"Biomedical sensors can be used to monitor important body functions like blood sugar level or heartbeat rate...."

Dag Ausen
SINTEF

Foresight:

Wireless doctor online

Biomedical sensors are an exciting proposition – and a potential growth industry for the Nordic region.

Imagine that your doctor can monitor your heart using data sent wirelessly from your home, around the clock, alerting you immediately if any abnormality is recorded. Or that diagnoses can be made instantly wherever the patient happens to be, reducing the need for costly hospital visits and tests.

This kind of remote surveillance, exploiting advances in micro- and nanotechnology, looks set to become routine in future health care regimes as biomedical sensors become smaller, smarter and cheaper. The combination of biomedical sensors and telemedicine in particular promises huge cost savings in public health provision.

In the future, chips implanted in the body might function as a constant onboard doctor, monitoring patients with chronic diseases, measuring vital data, detecting new health problems at an early stage, and even delivering drugs directly into the bloodstream.

The recently concluded foresight study FOBIS looked at the use of biomedical sensors in three important areas: home-based care, emergency medicine and chemical hazards.

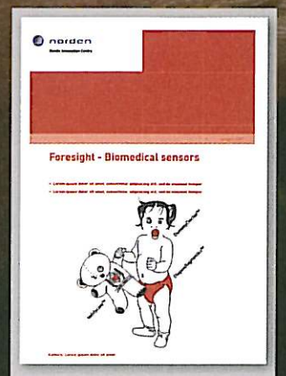
Dag Ausen of the Norwegian research group SINTEF was project manager. He defines a biomedical sensor as "a device that provides information about the state of the human body or elements affecting the state of the human body".

Vital signs

Ausen continues: "Advanced body-wearable biomedical sensors combined with remote monitoring and telemedicine, open up a whole new range of health care services. Patients with chronic diseases like diabetes or rheumatism can be monitored in order to safeguard their treatment. Biomedical sensors can be used to monitor important body functions like blood sugar level or heartbeat rate. Or they can check for levels of toxic agents present. Alarms can be set to go off when values are dangerous. There is even the possibility of having chips implanted into your body, chips that send signals directly to your doctor's office, or the hospital."

The Nordic countries, like most in the western world, are faced with an ageing population with an ever-increasing need for health care and too few hands to provide it. Norway alone will need 100,000 new health care workers in the next ten years.

Ausen believes that biomedical sensors enabling health professionals to monitor patients in their own home will be an important part of any solution. Additional →



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benefits will be improved quality of life, and prolonged longevity.

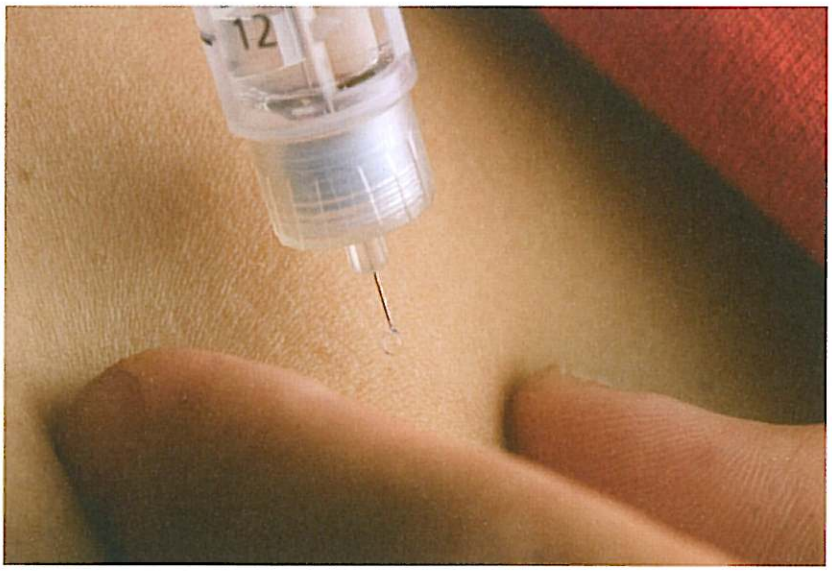
"This is especially important when you consider the impending tide of aged population in the western world, not to mention the challenge of obesity", he says. "It is important that patients are given tools that enable them to better understand the processes taking place in their bodies, and are helped to take actions that benefit their health. This will also indirectly limit the need for direct medical services."

Business as usual

Patients could have their own "control station" at home, transmitting continuous or periodic readings for storage in a central data bank, creating in effect a continuous medical history – including any alarming symptoms – that would be instantly available to doctors. At the same time, the patients would be going about their business without being hospitalized and/or tied down to machines.

However, Ausen adds," for sensors to be used on a large scale for medical purposes, they need to be robust and reliable. Having a patient hooked up to a sensor whilst lying quietly in a hospital bed with nurses in close vicinity is one thing. A patient in his own home, moving about and living an active life, is quite another. You have to know that the data coming in from the sensors are reliable." And given the inevitable budget limitations in public health, the technology has to be cost-effective.

"The use of biomedical sensors in emergency medicine, or when monitoring acute ill patients is another area we've looked at in the FOBIS-project study", Ausen continues. For example, the Intervention Centre at the Norwegian Rikshospital (National Hospital) in Oslo – one of several Nordic "hotspots" for new developments in wireless medical sensor technology – is working with SINTEF and Vestfold University College in developing a small sensor for use during operations on beating hearts. The sensor registers the heart's movements three-dimensionally, detecting any irregular heart activity at an early stage.



In the future, chips implanted in the body might function as a constant onboard doctor, monitoring patients with chronic diseases, eg. diabetes.

"Lab-on-a-chip"

In cooperation with SINTEF, the Norwegian company Norchip has developed a range of sophisticated biomedical diagnostic kits and in vitro diagnostic systems that can carry out a variety of chemical and biological readings within minutes. A doctor or nurse can place biological samples onto a plastic chip the size of a credit card which works like a miniature laboratory: the so called "lab-on-a-chip" system. In future a small droplet of blood is all it will take to measure your level of cholesterol, blood sugar or whatever – and all in the comfort of your own home.

But we will still need the doctor. This is no sci-fi technological scenario where health is left to computers. The point of biomedical sensors is to better equip the health professionals for the jobs they trained for. Data are only data; we will always need the professionals to assess them.

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