

HOW FLEX CIRCUITS AND WEARABLE TECH ARE CHANGING THE WORLD OF MEDICINE

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Wearable technology is something that quite a large number of people use every day—and don't even realize they are using it. The term sounds complicated and highly technical, but in reality, most wearable technology devices in use today include products like smart watches (Apple iWatch or the Kickstarter-created Pebble) and activity trackers (such as Fitbit and Garmin's Vivosmart.) Wearable technology has improved lives for a lot of people in rather straightforward ways—so far. However, the technology is new. Wearables are beginning to garner a lot of attention for their potential to do more than just tracking steps and controlling Pandora playlists.

In the future, it is entirely possible that [wearable technology and flex circuits](#) could play a major role in the [medical industry](#). In fact, these devices have already begun showing up in certain medical settings. We will discuss a few of the ways that wearables have and could impact medicine.



Figure 1: Example of a flexible circuit board.

To address the technology, a common thread that most of these devices share is that they require a flex circuit board. A flex or rigid flex circuit board is a critical component for these devices to be able to operate correctly. Furthermore, [flex circuits offer improvement or reduction in packaging requirements](#). In other words the size of the unit can be reduced by using flex and rigid flex as opposed to other methods of interconnect making the device more portable/wearable. A lot of times a flex or rigid flex must be used to meet design size requirements.

Medical Wearables Tend to be Single Point Solutions

One thing to keep in mind is that while the consumer market is pushing wearables to do more and more (look at the latest versions of the fitness trackers and how many extra features they include, for instance,) the wearable medical market is going in the opposite direction. Most medical wearables tend to be one solution devices. For example, a medical wearable will track "just insulin levels" or "just steps walked." Just because these devices only monitor one number does not make these devices any less effective or efficient. In fact, this was done more to ensure that the data collected is useful data, and not tarnished because the instrument is trying to do too much with too small of a device.

But, this is Changing

Medical wearable devices also have an enormous potential to use the same strategies that consumer wearables do—to track multiple types of data at once. The value in this is that a patient suffering from a chronic illness could benefit from his or her doctor learning about multiple layers of medical data. The growth of multi-use devices is something that will occur more as technology advances and the existing tools become better at what they do.

Medical wearables are not often the flashy, sporty wristbands that come to mind when consumers think about wearables. However, they are very effective, and the market is growing bigger every year.

Wearables for Physicians

Integration of Current Devices Into Practice – One of the main ways that wearable technology is most likely to impact the medical industry is if the devices move from being strictly a consumer device into being a "medical" device. Case in point—a doctor may provide an activity tracker, much like a Fitbit to his or her patients. The information collected by this device would not only be available to the patients but also to the doctor. When the physician has information from the device, it gives him or her a much better idea of exactly how much, and what kind, of physical activity the patient is achieving throughout the week.

Right now the doctor has to trust the information provided by the patient. While most individuals want to provide honest information, how many people have an accurate accounting of how much exercise they get? In addition to just tracking steps, some of these devices can measure heart rate or can even be used to encourage the measurement of caloric intake.

Wearables to Track Chronic Conditions

Another interest that physicians have in wearable technology is the ability these devices have, and may one day have, to track chronic conditions. Keeping up with patients that have diabetes, high blood pressure, heart disease, asthma and other chronic conditions can be a challenge. Even if the doctor asks the patient to keep up with certain numbers or track exercise and diet, the patient may not always comply.

A wearable helps the doctor be there 24 hours a day, seven days a week. The doctor has an insight into the patients' lifestyle and can better treat current and future symptoms, with the right information at hand.



Figure 2: Example of a wearable medical device for glucose monitoring system.

Wearables for Patients

For patients, the benefit of wearables is that they get better attention from their physician team—even in a busy setting. The simple "Fitbit" like device makes it possible to connect with the doctor on simple activities like exercise and diet. The tracking value is why so many people are choosing to wear these devices in a non-medical setting. Add the data-tracking tools in and it makes an amazing way for patients to stay in touch with doctors. However, in reality, that is only the beginning of how patients can benefit.

Patients do not always get the level of care they need or want, even when suffering from a severe illness or disease. The reason for this is that there simply aren't enough doctors or the cost to have doctors "on staff" serving patients in this capacity is simply unmanageable. A new product called "BioPatch" has now been approved by the FDA and is slowly being put into use by hospitals, according to [VentureBeat](#). The BioPatch is a tiny device that is attached to a patient's chest to monitor vitals and collects data all throughout the day.

With a monitor in place, it means that the medical staff can keep an eye on the patient's wellbeing even when there is not a doctor (or nurse) in the room. In fact, the BioPatch can even be worn home and notify the hospital of any potential problems. In some cases, it may allow patients to leave the hospital earlier—saving money and allowing them to be more comfortable.

One advantage a flex circuit board has in the medical industry is that the material polyimide it is made from. Polyimide has been approved by the FDA to be able to have contact with human skin. It is a certified

material and it does not cause any kind of allergic reaction to the patient. This makes flex circuits a great fit within the medical and wearable markets.

Conclusion

The adoption of wearables is still in its growth phase. In fact, it is [estimated that the wearable market will grow](#) from a \$3 billion dollar market to a \$50 billion dollar market from 2013 to approximately 2018. It will take some time to determine exactly what type of impact flexible circuit technology will have on the medical industry as a whole. It could be that in a few years we could not imagine a hospital being run without these devices. Only time will tell.