FACT SHEET

NATIONAL INSTITUTES OF HEALTH

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

- The emphasis of care is shifting toward prevention and early detection of disease, as well as management of multiple chronic conditions.
- Point-of-care testing gives immediate results in non-laboratory settings to support more patient-centered approaches to healthcare delivery.
- The NIH supports the development of sensor and microsystem and low-cost imaging 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.
- Current developments in point-of-care testing are addressing the challenges of diagnosis and treatment of cancer, stroke, and cardiac patients.
- Circulating tumor cells (CTCs) that spread, or metastasize, from a primary malignant tumor to distant organs are responsible for 90% of cancer-related deaths, a number that exceeds 500,000 every year in the United States alone. Early detection of cancer might be possible through capture and analysis of CTCs. In addition, the ability to capture and analyze CTCs in peripheral blood may be used in the development of therapeutic strategies that can be tailored to the individual patient and monitor an individual's responses to cancer therapies.
- Researchers supported by NIBIB have developed a unique microfluidic device capable of efficient separation of CTCs from whole blood. This technology has broad implications both for advancing cancer biology research and for the clinical management of cancer, including detection, diagnosis, and monitoring.

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, clinicians 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 finger stick, which 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 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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