National Institutes of Health

Fact Sheet *Point-of-Care Diagnostic Testing*

Point-of-care testing allows patient diagnoses in the physician's office, an ambulance, the home, the field, or in the hospital. The results of care are timely, and allow rapid treatment to the patient. Empowering clinicians to make decisions at the "point-of-care" has the potential to significantly impact health care delivery and to address the challenges of health disparities. The success of a potential shift from curative medicine, to predictive, personalized, and preemptive medicine could rely on the development of portable diagnostic and monitoring devices for point-of-care testing.

Yesterday

- In the earliest days of medicine, health care was similar to point-of-care in that it was delivered in the patient's home through physician house visits.
- As medical discoveries were made and new technologies developed, care then shifted to specialized hospitals with an emphasis on curative medicine.
- Large centralized laboratories were established, with cost-savings realized through the development of automated systems for analysis of patient samples.
- Point-of-care devices were used on a limited basis in the hospital for rapid analysis in intensive care units and for simple home testing, such as with pregnancy test kits.

Today

- Point-of-care testing gives immediate results as samples do not have to be shipped off-site to a centralized laboratory.
- The NIH supports the development of sensor and microsystem technologies for point-of-care testing. These instruments combine multiple analytical functions into self-contained, portable devices that can be used by non-specialists to detect and diagnose disease, and can enable the selection of optimal therapies through patient screening and monitoring of a patient's response to a chosen treatment.
- Sensor technologies enable the rapid analysis of blood samples for several critical care assays, including blood chemistry, electrolytes, blood gases, and hematology.
- Biosensors are used clinically for toxicology and drug screens, measurement of blood cells and blood coagulations, bedside diagnosis of heart disease through detection of cardiac markers in the blood, and glucose self-testing.
- Urinary tract infections are a serious health problem affecting millions of people each year. They result in more than 8 million office visits and over a million hospitalizations each year. The total cost for treatment reaches into the billions of dollars. A large share of that expense comes from waiting 48 hours for a urine sample to be cultured in the lab.
- NIH-supported researchers developed a sensor that can identify, in 30 minutes, from a single drop of urine, the specific bacteria responsible for an individual's urinary tract infection. This quick detection allows the patient to leave the physician's office or clinic with a prescription specific for their infection to begin immediate treatment.
- The detection process works at the molecular level – when the genetic target from the bacteria is recognized by the probes on the sensor, an electronic signal is generated. The signal is transformed by a computer chip on the unit into a digital readout. This sensor system is the result of collaboration between the UCLA Urology Department and GeneFluidics, Inc. GeneFluidics expects to have a system ready for FDA approval in about 2 years.

Tomorrow

- With the development of miniaturized devices and wireless communication, the way in which doctors care for patients will change dramatically and the role patients take in their own health care will increase. Health care will become more personalized through tailoring of interventions to individual patients.
- The next decade will bring a new realm of precision and efficiency to the way information is transmitted and interpreted and thus the way medicine is practiced. In the future, clinicans may be able to improve the regulation of diet in infants with inborn errors of metabolism through bedside monitoring. Currently, management of such diseases requires complex testing in a hospital setting. However, researchers are developing a chemical sensor, using a small sample of blood from a fingerstick, that changes color in response to metabolic irregularities. When such abnormalities are found, the diet of the infant can be adjusted immediately to prevent adverse effects such as mental retardation.
- Low-cost diagnostic imaging devices can be used at the point-of-patient care for disadvantaged and under-served populations in the U.S. as well as in the developing world. The development of low-cost imaging devices could make affordable diagnostic imaging more widely available, particularly in remote or rural communities and small hospitals that do not have ready access to these technologies.
- A new, low-cost ultrasound device could be used to diagnose complication of pregnancy, hemorrhage associated with trauma, renal obstructions, and other conditions.
- A new method using an optical probe for cervical cancer detection and treatment could significantly lower the mortality rate worldwide. Combining a small optical imaging device with a treatment modality could provide both diagnosis and treatment of cervical cancer at the same time.

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