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Rethinking Incontinence Care

Wearable sensor technology is improving the quality of life for residents at care facilities

AUTHORS

Eva Tansem Andersen, Concept Owner, Incontinence, Abena A/S
Diederik Burer, R&D Consultant Philadelphia Zorg
Dorinda Kuijf, Innovation Manager, Philadelphia Zorg

A future with an increasing number of elderly people and a decreasing number of young people challenges the care sector to re-evaluate how we can innovate to maintain high standards. The question is whether and how technology such as big data and the Internet of Things can help it to become more efficient and release time for actual caregiving.

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A future with an increasing number of elderly people and a decreasing number of young people challenges the care sector to re-evaluate how we can innovate to maintain high standards. Technology, and specifically the IoT, can help us re-think deployment of resources to improve quality of life and efficiency and ultimately release more time for actual caregiving.



AGING POPULATION

It is estimated that by 2050, the number of people over 65 years of age in the EU will increase by 70% and the number of over-80s will increase by 170%.

Source: World Federation of Incontinent Patients

In the last couple of years, the concept of big data has been seen as the solution to almost every challenge related to efficiency. Big data can teach us more about patients and residents, and this knowledge can help us structure procedures and care more efficiently. However, the challenge with big data is that staff at care centres do not have time to analyze and use the data and actually change their work habits.

Even if they do find time, in the world of care, just using general data like this is not always a good idea, as the individual resident rarely matches the big data.

But how can we use big data and the IoT to improve efficiency and resident care? We need to put the technology to use in the everyday tasks we perform at care centres – to make technology help us act right now instead of spending time analysing big data. One very interesting trend is wearable sensor technology.

What is wearable sensor technology?

As the name suggests, wearable sensor technology is a way of digitizing new or existing products by fitting them with sensors. Sensors can monitor different parameters from the product user and transmit the results in a useful manner. One of the most common wearable sensor technology products is the activity tracker. Many people wear these already to monitor their own activity, for example how many steps did I walk today? How many calories did I burn off? What was my pulse? Another example is from the care sector, where devices are worn by diabetes patients to monitor their blood sugar levels.

The technology presents the results in real time so that patients and/or caregivers can react immediately.



WEARABLE SENSOR

A product that is attached to the user's body during a longer period of time and includes circuitry, wireless connectivity technology, and processing capability.

Source: Information Handling Services (IHS)

Wearable sensor technology in incontinence care

One of the great challenges in the care sector is managing incontinence among residents. Changing continence products at care facilities is time consuming and physically challenging for caregivers. For residents, physical discomfort caused by incontinence can impair their quality of life.

Sample of current and upcoming data points that are possible to measure with wearable sensors.



- Adherent to Medication
- Blood Pressure
- Body temperature
- Calorie Consumption
- Cardiac Arrhythmia
- Early breast cancer detection
- ECG
- EDA
- Electrical Conductiveness
- EMG
- EOG
- Glucose level
- Hand sanitation
- Heart rate
- Heart rate variability
- Hydration
- Location
- Motion
- Plantar pressure
- Posture
- Proximity sensr
- Pulse oximetry
- Quality of sleep
- Respiration
- Stress levels
- Time and place of inhalator usage
- Urine incontinence
- UV radiation
- Voice recording

Source: Stegersjö & Ulenius. "Potential usage of wearable sensors in Professional Healthcare" Master thesis.

So, how can we introduce the IoT in incontinence care to meet these challenges? The intelligent continence product implements wearable sensor technology in disposable products used everyday at care centres. The sensors are built into the continence products and connected to a clip. When the built-in sensors detect the presence of urine, the clip sends a signal via a relay to a server which is connected to a mobile device carried by the caregivers. The caregivers are alerted in real time and can change the residents right away (Figure 1).

Wearable sensor technology in the future

And this is just the beginning. Imagine what would happen if more functionality and other sensors were added to the continence product? The obvious next step would be to add sensors that react to blood, faeces and infections. Or sensors that react if the continence product is tilted as a sign that a person has fallen. Or maybe people at open care facilities suffering from dementia could wear a 4G tracker in case they walk away on their own. We could even take it a step further. We could add information about the environment of residents

at care centres. We could monitor information about the weather, the light in the building or the indoor climate. All of this additional functionality will give the care givers access to qualified information and tools to develop the best possible procedures and secure the best care.

All this information will become even more useful after it has been compiled over a number of years. A pattern of residents' actions and behaviour will emerge which will support the real-time alert information caregivers use on a daily basis. Like big data, but tiny, individualized big data. In the future, this information can be built into the solution. Caregivers will receive information and advice from the solution, suggesting different actions to benefit the resident.

For example the system could suggest when a visit to the toilet would be recommendable based on the urination pattern of the individual.

This tiny big data will make care routines easier – releasing more 'warm hands' to care for the residents, and empowering the staff to organise their care for the patients in the best way possible.

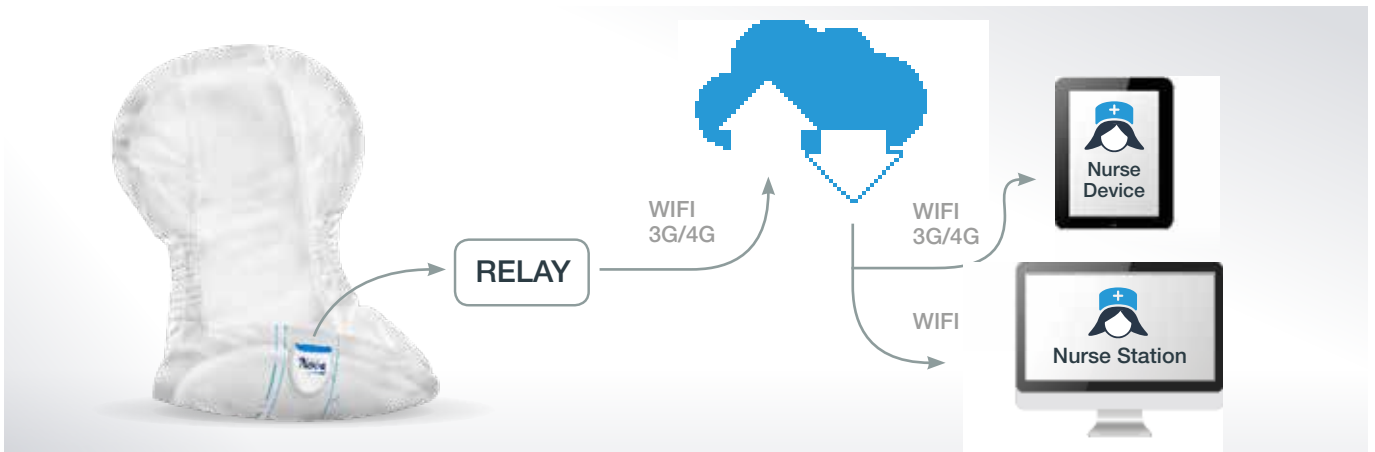


Figure 1: Abena Nova, the intelligent incontinence product for everyday use

Full circle

The information gathered over time, the big data, will also become relevant. With 600 sensors in a continence product, the continence products can register very detailed information, for example about where in the continence product the urine is first detected and how it spreads in the continence product. This information can then be communicated back to the continence-product manufacturer, which can use the information to develop the product further. 'So the big data goes back into the system to improve the products. The circle is complete.

A different way of thinking

Implementing the IoT in ordinary products gives a whole new perspective on the products. According to Diedrik Burer, R&D Consultant at Philadelphia Zorg, the real benefits from technology come when it actually transforms the product into a service. In the continence product context, the continence product is a simple product and has been used the same way for many years. Then we digitise the product and make it smarter. Now it is a smart product, and this is a huge improvement. But imagine a future where we do not even think about continence products. Where we think in terms of services instead. In this case, the service of keeping residents dry and comfortable. This service includes many factors – from ordering, storage, choosing continence product size and being alerted when the continence product needs changing, to feeding information about urination patterns back into the system in order to further develop the product. It is a full-service circle focusing on keeping residents dry and comfortable and the product itself is just one feature.

The intelligent continence product in the context of the 6 D's

One way of putting the development of wearable sensor technology in continence products in perspective is to see it in the context of Peter H. Diamandis' 6 D's of exponential advancing technologies: Digitized, Deceptive, Disruptive, Dematerialize, Demonetize and Democratize (Figure 2).

First the continence product is digitized when the sensors are implemented in the continence product. This makes the continence product more intelligent. To begin with, the benefits seem marginal. There might be some hype in the beginning but then the products/solutions fall into a deceptive period where people kind of dismiss them.

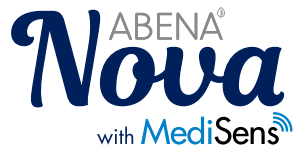
But the advantages become clearer and clearer. The residents no longer have to put up with wet continence products, the caregivers do not change the continence products unnecessarily, etc. Gradually, as the advantages of the intelligent continence product become clearer and the technology changes the established procedures or whole industries, the solution is perceived as disruptive. The intelligent continence product is on the verge of being disruptive right now. Once the intelligent continence product with the sensor technology becomes disruptive – everybody wants it, and it becomes democratized. Demand goes up, and costs go down; the technology becomes accessible to everybody.

The future

So, what does this tell us about the future of wearable sensor technologies in general and the intelligent continence product specifically? As the advantages of the wearable sensor technology become widely accepted, the technology and the intelligent continence products will become democratized. So, in the future we will all have access to intelligent wearable sensors in a number of products and services, including continence products. Caregivers will not only know whether the resident has a wet continence product, they will also know whether she has an infection, she has been exposed to pollution, she is inside or outside, her pulse is steady, and so on. The next step for us is to decide the detail of the information we really want and how we can use it in the best way to provide the very best quality of care.

*Figure 2:
Steven Kotler's 6 D's
of exponential growth*





Abena Nova is the first intelligent continence aid produced for everyday use. Via carbon fibre sensors built into the product, the aid can accurately collect all incontinence-related data through a small, discreet device attached to it. Via wireless technology, caregivers receive real-time notification (on their smart phones or tablet) about the optimal time to provide incontinence assistance for each person.

Abena is one of the largest manufacturers of incontinence solutions. Abena's pledge is to improve the quality of life for those with incontinence. The Group has subsidiaries in 17 countries, supplying more than 25,000 different products to 88 countries worldwide. Founded in 1953, Abena is a family-owned Danish production and wholesale company based in Aabenraa in Denmark.



The Philadelphia healthcare facility has 7,500 clients, 6,300 employees and 5,000 volunteers around the Netherlands. Philadelphia's ambition is to assist people with physical and mental disabilities and help them get the most out of their lives. The facility's keywords are responsibility, professionalism and constant attention. The site in Amersfoort is currently home for 16 clients with severe cognitive or neurological problems. All are immobile and in wheelchairs, and all suffer from incontinence.



MediSens Wireless, Inc. was founded in 2007. The mission of the company is to provide solutions to improve quality of life. The goal is to develop highly innovative technology platforms and to offer meaningful care solutions to clients at home and in extended care facilities. The company is based in Santa Clara, California (USA).