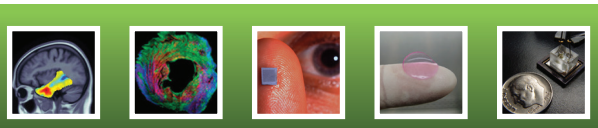
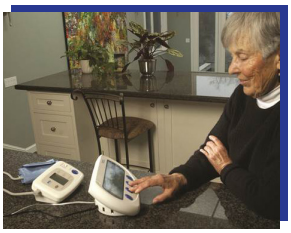


Telehealth



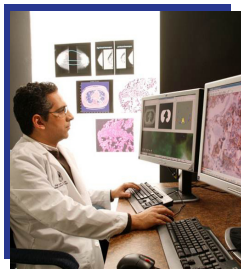
The tabletop remote care system for the elderly and chronically ill, asks a series of questions about sleep, eating habits and medication use, which are evaluated remotely by a health care professional.
Source: Health Hero Network.

What is telehealth?

Telehealth is broadly defined as the use of communications technologies to provide and support health care at a distance. Telehealth has become a valuable tool for improved health thanks to combined advances in a number of areas including communications, computer science, informatics, and medical technologies.

Telehealth can be as simple as two doctors talking on the phone about a patient's care or as complex as the use of robotic technology to perform surgery from a remote site. Today, telehealth is often associated with remote monitoring of a patient's condition; for instance blood pressure, heart rate, and other measurements of health status can be obtained by a device worn by the patient and electronically sent to medical personnel.

What types of telehealth technologies are there and how are they improving medical care?



Images of patient tissue samples can be sent from remote sites for analysis by experts.

Teleconsultations allow a physician in a rural area to receive advice from a specialist who may be in a distant location, about patients with special or complex conditions. Such consultations can be as simple as a phone call. Increasingly, they involve more sophisticated sharing of medical information such as CT, MRI or ultrasound scans. These images can be taken by the local physician, incorporated into an electronic medical record and sent to the specialist for diagnosis and treatment recommendations.

Remote patient monitoring (RPM) is a technology enabling patients to be monitored outside of conventional clinical settings, such as in the home. RPM requires sensors on a device that wirelessly transmits or stores physiological data for review by a health professional. Incorporating RPM into chronic disease measurement can significantly improve an individual's quality of life, particularly when patients are managing complex processes, such as home hemodialysis. For example, in diabetes management, the real-time transmission of blood glucose and blood pressure readings enables immediate alerts for patients and healthcare providers to intervene when needed.

Intraoperative monitoring (IOM) is a technique that allows a surgeon to perform continuous checking, recording, and testing during a difficult surgical procedure. In neurological surgeries, IOM is used to detect potentially damaging changes in brain, spinal cord, and peripheral nerve function prior to irreversible damage. Staff in rural hospitals rarely have the expertise to perform this type of monitoring. Remote IOM uses systems to transmit data, voice, and images over the Internet to a site for monitoring by an expert. The expert can then let the on-site surgeons know if any problems arise as the surgery progresses.

Telehomecare (THC) provides the remote care and reassurance needed to allow people with chronic conditions, dementia or those at high risk of falling to remain living in their own homes. The approach focuses on reacting to emergency events and raising a help response quickly. Deterioration can be spotted at an early stage before an accident occurs.

Medical diagnosis and treatment at the "point-of-care" refers to the ability to test and treat patients rapidly at sites close to where they live, rather than coming to the doctor or hospital for tests, waiting days or weeks for results, and then returning to the doctor for treatment. Point-of-care medicine is particularly useful for communities with limited access to large healthcare facilities, such as rural or low-resource areas.

Point-of-care medicine relies on portable diagnostic and monitoring devices that can be delivered to remote areas, combined with telehealth technologies. Such systems allow health care workers in remote areas to test patients and instantly send the results to experts to make a diagnosis and send back instructions for proper care. Portable devices have been developed that can measure blood gases, electrolytes, blood chemistries, glucose levels, and even detect cancer. This capability greatly enhances health care for patients in remote and underserved areas.

What are NIBIB-funded researchers developing in the area of telehealth to improve biomedical research and medical care?

Smartphone-based device provides rapid cancer diagnosis at low cost. NIBIB-funded researchers have developed a smartphone-based device that can diagnose cancer in less than an hour at a cost of under two dollars per patient. Certain types of cancer can be detected using biological fluids such as blood, saliva or other aspirates. The device could enable point-of-care cancer diagnostics in remote areas where a local clinic collects patient samples and must send them out to a central service that reports the results in several days—a system that often results in patients never returning to the clinic for follow-up care because they have to travel a long distance or cannot take off work. With the new device, biological fluid from patients is mixed with microbeads coated with antibodies that capture cancer cells. The smartphone, with a snap-on imaging module, then takes pictures of the cell-bead mixture. The pictures are transmitted to Massachusetts General Hospital where, within seconds, computer analysis classifies the sample as high-risk, low-risk or benign. This enables the patient to receive a diagnosis and initiation of treatment in a single trip to the clinic. The research team is bringing the system to small village clinics in Botswana to train local healthcare workers to screen for lymphoma.

This low-cost, disposable cartridge system is used by minimally trained health workers in the field to simultaneously test blood samples for multiple infections. Results can then be interpreted, remotely, by health care experts.
Source: Michael Lockhead, mBioDiagnostics.

Wearable sensors gather mobile health data to enable treatment. A multi-center effort known as Mobile Sensor Data-to-Knowledge (MD2K) is under development to use wearable sensors to conduct large-scale clinical trials by collecting data remotely. One project in its initial phase is the remote monitoring of individuals who are trying to quit smoking. Participants wear a chest strap that measures heart rhythm and can detect inhalation and even stress. A motion sensor on the arm tracks movements as the person smokes and eats. They also wear smart eyeglasses to record their surroundings, which might reveal visual exposure to smoking triggers, such as cigarette advertising. All of this remotely collected data will be used to identify when a person is about to smoke. Smartphones apps are being developed that can automatically send "just-in-time" stress interventions to help the person abstain from smoking. The MD2K consortium of 12 universities and centers work together to develop and test software systems that collect and analyze health data, which will be openly available to researchers. The consortium also provides training to expand the number and expertise of researchers interested in developing mobile sensor strategies for managing a wide range of diseases and disorders.

Simple computer test for early stages of Alzheimer's disease. Alzheimer's disease affects an estimated 5.3 million Americans, and is expected to increase in the coming decade. A critical goal of Alzheimer's disease research is to improve methods of diagnosis so affected individuals can be identified sooner and begin treatment in the early stages of the disease. NIBIB-funded scientists are developing an automated, web-based, behavioral screening test for early cognitive decline and memory loss. The goal is to adapt the Visual Paired Comparison (VPC) test of memory loss so that it can be performed with the subject viewing images on a computer screen. The VPC currently requires an eye tracking device that is expensive, requires specially trained personnel, and is not widely available. The researchers are developing a version of the VPC that uses simple methods to determine the eye movements of the test subject. The new automatic screening system will then be tested in the field for screening elderly individuals in various healthcare settings. If successful, it has potential to dramatically simplify current methods for diagnosing memory loss and enable millions of patients to take the test as part of a routine check-up.

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