

# Patient-generated Healthcare Data and Advances in Transdermal Wearable Technology (Smart Patches)

At Omnicom Health Group, we recognize the importance of wearables. Advancements in transdermal technology and patient-generated data are at the forefront of wearable technology. Wearables have gone beyond activity monitors, and in some cases can be sensors, monitors, and drug delivery systems. We would like to know what you think. Send us your feedback at [technology@omnicomhealthgroup.com](mailto:technology@omnicomhealthgroup.com).

## Patient-generated Healthcare Data

Patient-generated healthcare data (PGHD) is any health-related information that is recorded and gathered from patients to help address a health concern. Patient-generated healthcare data is different from the data a doctor gathers during an office visit and can lead to valuable insights about a patient's condition between visits. It provides an aggregate report of a condition rather than just a reading at a certain point in time.

In the past few years, the introduction of popular consumer fitness wearables, such as Fitbit® and the Garmin watch, have generated an incredible amount of PGHD. These devices often gather interesting information such as calories burned, activity level, and heart rate. Companies such as Validic help provide integration with remote-monitoring devices for the patient and the healthcare industry by connecting patient-wearable data with healthcare providers.

## Transdermal Wearables (Smart Patches)

Patient-generated healthcare data and transdermal technology are becoming hot topics in the healthcare market and there are some potentially groundbreaking technologies on the horizon. The healthcare industry has predominantly been focused on reactive care, but as more technologies that encourage PGHD through transdermal technology are being developed, we may soon find ourselves changing the way we think about preventive healthcare treatment. Transdermal wearables have the potential to permanently change how care is delivered.

The terms *transdermal* and *transcutaneous* are often used interchangeably, but there is a distinction. Transdermal is defined simply as "through the unbroken skin" while transcutaneous refers specifically to the process of a drug penetrating, entering, or passing through the intact skin. When we hear the term "transdermal wearable" it may imply both.

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When we think about a transdermal patch, we usually think about a medicated adhesive patch that's placed on the skin to deliver a time-released dose of medication into the bloodstream, such as the nicotine patch or birth control patch. Various transdermal patches and gels are available on the market today including a transcutaneous immunization (TCI) vaccine designed to interact with skin to create an immune response.

## PGHD: Going Beyond Calorie and Step Tracking With Transdermal Wearables

Fitbit, maker of a wearable physical activity tracker, is now a \$6 billion company. New startups such as Sano in San Francisco are now taking that technology beyond physical activity tracking. Sano is building a wearable sensor patch that would continuously monitor an individual's blood chemistry and specifically their glucose levels, while wirelessly transmitting the data.

Tracking glucose levels can benefit all people, not just those with medical conditions. Glucose levels can indicate many things, such as the best time for meals, the best types of foods for us, and perhaps the amount of food our bodies require; therefore tracking calories might not be nearly as important as tracking glucose levels. The PGHD would undoubtedly be extremely valuable and could serve as a preventive measure for different groups of people and different diseases.

## GI Healthcare

G-Tech Medical is another company trying to take patient-generated healthcare data beyond fitness. G-Tech describes itself as the solution to non-invasive diagnosis of functional gastrointestinal disorders. G-Tech is developing a wireless, wearable, disposable electrode patch to measure the electrical activity from the stomach, small intestine, and colon over a period of several days.

Data from the patches will be transmitted via Bluetooth to a wireless device and ultimately to a cloud database for the physician, who can analyze the data for accurate diagnosis and treatment. The signals from the GI organs may be able to provide the physician with enough data to determine the severity of symptoms, and if further testing or hospitalization is warranted. The technology could also help quickly rule out more serious illnesses and allow the doctor to begin treating the patient without a barrage of time-consuming and expensive tests.

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## Transdermal Microneedles

Perhaps the most intriguing transdermal wearable research of all is in “microneedle” technology. Microneedle technology takes transdermal technology to a new level and there’s currently some groundbreaking research in progress.

Transdermal drugs are generally poorly absorbed and therefore have been mainly reserved for only a few low-molecular-weight drugs. Therefore, treating systemic illnesses with transdermal drugs has not been the best option. Scientists have been trying to come up with better ways to absorb larger drug molecules through the skin, such as using chemical enhancers, ultrasound, electric energy, pressure-driven flow, and even lasers. Success has been limited.

Microneedles, on the other hand, may be an answer to this problem since they have been shown to increase transdermal flux of high molecular weight drugs by manyfold. Microneedles are made of microscopic needles a few hundred microns in size and can pierce the skin in a minimally invasive manner without causing pain.

Researchers at the Institute for Basic Science in Seoul, South Korea, have developed a new type of transdermal patch system known as a “wearable graphene-based biomedical device.” The patch provides accurate diabetes monitoring and feedback therapy through human sweat by using an enzyme-based glucose sensor. Metformin is then automatically injected into the skin via microneedles in response to increased levels of blood glucose.

The patch sensor will also transmit blood glucose readings to the patient’s mobile device to monitor and record all the data. The device connects to a portable wireless chemical analyzer via Bluetooth and transmits data to wireless devices, which enables point-of-care treatment.

## Conclusion

Smart Patches that can monitor blood levels, auto-inject drugs, and transmit valuable and vital PGHD are no longer science fiction. Mainstream transdermal technology research is more than just exciting—it may very well be a major game changer in the healthcare industry. The potential of this technology is limitless and it has only just begun.

If you’d like to learn more, please contact us at [technology@omnicomhealthgroup.com](mailto:technology@omnicomhealthgroup.com).

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## Sources

"G-Tech Medical." G-Tech Medical. N.p., n.d. Web. 26 Oct. 2016. <http://www.gtechmedical.com/the-g-tech-patch.php>

"HealthIT.gov." Patient-Generated Health Data. HealthIT.Gov, n.d. Web. 17 Oct. 2016.  
<https://www.healthit.gov/policy-researchers-implementers/patient-generated-health-data>

Lee H, Choi KT, Lee YB, et al. A graphene-based electrochemical device with thermoresponsive microneedles for diabetes monitoring and therapy. Nature Nanotech. APBN • Vol. 11 • No. 6 • 2007. 2016 Mar 21. doi: 10.1038/nnano.2016.38.  
[http://www.ibs.re.kr/cop/bbs/BBSMSTR\\_000000000738/selectBoardArticle.do?nttId=12806&pageIndex=1&searchCnd&searchWrds](http://www.ibs.re.kr/cop/bbs/BBSMSTR_000000000738/selectBoardArticle.do?nttId=12806&pageIndex=1&searchCnd&searchWrds)

Magee, Christine. "With \$10 Million In Seed, Sano Is Building A Metabolic Health Tracker." TechCrunch. N.p., 19 June 2015. Web. 26 Oct. 2016.  
<https://techcrunch.com/2015/06/19/with-10-million-in-seed-sano-is-building-a-metabolic-health-tracker>

"Microneedles for Drug and Vaccine Delivery." Microneedles for Drug and Vaccine Delivery. N.p., Nov. 2012. Web. 17 Oct. 2016.  
<http://www.sciencedirect.com/science/article/pii/S0169409X12001251>

"Result Filters." National Center for Biotechnology Information. U.S. National Library of Medicine, n.d. Web. 17 Oct. 2016.  
<https://www.ncbi.nlm.nih.gov/pubmed/23900241>

"Toward Biofunctional Microneedles for Stimulus Responsive Drug Delivery." - Bioconjugate Chemistry (ACS Publications). N.p., n.d. Web. 17 Oct. 2016.  
<http://pubs.acs.org/doi/abs/10.1021/acs.bioconjchem.5b00211>

"Transdermal vs Transcutaneous - What's the Difference?" N.p., n.d. Web. 26 Oct. 2016.  
<http://wikidiff.com/transcutaneous/transdermal>