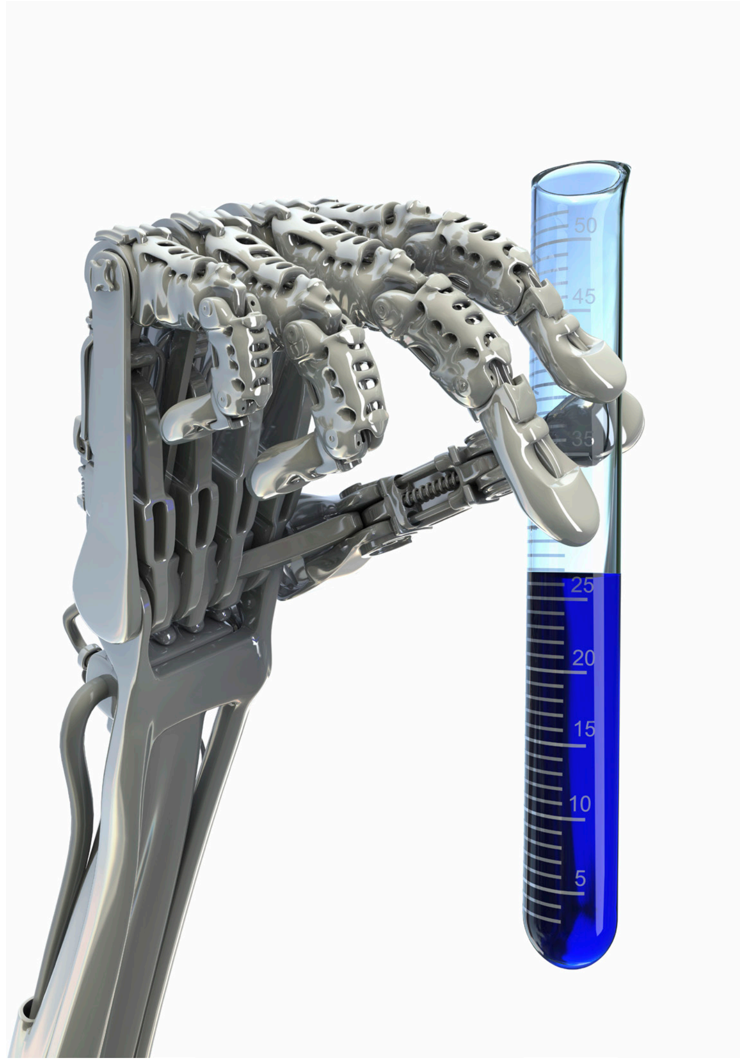
- Capture (sensor)
- Transmission (to analytical engine, whether central or remote)
- Aggregation (of multiple sensor inputs)
- Analysis (through sophisticated algorithms and referencing empirical studies)
- Interpretation and insight
- Monitoring (to see if course is changed)

Addressing the entire product value chain means that an offering cannot be marketed as a commodity. As well, the traditional MedTech revenue model of selling devices at a fixed price will likely need to change to a solutions-based pricing approach.

Conclusion

Smart, connected medical devices are now technologically and economically feasible. As health care shifts from institutional to outpatient and home settings, MedTech companies should consider focusing on opportunities that will likely result in product and market share advantages in this new landscape. The next decade will likely be critical in linking data generated by these smart MedTech devices with data from traditional systems, and integrating that information into everyday practice.

Companies should consider evaluating their portfolios, consider emerging threats and opportunities, develop a clear growth strategy, engage in partnerships and alliances, and begin making investments in technologies and care areas that might position them for an increasingly intelligent future.



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