FROST & SULLIVAN

Healthcare Market Updates

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Wearables

Apple awarded patent to use iPhone, smartwatch as carbon monoxide detector – February 4, 2019 (1/2)

Applicable Product Categories: Wearables

Technologies	Wearable (smartwatch + Apps)	**Therapeutic Areas**	Chronic Condition and Lifestyle Management
Applications	Environmental Health Monitoring	**Geographic Focus**	US
Segment Focus	Clinical/Consumer Grade	**Topics (News type)**	Application Extension/ Product Line Strategy
Companies	Apple	**Others**	NA

ANALYST TAKE:

Synopsis: Apple has been granted a patent today which illustrates how future products such as iPhone, iPad or Apple Watch could have built-in sensors to detect harmful, poisonous gasses, such as CO or CO_2 — often dubbed a silent killer due to its odorless, tasteless yet toxic state.

Industry Need:

- Climate change, as an environmental hazard operating at the global scale, poses a unique and involuntary exposure to many societies, and therefore represents possibly the largest health inequity in today's world. As per WHO, about 88% of the disease burden is attributable to climate change with significant affliction for children under the age of 5 years. Furthermore, rising atmospheric carbon dioxide concentrations are anticipated to decrease the zinc and iron concentrations of crops. While, the associated disease burden and optimal mitigation strategies remain unknown, carbon monoxide is considered to be one of the most dreadful gases that is injurious to health. It is often dubbed as a silent killer, because it is odorless and tasteless, one cannot be aware if they are inhaling it but once that happens it can severely affect health.

Apple awarded patent to use iPhone, smartwatch as carbon monoxide detector – February 4, 2019 (2/2)

Value Proposition:

- The carbon monoxide detector is in line with Apple's plans to help its users stay healthy by developing and integrating health technologies into its Apple Watch, iPad and iPhone. The company has even hired medical doctors to work on developing applications to help people with serious medical problems. Sources have revealed that the company currently employs as many as 50 doctors, including Sumbul Desai, a doctor from Stanford Medicine; Mike Evans, a family medicine doctor on the special projects team; and Michael O'Reilly, an anesthesiologist who has been on the Apple team for almost six years.
- About the patent: According to Patently Apple, "Apple's patent claim #9 points to a 'target gas consisting of at least one of ozone (O.sub.3), nitrogen dioxide (NO.sub.2), nitrogen monoxide (NO), sulfur dioxide (SO.sub.2), carbon monoxide (CO), methane (CH.sub.4) and volatile organic compounds (VOCs), and wherein the components of a gas mixture other than the target gas comprises poisoning species including siloxanes, sulfates, phosphates and chlorides, and/or interfering species such as water vapor.'" The patent shows diagrams of a "miniature gas sensing device encased in an enclosure" with an Apple Watch used in the example.
- Considering the fact that, carbon monoxide is considered to be one of the most dreadful gases, Frost & Sullivan finds the integration of carbon monoxide detector into Apple's everyday devices being used by a large mass of average consumers as a timely solution to promote preventive care concepts. This also provides Apple's future portfolio of healthcare devices a differential value proposition against growing competition. Frost & Sullivan also believes this CO monitoring feature on Apple's devices will also open up complementary partnership opportunity in the growing smart air-purifiers market.
- However, there are still some unanswered questions around the product design challenges. While ingraining a physical gas sensor into a device requires another physical chassis opening — something Apple and the industry is clearly moving away from — it would be extremely interesting to see if the company could retain IP68 water-resistance on iPhone and Apple Watch with this theoretical feature built-in.

- **Target End-User:** Healthcare consumer, Hospital monitoring solutions, Occupational health hazard management programs

WEBLINK: https://bit.ly/2E0LYcI

Google's Verily to develop smart shoes that detect weight – February 5, 2019 (1/2)

Applicable Product Categories: Wearables

Technologies	Wearable (sensor + Apps)	**Therapeutic Areas**	Obesity and Fall Management
Applications	Remote patient monitoring, Self-health management	**Geographic Focus**	US/Global
Segment Focus	Clinical/Consumer Grade	**Topics (News type)**	Application Extension/ Product Line Strategy
Companies	Verily (Google)	**Others**	NA

ANALYST TAKE:

Synopsis: As reported by CNBC, Alphabet's research company Verily has been looking for partners to co-develop a pair of smart shoes that can track a wearer's weight and detect falls. While CNBC said it couldn't determine whether the project was still active, health-tracking sensors and apps have been an active area for tech giants.

Industry Need:

- As per the Centers for Disease Control and Prevention, in the US 1 in 3 seniors aged 65+ suffers a fall each year, and >700,000 are hospitalized for their injuries. Medical costs of fall-related injuries for 65+ people are about $34 billion annually in the US and are expected to increase. Especially, elderly women showed a significant number of fall-related injuries and a high cost of healthcare. Given ageing population is a growing concern globally, wearable technologies with sensor functionality for weight and fall detection can empower senior citizens and their care givers to remain independent, and live an active lifestyle.

Google's Verily to develop smart shoes that detect weight – February 5, 2019 (2/2)

Value Proposition:

- CNBC's sources claim that the Verily prototype set is embedded with sensors that can monitor the wearer's movement and weight, as well as measure falls. The company has been showing different prototypes of the design in private meetings to potential partners in order to attract them to co-develop the product and take it to the market. The weight-tracking feature could potentially be used to prevent life-threatening conditions like congestive heart failure by alerting wearers to sudden weight gain, a common symptom of the malady resulting from internal fluid retention.
- Whether or not Verily is still pursuing this project is currently unknown, though according to CNBC, the company has recruited "dozens of engineers, scientists and health experts to its ranks" who could be working on the private project. If the shoes do, in fact, make it to production, they could be immensely beneficial to seniors in particular.

- Despite the speculation, Frost & Sullivan believes, if Verily decides to produce these shoes, it could detect many health-related issues that arise due to weight. For example, sudden weight gain could mean that the body is retaining fluid, which is a symptom of congestive heart failure. This also indicates, Verily is thinking outside of the smartwatch when it comes to wearables to complement its growing portfolio of healthcare focused products and solutions. Furthermore, the company is reported already working on other healthcare related projects like Liftware, a stabilising spoon that helps people with movement disorders eat, a smart contact lens for elderly who have issues with sight or for the ones who want to improve their eyesight after cataract surgery. Verily is also using Google's machine learning capabilities to detect heart-disease risks through scans of a person's eyes. The company has partnered with several companies for these projects in order to develop and manufacture the products. Considering above developments Frost & Sullivan anticipates a strong focus for Verily especially for emerging healthcare segments such as individual care, assisted living and elderly care.
- Frost & Sullivan also notes that Verily is not the first company to develop smart shoes with such features. There are both niche players such as E-VONE that has smart shoes in 26 different styles with sensors which detect a fall, Puma's updated RS-Computer shoes, and Nike's HyperAdapt self-lacing shoes; and even big names such as Apple already provides this feature in its smartwatch Series 4.
- **Target End-User:** Homecare, Elderly Care, Insurance Programs

WEBLINK: https://bit.ly/2MZK676

FDA approves Current Health AI-powered wearable solution for hospital care – February 7, 2019 (1/2)

Applicable Product Categories: Wearables

Technologies	Wearable (sensor + Apps) + AI	**Therapeutic Areas**	Chronic and Critical Patient Monitoring
Applications	Patient monitoring	**Geographic Focus**	US
Segment Focus	Clinical Grade	**Topics (News type)**	Product Line and Application Strategy
Companies	Current Health	**Others**	NA

ANALYST TAKE:

Synopsis: Scottish company Current Health (formerly known as snap40), the manufacturer of the wearable device, announced that, it has received Class II clearance from the FDA for its AI-powered wearable solution for hospital care. The clearance means the device has now been approved for use in both the United States and the European Union.

Industry Need:

- Frost & Sullivan research suggests that most hospitals globally do not have the option to continuously monitor a patient's vital signs except in a high-acuity unit such as ICU, HDU, or CCU. For example, on an average, 95% of the patients do not have access to continuous monitoring in a hospital environment, and 60%–70% of lower acuity care units do not have clinical-standard vital sign monitors. Furthermore, in about 43% of the cases, nursing staff are unaware of the abnormal vital signs of patients. Readmissions for patients whose conditions deteriorate after treatment costs US hospitals more than $40 billion annually.
- Given the increasing prevalence of lifestyle driven chronic health conditions and emergence of value-based care concepts, it has become imperative for hospitals to periodically monitor patient vitals to assist in early detection of dangerous situations.

FDA approves Current Health AI-powered wearable solution for hospital care – February 7, 2019 (2/2)

Value Proposition:

- Worn on the upper arm, the device non-invasively captures vital signs with ICU-level accuracy, providing automatic alerts for deteriorating patients, according to Current. The system also provides direct transmission of the data to the electronic health record through an HL7 or Fast Healthcare Interoperability Resources (FHIR) integration. According to the company, the device monitors patients' vital signs using proprietary algorithms that continuously analyze the data to help better predict their health trajectory and to enable clinicians to intervene earlier and improve outcomes. The wireless wearable solution can be incorporated with third-party devices to gather additional metrics, build patient-specific digital therapeutics and recommendations. At present, Current has been using the solution at a post-acute setting in Dartford and Gravesham NHS Trust, which serves a local population of 500,000 people.

- Frost & Sullivan finds Current Health's medical-grade, AI-powered patient monitoring solution, an intelligent solution that goes beyond the traditional point-of-care medical devices. It provides much needed flexibility and efficiency by enabling health organizations to decrease needless hospital readmissions for patients whose conditions degrade after treatment. The accuracy and health outcomes of Current Health's patient monitoring wearable solution is backed with clinical validation studies at reputed health systems. For example, a recent study at the Dartford and Gravesham NHS Trust's Hospital at Home team was able to reduce home visits 22% and hospital readmissions and emergency department visits after using the Current Health's patient monitoring solution to remotely monitor patients who were recently released from the hospital. Current Health is also being used to detect patient deterioration earlier and improve health outcomes at Mount Sinai Brooklyn.
- Frost & Sullivan believes that the AI application layers and interoperability with existing Health IT systems in hospital settings will continue to be the key differentiator for Current Health against other competing wearables in the hospital patient monitoring space such as; Vital Connect Inc, Cloud DX Inc., and Sotera Wireless, Inc. among others. Moving forward it will be also critical for Current Health to expand its vital monitoring capability to enable real-time non-obtrusive clinical-grade multi-parameter vital monitoring to promote preventative care for patients far earlier than standard care expectations .
- **Target End-User:** Hospitals, Clinical trials

WEBLINK: https://bit.ly/2RO3UuP

Omron Healthcare and physIQ Partner to Transform Cardiovascular Patient Care – February 6, 2019

Applicable Product Categories: Wearables

Technologies	Wearable (sensor + Apps) + AI	**Therapeutic Areas**	Chronic Condition and Lifestyle Management
Applications	Remote Patient monitoring, Self Health	**Geographic Focus**	US / Global
Segment Focus	Clinical Grade	**Topics (News type)**	Product Line Strategy/ Partnership
Companies	Omron Healthcare and physIQ	**Others**	NA

ANALYST TAKE:

Synopsis: Omron HeartGuide®, the first wearable blood pressure device, will integrate with physIQ's pinpointIQ® analytics platform to indicate a potential health risk.

Value Proposition:

- This combined solution is being deployed to enable remote monitoring of at-risk patients that have recently been discharged after heart failure or a heart attack. The goal is to provide clinicians with physiological insight to proactively address potential clinical deterioration. As per the press statement, "By integrating HeartGuide into our pinpointIQ platform, we are confident that we have an end-to-end solution that will address a massive unmet need in the market and bring enormous value to patients and their clinicians. This is the beginning of a relationship that we believe will truly transform how patients are cared for at home." Given the global reputation of Omron and recent FDA approval for **PhysIQ's** atrial fibrillation-detecting AI analytics engine, Frost & Sullivan views this deal as a synergetic one to bring best-of-breed clinical-grade device and data service capabilities, and excel commercialization strategy.
- **Target End-User:** Healthcare Consumers, Hospitals, Clinical Trials, Insurance Programs

WEBLINK: https://bit.ly/2DaI2Vg

Mobile Phones/ mHealth

Non-Invasive, Saliva-Based Glucose Test for Diabetes Management – February 4, 2019 (1/2)

Applicable Product Categories: Mobile Phones

Technologies	mHealth App; Digital Platform	**Therapeutic Areas**	Diabetes
Applications	Non-Invasive Glucose Monitoring and Diabetes Management	**Geographic Focus**	Global
Segment Focus	Clinical Grade	**Topics (News type)**	Care Delivery Innovation
Companies	iQ Group Global	**Others**	-

ANALYST TAKE:

Synopsis: The iQ Group Global, a consortium of life science and financial services companies which span the biopharma value chain, introduced the Saliva Glucose Biosensor, a non-invasive, saliva-based glucose test for measuring glucose in saliva rather than blood.

Industry Need

- The blood glucose monitoring ecosystem of products has seen evolution from invasive finger-prick glucometer, to current semi-invasive, sensor based sub-dermal CGMs. The future of industry is moving towards a non-invasive approach utilizing biomarkers from various body parts ranging from eyes, fingertips, earlobe and saliva with the sole aim to improve the quality of life for over 425 million people living with diabetes globally.
- These solutions are being augmented by Continuous and real time monitoring and patient engagement enabled by smartphones and wearables with data analytics support and wellness monitoring, mood/stress log, physical activity log, medication and food log so as to provide a holistic picture of a patient's blood glucose levels and real-time variations.

Non-Invasive, Saliva-Based Glucose Test for Diabetes Management – February 4, 2019 (2/2)

Value Proposition:

- The Saliva Glucose Biosensor comprises of two main components
  - A Glucose Biosensor Unit, which is a small, disposable strip, which needs to be exposed to an individual's saliva to instantly provide a glucose measurement.
  - A digital healthcare app which presents the glucose measurement in real-time on a patient's smart device.
- The company positions its product as a viable alternative to current finger-prick tests, being labeled as "painful and frustrating" for users on a continuous basis and often cited as the primary reason for non-adherence with periodic monitoring of blood glucose.

- Frost & Sullivan research finds that this is not the only company focusing on non-invasive blood glucose monitoring. While, the iQuickIt Saliva Analyzer from Quick LLC uses saliva to measure glucose levels, other companies are focusing on eye based solutions. NovioSense is developing a teardrop glucose sensing sensor), fingertip (LighTouch Medical uses spectroscopy applications to detect blood glucose; Glucosense Technologies is developing a laser based device; OrSense has an optical device, that tracks glucose and other parameters using occlusion spectroscopy) and earlobe (Glucowise device measures glucose levels in the skin at the fingertip or at the earlobe using radio waves; Glucotrack by Integrity Applications uses ultrasonic, electromagnetic and thermal technology to track blood glucose levels at the earlobe). While most of these solutions are still under development, the underlying value proposition remains the same. Additionally, there are other relevant challenges in blood glucose monitoring, like being continuous, real-time and offering data analytics based insights, which would really make a difference to the overall diabetes management ecosystem. Most importantly, post Google's news to abandon the contact lens project to detect glucose in tears due to inconsistent measurements, the approach to measure glucose in saliva needs scientific validation, before any significant clinical adoption can take place.

- **Target End-User:** Chronic condition patients, care givers

WEBLINK: https://bit.ly/2UzV0mm

DrChrono Becomes Certified for Meaningful Use Stage 3 for Native iOS App for iPad and iPhone, Completing Requirements for MACRA and MIPS – February 7, 2019

Applicable Product Categories: Mobile Phones

Technologies	mHealth App; EHR	**Therapeutic Areas**	All
Applications	Mobile based EHR	**Geographic Focus**	US
Segment Focus	Clinical Grade	**Topics (News type)**	Care Delivery Innovation
Companies	DrChrono	**Others**	-

ANALYST TAKE:

- **Synopsis:** DrChrono's EHR, which runs on the iPad, iPhone, and Apple Watch, has attained ONC certification for Meaningful Use Stage 3, the first to obtain that certification for a mobile-based product, as claimed by the company.
- Frost & Sullivan believes that the concept of "meaningful use", which essentially has been modified to promote interoperability within different EHR systems is an integral aspect of attaining the required efficiencies and value based care goals of today's healthcare ecosystem. While, other mobile based personal health records such as that of Apple and Ciitizen have been able to achieve certain levels of interoperability, the current system's ability to share EHR data easily between different provider systems, including using a file format called C-CDA, will go a long way in ensuring effective care coordination, especially in case of patients who move from one system to another.

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

Two new Google apps to benefit the deaf – February 6, 2019

Applicable Product Categories: Mobile Phones

Technologies	mHealth App; AI; Smartphone microphone	**Therapeutic Areas**	All
Applications	App based speech-to-text engine and sound amplifier	**Geographic Focus**	Global
Segment Focus	Consumer Grade	**Topics (News type)**	Care Delivery Innovation
Companies	Google	**Others**	-

ANALYST TAKE:

- **Synopsis:** Google has unveiled two apps named, Live Transcribe and Sound Amplifier, aimed at enabling deaf people to communicate better. The Live Transcribe app will utilize a speech-to-text engine which leverages the phone's microphone to turn real-world speech into text. The Sound Amplifier app would boost, filter and augment sounds so that people who are hard of hearing can enjoy a better quality of sound. Both the apps will be rolled out on the Play store.
- Frost & Sullivan views this as a classic example of perfect utilization of existing resources and solutions for newer dimensions of product positioning, thereby enhancing customer touch points and potentially newer revenue streams. The Live Transcribe app, for example leverages existing Google CART, a service that is able to let people join a meeting and create a transcription of the spoken dialog.

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

Smart Home Devices & Appliances

NHS using smart meters to monitor people with dementia – February 04, 2019

Applicable Product Categories: Smart Home Devices

Technologies	IoT, AI	**Therapeutic Areas**	Elderly care
Applications	Aging-in-Place	**Geographic Focus**	UK
Segment Focus	Consumer Grade	**Topics (News type)**	Technology Innovation
Companies	Mersey Care NHS Foundation Trust, Liverpool John Moores University	**Others**	-

ANALYST TAKE:

- As the UK rolls out smart meters across the nation, this research approach focuses on utilizing the data emerging from smart meters to monitor appliance usage, which would then be indicative of the normal routines or patterns of use by the occupants – in this case elderly living alone. “Instead, data is captured on habits and routines of individuals through their interactions with everyday electrical devices.”
- With dementia care, ‘sundowning’ is a common condition. “As you progress with dementia your body clock becomes more switched around, so you start becoming more active in the evening as opposed to the day time. And if you start interacting with appliances in the evening more often, that’s often a good indication to the clinician that you might be progressing with the condition.”

- Frost & Sullivan had outlined this concept in its study on smart homes for delivering healthcare, arguing that not just health tracking devices, but other smart infrastructure in the smart home could be leveraged for monitoring occupants, using security systems as an example. This approach makes the smart choice of piggybacking of available smart infrastructure to deliver a healthcare-related outcome, and we would expect more such features to emerge.

WEBLINK: https://bit.ly/2Sstfi7

Innovative Smart-Home-Care lamp detects body temperature, air quality and more. Now on Kickstarter – February 04, 2019

Applicable Product Categories: Smart Home Assistants

Technologies	IoT, AI	**Therapeutic Areas**	NA
Applications	Smart Home Hub	**Geographic Focus**	Taiwan / Global
Segment Focus	Consumer Grade	**Topics (News type)**	Technology Innovation
Companies	TorchyCity	**Others**	Kickstarter

ANALYST TAKE:

- TorchyCity has developed a smart lamp that can act as a smart home hub, claiming to connect to virtually all smart devices, and has voice support for **34 languages**, has built-in speaker and also microwave sensing capabilities (motion sensing). But from a health perspective, it can detect body temperature, monitor air quality and track PM2.5 levels, and can detect gases.

- Frost & Sullivan believes this is a smart move to integrate as many functions as possible in a single device – but the question on the quality of these capabilities remains. The challenge the company has set out to address is very real – how many smart devices should a customer buy to make their home truly smart? While a single device may not be the answer (unless the quality of all sensors, the detection, of the voice recognition and support are all great), a bundle approach or renting / leasing schemes may serve the purpose. Another great way to track health that this device attempts to do, is to monitor body temperature and point to illness in the early stage. We would argue that more parameters would need to be tracked, but this is a great first step, from a healthcare perspective.

WEBLINK: https://bit.ly/2HW9YS8 ; https://kck.st/2UGV7wo

Other Interesting Articles

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

News Title	Link	Remarks
Lowe's pulls the plug on the Iris smart home platform	https://cnet.co/2BxX1sr	As the market gets crowded, and saturated, more such announcements would be expected – either entire shutdowns, or consolidation by acquisition or compatible device support being provided. It will ultimately be about the 'survival of the fittest'.
Making Google's Assistant A Lot More User Friendly With Two Small Changes	https://bit.ly/2SxwJQr	Interface design changes are suggested here for a better experience – (a) continued conversation (instead of using the wake phrase for every subsequent command), and (b) having ability to wake Google devices with customized wake phrases to avoid waking all devices in the home (including your phone).
Number of smart homes in Europe is set to QUADRUPLE to 84 million by 2022 as users embrace Siri and Alexa	https://dailym.ai/2WOCGrv	A prediction, but outlines the potential for any smart home ecosystem devices that can work with smart speakers / virtual assistants, such as smart home appliances.
Will tech companies change the way we manage our health?	https://tcrn.ch/2HJzOsD	A very interesting read to understand the 'big picture' on tech companies, especially Amazon and Alphabet (nee Google), and their initiatives in healthcare. This helps outline their future health strategies I the smart home space.
Apple HomePod falls far short of Amazon Echo and Google Home smart speakers	https://bit.ly/2RNzc50	Being late to the game has cost Apple, has a meager market share, and makes it difficult to challenge either Google or Amazon.