HEALTH CARE

sodexo
QUALITY OF LIFE SERVICES

Game-Changing Technologies: 10 Promising Innovations for Healthcare

9 December 2017

Credit

“Game-Changing Technologies: 10 Promising Innovations for Healthcare”, **Martha Vockley**, Biomedical Instrumentation & Technology (BI&T), Association for the Advancement in Medical Instrumentation (AAMI), March/April 2017// Vol. 51//No. 2

sodexo
QUALITY OF LIFE SERVICES

AGENDA

- Common Themes
- 10 Promising Innovations
- Conclusion

sodexo
QUALITY OF LIFE SERVICES

Common Themes in Promising Innovations

- Address top priorities in Healthcare:
  - Cybersecurity
  - Smart use of data
  - Cost savings
  - Infectious disease prevention
  - Clinical effectiveness
  - **Improved patient care, outcomes and satisfaction**
- Interdisciplinary, translational solutions to complex problems
- Push boundaries of healthcare (science fiction → reality)

sodexo
QUALITY OF LIFE SERVICES

1

Behavioral Analysis, Machine Learning, and Artificial Intelligence for Cybersecurity

CyberSecurity (Prevention → **Detection**)

- Healthcare data is worth **considerably more** (than personal identification or financial details)
- Medical equipment (on its own) – do NOT have robust security; protected through the Network itself
- Generally, 20 year old technology based on **PREVENTION**- effective up to **95%** of network incursions
- Motivated intruders can crack ANY network:
    - **2015:** US Federal Bureau of Investigation (FBI)
    - **2016:** US National Security Agency (NSA)
- **UNKNOWN** when networks are under attack; normally discovered by 3rd Party (when data is offered for sale or operations are held at ransom)
- Average time of discovery of an intrusion = **5** months
- **DETECT** intruders using:
    - Machine Learning
    - Artificial intelligence
    - Behavioral analysis

sodexo
QUALITY OF LIFE SERVICES

2

Intelligent and Predictive Analysis

AIM: Actionable Intelligence → Meaningful Results

- Software platforms that act as '**air traffic control for health systems**'
- Software: aggregates, analyzes and learns from multiple data sources (internal & external), predicts potential problems and recommends actions to avert via text, voice or email.
- Internal data source (example):
  - Electronic Medical Records (EMR)
  - Documented process of **patient journey**: arrivals, orders, tests, diagnoses, admissions, procedures, medications, risk factors, call systems, transfers, discharge, etc.
  - Doctor's practices and preferences
- External data sources (example):
  - Weather forecast
  - Infectious diseases report, etc.
- **Radio Frequency Identification (RFID) Technology-** to improve
  - Asset and supply chain management
  - Enhance productivity
  - Improve patient safety

sodexo
QUALITY OF LIFE SERVICES

3

No Touch, Continuous Infection Control

How it works?

What is it?	How does it work?	Efficacy

How it works

1. The 405nm emitted from Indigo-Clean reflects off of walls and surfaces, penetrating harmful micro-organisms
2. The light targets naturally occurring molecules called porphyrins that exist inside bacteria. The light is absorbed and the excited molecules produce Reactive Oxygen Species (ROS) inside the cell
3. 405nm creates a chemical reaction inside the cell, similar to the effects of bleach
4. The Reactive Oxygen Species inactivates the bacteria, preventing it from re-populating the space

Visible light spectrum showing the active element in Indigo-Clean™

Inactivation of bacteria via visable light absorption

Indigo-Clean: continuous cleaning- 2 modes

During periods of occupancy, this IC100 control system is designed to set the Indigo-Clean fixtures into White Disinfection Mode, which provides comfortable white light, yet maintains a level of ***continuous*** disinfection to harmful bacteria. After the room has been unoccupied for a time, the control system will set the Indigo-Clean luminaires to Indigo Disinfection Mode, which provides maximum disinfection to harmful bacteria.

White Disinfection Mode

White disinfection mode provides ambient lighting and continuous environmental disinfection while room is occupied

Indigo Disinfection Mode

Indigo disinfection mode can be selected to provide maximum continuous disinfection when room is not in use

sodexo QUALITY OF LIFE SERVICES

VIDASHIELD

VIDASHIELD™

Home | Technology | Products | Research | Media | About Us

Intertek

VS01

DOWNLOAD SPECSHEET

Intertek

VS02

DOWNLOAD SPECSHEET

Intertek

VS03

DOWNLOAD SPECSHEET

sodexo
QUALITY OF LIFE SERVICES

UV-C Robots

sodexo
QUALITY OF LIFE SERVICES

4

Nanotechnology

Global Nanotechnology Market: compound annual growth rate = **17.5%**

← Disposable microneedle patch

Electrophysiological monitoring patch made with single strands of crystalline nanomaterials (< 10 µm) →

sodexo
QUALITY OF LIFE SERVICES

5

Robotics

sodexo
QUALITY OF LIFE SERVICES

Tele-Robotic Intelligent Nursing Assistant (TRINA) by Duke University

sodexo
QUALITY OF LIFE SERVICES

TRINA prototype

sodexo
QUALITY OF LIFE SERVICES

Robotic Surgery

sodexo
QUALITY OF LIFE SERVICES

6

3D Printing and Bioprinting

sodexo
QUALITY OF LIFE SERVICES

Example of what we can 3D Print in Medicine and Healthcare

- **Medical equipment/devices:**
  - Finger splints
  - Tumour models
  - Organ models
  - Printed plastic implants
  - Personalized Plaster Casts
  - Low cost prosthetic parts

sodexo
QUALITY OF LIFE SERVICES

Biomaterials: Blood Vessels, Bones, Heart Valves, Ears, Skin, Organs

sodexo
QUALITY OF LIFE SERVICES

Spritam: FDA approved epilepsy drug that is made by 3D printing

Making Medicine Using 3D Printing

A revolution in dosage form technology

ZipDose® Technology is the first and only drug-formulation platform that uses 3D printing (3DP). The 3DP process does not rely on compression forces, punches, or dies. Instead, 3DP binds layers of powdered medication together with an aqueous (water-based) fluid. This forms medicine that is solid, yet very porous (has tiny spaces or holes). The porous design helps medication made with **ZipDose® Technology** to rapidly disintegrate when taken with a sip of liquid.

Breaking down the 3DP process

First, the powder blend is deposited as a single layer

Then, the binding fluid is applied, causing the particles to bind together

The process is repeated several times to create the finished product

sodexo QUALITY OF LIFE SERVICES

7

Augmented and Virtual Reality

Microsoft HoloLens

sodexo
QUALITY OF LIFE SERVICES

Augmented reality for Education

sodexo
QUALITY OF LIFE SERVICES

Use of AR by CAE Healthcare to Provide Healthcare Simulation Solutions

sodexo
QUALITY OF LIFE SERVICES

8

Noninvasive Diagnostics

sodexo
QUALITY OF LIFE SERVICES

Respiration Collector for In-Vitro Analysis (ReCIVA)

Exhaled breath contains thousands of Volatile Organic Compounds (VOCs). As products of underlying metabolic processes, VOCs directly reflect actual disease activity and represent a goldmine of biomarkers accessible via a non-invasive "Breath Biopsy".

The clinical applications for breath based VOC biomarkers include early detection, as well as precision medicine applications such as therapeutic stratification, monitoring of therapy response and monitoring of disease activity.

The ReCIVA Breath Sampler was named Invention of the Year in the 2017 Top 50 in Digital Health Awards.

- Reliable, reproducible breath collection for biomarker analysis
- High patient safety and comfort
- Adult and pediatric (5+ years) disposable masks
- CE marked
- In use in the world's largest breath-based clinical trials, at over 60 clinical sites around the world

owlstonemedical.com/reciva

sodexo
QUALITY OF LIFE SERVICES

End to End Solution

VOC Biomarker Analysis

VOCs collected on sorbent tubes can be easily stored and transported to Owlstone Medical's Breath Biopsy laboratory for analysis (learn more at owlstonemedical.com/services). Alternatively you can perform the analysis in your own laboratory using a range of analytical platforms including GC-FAIMS and GC-MS.

1. Rent **ReCIVA Breath Sampler**, collect samples

2. Send samples to **Owlstone Medical**

3. Pay per sample for **Biomarker Services**

sodexo QUALITY OF LIFE SERVICES

iBreast Exam

sodexo
QUALITY OF LIFE SERVICES

9

Wearables and More

Motiv Ring; Omron Project Zero; Sgnl Watch Strap

sgnl

sodexo
QUALITY OF LIFE SERVICES

Neogia Sleep Apnoea Watch; TempTraq Temperature Patch

sodexo
QUALITY OF LIFE SERVICES

Bloomlife- Measuring Contractions; Bodytrak- vital signs monitor: T, HR, VO2, speed, distance, etc.

sodexo
QUALITY OF LIFE SERVICES

10

Drones

sodexo
QUALITY OF LIFE SERVICES

Zipline in Rwanda- delivering vaccines, medications and blood

Ambulance Drones- developed by TU Delft, Nederlands

sodexo
QUALITY OF LIFE SERVICES

Round-up of 10 Game Changing Innovations

1. Behavioral Analysis, Machine Learning, and Artificial Intelligence for Cybersecurity
2. Intelligent and Predictive Analytics
3. No-Touch, Continuous Infection Control
4. Nanotechnology
5. Robotics
6. 3D Printing and Bioprinting
7. Augment and Virtual Reality (AR & VR)
8. Non-invasive Diagnostics
9. Wearables and More
10. Drones

sodexo
QUALITY OF LIFE SERVICES

C

Conclusion

Conclusion

- Innovations- potential to be game-changers in healthcare
- WOW factor- attract biomedical engineers!
- Validate the role of biomedical and clinical engineers
- Remain focused on:
  - Optimizing **costs**
  - Improving **patient outcomes**
  - Improving **efficiency** of caregivers
  - Enabling caregivers to be **closer** to patients
- Biomedical engineers: continue to be part of the **inter-disciplinary teams** in the quest for **next-generation innovations**!

sodexo
QUALITY OF LIFE SERVICES

HEALTH CARE

sodexo
QUALITY OF LIFE SERVICES

Thank you!

Col Lin YEO
Director, Sales and Business Development Healthcare – Asia Pacific
Sodexo
Tel: +66 2714 1661
Mobile: +66 818 432 339
International Mobile: +1 (504) 641 2801
collin.yeo@sodexo.com

www.sodexo.com