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# The Journal of mHealth

The Global Voice of Digital Health

November / December 2018 | Volume 5 Issue 6

# THE TECHNOLOGY OF CHRONIC DISEASE

## FEATURE

Adoption or Adaptation: Implementing eHealth

## IN FOCUS

GIS Technology, Connecting the Dots

## INTERVIEW

Improving the Management of Diabetes

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# In This Issue

# Welcome

The treatment and management of patients with chronic conditions such as diabetes, heart disease, and COPD present huge challenges for healthcare systems around the world. With a growing prevalence in many of these conditions, technology represents a significant opportunity to deliver more effective disease management and help improve outcomes.

Real-time monitoring and the collection/analysis of relevant data, empower all aspects of the care provision equation. Streamlined communication technologies facilitate carer-patient relationships, while greater access to validated information and learning resources help people understand their own conditions in ways that help them to take more proactive steps to manage their own health.

In this issue we look at the technology surrounding a number of chronic conditions and consider the impact that these technologies are having upon the management of those conditions.

By 2035, it is estimated that 592 million people worldwide (between the ages of 20-79) will be affected by diabetes. As a result, the social and financial costs of this condition are causing crippling impacts upon health systems. The need for better prevention, diagnosis, treatment and management are challenges that face countries around the world. While technology is not a solution, by itself, it does offer huge potential to improve the way in which both patients and care-providers manage the condition, as well as to help identify people with risk factors for developing the disease. Health technologies are also significantly improving the way that people manage their own condition by empowering them with the data, and tools, to make informed changes to their lifestyle, in order to benefit their own health. In this issue we include a number of articles that discuss the impact that technology is having on diabetes care.

Technology is viewed as an essential component to substantially improve mental health care services. It offers great opportunities to address some of the biggest challenges that the mental health sector is currently facing. However, one challenge that remains across healthcare provision is the effective implementation of technical solutions. Introducing technology into clinical practice requires changes to the status quo that are not always easily adopted. As a result technology can often be underutilised and/or ineffective. In a detailed discussion of this process (in a mental health care setting) the article 'Adoptation or Adaptation: Implementing eHealth into Clinical Practice' considers the best approach to implementing technology in care delivery.

Finally, it was back in 1988 that the World Health Assembly set the ambitious goal of eradicating polio by the turn of the century. Since then major milestones have been reached but in 2018, polio still remains endemic in three countries: Nigeria, Afghanistan, and Pakistan. eHealth Africa (eHA) is an organisation on the frontlines of the effort to improve health outcomes in West Africa using GIS technology. In this issue we include an insightful feature that discusses how advances in geospatial information systems (GIS) technology, which captures, stores, and displays spatial and geographic data, have created innovative opportunities to improve vaccination coverage and public health outcomes in Africa's healthcare systems.

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# Adoption or Adaptation

## Implementing eHealth into Clinical Practice

*By Helen Lionarons MSc., Consultant Clinical Psychologist and Clinical Director at Oh My Mood UK Ltd, Dr. Andrew Jones, Institute of Psychology, Health and Society, University of Liverpool and Pauline Post MSc., Health Psychologist and Co-Founder at Oh My Mood UK Ltd*

Technology is viewed an essential component to substantially improve health care services. It offers great opportunities to address some of the biggest challenges that the mental health sector is currently facing. Despite the many initiatives to improve access to health care, currently only about 40% of people with mental health conditions are receiving proper treatment. According to the Health Foundation and Institute for Fiscal Studies (IFS), financial resources need to more than double to reach 70% of the people who need mental health care. Increasing demands and limited resources necessitate to search for more efficient ways to provide mental health care, i.e. making better use of health technologies. However, despite widespread political agreement about the importance of eHealth, the realization of its benefits has been slow, mostly due to difficulties with adoption and implementation by the sector. In this article we will take a closer look at what we, from both a practical and a scientific point of view, consider one of the most important pitfalls in the adoption of IT by clinical staff.

### Technical vs Adaptive Change

It was Harvard professor Ronald Heifetz who made clear the distinction between technical versus adaptive change. When dealing with technical change, expertise rules. Problems may be complicated, and require collaboration across disciplines; yet the resolution of the problem is clear and straightforward: follow a series of steps and things go well. For the most part, when we face technical challenges, we focus on improving processes, providing training to improve skills, and doing the right things right. In other words, we know the answer; it is more a matter of careful implementation. Following a recipe is a technical change; so is downloading and then using most apps for your smartphone.

How different things are with adaptive change. Adaptive change requires more than simply sharpening our processes and skills. Instead, adaptive change challenges our beliefs and ways of thinking. It requires that we change our mindset, our mental models of how things should be done. But since our mental models provide internal stability in a world of continuous change, we are often resistant to change. As Heifetz and colleagues stated: **Adaptive challenges can only be addressed through changes in people's priorities, beliefs, habits and loyalties. Making progress requires going beyond any authoritative expertise to mobilize discovery, shedding certain entrenched ways, tolerating losses and generating the new capacity to thrive anew.**





### Implementing technology in clinical practice

One of the challenges of implementing eHealth in clinical practice is that it gives the impression of being a technical change, while the complexity, nuance, and decision making under uncertainty that characterizes clinical work makes it an adaptive change of the highest order. Implementing eHealth into clinical practice not only asks for changes in the system, at the bottom line it asks for changes in clinicians' beliefs, habits and loyalties.

Clinical staff will undoubtedly have put blood, sweat, and tears into their traditional clinical practice. Asking them to break with old habits, especially for those who have successful methods, can be difficult; an inappropriate proposal to change high held values about the doctor-patient relationship, or more down-to-earth, a way to change roles within health care for the benefit of other parties. But as we all know, beliefs, ideas, images, and opinions that we have consciously or unconsciously formed from our experiences, when formed become representations of a perceived reality and predispose us to behave in certain ways. Although meant to provide internal stability in a world of continuous change, our mental models also blind us to facts and ideas that challenge or defy our deeply held beliefs, and guide our thoughts and actions within narrow channels.

### Change of focus of eHealth implementation

Until this moment, much focus of eHealth funding has been directed to the clinical effectiveness of eHealth, while research on the adoption and implementation of eHealth has not yet received the funding that is necessary for eHealth to successfully become a part of health care. For eHealth to be successfully implemented, leaders in the field must also understand the difference between what is technical and what is adaptive. Technical solutions are so much quicker and easier to explain and implement, but they only work for technical problems. Adaptive change asks for changes in clinicians' mental models that cannot be resolved through the application of authoritative expertise and through organizational structures, procedures and habitual ways of doing things. Therefore, when implementing our innovative health care pathways, we always carefully take these factors into consideration. The adaptive challenges can only be addressed through changes in clinicians' priorities, beliefs, habits and loyalties. Making progress requires going beyond any authoritative expertise to mobilize discovery, shedding certain entrenched ways, tolerating losses and generating the new capacity to thrive anew.

### Encouraging the implementation of eHealth

Since the adoption of new models of care can be disruptive to daily practice, especially for those in the front line, it is necessary to take a careful look at why and how clinicians adopt eHealth. Various studies have identified barriers to e-health implementation; including financial, structural, cultural and technical. For a successful adaptive change multiple levels within an organization should be actively involved in the change process. From our experience we notice that only with the support on various levels within an organization the road for the clinicians can be paved and facilitated to adopt eHealth solutions. Without the right motivation or incentives the implementation of eHealth will be limited to a few techie doctors, whereas the aim is that the majority of clinicians will embrace it.

One way of encouraging the implementation of eHealth is by linking its technology with a clinical content clinicians are used to work with. Therefore, new health care pathways should be developed that combine evidence-based therapeutic interventions with the latest digital solutions. Such new models of blended care can seamlessly integrate eHealth with care as usual, and avoids the deployment of eHealth products as an add on only. Such blended health care concepts do not only increase health care capacity, reduce waiting lists and increase the quality of care. It also reduces the pressure on clinicians immensely and creates freedom in their work routines.

An often heard fear of clinicians in the adoption of eHealth is that it would make treatment less personal. However, eHealth has been developed to facilitate psychotherapy without losing the personal attention for the patient. When applied in an intelligent way, technology can contribute to an even more personalized mental healthcare, in which treatment can be more easily adapted to the idiosyncratic characteristics of the patient. To really profit from all technology has to offer, it is important to develop and test new health care pathways in which technology is ruled by the clinician and adaptive challenges (changes in beliefs, habits and loyalties) are monitored by action learning, reflection and investigation in order to understand the gains from adapting technology in clinical practice.

Recent systematic reviews have identified other factors which may further improve the uptake of e-health through adaptive change, including cognitive participation, in which enthusiastic health professionals act as 'local champions' and support enrollment and commitment to e-health amongst colleagues. Furthermore, overcoming more practical barriers such as organizational issues (policy and administrative support, resource allocation) and issues around confidence and accountability may require small amounts of effort but lead to large shifts in attitudes towards e-health and its many benefits.

*Oh My Mood develops innovative and widely applicable health care pathways for improving care processes within mental health care.*

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# How eHealth Africa uses GIS Technology to Connect the Dots in Africa's Healthcare Systems

*By Jennifer Bencivenga*

## The Challenge of Polio Eradication and a New Approach

Sixty years ago, polio was a global and ubiquitous disease that paralyzed about one in two hundred people, mostly during childhood. With the development of an effective and inexpensive oral vaccine, the number of cases fell drastically and eradication seemed like a feasible, if distant, aim. In 1988, the World Health Assembly set the ambitious goal of eradicating polio by the turn of the century[1]. Undeniably, major milestones have been reached—since then, the number of wild poliovirus cases have decreased by over 99%[2]. Still, 18 years after the deadline, polio continues to appear in some of the world's most vulnerable populations. In 2018, polio remains endemic in three countries: Nigeria, Afghanistan, and Pakistan.

*Frontline healthcare workers during a door-to-door immunization campaign.*

Disease eradication by vaccination is an arduous endeavor—to date, only smallpox has been successfully eradicated in human populations using this method. Despite the existence of inexpensive and effective vaccines for polio that are easily administered, certain factors can still undermine the effectiveness of vaccine delivery systems.

The key to eradication is high immunization coverage and at least three doses of the polio vaccine for each child. However, certain communities are particularly difficult for vaccination teams to reach, including settlements located in conflict zones, migratory groups, and remote unmapped communities. It is not just the ability of healthcare workers to reach these areas that presents a challenge—supply chain issues brought on by poor demand forecasting and cold chain equipment failures can lead to stock outs, shortages, and vaccines rendered unusable by heat damage.

Advances in geospatial information systems (GIS) technology, which captures, stores, and displays spatial and geographic data, have created innovative opportunities to improve vaccination coverage and public health outcomes in general. Accurate geographic data provides health officials with reliable information on where people live, how to best reach them, and the location of nearby health facilities, which can vastly improve the planning and execution of health interventions. Doctors and frontline workers equipped with accurate maps can more easily serve target groups, and are better supplied when they do. During health emergencies or disease outbreaks, where timeliness is critical, readily accessible real-time geodata can help save lives.

*A child receiving the oral polio vaccine.*

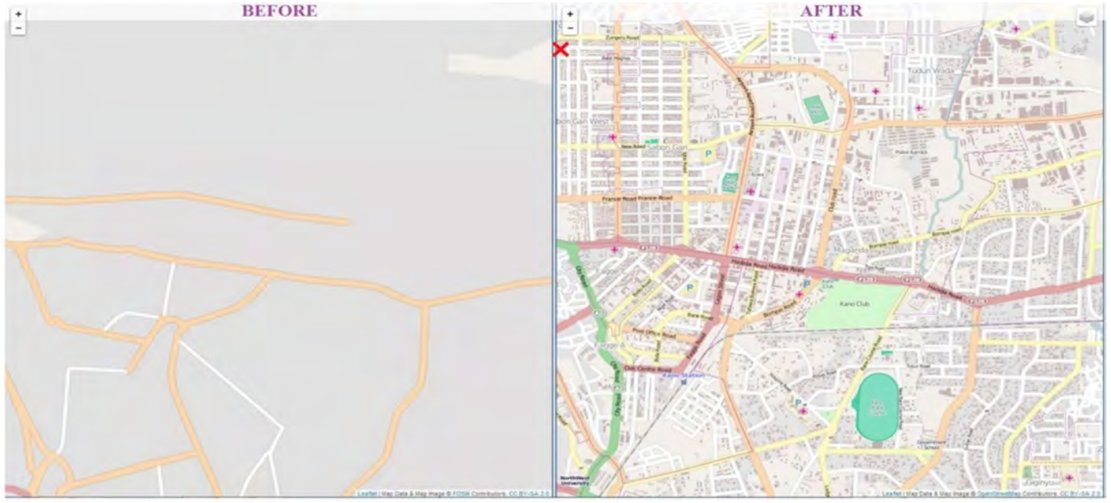
## How eHealth Africa Leverages GIS Technology

eHealth Africa (eHA) is on the frontlines of the effort to improve health outcomes in West Africa using GIS technology. The organization was founded in 2009 by Adam Thompson and Evelyn Castle, who met at the University of California, Santa Cruz, researching the impact of technology and data on public health. Their first project in Nigeria involved transitioning a Kaduna State Family Health Center from a paper-based to an electronic medical record system. Since then, the organization has been driven by the belief that accurate and timely access to health information facilitated by data-driven technology can improve health outcomes in underserved areas. Since eHA was founded, their focus has grown in scope, and their size has shifted alongside conditions in West Africa, expanding throughout the region to support during the Ebola crisis response, and scaling back as recovery set in.

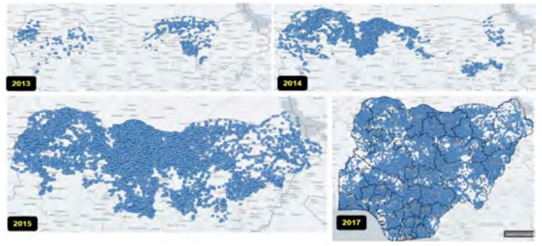
Today, eHA's offices include their largest in Nigeria and Sierra Leone, with additional staff based in Germany and the United States. Though the organization is perhaps best known for its work to eradicate polio and for emergency operations during the Ebola crisis, its involvement in health interventions extends to five different focus areas. For the organization, GIS has become an essential tool in all of them.



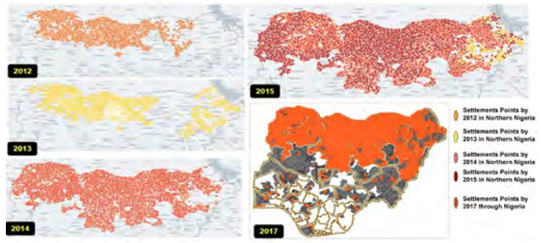





*The development of base maps of Kano, Nigeria using GIS technology.*




*The development of recorded health facilities in Northern Nigeria using GIS technology.*




*The development of settlement points recorded using GIS technology in Northern Nigeria.*

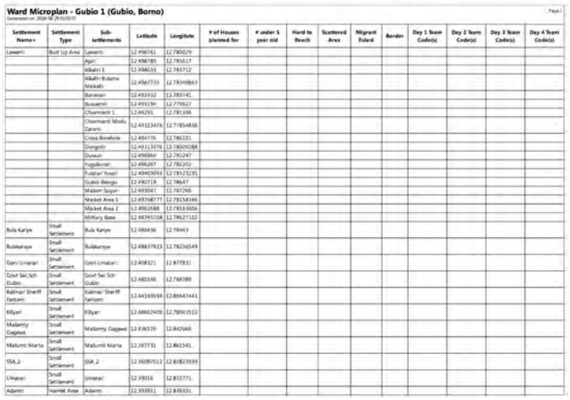
With a team of highly skilled and efficient GIS developers based in West Africa, eHA has contributed spatial data collected throughout Nigeria to the OpenStreetMap platform, and was one of the first organizations to actively start mapping Borno State at the height of Boko Haram in 2014. Its Kano-based GIS department is focused on the collection of data, production of maps, tracking of health workers and commodities, and the presentation and analysis of this data to inform health interventions. When teams of data collectors equipped with mobile devices go into the field, the points they record and their movement is tracked using GPS. This information is used to create highly detailed maps with context on terrain, topography, infrastructure, health centers, and other points of interest, so that frontline healthcare workers can more easily navigate previously inaccessible regions. For immunization programs, geodata on the areas reached and the areas missed is used to ensure adequate coverage during immunization campaigns as well as to improve microplanning for future campaigns.

## A Better Way to Gather Data

Data collectors need specialized tools to capture reliable GPS coordinates, and eHA's most recently developed software solution has been designed with this in mind. Gather, a tool that enables frontline workers to securely collect different types of data in the field and share it everywhere it is needed, was built with GIS capabilities so that location and position information can also be recorded. The tool, which allows for easy management of the collection, curation, and publication processes, has already been successfully used across numerous eHA projects.

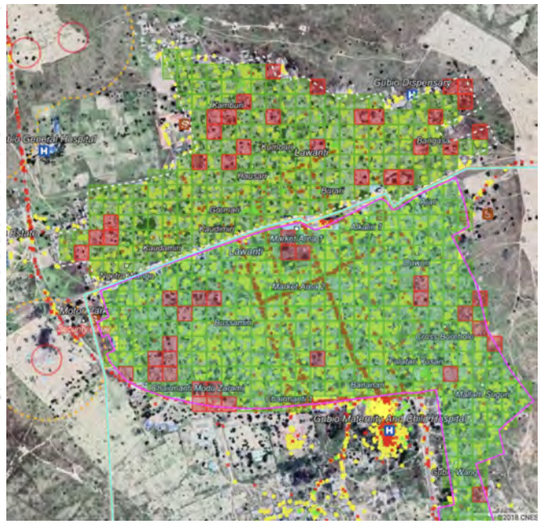
In 2017, eHA partnered with the The University of California, Los Angeles's (UCLA) Fielding School of Public Health on the first project to use Gather's GIS capabilities—a microcensus in the Democratic Republic of the Congo (DRC). The population data was collected to support a health intervention aimed at eradicating Human African trypanosomiasis (HAT), more commonly known as sleeping sickness, from the DRC. Gather's versatility was an ideal match for the project, which required a tailored solution and an advanced user interface for detailed satellite imagery. At the start of the project, large portions of the survey area were unmapped or contained unidentified settlements. The mapping capabilities of Gather allowed data collectors to visualize the surrounding area on satellite imagery, which helped them reach survey sites in the most remote locations in the DRC, and to add or edit geographic points of interest. Surveyors could also see buildings on high resolution satellite imagery and mark their status as complete, information they used to revisit certain structures. By the project's conclusion, over 34,000 households and 171,000 individuals throughout 530 clusters were surveyed in the microcensus, an area approximately the size of the US state of Arizona, and approximately 700 villages were geolocated and identified.

Currently, Gather is being used in eHA's contributions to the GRID project, a multi-country, multi-donor initiative, aimed at improving the availability and access of geospatial information to support improved decision making by governments. The project collects spatial reference data and coordinates of community locations and facilities including clinics, schools, and markets. This information will be stored in a geodatabase used by govern- ➪


Ward Microplan - Gubio 1 (Gubio, Borno)

| Settlement Name | Settlement Type | Sub-settlements | Latitude | Longitude | # of Houses planned for | # under 5 year old | Hard to Reach | Scattered Area | Migrant Fulani | Border | Day 1 Team Code(s) | Day 2 Team Code(s) | Day 3 Team Code(s) | Day 4 Team Code(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lawanti | Built Up Area | Lawanti | 12.4765761 | 12.7905279 | | | | | | | | | | |
| | | Ayari | 12.4766789 | 12.7856137 | | | | | | | | | | |
| | | Alkalari 1 | 12.498633 | 12.793712 | | | | | | | | | | |
| | | Alkalari Bukarna Mokkalo | 12.4967733 | 12.7834983 | | | | | | | | | | |
| | | Bananari | 12.493332 | 12.793745 | | | | | | | | | | |
| | | Bussarari | 12.4931134 | 12.7799627 | | | | | | | | | | |
| | | Chaminari 1 | 12.49291 | 12.791398 | | | | | | | | | | |
| | | Chaminari Mokka Zaranti | 12.49123476 | 12.7785488 | | | | | | | | | | |
| | | Cross Borelicte | 12.4854776 | 12.786521 | | | | | | | | | | |
| | | Dungarti | 12.49113976 | 12.7809088 | | | | | | | | | | |
| | | Duneari | 12.496969 | 12.792447 | | | | | | | | | | |
| | | Fugubchari | 12.4962672 | 12.7922732 | | | | | | | | | | |
| | | Fulatari Yusari | 12.49403896 | 12.7817235 | | | | | | | | | | |
| | | Gubiri Bangu | 12.490719 | 12.78647 | | | | | | | | | | |
| | | Malam Sapari | 12.4983041 | 12.787768 | | | | | | | | | | |
| | | Market Area 1 | 12.49768777 | 12.7853446 | | | | | | | | | | |
| | | Market Area 2 | 12.4992688 | 12.7816606 | | | | | | | | | | |
| | | Military Base | 12.48743128 | 12.7862122 | | | | | | | | | | |
| Bula Kariye | Small Settlement | Bula Kariye | 12.488436 | 12.78443 | | | | | | | | | | |
| Bulakariye | Small Settlement | Bulakariye | 12.48637823 | 12.7822649 | | | | | | | | | | |
| Gorri Umaiari | Small Settlement | Gorri Umaiari | 12.4838321 | 12.877832 | | | | | | | | | | |
| Govt Sec Sch Gubio | Small Settlement | Govt Sec Sch Gubio | 12.482246 | 12.786389 | | | | | | | | | | |
| Kalimari Sheriff Yarisiri | Small Settlement | Kalimari Sheriff Yarisiri | 12.44169598 | 12.8944441 | | | | | | | | | | |
| Kilyari | Small Settlement | Kilyari | 12.48662409 | 12.7894152 | | | | | | | | | | |
| Mallamty Gagawa | Small Settlement | Mallamty Gagawa | 12.4838378 | 12.842668 | | | | | | | | | | |
| Mallumti Marta | Small Settlement | Mallumti Marta | 12.507731 | 12.861341 | | | | | | | | | | |
| SSA_2 | Small Settlement | SSA_2 | 12.5608702 | 12.8282939 | | | | | | | | | | |
| Umaiari | Small Settlement | Umaiari | 12.59016 | 12.872771 | | | | | | | | | | |
| Adamti | Hamlet Area | Adamti | 12.593891 | 12.856331 | | | | | | | | | | |

*Screenshots of microplans and missed settlement lists. Data on the areas reached and the areas missed is used to ensure adequate coverage during immunization campaigns and improve microplanning for future campaigns. Reds areas are places that have been missed and green areas are places that were visited.*



ments and health officials. Since getting involved in the project in November 2017, Gather has been used to collect 74,098 settlement names and 426,069 points of interest across Nigeria.

In September 2018, eHA demonstrated the real-time geographic data collection capabilities of Gather at Connecting the dots—Geodata in Healthcare, the second in a series of meetups hosted by the Germany-based eHA office. Here, a mobile device was used to collect the GPS coordinates of the event location. Viderum, a partner at the event, then demonstrated a data visualization tool they developed that can be connected to Gather.

## Looking forward

As GIS technology advances, it is an increasingly important component of digital health technology, and is especially valuable in the last battles of the fight against polio. The accurate and timely data on communities, health institutions, and medical commodities provided by GIS tools can vastly improve immunization coverage. Dami Sonoiki, the Deputy Director of GIS and Analytics at eHA says of their role in these efforts, "eHA is working with the government and stakeholders within the health sector in Nigeria to develop advanced analytics tools and capabilities that will be used to inform the efforts at the last mile of polio eradication in the North East and the rest of Nigeria.

*To ensure polio vaccination coverage, vaccinators are equipped with GPS-enabled mobile devices that pick up geographic coordinates of settlements.*

We are looking forward to a polio-free Nigeria as we collaborate with all donors, partners and stakeholders to ramp up efforts to ensure the deadly disease is eradicated from the country."

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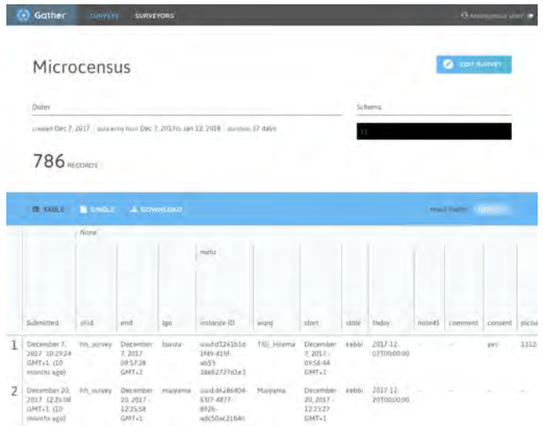
2. *http://www.who.int/news-room/fact-sheets/detail/poliomyelitis* ■


*A screenshot of the Gather interface with sample data.*

*The Director of eHA's Global Health Informatics, Dave Henry, speaking at Connecting the dots—Geodata in Healthcare in Berlin.*





# The Power of Wearable Sensors in Healthcare

*By J.D. DiGiacomandrea, Applications Engineering Manager at global battery specialist Ultralife Corporation*

By 2050, there will be around 83.7 million senior citizens in the United States, increasing rapidly from 49.2 million in 2016. The ageing population across the western world is no surprise to anyone in the healthcare profession, but medical technology (MedTech) has to adapt to meet these changing needs. With many supporting wearables as a way forward, here, J.D. DiGiacomandrea, applications engineering manager at global battery specialist Ultralife Corporation, looks at how to support the development of wearables with new battery technology.

A recent article by academics from the University of Hamilton, Canada, says that the ageing population will cause a "significant impact on the socio-economic structure of society in terms of social welfare and healthcare needs. Therefore, it is an utmost necessity to develop and implement new strategies and technologies in order to provide better health care services".

When developing new technologies to better care for the ageing population, many MedTech companies are also following the industrial trend of the Internet of Things, with a multitude of connected devices feeding information back to a central point. Wearable devices and sensors are seen as a way to keep a constant monitor on vitals, in a hospital and outside of a healthcare environment.

In a hospital, doctors can use wearables that measure vitals, without the patient being restricted to a bed, but can also use items such as the SensiVest. This vest is used to prevent recurrent heart failure by measuring the level of fluid in a patient's lungs and sends the information to a doctor's computer, allowing the doctor to change the medication if the level of fluid raises.

One example of how wearables are used outside of a hospital environment is created by Kenzen, manufacturers of a wearable smart patch that analyses the electrolytes, metabolites, small molecules and proteins in sweat. These can then indicate through a smartphone app if the body's glucose levels are too high or if someone is dehydrated.

If wearables are used in either a life-critical device or a device simply to measure everyday health indicators, it is still essential that the device is powered by a reliable battery, despite requiring a small component. This is where thin cell batteries come in.

The Thin Cell range, as manufactured by Ultralife, has cells as thin as 0.4mm, which are packaged in a pouch cell format. The high energy Lithium Manganese Dioxide chemistry means that the battery has a high energy density for its size, denoting manufacturers do not need to increase the size of the wearable device to fit a long-lasting battery.

As thin cell batteries can be manufactured as thin as 0.4mm, they reduce the size of the components going into the wearable device. If a wearable device is worn around the clock by someone on the go or by a patient in a hospital bed, it should not be obtrusive. While the thin cell battery is not a conformal battery, its form encourages a much more ergonomic design to a wearable device.

When manufacturing wearable devices for the changing healthcare market, it's vital that manufacturers consider how to power the device, to ensure that it is long lasting and suitable for the needs of the end user.

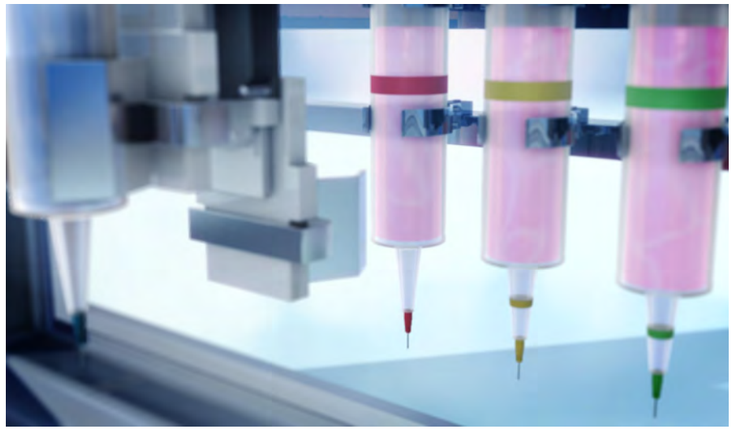
For MedTech to meet the challenges of the ageing population, design engineers must consider the minute detail of every one of their components. Otherwise, wearable products and other new MedTech offerings may exist, but they may not be fit for purpose. ■

# INDUSTRY NEWS

News and Information for Digital Health Professionals

## Bioprinting Holds Wealth of Promise for Future of Healthcare

In June 2018, US-based biotech company BIOLIFE4D successfully demonstrated its ability to 3D bioprint human cardiac tissue in patch form in just a few days, well ahead of 6-8 month development time predicted in scientific literature. Although bioprinting is still in infancy, it holds a wealth of promise for the future of healthcare, says leading data and analytics company GlobalData.



Bioprinting is a form of 3D printing that employs living cells or 'bioink', as the printing material. Generally, bioink is deposited onto a gel in layers, resulting in a 3D-printed biological structure. BIOLIFE4D's technique uses a patient's own white blood cells, which are reprogrammed into induced pluripotent stem cells and then cardiac cells.

Besides BIOLIFE4D, companies such as TeVido, BioDevices and Organovo are innovating with proprietary bioprinting technologies. TeVido is developing nipple reconstruction implants for breast cancer survivors by employing a patient's own skin cells in a proprietary process. Organovo creates functional 3D human tissue products using the company's proprietary NovoGen Bioprinters and bioink technology. The company's first program is targeting rare liver disease.

Jennifer Ryan, Medical Device Analyst at GlobalData, says: "Innovations such as bioprinting are part of the next wave of medical advancement and hold a wealth of promise for the future of healthcare. Bioprinted tissue can be used for drug development and safety, as well as other medical research efforts. In the future, the aim is to create replacement organs for patients in need of a transplant."

According to American non-profit organization, United Network for Organ Sharing (UNOS), nearly 15,000 patients in the US are currently on the organ transplant waiting list and 20 patients die each day, on average, while waiting for a transplant.

The need for organ transplants continues to far exceed the number of registered donors, leaving patients with no option but to wait. Advancements in bioprinting capabilities aim to one day 3D print an entire functioning organ complete with all component parts, for transplant patients.

After successfully bioprinting a cardiac patch, BIOLIFE4D has now focused its attention on printing other heart constructs, such as heart valves and blood vessels and a mini-heart as it seeks to progress to 3D bioprinting a full human heart.

Ryan concludes: "Already other 3D printing techniques such as selective laser sintering and material jetting are employed in the medical device industry to create a variety of products such as surgical guides and patient-specific orthopedic implants. With the progression of bioprinting technology, 3D printing will have an even greater impact on patient treatment through evolving drug therapies and engineered organ replacements." ■





## Oxford VR Raises £3.2m for Virtual Reality Psychological Therapies


Oxford VR, a spinout company from the University of Oxford, has raised £3.2m with investors including Oxford Sciences Innovation, University of Oxford, Force Over Mass, RT Capital and GT Healthcare Capital Partners. This new investment round powers the pace of company growth to bring automated immersive, clinically validated Virtual Reality (VR) technologies to market as user-centered treatments for patients with mental health problems.

Oxford VR's first product, an automated VR treatment for height phobia, was tested this year in a large randomised controlled trial, with the results gaining global acclaim when published in the Lancet Psychiatry. The treatment is now being used in selected NHS clinics.

The latest investment round will finance an ambitious strategy of product development, led by newly appointed CEO Barnaby Perks, formerly founding CEO of Ieso Digital Health. Although Oxford VR's first treatment is for a phobia, it is the company's intention to tackle the full range of psychological problems.

"Our focus is on developing clinically validated, cost-effective, user-centred treatments for clinical conditions with significant impact on patients, the health system and wider economy. That means targeting complex conditions such as psychosis and social anxiety," states Barnaby Perks, CEO of Oxford VR. "I am delighted to lead a company that will transform mental health for millions by combining state-of-the-art immersive technology with world-class science from the University of Oxford. Professor Daniel Freeman's research, combined with the advent of highly immersive consumer VR, means that Oxford VR can develop treatments that are faster and more effective than traditional treatments, significantly cheaper for health services to deploy, and – crucially – engaging and entertaining for users."

Professor Daniel Freeman, Chief Clinical Officer of Oxford VR, Professor of Clinical Psychology at the University of Oxford and Consultant Clinical Psychologist, Oxford Health NHS Foundation Trust, led the Fear of Heights study published in Lancet Psychiatry. He states: "Instead of a real-life therapist, we used a computer-generated avatar to guide users through a cognitive treatment program for fear of heights. On average, people spent around two hours in VR over five treatment sessions. Everyone in the VR group saw their fear of heights diminish, with the average reduction being 68%. Half of the participants in the VR group had a reduction in fear of heights of over three quarters. These are amazing results: better, in fact, than could be expected with the best psychological intervention from a real-life therapist."

David Norwood, Co-founder of Oxford Sciences Innovation (OSI), said: "Mental health problems are incredibly common, debilitating, and costly to society. Yet only a fraction of the people who need them have access to the treatments that work. We believe Oxford VR can make a huge contribution here, dramatically improving the lives of millions of people around the world. OSI is proud to have been involved from day one and we look forward to helping the company achieve long-term, lasting success."

Theo Osborne, Co-founder and Head of Strategic Relationships at Force Over Mass, said: "We are really excited to be investing in a stellar team, innovating at the intersection of technology and mental health to solve a global problem."

The current investment will enable Oxford VR to continue to build a high-calibre team, with a proven record of clinical and commercial success in digital health, and in cutting-edge immersive technologies. Alongside CEO Barnaby Perks and Chief Clinical Officer Daniel Freeman, the company has recruited Katie Bedborough as Chief Financial Officer, formerly Head of FP&A at the games company NaturalMotion; Christophe Faucherand as Chief Product Officer, formerly Head of Product of Ieso Digital Health; Dr Aitor Rovira as Head of VR Strategy from the University of Oxford; June Dent as Clinical Partnerships Director, formerly Clinical Lead for Oxfordshire IAPT Services; and Jason Freeman, a long-standing collaborator of Professor Freeman, as Chief Operating Officer. Oxford VR is headquartered in central Oxford.

Sam Gage, formerly of Sony PlayStation VR and the visualisation studio Third Floor, has also joined as Head of VR Development located at Oxford VR's growing development office in London. ■

# Indian Patient-Doctor Platform DocPrime gets $50M for City Expansion

Less than three months after it raised $200 million led by SoftBank's mighty Vision Fund, Indian digital insurance startup PolicyBazaar beefed up its new healthcare business through a $50 million capital injection.

DocPrime, which lets visitors book consultations with doctors or schedule a range of medical tests, launched in August. Already, it claims to host 14,000 doctors and 5,000 diagnostic labs on its platform serving Delhi-NCR — the 'capital region' that surrounds the city.

With this investment — which is provided by PolicyBazaar — DocPrime will begin an expansion next month that is expected to take it into major cities such as Mumbai, Bangalore, Hyderabad and Chennai. That's part of a wider goal to reach 100 cities across India and grow the network to 150,000 doctors and 20,000 labs.

DocPrime is up against established competitors, however.

Practo has raised $230 million from investors including China's Tencent and it claims to work with 200,000 healthcare providers. Beyond India, Practo has already expanded overseas to four countries to tap the doctor-patient gap in other emerging markets. Lybrate, another doctor-patient matching service, has raised over $14 million although it has quietened down somewhat lately. 1mg and Netmeds are others that are active in the space in India.

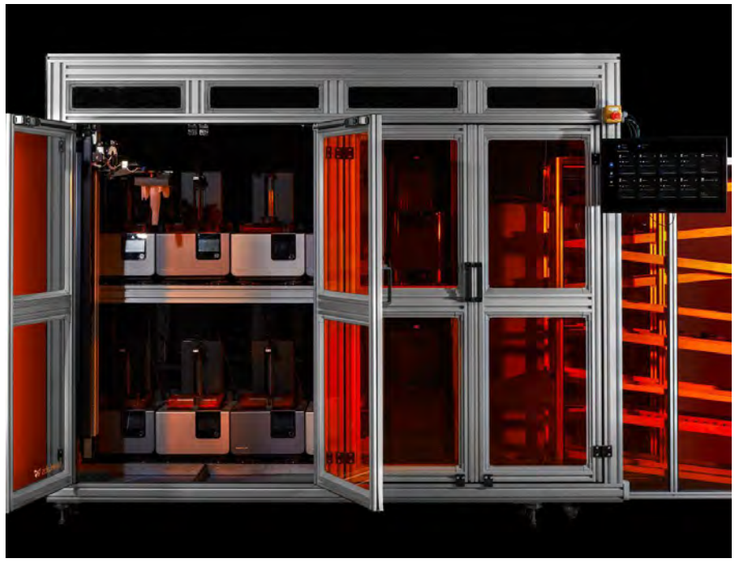
To get an edge, DocPrime has pushed to work closely with China-based Ping An Good Doctor, a fellow Vision Fund company that claims over 30 million monthly active users.

Original article from *techcrunch.com* ■

# Study Suggests Automating 3D Printing with Form Cell could Save Millions in Operating Room Time

Formlabs and Northwell Health have announced that the powerful automated 3D printing system Form Cell has been incorporated into Northwell's 3D Design and Innovation Center to increase production of patient-specific anatomical models and surgical guides.

Northwell Health – New York State's largest health care provider with 23 hospitals – has already used Formlabs' standalone Form 2 3D printers in its 3D printing lab, but looks to increase production with the Form Cell, an automated 3D print production solution. Personalized models provide surgeons with more effective preparation, offering a hands-on opportunity to get a feel for patient anatomy, and pre-fit equipment before entering the operating room. During orthopedic or oncologic procedures, surgeons are now able to use patient-specific, 3D-printed surgical guides, which help with precise excisions of tumors or drill depths for optimal screw insertions.



The benefits of the partnership are evident to Barnaby Goberdhan, whose son, Isaiah Onassis Goberdhan, age 7, recently utilized a 3D printed model of the youngster's palate to physically visualize the procedure and talk through the surgery. Mr. Goberdhan visited a Northwell Health physician because his son had trouble breathing through one of his nostrils. The checkup revealed an aggressive tumor in his palate and nasal cavity. Isaiah needed surgery to remove the tumor, so the family met with Neha A. Patel, MD, a pediatric otolaryngologist at Cohen Children's Medical Center in New Hyde Park, NY.

"Having a 3D printed depiction of my son was really helpful when talking with the doctor about his surgery," said Mr. Goberdhan. "The doctor was able to do more than talk me through what they were going to do – Dr. Patel showed me. There is almost nothing more frightening and stressful than having your child go through surgery. There were several options Dr. Patel walked us through for the best way to preserve Isaiah's teeth and prevent additional cuts within his mouth. I wanted all of my questions answered so I could be less fearful and more prepared to talk my son through what he was about to face. I wanted Isaiah to feel prepared. With the 3D model, we both felt more at ease."

Dr. Patel worked with Todd Goldstein, PhD, and his 3D Design and Innovation Center to develop the 3D model for Isaiah. From Isaiah's CT and MRI scans, Dr. Goldstein was able to create a personalized 3D rendering of his mouth and nasal cavity. Dr. Goldstein used Formlabs industry-leading 3D printing technology to print an anatomical model with the tumor in place as well as removed.

A recent study based on Northwell Health data shows the use of 3D printed models or surgical guides for complex cases can reduce time in the operating room by at least 10 percent. This shows significant savings, for instance, assuming 10-15 percent of select surgical cases could use a 3D printed model or guide, the annual operating room cost avoidance for 1,150 annual cases would be approximately $1,750,000. Based on these findings, within four years models printed on the Form Cell could save Northwell Health approximately $7 million in operating room time alone.

"As a part of Northwell's multidisciplinary team, I had the opportunity to work with Dr. Dev Kamdar from Head and Neck Surgery, Dr. Ken Kurtz from Prosthodontics, and Dr. Korgan Koral from Neuroradiology to formulate a treatment strategy for Isaiah," said Dr. Patel. "It wasn't until we worked with Dr. Goldstein's team that we were able to incorporate 3D printing into our surgery and really bring Isaiah's family into the shared decision making process. The 3D models help me explain surgery to patients and plan for surgery. In Isaiah's case, I wanted to be able to visualize where the tumor was and to determine whether we could preserve key structures in the area. The palate and nasal cavity is a delicate area, close to the orbit and dentition. Precision is key and the 3D-printed model helped us get very accurate."

Dr. Patel and Dr. Kamdar conducted the surgery in April 18. Today, Isaiah is healed and doing well. Isaiah can now breathe out of both nostrils, allowing him to run and play like other children.

"Before the surgery, I had trouble breathing in and out of my nose, which made it hard for me to keep up with my family and friends at school," said Isaiah Onassis Goberdhan. "The surgery was fine and now I'm able to breathe so much better."

Now with the Formlabs Form Cell, Northwell will be able to scale production of anatomical models and surgical guides, bringing this pre-planning and explanation capability to even more patients. ■

# Oxehealth Secures World-first Accreditation for its Vital Signs Technology

The British Standards Institute (BSI) has accredited Oxehealth's vital signs measurement software as a Class IIa medical device in Europe.

This is the first time that software enabling a digital video camera sensor to remotely measure vital signs has been approved as a medical device. No global medical device regulator, including the US Food and Drug Administration, has previously approved a device of this nature.

To detect pulse rate, the device works in the same way as the familiar pulse oximeter, which detects the slight changes in skin colour caused by the blood being pumped around the body.

However, unlike a pulse oximeter, which must be attached to a patient's skin, it can be used to monitor pulse rate remotely. The device also detects the movements of the body caused by breathing to count breathing rate.

The Oxehealth vital signs measurement software will now be marketed alongside the company's existing suite of contact-free activity tracking tools, which are already being used by NHS trusts and care homes to assist staff who need to monitor patients at risk of falls, self-harm or other injuries.

Chief executive Hugh Lloyd-Jukes said: "I am thrilled by the European medical device accreditation, which confirms that our technology can take spot measurements of pulse rate and breathing rate that are as accurate and safe as a device that you clip on the skin.

"Pulse oximeters are used in GP practices and hospitals every day. The difference is that we measure pulse rate and breathing rate entirely contact free, anywhere in the patient's room.

"This will be hugely beneficial to public and private sector organisations that care for elderly and vulnerable people, whose staff cannot be present in every room or do not wish to interrupt ➪

the rest of the people they are looking after."

The European medical device accreditation is the culmination of six years' work by Oxehealth, a spinout from Oxford University's Institute of Biomedical Engineering and Oxford University Hospitals NHS Foundation Trust. From the start, the company worked closely with clinicians.

The first clinical studies were completed at the John Radcliffe Hospital in Oxford and tests were later conducted at the Broadmoor Psychiatric Hospital and Coventry and Warwickshire Partnership NHS Trust.

To secure the accreditation, the company had to complete a clinical pivotal study to prove the efficacy of its product, and to build a medical device Quality Management System covering its software development and business processes. Both were assessed by The British Standards Institute, acting as a Notified Body on behalf of the MHRA.

The Oxehealth vital signs measurement software will now be launched as part of the company's Digital Care Assistant solution, which uses an optical sensor to pay attention to patients when clinicians cannot be with them. The DCA software alerts staff to risky situations, such as a patient getting out of bed, leaving a room, or moving into a risky area, so staff can intervene quickly. The system also generates reports that give teams objective data on activity. These are invaluable in shift handover meetings and for understanding patient behaviour.

Lloyd-Jukes added: "Clinicians have been using the Digital Care Assistant to help them to identify risky activities and to understand patient activity better.


"The addition of the medical device solution will enable organisations to take pulse and breathing rate observations to inform treatment decisions. It is a world first that has the potential to help staff transform care in settings where they cannot, or do not want to, enter a room.

"Looking after the elderly and vulnerable can be extremely challenging. Yet, in contrast to their peers in intensive care, the medical staff working in mental health, nursing homes and custodial settings have never had access to frequent, accurate vital sign measurements.

"Now they do, and we are thrilled to be bringing them a 21st Century tool that will help them improve the care of some of society's most frail patients." ■




# Next Generation EPR Designed by Clinicians for Clinicians

Nervecentre Software has called for a radical new approach to NHS digitisation with the launch of its Next Generation EPR

The platform – the first new EPR for the NHS in twenty years – exploits modern mobile technology to give clinical and operational teams in acute settings the real-time information they need to deliver safer, faster, high quality care.

Unlike traditional EPRs, the entire Nervecentre suite has been developed and designed in the mobile era, enabling hospital teams to capture and access real-time information at the bedside via fast, intuitive, clinically-focused user interfaces. Nervecentre provide 21st Century tools for a 21st Century NHS.

"It is indisputable that Next Generation EPR has to be mobile," says Paul Volkaerts. "There are over 5 billion mobile devices in the world and, whether we're at work or play, they're our tools of choice for almost everything we do. In the acute setting, the benefits of mobility are compelling; patient safety, efficiency and flow all improve with visibility of real-time information and better communication. And because mobile tools are so familiar, clinical adoption increases too. This can only be good news for hospitals. It's great news for patients too, with Next Generation EPR finally – and rightfully – giving them the tools for active engagement with their care."

Nervecentre's Next Generation EPR has been designed with – and for – clinicians to support hospitals as they tackle their most resonant challenges; patient safety and patient flow. It provides mobile tools to help trusts build a culture of real-time data entry by putting the EPR into clinicians' pockets and ready to use at the patient's bedside. Evidence shows that the real-time visibility unlocked by mobile solutions can have a significant impact on hospitals' ability to recognise patient deterioration, escalate care and improve flow.

The new EPR augments Nervecentre's well-established clinical workflow solutions with the addition of new tools to help integrate and accelerate pathways. The solutions, which can play a major role in the drive for paperless care, free clinicians to spend more time with patients, empowering them to make safer decisions quicker and improving the fluidity and agility of acute care.


The new functionality integrates seamlessly with – and complements – pre-existing Nervecentre tools; eObservations, Clinical Noting/eHandover, ED, PAS, sepsis screening, Patient Flow/Bed Management, Risk Assessments, Referrals, clinical workflow and digital photography.

Unveiling the EPR at the iconic London Science Museum, Paul Volkaerts said that a pressurised NHS not only needed Next Generation EPR to address its modern-day challenges – it also needed a 'Next Generation approach' to digital transformation to ensure the advantages of modern technology are quickly realised where they matter most: on the front line of patient care.

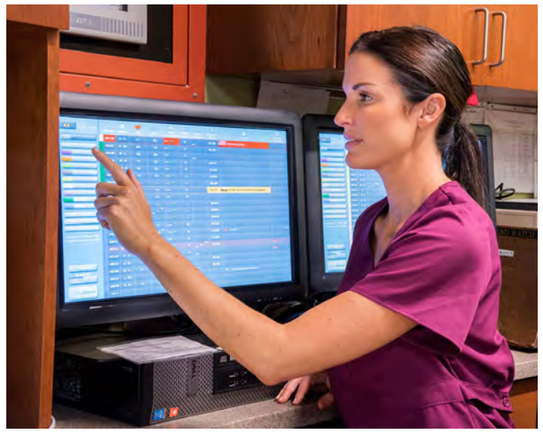
"Conventional wisdom dictates that an EPR strategy starts with replacing all key administrative systems; PAS, outpatients, theatres and order comms. But the 'PAS-first' approach is complex and expensive. It often costs millions of pounds, takes years to implement and offers more pain than gain to clinical and operational teams. The clinical benefits can take as much as five years to materialise.

"We propose an alternative: a 'PAS-last' approach. By deploying Nervecentre as a 'shadow' PAS, hospitals can focus on clinically advantageous projects such as eObservations, sepsis screening or flow. Such projects cost less, have a demonstrably shorter time-to-benefit and stronger clinical adoption. Capabilities can then be migrated off the PAS until it's quietly decommissioned – avoiding the cost and risk of a big-bang switchover. The 'PAS-last' EPR deployment strategy gives NHS hospitals much-needed agility as they battle the challenge of managing burgeoning demand with finite resources."

Nervecentre is currently deployed in over 30 UK trusts, with many citing it as their most used clinical system. For further information on Nervecentre as well as case studies that evidence the impact of mobility on acute care, visit *www.nervecentresoftware.com.* ■

# Leading Netherlands Hospital Adopts the EarlySense System for Continuous Patient Monitoring

EarlySense, the market leader in contact-free continuous monitoring solutions across the care continuum, has released details of a comprehensive implementation by Franciscus Gasthuis & Vlietland (Rotterdam), a leading hospital in the Netherlands. The hospital installed EarlySense's continuous monitors in its 28-bed pulmonology ward following a successful evaluation of EarlySense's sensors by the hospital's nursing department.



Leveraging big data analytics, the EarlySense system will enable hospital staff to continuously and accurately monitor patient heart rate, respiratory rate and movement. This consistent stream of patient data will aid the nursing staff with early detection of patient deterioration, helping in preventing adverse events including patient falls.

"We are dedicated to providing our patients with the highest level of care, and equipping our nursing staff with advanced technologies to help them succeed in their roles," said Lex Kahlman, Care Manager Pulmonology at Franciscus Gasthuis & Vlietland. "Preventing patient deterioration and falls is one of our key patient health objectives, as many of our patients are elderly and prone to falls. The EarlySense continuous monitoring system is a powerful tool that will help us mitigate this risk, and we are excited to add it to our ward as part of our total safety initiative."

Used worldwide in hospitals, rehab and skilled nursing facilities, the EarlySense continuous monitoring system leverages advanced algorithms to notify nurses of potentially adverse changes in patient vital signs, sending alerts to their pagers and to the central display station. The FDA-cleared and CE-approved solution has been clinically proven to help prevent adverse events, including code blues which are a result of cardiac or respiratory arrest, preventable ICU transfers, patient falls, pressure ulcers, and hospital readmissions.

"Franciscus Gasthuis & Vlietland is the latest hospital to join our growing list of global customers and we are proud to be included in their vision for patient safety," said Yfat Scilaom, VP of International Sales and Marketing at EarlySense. "Continuous monitoring solutions are coming closer to becoming a standard of care across the health continuum, and we are proud to see EarlySense technology continue to help patients and healthcare teams across the world." ■

# NHS Trust Bids Farewell to Legacy Pagers

The Isle of Wight NHS Trust, in the UK, which provides hospital, community, mental health and ambulance services to over 140,000 island residents, has deployed CommonTime's smartphone based Intelligent Paging app. This is a direct replacement to the 130 pager devices in use by staff across the organisation.

This move towards a more digital system of paging, with increased functionality, is part of the Trusts desire to continuously improve efficiency within their clinical communications. The ability to generate a full audit log at any time to review historic communications for governance purposes can be seen as a significant advantage over standard paging systems.

The legacy devices were recently retired by the Trust due to the closure of the national Vodafone paging network. Staff who previously carried a pager have been provided with an Android smartphone device by Vodafone, which is pre-loaded with CommonTime's Intelligent Paging software.

CommonTime worked directly with the Isle of Wight NHS Trust IM&T team to ensure a seamless transition to Intelligent Paging and supporting infrastructure. This swift deployment means clinicians have and will remain connected at all times, removing pressures on switchboard staff.



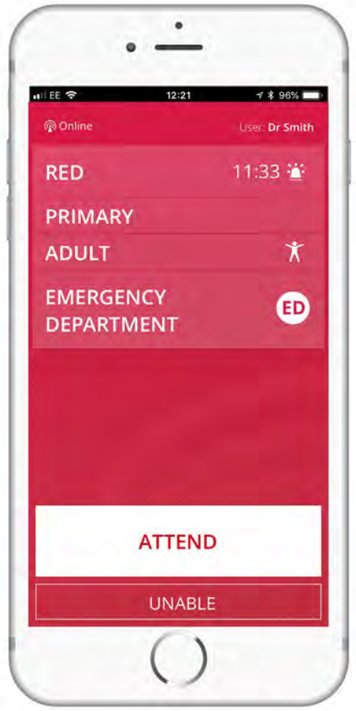


Lee Haward, Isle of Wight NHS Trust Service Delivery Manager (Hub) had this to say about Intelligent Paging "Our organisation originally chose the system as a replacement for the old long range pager system that was used by our 'off site on call team' when the old system became obsolete. It was chosen for its versatility of uses and the different devices the product could be accessed from. The fact that it could be put on our staff's own devices was extremely useful to us s it can save carrying two or more devices with them. The fact that the app can override the users phones sound settings means they can be on call for a pager but not be disturbed by other apps on their phones.

Also the system provides an audit trail with acknowledgements which is very important to us as this was something we were unable to do with the old technology. We are now looking at other uses and more products to see if they can be used for more uses across the Trust.

The interface is extremely easy to use and was rolled out with relatively little training required."

Going forward, Intelligent Paging for Teams will enable staff to send mobile alerts, that can include multimedia attachments, to all users - enabling informed decision making in front line care delivery. Alerts will be delivered as persistent notifications that override device sound and sleep settings, ensuring important messages are not missed.




Ian Knight, Chief Executive Officer of CommonTime said: "We recognise the need to be agile and adaptive in software delivery which is why we developed our 5-day deployment process. As we are partners with Vodafone we can replace an existing pager system with our own in just 5 days, ensuring minimal disruption for all parties involved. This is a fantastic example of how we have been able to support the development of an innovative Trust, replacing a legacy system and providing additional practical value.

Our team are excited to continue working with the Isle of Wight NHS Trust to provide software updates, new functionality and ensure Intelligent Paging remains at the cutting edge of healthcare communication technology."

The first scheduled update will add a telephone interface that provides staff with additional methods of initiating a page. ■

# Care Connect API for Safer Prescribing

The Connecting Care Interoperability Programme has gone live with its first Care Connect FHIR API so staff working with homeless and vulnerable people can see if they have a prescription for Opioid Substitution Therapy (OST) drugs.

The Care Connect interface links Orion Health's pioneering integrated digital care record and the Cyber Media drug and alcohol system, Theseus, which is used by Bristol City Council. It was developed to reduce the risk of duplicate prescriptions being issued for controlled drugs, which can lead to overdoses and other serious incidents. Dr Mike Taylor, lead GP at The Homeless Health Service in Bristol, said: "GPs working 'in hours' or 'out of hours' now have a reliable, quick, efficient way of knowing whether the patient in front of them is receiving opiate substitutes from drug workers outside practice-based care.

Clinicians in hospitals can also be aware of this source of prescription. This has real potential for saving lives and reducing drug-related deaths."

The link is also significant because it makes NHS South Central and West Commissioning Support Unit (SCW), which supports Connecting Care, one of the first organisations nationally to use the Care Connect FHIR APIs championed by NHS Digital and INTEROPen.

NHS England commissioned the development of Care Connect APIs to make it easier for health and care services systems to share information, using HL7 FHIR, a new standard for exchanging healthcare information electronically.

Emlyn Jones, technical lead for the Connecting Care programme said: "Our long-term goal is to create a consolidated list of medications for each patient, and this is the first step in doing that. So, we were looking for an interface that we could re-use, and the FHIR profiles felt like a good fit.

We spend a lot of time in the tech community talking about FHIR, and this seemed like a good opportunity to try it. FHIR is polished by being used. By doing things, we get them right."

To support timely availability of the OST medications, the The-

seus system, presents Connecting Care with an API that the Orion Health Clinical Portal calls to find out if a listed patient has been prescribed controlled drugs.

Fran Draper, senior project manager and engagement lead, Connecting Care Programme said: "This was a very rapid project; from design to go-live took just seven weeks.

It was an exciting project to work on, but it was just dipping our toes in the water. We want to go further, and to use this work to get into the technology of the twenty-first century and beyond."

The Care Connect FHIR API initiative was started in 2016 and is at the heart of INTEROPen's vision to create nationally defined HL7 FHIR resources and interaction patterns, to simplify integration and interoperability within UK health and social care. NHS Digital are supporting INTEROPen to foster collaboration between industry, standards bodies, informaticians, terminologists and health and care providers to define FHIR resources tailored to the NHS which support interoperability between health and care systems.

Orion Health, which provides the technology that underpins Connecting Care, was one of the founder members of INTEROPen. The INTEROPen initiative can help support the vision of the secretary of state for health and care, Matt Hancock, by introducing the data interoperability standards he wants to make sure that the IT systems used by NHS staff can "talk to each other."

The work in Bristol puts SCW and Orion Health in the vanguard of this national agenda. Dr Amir Mehrkar, GP and co-chair of INTEROPen, said: "Members of the INTEROPen collaboration have co-produced a set of national CareConnect FHIR profiles over the past year, so it is wonderful to see real implementation of these interoperability standards in the service.

"There is a lot more work to do but this is an important example of how sharing clinical information stands to make a real difference in patient safety."

Connecting Care is one of the longest-running and most extensive integrated digital care records in the country, enabling secure, instant view only access to health and care records for around 6,000 professionals working in Bristol, North Somerset and South Gloucestershire.

Role-based access is built into the Orion Health technology that underpins the project, so professionals can only see the information they need to do their jobs. Citizens can opt-out at any time.

Every new interface added to Connecting Care goes through a rigorous information and clinical governance control process that can include discussion by the Connecting Care board.

The new FHIR supported interface is already live in Bristol, where it can be viewed by staff working in 27 organisations, including 85 GP practices, NHS hospitals, mental health and out of hours services, social services, paramedics, charities and hospices.

The next step will be to extend it to the other areas using Connecting Care. Gary Birks, general manager, UK and Ireland, Orion Health, said: "We are proud of our association with Connecting Care, which is undoubtedly one of the most-cutting edge integrated digital care records in the country.

Orion Health was a founding member of INTEROPen so we were particularly pleased that SCW decided to use a Care Connect FHIR API for this important project. We continue to work with SCW on developing leading edge interoperability and look forward to more successful delivery in the future." ■

# Partnership to Provide VR Devices for use in Paediatric Healthcare Settings

SOTI, a provider of mobile and IoT device management solutions, has announced that it has partnered with Lenovo as the first enterprise mobility management (EMM) technology leader to manage the innovative Lenovo Mirage Solo with Daydream virtual reality (VR) headset.

In the world's first implementation of this joint venture, SOTI and Lenovo have teamed up together to work with the Starlight Children's Foundation, an organisation dedicated to creating moments of joy and happiness for hospitalised children, to provide and manage VR devices for use in pediatric healthcare settings. "Starlight Xperience" runs on the Lenovo Mirage Solo with Daydream, Google's VR platform, and is a ground-breaking program designed to entertain, educate and inspire hospitalised kids across the US through stimulating immersive experiences that transport children from the hospital to any place in the world – or beyond – through the magic of virtual reality. Delivered to Starlight's network of 800+ pediatric partners through its 360-degree program distribution platform, Starlight Xperience offers equipment and content geared toward entertainment and distraction for kids and will become the go-to AR/VR solution for pediatric care providers.

"We are very excited to work with Lenovo and the Starlight Project," said Larry Klimczyk, vice president, Strategic Alliances at SOTI. "Our latest integration with the Lenovo Mirage Solo will bring countless innovations to the healthcare and education sectors." SOTI was the first EMM solution to introduce management of smart glasses and smart watches. With the recent addition of Linux support, SOTI continues to be on the leading edge by enabling management of the world's next generation of innovative devices.

"By partnering with SOTI, Lenovo can combine VR technology with SOTI solutions, ensuring our device is securely managed and successfully implemented. We look forward to expanding the use of VR and delighting both consumers and the enterprise alike," said Gunjan Shah, general manager for North America Smart Devices at Lenovo.

Lenovo's Mirage Solo is the world's first stand-alone Daydream VR headset. Powered by Google's WorldSense technology, which allows applications to track a user's movement in space without the need of external sensors, Mirage Solo gives users the ability to explore endless possibilities. SOTI's solution will bring advanced management capabilities to enhance Mirage Solo's deployment in education and commercial space. You can learn more about the product by visiting *www.lenovo.com/us/en/daydreamvr.* ■

# Digital Heart Rhythm Monitor Receives FDA Clearance

The FDA has approved FibriCheck as a medical smartphone application to become the first FDA approved app for heart rhythm disorders that uses only an optical signal originating from a non-medical device such as a smartphone.

FibriCheck utilises the camera of a smartphone, or the optical sensors of a smartwatch, to detect heartbeats and derive a heart rhythm. This technique is based on photoplethysmography or PPG for short. By using artificial intelligence in combination with medical software, FibriCheck is able to carry out an accurate analysis of the heart rhythm and informs the user and/or the physician about this condition.

The main purpose of FibriCheck is to detect atrial fibrillation, a disorder that affects 1 out of 4 adults and has a fivefold increase for having a cerebrovascular stroke. By using the FibriCheck technology, the user can timely detect atrial fibrillation and correct therapy can be provided.


## A unique filing for the FDA

The FibriCheck-filing was unique as it is the first time the FDA has approved a smartphone application to detect heart rhythm disorders without using any external medical devices.

In order to receive its FDA clearance FibriCheck had to demonstrate its accuracy compared to traditional technology to detect these heart rhythm disorders using an electrocardiogram or ECG. FibriCheck succeeded in achieving equal accuracy results compared to a state-of-the-art external device that connects to a smartphone with 2 electrodes to record a single lead ECG.

Lars Grieten, CEO and co-founder, comments: "Receiving FDA clearance for a software-only application using consumer devices was a difficult challenge and demonstrates the competence and the excellence of our team. Having all knowledge in-house, it serves as a foundation to expand our product development roadmap beyond the smartphone and look into continuous monitoring"

Because users receive a medical diagnosis, the FibriCheck smartphone applications needs to comply with the strict regulatory guidelines provided for medical devices. In 2016 FibriCheck already received its European Class IIa clearance and now with the FDA approval, it can access the American market. Earlier this year, FibriCheck opened a satellite office in San Francisco to prepare for its market entry. Since then, several business development activities have been set up to integrate its underlying technology in existing hardware platforms. This is revolutionary since the FibriCheck software can convert a consumer device into a medical device. The start-up expects that the FDA approval will facilitate these processes and hopes to bring its product to the US market in 2019. ■

# UK NHS Saves £100 Million Through Safer, Lower Cost Prescriptions

GP practices and NHS clinical commissioning groups across England save over £100 million since using FDB OptimiseRx to improve prescribing quality.

GPs and community providers across the country have surpassed £100 million in directly attributable savings since frontline staff began using an innovative technology to prescribe less expensive and more clinically appropriate medicines for individual patients, it has been revealed today.

First introduced into the NHS in 2014 the medicines optimisation solution, called OptimiseRx, is now used in thousands of GP practices, and more than 125 of England's 195 clinical commissioning groups (CCGs) have implemented the solution. It prompts doctors with messages when more cost-effective or clinically appropriate medications are available and makes patient-specific recommendations based on the patient's medical record and clinical best practice.

A review of system usage across England, conducted by FDB (First Databank), found that £100 million of savings have been achieved by many thousands of prescribers selecting medicines suggested by the solution.

Phil Verplancke, Head of Product Management at FDB, the company behind the technology, said: "It's great news for the NHS that CCGs are making prescribing budget savings by allowing frontline staff to make the most of technology. However, the solution is more than saving money, and when you factor in the enormous health benefits and non-cash realisable savings that safer prescribing and best practice can bring, such as avoided hospital admissions, the overall benefit to the NHS and patients is likely to be even greater."

NHS Ipswich and East Suffolk CCG has made the highest saving of any CCG in the country. Rifat Choudhury, Medicines Management Pharmacist, NHS Ipswich and East Suffolk CCG, said: "FDB OptimiseRx has become a powerful tool that our medicines management team rely on to ensure that patient care is optimal, safe and in line with our local governance framework and drug formulary. Our general practice staff work incredibly hard to select the best possible medication and treatment choice for our patients, and OptimiseRx gives us the added ability of


always promoting the most clinically appropriate and cost-effective choice based on fluctuating drug tariffs."

At peak times OptimiseRx supports more than 1 million prescribing transactions each day for the GP practices, out of hours clinics, and community care settings it serves.

It integrates directly with existing primary care clinical systems, including EMIS Web, TPP SystmOne and Microtest Evolution. This means that busy healthcare professionals are able to receive and act on alerts without logging in and out of multiple clinical systems.

The technology includes thousands of patient-specific algorithms that respond to clinically coded information in the patient record, and is still the only solution supporting medicines management teams with this level of patient specificity. This means that a patient's medical history, co-morbidities, existing drug regimen, and diagnostic results are considered in messages sent to prescribers. National guidance from NHS England and best practice guidance from organisations including NICE and the MHRA are also taken into account, with information then linked to the latest cost of pharmaceutical products in the market, and details of which medicines are approved for prescription locally.

Data from FDB customers also revealed that there is typically a less expensive alternative in around one in four patient consultations. ■

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# Upcoming events

## November 2018

**14–15 Diabetes Professional Care**
London, UK
For more information visit:
www.diabetesprofessional-care.com

**15–16 Frontiers Health**
Berlin, Germany
For more information visit:
www.frontiershealth.co

**18–20 Cognitive Health**
Berlin, Germany
For more information visit:
www.cognitive-health.ai

**18–20 Health:Code**
Berlin, Germany
For more information visit:
www.health-code.berlin

**21–22 2018 GIANT Health Festival of Health Tech Innovation**
London, UK
For more information visit:
www.gianthealthevent.com

**28–29 AI Expo North America**
Silicon Valley, CA, USA
For more information visit:
gateway.ai-expo.net/north-america-2018/central-grid/register/

## December 2018

**4–5 Digital Healthcare Innovation Show**
Riyadh, KSA
For more information visit
www.saudihealthcareshow.com

## January 2019

**21–22 Social Media in the Pharmaceutical Industry**
London, UK
For more information visit
http://www.social-media-pharma.com/jmhban

## March 2019

**18–19 Future Healthcare 2019**
London, UK
For more information visit
https://www.futurehealthcareuk.com

**25–26 Digitalhealth Rewired**
London, UK
For more information visit
https://digitalhealthrewired.com/