The Role of GeoIoT in Health and Care and Emerging Trends

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Nively CTO
Which Major Industry Will Be Next In Line For Disruption?

"If you want to get a ride to the airport, you can whip out your phone (or give a voice command to a virtual assistant like Alexa) and hail an Uber. But if you get sick, you probably still take off work and go to the doctor. "

Technologies have been mainstream for years: video chat or even email—even though these you probably don’t consult with your physician via video chat or even email—even though these

Source: www.ioti.com
INNOVATION IN HEALTHCARE IS ... HARD, VERY HARD
"Soaring cost of health care"

"Horizontal integration is needed"
The strategy that will fix health care

Health care is so hard

Why innovation in health care was so hard

From the May 2009 issue

By Regina E. Egermeier
BUT... SOMETHING IS CHANGING

(LET’S SEE WHY)
Population Pyramid in Europe
..AND AGE IS DIRECTLY RELATED TO MULTIMORBIDITY AND CRONICITY
Current Healthcare Expenditure (% of GDP)
National health expenditures in the US accounted for $3.2 trillion in 2015 or 18% of the GDP.
NUMBER OF HOSPITAL BEDS PER 100 000 INHABITANTS, EU-27
UNSUSTAINABLE
The IoT Healthcare market is expected to grow with a CAGR of 43.01% during the 2016-2022 period. The IoT Healthcare market is expected to grow to $117 billion by 2020.
4 million patients globally will remotely monitor their health conditions by 2020.

Today, 57% of US users access PHR and use Internet to get information on healthcare (symptoms, etc.)

The number of fitness devices will grow 5x until 2020.
The number of connected devices in the healthcare sector globally is expected to reach 1.2 billion by 2024 according to Machina Research.

Some 6.4 billion connected devices in the...
Redefining healthcare with the potential of IoT

IoT in Healthcare: What’s in Store?

Source: Gartner
SCENARIO #1: HEALTH & WELLBEING
Market forecast at $19 billion by 2018 of which 61% of devices will be sport and fitness trackers.
WEARABLE FOR MONITORING OF SPORT ACTIVITY

Source: www.sportsthinktank.com
WEARABLE FOR CARE/CURE

Source: www.quell.com

WEARABLE INTENSIVE NERVE STIMULATION (WINS) SOLUTION BY QUELL
BODY PART INVOLVED

- Head: 7%
- Neck: 3%
- Ankle: 3%
- Ear: 5%
- Finger: 1%
- Wrist: 5%
- Purse/pocket/shoe: 17%
- Chest: 23%
- Arm: 8%
- Leg: 5%
- Clothing: 6%
MONITORING OF SENIORS
MONITORING OF SENIORS

Credit: Freimages.com/CB
WANDERING
Falls Are the Greatest Cause of Death Among Those Aged 65+
REACTIVE SCENARIOS
Multiple dangers detected in the product: Mentorace®

More than a simple fall detection

- Fall
- Exit room from bed
- Rising from bed
- Prolonged presence in a room
- Night wandering

Smart data analysis
THE PRODUCT: MENTORAGE®

Images of the App
Smart data analysis
SMART ENVIRONMENTS AND COACHING
video

https://www.youtube.com/watch?v=394G

1JbC7yr

video
Turn off the oven.
The food is ready.
Today is your daughter's birthday. Call her.
Maria had a stroke and needs to be reminded to do her exercises every day.
PEOPLE AND DEVICE MANAGEMENT (HOSPITAL)
INCREASING NUMBER OF MOBILE MEDICAL DEVICES PER BED

Source: GE Healthcare

Credit: Freimages.com/Griszka Niewiadowski

+62%
SIGNIFICANT INCREASE IN SERVICE AND MAINTENANCE COSTS

%90+
Increasing "Invisibility" of Portable Medical Equipment

10-15% Portable medical equipment is stolen or lost every year within hospitals.
21 min. per shift
10-30%
NURSES STAFF TIME SPENT LOOKING FOR PORTABLE MEDICAL EQUIPMENT

21 min. per shift or for maintenance staff

75% for

10-30%
Effect: over-procurement if compared to real requirements

+20-30%
MOBILE CLINICAL ASSET (INFUSION PUMPS ETC.) UTILISATION LEVEL IS LOW

35-42%

Source: GE Healthcare

Credit: Freimages.com/ Fernando AUDIBERT
Typical figures, for a 200-bed hospital:

- Reduction of more than 100 infusion pumps (out of 400+)
- Savings in the range of $300,000 to $500,000 per annum in saved rental and reduced costs.

Source: GE Healthcare
TYPICAL USE CASES
EXAMPLES IN THE MARKET
CLINICAL GRADE MONITORING
(PRE/DURING/POST HOSPITALISATION)

Credit: Freimages.com / Lotus Head
HC1100 embeds three ultra-low-power radios for Wi-Fi, Ultra-wideband and Medical Band (MBAN) transmissions and has the capacity to support the monitoring of multi-lead ECG, heart rate, blood oxygen levels and respiration of 50 to 60 wireless-liked patients within a 25-meter perimeter, while continuously transmitting for up to five days at wire-grade link quality on low-cost Zn-Air coin batteries.

In addition, MEMS microphones and motion sensors can detect patient behavior.
Hot GeoIoT Trends in Healthcare: (my best guess)
Within five years, the majority of clinically relevant data... will be collected outside of clinical settings. (2011)

Drivers:
- Increase self management (healthcare)
- Chronic-disease management and process at HOME
- Increase self-management (healthcare)

Consumers utilizing home health technologies will increase from 14.3 million worldwide in 2014 to 78.5 million by 2020.
DEVICE INTEROPERABILITY AND DATA INTEGRATION

Source: http://medicalfuturist.com/
back in 2015, 80% of doctors surveyed said telemedicine is a better way to manage chronic diseases than traditional office visits. Why? Telemedicine offers patients and health care providers both a new wave of freedom and accessibility. For the first time, a patient's care options are not limited by geographic location.
A Varying Value Proposition According to the Patient’s State

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<th>Generation Constraint</th>
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<th>Processing Challenge</th>
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<td>Post-Acute Care</td>
<td>Acute Care</td>
<td>Chronic Care</td>
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A VARYING VALUE PROPOSITION ACCORDING TO THE PATIENT’S STATE

"The value of improved health of chronic disease patients through remote monitoring could be as much as $1 trillion per year in 2025."
Example: Italy

- Growth of cost by 6 billion euro by 2060
- Cost while by 2016 was already 1.26% of GDP
- in 2014 the cost was 0.84% of GDP and 12% of healthcare

With Long-Term Care (LTC) As Prime Target
The system of wearables, sensors, software capable to generate medical report or indicators.

Credit: Freemiages.com / Daino.76

Artificial Intelligence + Big Data + Patient Centered Analytics at the Point of Data Collection

Analytics + Fog Computing
LPWA TECHNOLOGIES TAKE OFF IN HEALTHCARE

Low-Power Wide-Area Network (e.g. LoRa and Sigfox) and...

- Narrowband IoT (NB-IoT)
- LTE-M (Long Term Evolution for Machines)
PAPIoT:
Position and Activity monitoring Platform based on IoT technology

LEAT - Abeeway - Nively
ADL analysis based on IoT solution
"IoT-enabled connectivity within hospital labs will increase total global laboratory test throughput by more than 3.02 billion diagnostic tests over the next 5 years."

Credit: Freeimages.com / Grisza Niewiadomski
patients are now in the driver’s seat, with better access to higher-quality doctors, and higher satisfaction rates overall. It’s a healthy new way to look at health care.

"Patients are now in the driver’s seat, with..."
BYOD (ECG’s, DIY blood tests, etc.) + self-management at pharmacies or supermarkets

System-level required innovation
BUSINESS RELATED TO COMPLIANCE WITH REGULATORY FRAMEWORKS (E.G. GDPR)
For institutional scenarios with a clear role is to be demonstrated today’s unsustainable system vs “population-based evidence creation” with a clear role is to be demonstrated
SECURITY, WHERE ARE THOU?
The WannaCry ransomware hit 300,000 machines in 150 countries worldwide (plus other medical facilities including 48 U.K. medical facilities).
Many people don’t realize that healthcare hardware -- like MRI machines, ventilators, and some types of microscopes -- are actually computers.

"If it ain’t broke, don’t fix it" mentality can’t be applied to computer systems.
Johnson & Johnson Warns Insulin Pump Vulnerable to Hacking

By Reuters

HEALTH OCT 4 2016 11:45 AM ET

Johnson & Johnson is telling patients that it has learned of a cyber security bug in one of its insulin pumps that a hacker could exploit to overdose.
When security researcher Billy Rios reported earlier this year that he found vulnerabilities in a popular drug infusion pump, the main pump board was little cause for concern. Because limits on medication delivery to patients, there was little cause for concern. However, Rios found that a hacker could raise the dose of a drug to a fatal level. The researchers have found that hackers could control the pump remotely. The researchers have found that hackers could control the pump remotely. They have also found that the pump could be used to send data to a remote server.
A report by FBI and US Dept of Homeland Security highlights the threat through IoT devices.
THE GDPR - GENERAL DATA PROTECTION REGULATION IS ARRIVING... ARE YOU READY?

According to Gartner, 50%+ of companies will not be in full compliance with the GDPR by May 2018. A regulation (adopted in April 2016) not just a directive.
The GDPR give control to citizens and residents over their personal data.

"Which can be anything from a name, a home address, a photo, an email address, bank details, posts on social networking websites, medical information, or a computer’s IP address..."
Barriers?
Main barriers to be overcome:

- Limited standards
- Fragmented market
- Cultural barrier (sensors and wearables)
- Lack of strategy regarding IoMT
- Legacy systems
- Patient engagement level
- Regulatory and reimbursement challenges linked to connected health programs
- Legacy systems

Credit: Freemages.com / Adrian van Leen
This is a major bottleneck for mHealth applications.

Credit: Freimages.com / Corena Golliver
CONSUMERISATION OF HEALTHCARE (PRO VS CONSUMERS)

Unclear distinction between wellness product and medical devices
Examples of iOS HealthApps
Limited "clinical grade" mobile applications that can connect devices for clinical use.

While there are over 165,000 mobile health apps available on iOS and Android, only 2% of these apps can connect to a patient to a provider system. Few clinical grade apps.
CERTIFICATION AS MEDICAL DEVICE?

Plus:
- Cybersecurity
- Carrier certification (such as smartphones)

CE Marking on product is a manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.
In 2015 France adopted a law to regulate exposure to radio frequency fields.
VLC - Visible Light Communication (VLC)

**FOR LIGHT COMMUNICATION**

**Source:** luciom.com

- **Li-Fi**
- **Fi-Fi**

Acquisition by Philips’ Lighting

- Acquisition by Philips’ Lighting
- To laser diodes
- It could be faster than WiFi moving from LEDs
- Radio spectrum 1,000-10,000 x wider than the light spectrum 1,000-10,000
anywhere’ mode of care delivery’
between patients and providers to an ‘anytime,
‘The shift from episodic, in-person encounters

BUSINESS TECHNOLOGY LEADERSHIP

CIO

CULTURAL CHANGE
A LAST NOTE.
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Call for submissions: Digital Health 2018 Innovation Prize

Deadline: 26th March 2018

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