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Original Research Article: Benefits of new tech in health care & health care prevention

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Abstract
Medical device engineering is a combination of medical and engineering. A field of study of biomedical engineering and technological concepts applied to develop equipment and instruments required in health care delivery. Apply engineering principles to research and development of medical applications, treatments or diagnostic technologies related to acute or chronic medical conditions. Medical engineers are employed by research organizations, manufacturers, government agencies or major medical centers. A lot contribution done by the engineering in implementation of medical devices. This paper tells about the existing methods used for the medical consultation and what can be future steps that take be taken in many sectors for growth of medical sciences with the help of technology.

Keywords: biomedical, medical services, mhealth, e-visit, telemedicine

1. Introduction
Medical Devices engineering is combination of medical & engineering. A field of study of biomedical engineering and technological concepts applied to develop equipment and instruments required in health care delivery. Apply engineering principles to research to research and developments of medical engineers are employed by research organizations, manufacturers, government agencies or major medical centers. Biomedical Engineering is the confluence of engineering, technology and biological sciences to improve the quality of healthcare, medicine and human life. Biomedical engineers and scientists are responsible for developing, designing and improving medical devices and procedures for efficient diagnosis, operation and treatment of diseases and other health ailments. Some examples of Biomedical Engineering innovations are artificial limbs, prosthetics, imaging machines and various other medical devices. Modern medicine and healthcare rely heavily on engineering to deliver improved prevention, diagnosis and treatment of illness, handicapped devices. These technologies are vital to the delivery of efficient health services through the National Health Service (NHS). However, in the health sector the contribution of engineering is often hidden.

2. Literature Review; Existing Technologies
The health care industry will see a 21% increase in IT jobs by 2020, according to research by the University of Chicago. Across all health care sectors, there is a demand for creative, thoughtful uses of health informatics, mobile technology, cloud systems, and digital diagnostics. The reach of technological innovation continues to grow, changing all industries as it evolves. In healthcare, technology is increasingly playing a role in almost all processes, from patient registration to data monitoring, from lab tests to self-care tools. The following are ten technological advancements in healthcare that have emerged over the last ten years:-

i) The electronic health record
In 2009, only 16 percent of U.S. hospitals were using an EHR. By 2013, about 80 percent of hospitals eligible for CMS' meaningful use incentives program had incorporated an EHR into their organizations. "For such a long time we had such disparate systems, meaning you had one system that did pharmacy, one did orders, one that did documentation," says Jeff Sturman, partner at Franklin, Tenn.-based Cumberland Consulting Group. "Integrating these systems into a single platform, or at least a more structured platform, has allowed more integrated and efficient care for patients," he says.
While the EHR has already created big strides in the centralization and efficiency of patient information, it can also be used as a data and population health tool for the future. "There's going to be a big cultural shift over the next several years of data-driven medicine," says Waco Hoover, CEO of the Institute for Health Technology Transformation in New York. "Historically, that hasn't been a big part of how medicine is practiced. Physicians go to medical school and residencies, but each organization has its own unique ways they do things. That's one of the reasons we see varied care all over the country. When data is what we're making decisions off of, that's going to change and improve outcomes of the consistency of medicine delivered."

ii) mHealth
Mobile health is freeing healthcare devices of wires and cords and enabling physicians and patients alike to check on healthcare processes on-the-go. An R&R Market Research report estimates the global mHealth market will reach $20.7 billion by 2019, indicating it is only becoming bigger and more prevalent. Smartphones and tablets allow healthcare providers to more freely access and send information. Physicians and service providers can use mHealth tools for orders, documentation and simply to reach more information when with patients, Mr. Sturman says. However, mHealth is not only about wireless connectivity. It has also become a tool that allows patients to become active players in their treatment by connecting communication with biometrics, says Gopal Chopra, MD, CEO of PINGMD, and associate professor at Duke University Fuqua School of Business in

Durham, N.C. "Now I can make my bathroom scale wireless. I can make my blood pressure mount wireless. I can take an EKG and put it to my smartphone and transfer that wirelessly," he says. "mHealth has the opportunity to take healthcare monitoring out of the office, out of the lab and basically as a part of your life."

iii) Telemedicine/telehealth.

Studies consistently show the benefit of telehealth, especially in rural settings that do not have access to the same resources metropolitan areas may have. A large-scale study published in CHEST Journal shows patients in an intensive care unit equipped with telehealth services were discharged from the ICU 20 percent more quickly and saw a 26 percent lower mortality rate than patients in a regular ICU. Adam Higman, vice president of Soyring Consulting in St. Petersburg, Fla., says while telemedicine is not necessarily a new development, it is a growing field, and its scope of possibility is expanding. The cost benefits of telehealth can't be ignored either, Mr. Hoover says. For example, Indianapolis-based health insurer WellPoint rolled out a video consultation program in February 2013 where patients can receive a full assessment through a video chat with a physician. Claims are automatically generated, but the fees are reduced to factor out traditional office costs. Setting the actual healthcare cost aside, Mr. Hoover says these telemedicine clinics will also reduce time out of office costs for employees and employers by eliminating the need to leave work to go to a primary care office.

iv) Portal technology

Patients are increasingly becoming active players in their own healthcare, and portal technology is one tool helping them to do so. Portal technology allows physicians and patients to access medical records and interact online. Mr. Sturman says this type of technology allows patients to become more closely involved and better educated about their care. In addition to increasing access and availability of medical information, Mr. Hoover adds that portal technology can be a source of empowerment and responsibility for patients. "It's powerful because a patient can be an extraordinary ally in their care. They catch errors," he says. "It empowers the patient and adds a degree of power in care where they can become an active participant."

v) Self-service kiosks

Similar to portal technology, self-service kiosks can help expedite processes like hospital registration. "Patients can increasingly do everything related to registration without having to talk to anyone," Mr. Higman says. "This can help with staffing savings, and some patients are more comfortable with it." Automated kiosks can assist patients with paying co-pays, checking identification, signing paperwork and other registration requirements. Mr. Higman says there are also tablet variations that allow the same technology to be used in outpatient and bedside settings. However, hospitals need to be cautious when integrating it to ensure human to human communication is not entirely eliminated. "If a person wants to speak to a person, they should be able to speak with a person," he says.

vi) Remote monitoring tools

At the end of 2012, 2.8 million patients worldwide were using a home monitoring system, according to a Research and Markets report. Monitoring patients' health at home can reduce costs and unnecessary visits to a physician's office. Mr. Higman offers the example of a cardiac cast with a pacemaker automatically transmitting data to a remote center. "If there's something wrong for a patient, they can be contacted," he says. "It's basically allowing other people to monitor your health for you. It may sound invasive but is great for patients with serious and chronic illnesses."

An article by Kaiser Health News, National Public Radio and Minnesota Public Radio discussed the effects a home monitoring system had on readmission rates for heart disease patients at Duluth, Minn.-based Essentia Health. The national average rate of readmissions for patients with heart disease is 25 percent, but after Essentia Health implemented a home monitoring system, the rates of readmission for their heart disease patients fell to a mere two percent. And now that hospitals are being financially penalized for readmissions, home monitoring systems may offer a solution to avoid those penalties.

vii) Sensors and wearable technology

The wearable medical device market is growing at a compound annual growth rate of 16.4 percent a year, according to a Transparency Market Research report. Wearable medical devices and sensors are simply another way to collect data, which Dr. Chopra says is one of the aims and purposes of healthcare. He says sensors and wearable technology could be as simple as an alert sent to a care provider when a patient falls down or a bandage that can detect skin pH levels to tell if a cut is getting infected. "Anything we are currently using where a smart sensor could be is part of that solution," Dr. Chopra says. "We're able to take a lot of these data points to see if something abnormal is happening."

viii) Wireless communication

While instant messaging and walkie-talkies aren't new technologies themselves, they have only recently been introduced into the hospital setting, replacing devices like beepers and overhead pagers. "Hospitals are catching up to the 21st century with staff communicating to one another," Mr. Higman says, adding that internal communication advancements in hospitals followed a slower development timeline since they had to account for security and HIPAA concerns.

Systems like Vocera Messaging offer platforms for users to send secure messages like lab tests and alerts to one another using smart phones, web-based consoles or third-party clinical systems. These messaging systems can expedite the communication process while still tracking and logging sent and received information in a secure manner.

ix) Real-time locating services

Another growing data monitoring tool, real-time locating services, are helping hospitals focus on efficiency and instantly identify problem areas. Hospitals can implement tracking systems for instruments, devices and even clinical staff. Mr. Higman says these services gather data on areas and departments that previously were difficult to track. "Retrospective analysis can only go so far, particularly in places constantly changing like emergency departments," he says, but tracking movement with a real-time locating service

can highlight potential issues in efficiency and utilization.
These tools also allow flexibility for last minute changes. "If [a physician has] an add-on case today, do they have instruments on hand, and where are [the instruments]?" he asks. At the most basic level, these services can ensure equipment and supplies aren't leaving the building, and for high-cost equipment and supplies of which hospitals may only have one or a few, being able to track their location can help verify its utilization, he says.

x) Pharmacogenomics/genome sequencing
Personalized medicine continues to edge closer to the forefront of the healthcare industry. Tailoring treatment plans to individuals and anticipating the onset of certain diseases offers promising benefits for healthcare efficiency and diagnostic accuracy. Pharmacogenomics in particular could help reduce the billions of dollars in excess healthcare spending due to adverse drug events, misdiagnoses, readmissions and other unnecessary costs.
Before a full-fledged system of pharmacogenomics comes to fruition, the healthcare industry needs a tool that can aggregate and analyze all the big data and digital health information, Mr. Hoover says. "When we really start to have the ability to study a lot of that data, it's going to transfer how we match up that information at the population, individual and macro levels," he says. "The ability to actually compare that information is going to be valuable as we move forward, making sure medications we are taking are going to work for us."
Tools for big data analysis for pharmacogenomics are still being developed, but data analytics and data aggregation for the purpose of population health may be the next big advancement on the horizon. "Understanding and connecting all these variables is going to be profound as it relates to moving forward in healthcare and designing interventions and analyzing patient populations and ultimately improving the lives and health of the American population," Mr. Hoover says.

3. New Tech needed for Health care & its benefits
Many of these new inventions have yet to be needed, a process that can take up to 10 years. But that's not stopping the research and development of new technologies. Here are 10 types of tech that are changing the course of health care.

i) Digital diagnostics
Making health care more accessible includes providing digital diagnostics options for people who need it, especially those who can't get to a doctor's office. This is one of the main themes of digital health. One example of digital diagnostics is Neurotrack, a software-based Alzheimer's diagnostic test that can detect impairments on the hippocampus (the first area of the brain to be affected by the disease) by evaluating eye movement.

ii) The cloud
According to recent research by Skyhigh Networks, more than 13% of cloud services in health care are considered high-risk for security breaches, and 77% of them are medium-risk. Cloud services provide a lot of benefits for medical providers, especially in under-developed or rural areas, but there is definite risk involved. The research showed that there are 944 cloud services in use across healthcare providers, and 53% of employees use at least three devices at work.

iii) Ultra-fast scans
GE showcased its breakthrough ultra-fast CT scanner earlier this year, which can capture a still image of a heart in one beat. The company said that according to research, about 60% of patients have heart rates of higher than 60 beats per minute and are turned away from scans because their heart beats too fast to scan. With this Revolution CT, doctors can see specific areas of the heart that they could not before.

iv) Wearables
Wearable technology is going to play a huge role in health care in years to come. The Consumer Electronics Association reports that sales of fitness trackers and smart watches will reach $1 billion this year. But monitoring fitness is only the beginning. For instance, Intel teamed up with the Michael J. Fox Foundation to use wearables to find certain characteristics of Parkinson's disease.

v) Health informatics
More than half of US hospitals use some type of electronic records system, but only 6% meet all the federal mandates, according to a recent study out of the University of Michigan. According to researchers at the University of Chicago, 50% of health care dollars are wasted on inefficient record keeping processes. Electronic records have been shown to save large hospitals anywhere between $37 and $59 million. It streamlines the medical care process and lowers malpractice claims, and increases coordination between providers. The federal government set a mandate to have some electronic system in place by this year.

vi) Digital therapy
Digital therapy is important for patients who need at-home care, can't afford to travel to a clinic, or have no way to get to a clinic for therapy. Well frame is a platform that combines mobile technology with artificial intelligence to provide patients with care after they've returned home from the hospital or doctor's office. It's been described as a "GPS navigation system for patients." There is a daily to-do list for the patient and a tracker for diet and exercise, but an advanced algorithm adapts the content based on the information from patient and healthcare provider. The company has performed trials with cardiovascular, pulmonary, and mental health patients.

vii) Concierge medical services
Startups are making it easier to pay out-of-pocket for on-demand health care services. For example, GoodRX allows you to compare prices for drugs at different pharmacies and save up to 80%. One Medical Group was created by doctors to build a better system for doctor's visits. In certain cities, you can search for an office based on your needs, find same-day appointments, email access, online scheduling, and trained primary doctors.

viii) Networks and coaching
With mobile technology, it's easier than ever to have a customized diet or health plan. Thrive On is personalized coaching for mental health, offering plans by assessing your

sleep, mood, stress, anxiety, and body image. Retrofit offers coaching and expert advice for weight loss and weight management.

ix) Self-insurance

With the onset of Affordable Care Act, more consumers have had to manage their own data and health future. Several startups are using this as an opportunity to offer insurance, benefits, and solutions services. Health solutions platforms such as Jiff, which connects employee behaviors to company benefits and incentives, are becoming more common.

x) Hackathons

Hacking is becoming an increasingly popular tool to solving real world problems, especially in the health care industry. Health care, which usually evolves slowly, is being revitalized with software developments, hardware inventions, cloud systems, apps, and wearables, and many of these ideas are born out of hackathons. MIT held a hackathon earlier this year that drew 450 people from various backgrounds such as engineering, journalism, medicine, and IT to tackle global health, diabetes, and hospital IT.

4. Conclusion

This paper severs the existing technologies which are using in medical and health care and what can be next for improvement of health Care benefits & Medical services.

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