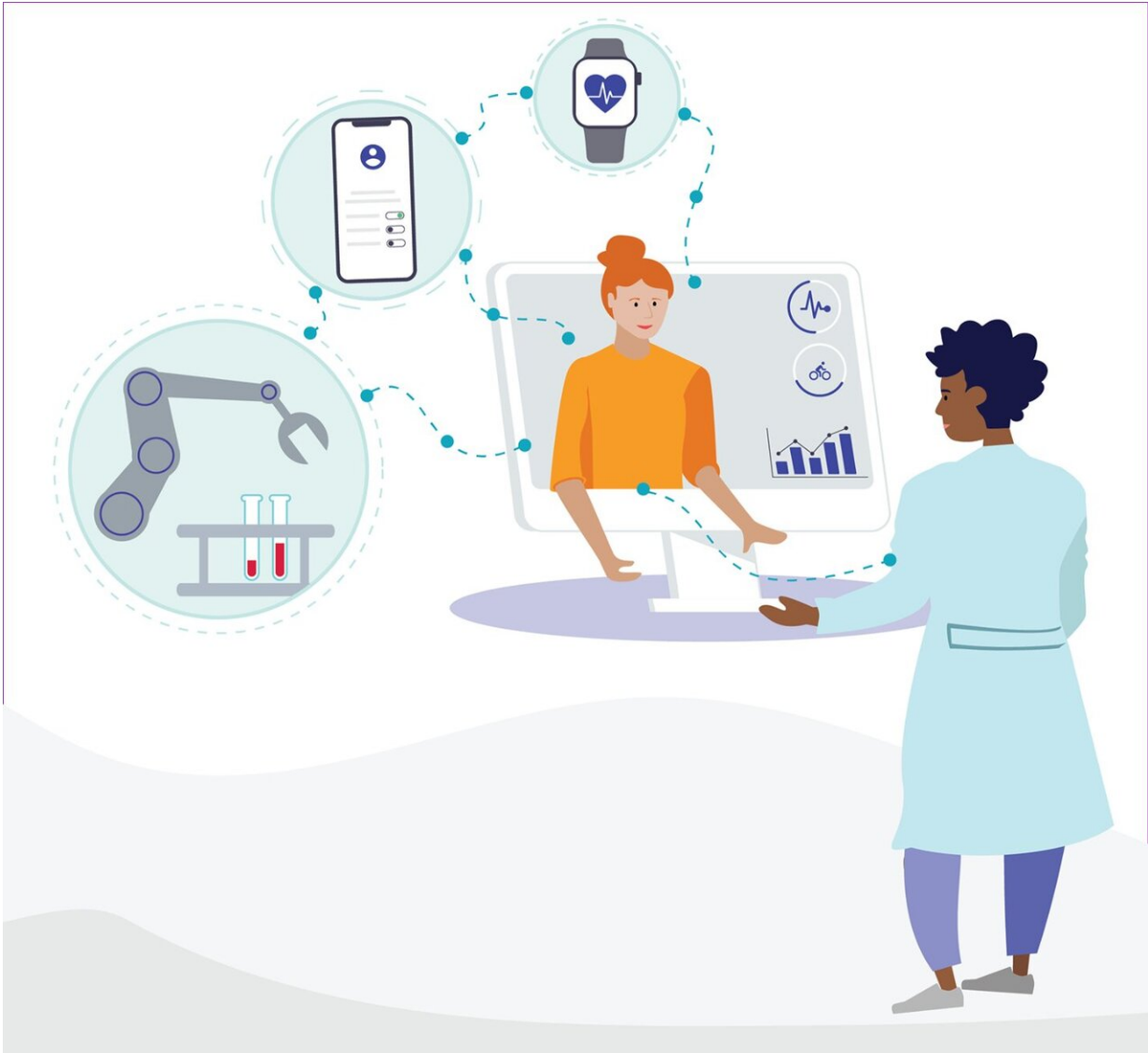# Improving health care in rural areas

November 2 2023, by Fabienne Bäcker

The digital ecosystem interconnects all of the components like the health stations and wearable devices. Credit: Fraunhofer IESE

With long waiting lists, significant journey times, an ever-shrinking number of doctor's practices and the aging population, medical care services in sparsely populated regions are under mounting pressure. As part of its Neighborhood Diagnostics project, the Fraunhofer Center for Digital Diagnostics ZDD is working to develop a digital ecosystem for delivering patient treatment close to where they live in order to ensure that people in rural areas can access high-quality medical care despite the shortage of doctors.

One of the digital ecosystem's key features are its decentralized health stations, which are tailored to local needs and feature fully automated labs that will ensure medical tests and diagnoses can be provided round the clock. The project will be on display at the joint Fraunhofer booth (Hall 3, Booth E74) at the MEDICA trade show in Düsseldorf from November 13 to 16, 2023.

Delivering medical care is becoming challenging in rural areas. According to a study by the Robert Bosch Stiftung, approximately 11,000 family doctor's practices will be unoccupied by 2035. This means that around 40% of rural districts face the risk of a shortage of family doctor services. Given the aging population, the growing shortage of skilled workers and the predicted retirement of doctors based in rural areas, the situation is precarious.

The three core Fraunhofer institutes of Fraunhofer ZDD and the Fraunhofer Institute for Factory Operation and Automation IFF are working to combat this problem through the Neighborhood Diagnostics project, which aims to create a technology-neutral, rapidly adjustable and modular digital ecosystem. The idea is that this will relieve some of the pressure on doctors and specialized personnel and provide rapid, early diagnoses and high-quality care to patients, without them having to travel long distances.

"The digital ecosystem is based on the principle of openness. This is an important consideration for partners in industry, on whose expertise we have been relying right from the start to help collaboratively advance the Neighborhood Diagnostics research project," says Simon Scheer, project manager and scientist at the Fraunhofer Institute for Experimental Software Engineering IESE.

The model region of Brandenburg is the starting point for the trial phase, with the focus on providing care for patients with chronic illnesses. The system is then set to be gradually expanded to rural areas all across Germany.

Ecosystem's digital platform provides interfaces for third-party services

There are several key features of the digital health ecosystem. At its core is a digital platform that receives all of the medical data. It interconnects all of the necessary medical-diagnostic components and provides open interfaces for third-party services and applications.

The platform is connected to wearable devices that use the Neighborhood Diagnostics app installed on them—developed as part of the project—to transmit vital signs like blood pressure, blood glucose level, pulse and heart rate to the ecosystem's platform. Just like remote-monitoring devices, these play a vital role in medical care and can trigger alerts if they detect unusual readings, for example.

In the future, the platform will be able to interpret the data and reach diagnoses. This will then be used to recommend health care services like medication, physiotherapy and much more.

On-site diagnostics provided by health stations

Another key feature of the digital ecosystem are its health stations, which will do away with the long journeys to doctor's practices and will, in the final stage of development, be able to carry out the functions of a fully automated laboratory. Patients will then be able to drop off samples and test kits of all types there or pick up new test kits. The only thing they need to do is register and follow a step-by-step guide.

The tests will be carried out autonomously within the station by sophisticated industrial robots and, if necessary, held in cold storage. The results will be available shortly afterwards. Depending on their individual health situation, patients can receive the results on-site, via the app or from their doctor.

"Fundamentally, these health stations are the medical sector's equivalent to ATMs, which don't require any staffing," says Scherr, drawing a comparison with the financial sector. The data gathered via the health stations will also be transmitted to the digital platform, but, in order to protect people's personal data, it will not be stored there.

The health stations can be fully customized and expanded, and they can be adjusted to the needs of a specific region and equipped with various diagnostic services. In the trial phase, the health stations will initially be installed in care homes and assisted-living facilities.

"Digital solutions hold the potential to improve patient care in the future. Given the burgeoning nursing crisis, these health stations—as part of the digital ecosystem—can help alleviate the situation," says Dr. Thomas Tradler, Head of Business Development at the Fraunhofer Institute for Cell Therapy and Immunology IZI.

Technology-neutral, data-driven approach

Manufacturers of medical devices such as fall-detection sensors or blood-pressure monitors can also feed data into the digital platform using its open interfaces, without having to go via the Neighborhood Diagnostics app—the data can be transferred directly.

"This is useful in application scenarios where patients need to be monitored closely, and it also demonstrates the technology-neutral, data-driven approach of our system," says Scherr.

Simplifying data collection

The digital platform's open interfaces enable all of the services and partners involved to exchange data. The platform links all parts of the health care system while also connecting with patients. At the same time, it helps to simplify and accelerate the process of collecting data—which relieves some of the pressure on doctors and health care professionals, saves sick people from making long journeys, allows conditions to be diagnosed early and provides those living at a distance from urban centers with digitally supported, decentralized health care.

Given the importance—in such a sensitive context as health care—of ensuring that patient data is managed securely and that their privacy is protected, the data is not stored within the digital platform. Instead, it remains on the devices of the entities that make up the ecosystem.

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