20 Examples of Wearables and IoT Disrupting Healthcare - Avenga

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The Internet of Things or IoT redefines many aspects of our day: how we control and automate the environment we live in, how we shop, how we get healthcare and so much more. Wearables bring about a new digitized and connected economy, where people and organizations collaborate in different and deeper ways, devices communicate with other devices, and customers choose what they want and need without physical constraints. Intelligent orchestration, configuration, analytics, and management tools along with continuous delivery and deployment keep companies not only sane but more productive as never before. With IoT remote functioning, there’s almost nothing that we can’t access virtually over the internet (as long as we have access to it).

IoT and wearables have emerged as an element of intense business and social change, as well as a result of global forces that are driving this change. It has reshaped modern society in many good ways. Wearables are changing business and management processes, operations and models, while creating new value, improving efficiency and leading to new ways of making money and delivering greater value to customers.

When it comes to the world of pharma and healthcare, wearables open up a whole world of possibilities. When ordinary medical wearable devices are connected to the internet, they can collect essential data which could be life-saving. They also serve in providing extra insight into symptoms and trends of any particular physiological or even psychological disorder. IoT enables the execution, into reality, of remote care which was once just the stuff of science fiction. Generally speaking, IoT gives patients more control over their treatment and they can witness a blow by blow development of the healing of their disorder(s) through their medical wearable devices that are connected to the internet.

The next decade is IoT's decade

Over the next ten years and more, we may well see the revolution of disease treatment and diagnosis. IoT wearable devices are reshaping the way we receive healthcare, and are equipping companies-sponsors, doctors, and patients with innovative insights and analytics. The data obtained from the IoT devices help healthcare, pharma and life science companies to make better decisions and gain a competitive advantage. The advancements in IoT and its continuous coordination with Pharma and the Healthcare Industries will launch the evolution of real time monitoring and treatment of diseases. The following are ongoing developments using IoT:

1. Glucose trackers

1 in 11 adults in the world suffers from diabetes. What's more, 46% of people with diabetes are not diagnosed. Currently, there are various solutions on the market that help to deliver insulin to the body and monitor glucose levels. The wearable devices for diabetes include continuous glucose monitoring systems and automated insulin delivery systems.

The most famous continuous glucose monitors are Dexcom and Eversense. Eversense is the first FDA-approved continuous glucose monitor that includes a fully implantable sensor that tracks glucose levels and can be worn for up to 90 days.

Beta Bionics has developed a fully integrated medical wearable device that can autonomously manage blood sugar levels 24/7 for people having type 1 diabetes. Right now is in the state of clinical testing and not available for sale.

2. Wearables for heart attacks

People that suffer from dangerously fast heartbeat (tachycardia) and abnormal heartbeats (arrhythmia) may utilize either wearable defibrillators or implantable defibrillators. Wearable defibrillators, such as Zoll LifeVest 4000 helps to treat life-threatening heart rhythms for people that have a risk of sudden cardiac arrest. The device continuously monitors the heart rhythm, and when it detects a life-threatening rhythm it can produce a shock treatment to restore the patient's heart rate to the normal rhythm. However, the device is quite costly, it costs $3,370 per month.

Patients suffering from irregular heartbeats can also opt to use implantable cardioverter-defibrillators. They are small battery-powered devices placed in the chest and monitor the abnormal heartbeats. They also have the ability to simulate the heartbeat if the heart rate is too slow. Implantable defibrillators proved itself as an effective tool to prevent sudden death in patients that suffer from fibrillation or tachycardia.

3. Protection against concussion

A wearable device worn on the neck helps to protect the brain from sports traumas and concussions. The concussions are caused by the movement of the brain inside the skull. Such sharp movements can cause structural brain changes and long-term damage that affects brain function. The Q-Collar uses the body's physiology to stabilize the brain inside the skull by slightly constricting the jugular vein in the neck. This pressure increases the blood volume inside the skull and helps to decrease brain movement and avoid a concussion.

It's not only about strong hits to the head that leads to a concussion. Small, repeated hits, which are called subconcussive hits can affect brain function and result in structural changes in the brain. The wearable Q-Collar can protect from forceful movement in the brain.

4. Sensors for stroke patients

Electromyography (EMG) sensors are used to measure muscle movements that help the rehabilitation of prosthetic patients and patients after a stroke. In particular, EMG

sensors help to self-monitor and strengthen muscle conditions by measuring the activity associated with muscle contractions. These sensors are wireless and non-invasive and can also assess nerve condition and muscle response in the injured tissues.

5. Asthma monitoring

In a conventional situation, most people with asthma will not know they are having an attack until it is at an advanced level. This is annoying not to mention very dangerous. With medicine that is on hand, the person can intervene against the attack, but the feeling of exhaustion will have crept up on them and depleted their energy.

There is Intelligent Asthma Monitoring wearable technology that can forecast, in advance, oncoming asthma attacks before the patient wearing the device even notices the asthma symptoms.

At present, when the patient sneezes, coughs, wheezes or experiences shortness of breath, that’s when the medicine is whipped out and used to alleviate the effects of the asthma attack. That’s reactive medicine whereas the wearable device with IoT is Predictive Medicine.

6. Movement disorders

People suffering from movement disorders and Parkinon’s disease can use Apple Watch to measure and record dyskinetic symptoms and tremors. The Apple Watch app monitors the severity of the symptoms and helps patients to plan their activities around the symptom patterns. The Apple Watch Health app helps to evaluate patient response to medication and track the disease progression.

7. Coagulation monitoring

For some patients, blood coagulation is observed closely so they stay within a normal range. If they have an extended period of blood coagulation (longer than normal), this increases the risk of stroke or bleeding for them.

A recently developed Bluetooth enabled coagulation system enables patients to check how quickly their blood clots in real-time. They do self testing and the results are transmitted to their healthcare providers and they don’t need to visit the clinic regularly as they did before, and, the patients can also add comments when the results are transmitted. The device also acts as a reminder to the patient to do the self-test and also issues a warning when the results are not within the target range.

8. Depression monitored through an app

Depression is one illness that is mostly abstract compared to other physiological disorders. But recent developments in the Internet Age makes it more measurable and preventable.

An Apple Watch app has been developed to monitor and assess patients with Major Depressive Disorder (MDD). An exploratory study was conducted recently wherein participants used the app daily to monitor their mood and cognition. While it has not been launched for widespread use, it showed the potential for wearable technology to evaluate the effects of depression in real time. The app also gives data that provides insight into the still abstract world of mental illness and encourages more meaningful professional conversation about it.

9. Smart contact lenses

Medical smart contact lenses are an ambitious venture in the Internet of Things (IoT) context, in the sense that not much development has been achieved in this medical field.

One of the few success stories for wearable devices here, is about noninvasive smart contact lens which automatically record changes in eye dimensions. There is also a warning that this ocular deterioration can lead to glaucoma, if left untreated. This technology is now CE marked and FDA approved for marketing and sale in Europe and the USA. It is also approved for sale in Japan.

10. Monitoring medical adherence

A part of the patients suffering from hypertension, diabetes, psychosis and other conditions are non-adherent to the prescribed medications, mostly due to forgetfulness. Non-adherence to prescription drugs leads to a greater number of hospital readmissions and clinical complications. Wearable smart necklaces are capable of determining whether the drug has been ingested based on the skin movement of the neck when the person swallows. Bayesian networks help to precisely classify the swallowing of medication capsules, drinking the water, speaking and saliva swallows with a total precision rate of 90%. Such wearable necklaces are capable of assessing medication adherence with high accuracy and assist patients with their forgetfulness.

11. Cancer treatment

The developments we are currently seeing have stopped people with medical conditions from being prisoners in their homes and are minimizing their need to regularly visit the hospital.

The American Society of Clinical Oncology, or ASCO, has moderated the randomized clinical trial of 357 patients who received treatment for head and neck cancer. They used a Bluetooth enabled weight scale and blood pressure cuff, linked to a symptom tracking app. This system sends updates every weekday to the patients' physicians of their symptoms and treatment responses. This system is called CYCORE and through this, the participating patients have shown diminished severe symptoms connected with their cancer compared to patients who carried on with conventional weekly doctor visits.

CYCORE enables the patients and their care providers to identify immediately emerging side effects and symptoms so they can be addressed quickly and efficiently.

12. Posture correction

Upright Go, a small wearable device, helps patients to train themselves to employ a healthier posture using biofeedback. It produces a small vibration when the person wearing the device is slouching. In the app, a user can see an onscreen avatar that mirrors their position as they wear the device. This avatar becomes red when the posture is stooping, thus motivating the person to get into a straighter healthier position. Plus, the biofeedback vibration helps users to form better overall posture behaviors and reduce the possibility of future spinal problems.

13. Hearing aid

People that have hearing disabilities can use digital hearing aids that convert sound waves into digital signals and produce precise sound duplication. The computer chips embedded in the digital hearing aids can analyze speech and other sounds in the environment. Digital hearing aids have substantial flexibility in hearing aid programming, so that sound they produce can be matched to the specific hearing loss pattern. For example, iPhone users can utilize Airpods' Live Listen feature to amplify the sounds they hear. With this functionality people with hearing impairments can clearly hear the conversation in the noisy area.

14. Sleep monitoring

Wearable devices can measure and provide recommendations for improving your sleep. One of such wearables is Beddit. It measures sleep time, heart rate, breathing, humidity, and room temperature. Users can set up sleep time goals and based on the sleep patterns the app can recommend how to achieve these goals with bedtime reminders and nudges.

15. Early detection of Alzheimer's

50 million people all over the world suffer from Alzheimer's. Right now no cure can stop the progression of dementia. To develop treatments for dementia neurodegeneration is needed at the very early stage to detect the disease before the symptoms appear. At the moment there are invasive and expensive solutions, such as PET brain imaging and cerebrospinal fluid sampling. The Early Detection of Neurodegenerative diseases (EDoN) aims to develop a cost-effective and non-invasive wearable that helps to detect Alzheimer's at the earliest stage.

16. Hospital internal monitoring

IoT devices are very useful in hospitals. Medical equipment is tagged with sensors that track, in real time, its location within the hospital parameters. This could include portable equipment like defibrillators, nebulizers, wheelchairs, oxygen pumps and other essential medical devices.

Additionally, the location of medical staff could be detected in real time through a wearable. In this time of widespread viruses, IoT enabled hygiene devices can be made operational anytime that health and sanitation conditions are deemed imperiled.

17. Respiratory disease detection

Wearable respiratory monitoring sensors, placed as a patch over the chest, can alert the patients on a smartphone about the changes in their breathing patterns, heart rate and temperature. These signals provide early detection of lung function deterioration. The device can transmit exacerbations that need quick attention of a doctor.

The accurate breathing pattern monitoring helps to assess and predict disease progression, enabling medical personnel to provide treatment early, avoiding lung failure.

18. Artificial kidneys

The most popular treatment worldwide for people that have kidney failure is in-hospital hemodialysis. With the current advances in wearable technology, artificial kidneys have the potential to transform the lives of patients with kidney failures. With the latest research from Arkansas University, we're one step closer to artificial kidneys. Scientists have created a synthetic nephron, a device that can filter the blood similarly to biological nephrons. This nephron can be combined with nanofiltration, ultrafiltration, and reverse osmosis modules that can further be integrated into artificial kidneys.

19. Blood sensors

Scientists and engineers from Brolis Sensor Technology are developing a non-invasive wearable sensor remotely testing the concentration of crucial blood elements such as glucose, ketones, lactate, urea or ethanol. The wearable sensor uses infrared laser absorption spectroscopy to listen to the rotational-vibrational movements of molecules. The wearable device should be ready by 2021 and with people suffering from chronic health conditions such as diabetes can measure the blood glucose levels without puncturing their fingers a couple of times per day.

20. Lung monitoring

According to the World Health Organisation, chronic obstructive pulmonary disease (COPD) is considered to be the top one disease causing the biggest number of deaths worldwide. The WELMO project aims to develop and validate the cost-effective and low-power miniaturized sensors that can be integrated into the smart vest and effectively monitor the lungs, simultaneously collecting sound and electric impedance tomography signals. This will help to make an accurate and comprehensive real time evaluation of the lung status and function and to treat chronic obstructive pulmonary disease more efficiently.

Conclusion

The healthcare industry has emerged as a big winner in IoT. But not only healthcare, the life sciences and pharmaceutical industry are a large presence too. They already utilize IoT to monitor patients remotely. IoT significantly lessens the cost of healthcare delivery and lowers the number of physical visits to doctors and emergency departments. Beyond this, the little microscopic sensors embedded on our body and sensors help to gather crucial data that can be utilized to help prevent the progression of a disease.

IoT has changed the way businesses operate and compete in today's world. It transforms business processes, product development, go-to-market strategies, customer support, supply chain and logistics, and creates a golden opportunity — an opportunity to rethink current products, services and development from the ground up.

IoT has emerged as a chance to reinvent your company, industry and market. Will you take this chance?

Avenga's expertise in IoT and wearable software development

Avenga professionals have experience in developing software for IoT devices like wearables, smartphones, and in-home health devices that enable precise patient monitoring and enhance the flexibility of clinical trials. We can help with developing digital solutions for patient monitoring, adverse monitoring and reporting, emergency notification systems, and for other use cases scenarios as well.

At Avenga, we work with medium-size enterprises and large businesses to develop functional and elegant wearable apps that work perfectly across different devices. We specialize in health wearable application development, such as self-tracking health wearable apps, and biometric and biofeedback apps.

Start a conversation. Use the contact form below and we'll get back to you shortly.