Photo by Arno Massee

"The Box" Project - A Case Study

" *Remote monitoring has proven to be an effective method for providing the right care at the right time and place, all while upholding the quality of our care against lower costs. The adherence to connected health devices allows for meaningful follow-up thanks to being able to obtain reliable, useful data.* "

Prof. Dr. Douwe Atsma,
Interventional cardiologist and professor of cardiology at the LUMC

PARTNER

Leiden University Medical Center

Leiden University Medical Center (LUMC) is located in the Netherlands and is a leading hospital in innovative research, education, and patient care.

Withings has been partnering with LUMC since 2015 when the Cardiology Department started a single-center, open, randomized controlled trial (called 'the Box') to implement e-health in clinical practice. The Box project supports patients once they are back at home through remote patient monitoring. The first patient group benefiting from *the Box* were patients with myocardial infarction.

In their follow-up, patients are asked to take daily measurements with Withings connected devices.

[1]https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2764578
[2]https://erj.ersjournals.com/content/58/2/2100636

PARTNER
- Leiden University Medical Center, The Netherlands

CHALLENGES
- Improve health care through innovation
- Introduce a remote patient monitoring solution that is reliable, scalable, and easy to implement and use for a variety of conditions.

SOLUTION & DEVICES
- Withings Mobile App & Enterprise API
- Withings ecosystem of connected health & medical devices

RESULTS
- Quality of health care improved[1]
- Cost & time saving for the hospital
- Decreased pressure on hospital capacities[2]
- 16 departments of the hospital and three other affiliated Dutch hospitals equipped
- Currently 2500 patients actively measuring
- 21 different use cases

CHALLENGES

LUMC WANTED TO ADDRESS THROUGH THE BOX PROJECT

Optimizing the care track

Traditionally, the hospital would make an appointment with a patient. In many cases, everything was stable, meaning that it was not necessary for the patient to come in person to the outpatient clinic for a check-up with the doctor.

> " *We'd like to spend less time on the patients that don't need it that much and more time on the ones that need it more. Thanks to the Box, we can concentrate on the patients that require the most attention.* "
>
> **Prof. Dr. Douwe Atsma**

Improve efficiency and quality of care

Photo by Arno Massee

Prior to this new program, a doctor would only record a few, necessary measurements from a patient during appointments. Connected medical devices and remote patient monitoring (RPM) solutions open new possibilities in health care in terms of measurement of physiological parameters and activity tracking. LUMC saw the opportunity to have more and new types of measurements, taken at home in the natural environment of the patient. These additional data measurements can enable health care providers to continuously follow the evolution of a patient's health in the medium and long term and to better adapt medication in real-time.

Enhance lifestyle-changing

Apart from optimizing the treatment pathway, LUMC was also looking for a way to enhance lifestyle changes. According to Prof. Dr. Atsma, developing healthy habits is difficult and patients need a lot of input to be guided in the right direction. In terms of resources, it is impossible to provide the necessary in-depth support to every patient. E-health could potentially be a solution by offering a digital coach and engaging connected devices to support the patient.

FOR IMPLEMENTING THE BOX PROJECT

On the LUMC team's side

The doctor team had to be convinced that there was a better way to follow up with patients. Medical staff had to be trained and made aware of the benefits of such innovation to overcome resistance.

Patient data needed to be easily accessible but also safely stored, and new solutions needed to be easy to integrate into the hospital's existing IT system and processes.

On the patients' side

On the patient side, easy-to-use devices were needed to make sure that even less tech-savvy patients could benefit from in-home monitoring. Patients needed motivation to regularly take measurements.
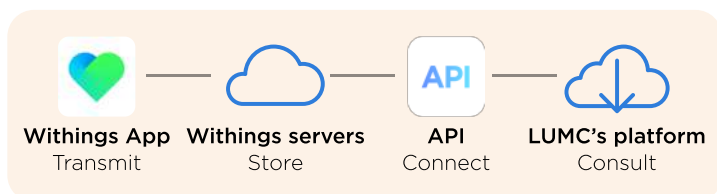
WITHINGS
HEALTH SOLUTIONS

Leiden University Medical Center

SOLUTION

Devices

Withings devices deliver reliable and accurate measurements. The long battery life, the user-friendly handling, and an elegant design that does not convey a "hospital feeling," are all aspects of Withings products that motivate patients to regularly take measurements. Depending on the patient group, boxes include a disease-specific combination of the following Withings devices, which are clinically validated (if applicable) and can measure a large variety of vital parameters:

- **BPM Connect** provides diastolic and systolic blood pressure and heart rate measurements with immediate feedback on the device.
- **Thermo** is a smart and contactless temporal thermometer.
- An **ECG hybrid smartwatch** allows the user to monitor sleep and activity, and to record a 1-lead electrocardiogram.
- **Body** is a Wi-Fi smart scale that delivers a precise assessment of weight.
- **Sleep Analyzer** is an under-the-mattress medical device that tracks sleep cycles, sleep quality, heart rate, and breathing rate. It can also detect snoring and sleep apnea.

Data connector option

Withings App	Withings servers	API	LUMC's platform
Transmit	Store	Connect	Consult

LUMC uses the Withings API to securely transmit data from the Withings app to their platform, which they developed in-house. Collected data is safely stored in Europe on Withings servers and integrated into LUMC's Electronic Medical Record (EMR) in real-time.

The solution is complemented by the **Enterprise Plan** to follow an unlimited number of patients. With the Service Level Agreement, Withings offers technical support to the LUMC team. Withings supported LUMC's technical team with the API integration and cloud set-up and offered training about remote patient monitoring and appropriate use of the devices.

The patient journey

To facilitate the patient journey, LUMC found a creative solution: Patients are instructed by a team of **e-health assistants** in the "**Box office,**" a dedicated space in the hospital that looks like a cozy living room. The e-health assistants support patients from the beginning to the end with installing the devices and taking measurements. In case of technical issues, patients can reach out to them.

Photo by Arno Massee

> " *For us, the Box project is a project for better health. The care doesn't end with the hospital but continues at home. We, the e-health assistants, add the personal touch to the Box project. When a patient calls us they don't get an automatic voice on the phone, they just get us, immediately.* " **Angelina Ouwehand,** e-health assistant

Once at home, patients are accompanied by the care team, who regularly check the measurement data. In addition, patients are followed through teleconsultation, thus reducing physical visits to a minimum. Depending on the patient type and condition, patients participate in the Box project for 3 months to 1 year. Afterward, they can decide to keep the devices and continue using them for themselves.

Until 2021, almost 2000 patients were accompanied by a box of connected devices. LUMC has the ambitious goal to include a total of **4000 patients** in the project in 2022. Today, Boxes are used in 16 departments of the hospital and three other affiliated Dutch hospitals for COVID-19 patient monitoring. Overall, 21 different use cases are included in the project and 2,500 patients are actively taking measurements.

WITHINGS
HEALTH SOLUTIONS

Leiden University Medical Center

RESULTS

Increased satisfaction

A survey by LUMC highlights that **patients' experience of *the Box* project is positive**. The average patient satisfaction is 8.2 (out of 10). Patients generally feel safer through remote patient monitoring as they know that their vital parameters are regularly monitored by a nurse or doctor.[1]

A high satisfaction level can also be observed on the caregiver's side. In the survey, the average caregiver satisfaction was 4.2 - 4.8 (out of 5 and depending on the parameters asked).

Better quality of provided care & improved health of patients

The care team now has access to more measurements that are taken in the relevant context - at home. This allows them to see whether a patient is taking the right treatment and to adjust medication from a distance. It also helps to decide whether a patient needs to come to the hospital for a consultation or not. In addition, the Withings app motivates patients to actively improve their health.

Photo by Arno Massee

> " *Before, we only had one blood pressure measurement in three months for myocardial infarction patients. Now we have more and different types of measurements. This makes it a lot easier for us to adjust medication. The Box project is about patient empowerment. Patients become more aware of how the medication works. It is called a 'project', but for me, it's standard care already.* "
>
> **Nicolette van Hof,** nurse practitioner

> " *Patients are more aware of their health and motivated to improve it and live healthier. Our role is also to motivate them to take their measurements.* "
>
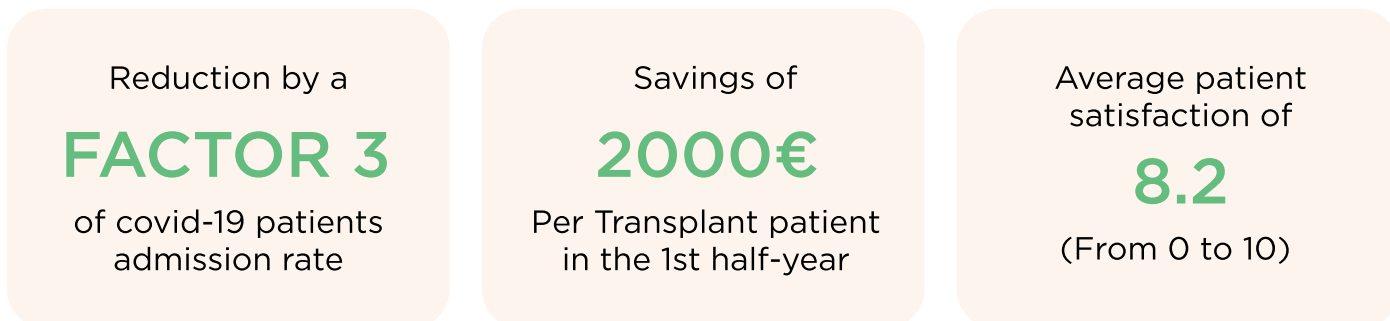> **Jasperine Brussee,** e-health assistant

Benefits for monitoring of patients with myocardial infarction

The Box improved continuous monitoring by increasing the number and types of measurements taken. Before the introduction of connected devices, the care team had only 4 blood pressure measurements taken in a one-year period during check-ups. Treatment was based on these 4 measurements. Thanks to the Withings BPM Connect, 150 measurements are now taken on average per year per patient. Withings hybrid smartwatch Move ECG records 1-lead electrocardiograms and counts steps — important parameters for understanding a patient's well-being and early detection of possible problems. Apart from that, the care team can see whether a patient is actually taking their medication. Half of in-person check-ups could be replaced by teleconsultations.

---

[1]https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2764578?

Benefits for Covid-19 patients

The satisfactory results of remote patient monitoring of suspected Covid-19 patients highlighted the advantages of *the Box* project. 27% of suspected Covid-19 patients who were not ill enough to be admitted to the hospital returned for short-stay admissions when sent home **without** a box. This number dropped to only 9% when sent home **with** a box.[1]

Reduction by a	Savings of	Average patient satisfaction of
FACTOR 3	**2000€**	**8.2**
of covid-19 patients admission rate	Per Transplant patient in the 1st half-year	(From 0 to 10)

Accompanying patients beyond the hospital

The positive results regarding improved quality and efficiency of care have led LUMC to scale up the project and focus future investments on it. It shows that through remote patient monitoring and intuitive connected devices, clinical outcomes are similar to regular follow-ups, patient satisfaction is higher, and healthcare delivery costs are lower than traditional healthcare.[2]

LUMC also developed its own algorithm based on Artificial Intelligence with measurements from Withings devices and other data sources. This algorithm identifies critical episodes of a patient before they actually happen and warns the medical team—with 90% accuracy. It allows a shift from an emergency care approach to preventive and chronic care.

About Prof. Dr. Douwe Atsma

Prof. Dr. Douwe Atsma is an interventional cardiologist and professor of cardiology at the LUMC. He is the coordinator of e-health for the entire hospital and initiated *the Box* project. Passionate about e-health and innovation, he is a board member of the National e-Health Living Lab (NELL) and the National Knowledge Platform "Physician and Lifestyle".

---

[1] https://erj.ersjournals.com/content/58/2/2100636
[2] https://cardio.jmir.org/2021/2/e26072

About Withings Health Solutions

Withings Health Solutions, part of Withings, is dedicated to healthcare professionals. Its mission is to continuously and effortlessly provide healthcare professionals with medical-grade data generated by patients from an ecosystem of connected devices.

For more than a decade, Withings has built a range of clinically validated products including activity trackers, connected scales, wireless blood pressure monitors, a smart temporal thermometer, and an advanced sleep analyzer.

Withings has dedicated solutions for digital health programs, remote patient monitoring, pharmaceutical companies and researchers that provide the richest array of accurate real-world data thanks to a complete ecosystem of connected devices, data connectivity options, and a remote patient monitoring platform.

Please visit www.withingshealthsolutions.com to learn more about our products and solutions.