FROST & SULLIVAN

Healthcare Market Updates

Table of Contents

Wearables

Garmin to develop wearables for clinical trials with ActiGraph – December 13, 2018 (1/2)

Applicable Product Categories: Wearables

Technologies	Wearable (Device + App)		**Therapeutic Areas**	Clinical Trial Remote/Virtual Patient Monitoring
Applications	Remote Patient Monitoring, Virtual Clinical Trials		**Geographic Focus**	US/ Global
Segment Focus	Clinical Grade		**Topics (News type)**	Collaboration
Companies	Garmin and ActiGraph		**Others**	NA

ANALYST TAKE:

- **Synopsis:** Garmin, Actigraph partner on wearable-driven medical research. The companies will be applying ActiGraph's CentrePoint data analytics platform to Garmin's sensor-carrying wearables.

- **Industry Needs:** Pharma clinical trials are slow and expensive processes. Based on industry estimates, due to lack of patient-centric trial designs, up to 35% of patients drop out of clinical trials. Another 35% are non-adherent to study protocols, which costs about $1 million per trial in lost productivity alone. Recent Frost & Sullivan analysis acknowledges that early application and integration of wearable devices and smartphones app data demonstrates compelling benefits around reducing trial costs, streamlining trial processes and demonstrating real-world efficacy. Frost & Sullivan also estimates that by 2018 15%-20% of the clinical trials globally will adopt some form of remote or virtualization patient monitoring solutions – mHealth solutions will gain maximum traction.

- **Value Proposition:** The partnership will explore health and activity monitoring innovations combining Garmin wearables with ActiGraph's CentrePoint data analytics platform for academic research, clinical trials, and remote patient monitoring. As per Travis Johnson, global product lead at Garmin Health, "By combining the sensor data from Garmin wearables with the data capture and analytical expertise of the ActiGraph platform creates a powerful solution for many different patient monitoring applications."

- Frost & Sullivan views this as a winning deal for Garmin, to compete against clinical-grade wearables rivals such as Apple and FitBit in the growing application areas such as remote clinical trial patient monitoring. Additionally, ActiGraph wearable accelerometry monitors and a software technology platform are well know brands in the clinical research space, and extensively validated devices of their kind, with clients at more than 1,500 pharmaceutical, academic, and scientific institutions in over 85 countries. However, ActiGraph already has a proven medical grade wearable device portfolio, and it will therefore be interesting to watch how/what specific digital end-points form Garmin's wearables they would find complementing for future applications.

- Frost & Sullivan finds Garmin particularly very active in attempts to penetrate into the clinical trial space. For example, recently Garmin partnered with Fitabase's research platform, and are already working with a Copenhagen University clinical study on physical activity during pregnancy. Looking at 2018 as a whole, the company has made a number of moves in the healthcare space including the release of its Vivosmart 4 activity tracker with pulse oximetry and sleep analysis, an integration with heart health app Cardiogram, and a research agreement with the University of Kansas Medical Center. ActiGraph, for its part, was also recently announced as the technological backbone of a pilot study at Bayer.

- Entailing these developments, Frost & Sullivan believes, both clinical and medical grade wearables have compelling growth opportunity in the emerging patient-centric remote/virtual clinical trial space. The debate on the application of wearables in the clinical research space is moving for 'Consumer vs. Clinical' grade to how consistently and meaningfully wearables can provide novel digital biomarkers and engage patients.

- **Target End-User:** Pharma Clinical trials, Academic Research Organizations

WEBLINK: https://bit.ly/2EnhHWh

# Verily, Sanofi-backed diabetes management program to offer Orpyx's foot ulcer sensors – December 13, 2018 (1/2)

Applicable Product Categories: Wearables

Technologies	Wearable (Device + App)	
Applications	Remote Patient Monitoring and Condition Management, Preventive Care	
Segment Focus	Clinical Grade	
Companies	Verily (Google), Sanofi, Onduo, and Orpyx Medical Technologies	

Therapeutic Areas	Virtual diabetes program for foot ulcer prevention
Geographic Focus	US / Global
Topics (News type)	Strategic Collaboration
Others	NA

ANALYST TAKE:

- **Synopsis:** Onduo, a Verily-Sanofi joint venture focused on digitally-driven diabetes management, is looking to further protect its members from foot ulcers and limb loss by offering Orpyx Medical Technologies' diabetic foot ulcer sensors for its members. In 2019, Orpyx foot ulcer sensors will be offered to select members as part of Onduo's diabetes management and lifestyle support services

- **Industry Needs:** As per WHO, diabetes is a leading cause of blindness, amputation, and kidney failure. industry estimates suggest that, 25% of people with diabetes develop foot ulcers over their lifetime and today, one in five of those people experience complications that lead to amputation. Wearables such as Orpyx helps people with diabetes to prevent foot ulcers by providing insight that protects foot health and mobility and reduces the risk of complications that can lead to limb loss.

- **Value Proposition:** Per the deal struck between the companies, Orpyx Medical Technologies' FDA-cleared SurroSense Rx system will be offered for foot ulcer prevention to select members. The system consists of a thin sensor that is placed in a patient's shoes and a wirelessly connected smartwatch, which displays readings and alerts to the user when dangerous pressure levels are detected.

- **What's the impact?** Onduo's digital platform is an integrated ecosystem of software and devices designed to provide personalized diabetes management. The addition of Orpyx's system provides the program's members with another option for foot ulcer prevention, allowing them to choose the offering that most conveniently fits their comfort and lifestyle. Onduo integrates hardware and software will provide people with access to personalized, convenient diabetes care. People with diabetes can match their lifestyle and clinical interventions, which for participating clients and select users will include wirelessly connected foot monitoring from Orpyx next year. As per Breanne Everett, CEO of Orpyx Medical Technologies, "Orpyx helps people with diabetes to prevent foot ulcers by providing insight that protects foot health and mobility and reduces the risk of complications that can lead to limb loss."

- Frost & Sullivan views the addition of Orpyx foot ulcer prevention technology as a thoughtful capability expansion into Onduo's innovative Virtual Diabetes Program that gives diabetes patients meaningful tools and coaching to practice preventive care and live healthier. Backed with $500 million investment by two big names such as Google and Sanofi, Onduo's "virtual clinic" has been active in striking best-of-breed partnerships since it launched in late 2016. These deals range from partnerships with the Blue Cross Blue Shield Association, CGM device maker such as Dexcom, and a spate of platform integrations and digital diabetes care companies such as; Voluntus, Glytec and BioTelemetry.

- Having said that, Frost & Sullivan also finds virtual diabetes management and coaching space a high growth market, with ever increasing competition from innovative digital health platform companies such as; Vida Health, WellDoc, Livongo and Glooko among others. Moving forward Frost & Sullivan believes collaboration will be the key for future success to make this platforms a holistic ecosystem for diabetes care and condition management. This also opens opportunity for wearable device makers that have specific focus on diabetes and its comorbidity monitoring and insight services.

- **Target End-User:** Diabetes Patients, Diabetes Care Clinics, Community Health Centers

WEBLINK: https://bit.ly/2GeFvy8

Lilly and Evidation Health Expand Collaboration to Analyze Data from Smartphones and Connected Sensors – December 14, 2018 (1/2)

Applicable Product Categories: Wearables

Technologies	Wearable (Device + Platform)
Applications	Remote Patient Monitoring, Digital Therapeutic
Segment Focus	Clinical / Consumer Grade
Companies	Eli Lilly and Evidation Health

Therapeutic Areas	Clinical Trial Remote /Virtual Patient Monitoring
Geographic Focus	US / Global
Topics (News type)	Strategic Collaboration
Others	NA

ANALYST TAKE:

- **Synopsis:** Eli Lilly and Company (LLY) and Evidation Health expanded their collaboration with a multi-year agreement to provide Lilly with global access to Evidation's Andromeda data platform.

- **Industry Needs:** It is a well-known fact that, pharma clinical trials are a slow and expensive bet. A recent MIT research suggests that, more than 85% of clinical trials fail to get FDA approval. Frost & Sullivan analysis note increasing adoption of patient-centric digital technologies such mHealth and wearables offer new ways to capture objective measurements as clinical trial participants go about their daily lives by utilizing novel primary, secondary, and exploratory endpoints and help pharma companies to reducing trial costs, optimize patient enrichment strategy, streamlining trial processes, and demonstrating real-world efficacy.

- **Value Proposition:** As part of this deal, pharma giant Eli Lilly will leverage Evidation's Andromeda data platform to analyze large scale data aimed at uncovering novel digital measures of health. As a result of this announcement, Lilly scientists and researchers across therapeutic portfolios will have access to Evidation's data platform with the goal of uncovering new ways to measure and understand a patient's health by accessing consented data derived from smartphones, connected sensors, wearables, and even their own voice. However, the terms of the agreement are undisclosed. As per Divakar Ramakrishnan, Lilly's Chief Digital Officer. "By leveraging Evidation's Andromeda platform, Lilly's scientists are gaining a deeper understanding of the physiological, environmental, and contextual indicators that can help shape future advancements in medicine and medicine delivery."

- As one example among multiple therapeutic areas, Evidation's data platform is being used by Lilly to analyze data from continuous glucose monitors, insulin pumps, and real world information to improve the experience of people with diabetes and support the company's significant efforts to build a connected ecosystem that includes an automated insulin delivery device and connected insulin pen.

- Frost & Sullivan views this deal as a classical example of how collision of healthcare with life science IT systems is transforming the pharma industry value proposition from selling drug to medicine-as-a-service, often called as digital therapeutics. As one of the progressive pharma companies, Lilly is already using the digital solutions to analyse data from continuous glucose monitors, insulin pumps and real world information, to improve the experience of people with diabetes, and build a connected system based around an automated insulin delivery device and connected pen. With Andromeda, Lilly scientists now have instant access to a private, collaborative, and secure analytical environment where they can use Evidation's algorithms to process raw data for use in clinical studies or to create their own predictive models. For example, the models turn complex, patient-generated behaviour data into novel, quantifiable, and clinically meaningful insights that can transform how diseases are identified, treated, and monitored. Additionally, Evidation already has working partnerships with other leading pharma and academic research organizations such as Sanofi, Tueo Health, Shepherd Center, CrowdMed, and Stanford Healthcare among others.

- Entailing this, Frost & Sullivan believes there is a great prospect for progressive wearables device and data service providers to explore ideal collaboration opportunities in the clinical research and digital therapeutic space, attuned to their wearable solution based condition and therapeutic focus. Frost & Sullivan research observes, currently, the major use cases of mHealth and wearables include recruitment, RPM, and medication adherence. Future use will focus more on wearable activity trackers and biosensors for observational studies, post-market and patient communities research.

- **Target End-User:** Pharma Clinical trials, Academic Research Organizations

WEBLINK: https://on.mktw.net/2UHQXoY

Mobile Phones/ mHealth

Gates-backed Penn State, Johns Hopkins project measures heart rate from 4 ft. away with cellphone cameras – December 10, 2018 (1/2)

Applicable Product Categories: Mobile Phones

Technologies	mHealth App, Smartphone Camera	**Therapeutic Areas**	Vital signs monitoring
Applications	Photo-plethysmography and computer vision aided heart rate monitoring	**Geographic Focus**	Global
Segment Focus	Clinical Grade (under development)	**Topics (News type)**	Tech Innovation
Companies	VideoVitals	**Others**	Bill & Melinda Gates Foundation / Johns Hopkins / Penn State

ANALYST TAKE:

Synopsis: Researchers at John Hopkins and Penn State, have developed a smartphone camera based technology, named VideoVitals, which could measure the user's vital signs from a distance of up to 4 feet

Industry Need:

- Vital signs monitoring from a distance, especially through a readily available device such as a smartphone could be highly useful in situations of epidemics and during break out of contagious diseases such as Ebola, tuberculosis, or H1N1.
- Considering the fact that these epidemics are more common in low resource locations or nations, its also important to enable such technology to effectively work on low end smartphones, which are widely used in such countries.

Value Proposition:

- The technology called VideoVitals, which is being developed with the help of a $100,000 grant from the Bill & Melinda Gates Foundation, will be tested in lower resource settings in countries like India and Sierra Leone between now and March 2019.

- VideoVItals uses a combination of photo-plethysmography, the same technology used in the Apple Watch for heart rate detection, and computer vision to detect heart rate based on minute skin color changes. The computer vision helps to account for differences in environmental lighting, skin pigmentation, and camera quality, and to complete a measurement even when the subject is moving.

- Mobihealthnews reports that a number of companies, including Fujitsu and Philips, have announced similar initiatives to develop solutions monitoring heart rate from a distance as early as 2013. However, the VideoVitals approach is among the first to include a further layer of lower cost smartphones to make it more meaningful for use in developing nations. Additionally, the use of computer vision for detection of facial feature, pigmentation and environmental lighting would further enhance the solution's accuracy.

- Frost & Sullivan believes that while such a solution would be highly helpful for the intended use cases already mentioned, its important to thoroughly look at the distribution and commercialization models of such a solution, once it is legitimated through an approval process, which is still a few years away. Companies who are well entrenched in mid to lower range smartphone segments in countries like India, may find high levels of differential value to integrate such solutions with their smartphone offerings in partnerships with relevant governmental organizations, healthcare entities and first responder associations who are at the fore-front during epidemics to screen and diagnose early cases.

- **Target End-User:** Hospitals; Primary Care Centers; Patients

WEBLINK: https://bit.ly/2SK3fvo

Study: iPhone's step tracker is solid, but don't rely on its distance measurement features – December 12, 2018

Applicable Product Categories: Mobile Phones

Technologies	mHealth App, Pedometer
Applications	Smartphone pedometer enabled distance measurement algorithm
Segment Focus	Clinical / Consumer Grade
Companies	Apple
Therapeutic Areas	Activity tracking, Wellness
Geographic Focus	US
Topics (News type)	Care Delivery Innovation
Others	-

ANALYST TAKE:

- **Synopsis:** Apple's iPhone's CoreMotion Pedometer has been found to sufficiently measure a user's steps in order to remotely monitor his activity. However, a Stanford University study has found inconsistencies in its distance measurement algorithm due to inaccuracies in measuring the user's stride length.
- Frost & Sullivan believes that this is not a cause of major concern if the end requirement for iPhone is a fitness and wellness enabler, so as to be used in various activity incentive programs, where in addition to some other smartphones, it has been shown to perform better than dedicated fitness tracker wearables. However, considering Apple's serious medical grade ambitions, this is a setback for the brand to be used for activity tracking in certain medical conditions such as peripheral artery disease (PAD).

WEBLINK: https://bit.ly/2PDGLtO

Feds, Philips Warn of Security Flaw in HealthSuite mHealth App – December 12, 2018

Applicable Product Categories: Mobile Phones

Technologies — mHealth App

Applications — Cybersecurity of mHealth app

Segment Focus — Clinical Grade

Companies — Philips

Therapeutic Areas — All

Geographic Focus — Global

Topics (News type) — Cybersecurity

Others — -

ANALYST TAKE:
- **Synopsis:** Philips, as well as the Department of Homeland Security have made announcements about possible cybersecurity vulnerabilities of the Philip's HealthSuite Health Android app due to inadequate encryption strength.
- The app, which if hacked, could provide the hackers access to confidential PHI data as well as maneuverability to impact integrity of Philips' ecosystem of connected products including the health watch, connected scale, blood pressure monitor and thermometer.
- Frost & Sullivan finds this as a significant event considering the fact that medical device, healthcare IT as well as pharma companies have all been highly proactive in augmenting cybersecurity of their devices. While they work in tandem with government agencies, industry associations as well as security researchers in building robust systems, care facilities have a definitive part to play in this. Care staff can take basic preventative security measures such as avoiding clicking any unknown links, mails, accessing and distributing user data, medical records and lab records on protected internal networks, and sticking to recommended user guidelines for the medical devices

WEBLINK: https://bit.ly/2G8tQRc

Smart Home Devices & Appliances

High Cost Of Health Care Drops With Right Home Design –
December 10, 2018

Applicable Product Categories: -

Technologies	IoT & more		**Therapeutic Areas**	Chronic Respiratory conditions, wellness	
Applications	Voice Assistants		**Geographic Focus**	US / Global	
Segment Focus	Consumer Grade		**Topics (News type)**	Other Trends	
Companies	KTGY architects		**Others**	-	

ANALYST TAKE:

- **Synopsis:** KTGY architects have launched the 'KB Home ProjeKt' to "proactively combat (health conditions) through the right home design."
- "The ProjeKt takes a look at design practices that support more active lifestyles, as a proactive prevention of heart disease. It also incorporates the latest smart home technologies and sophisticated engineering to provide the right balance of air exchanges, low moisture and clean air to prevent chronic lower respiratory diseases."

- Frost & Sullivan agrees with the guiding principle that home design, along with the right utilization of smart technologies can actually help support wellness initiatives, as well as help maintain and improve chronic health conditions. The right integration between 'design' and smart 'medtech' solutions will be even more powerful for addressing such health issues.

- Note, the article includes a link to register for a tour of the prototype home in Las Vegas, in February.

WEBLINK: https://bit.ly/2Lh19k3

Other Interesting Articles

When available, other interesting articles will be covered here in short.

News Title	Link	Remarks
BTI introduces smart home in Bangladesh real estate	https://bit.ly/2Ek57H4	Even small, undeveloped economies have a premium segment in real-estate that are looking at smart technologies to offer their customers, and can be a target segment for smart home tech that is cost-adjusted for the region.
Students open doors to smart homes	https://bit.ly/2PziB3T	The University of Queensland has a research project allowing student to work with experts for the design and manufacture of smart homes. Such research projects can evolve to include health-related tech as well.
Will China embrace Apple's HomePod?	https://bit.ly/2zZBZ4T	Compared to 25 mn smart speakers sold in US, China had 350,000 sold last year, but the market is picking up – however the preference is for low-cost solutions, as evidenced by Baidu's launch of a US $14 smart speaker after a US$250 speaker flopped in the market. China is one of the largest markets for internet users, and with local competition dominating, it will be interesting to see how Apple is perceived – mass market or premium offering (especially when Apple does not compete on price).

FROST & SULLIVAN