

Technology that Cares

Technology has the potential to improve the quality, safety, and efficiency of healthcare, which can then be provided at a much reduced cost. The digitization of healthcare has created a foundation for a future that offers more efficient patient care and cost savings. Innovations such as M-health, Telemedicine, VoIP, multimedia collaboration tools and wireless services allow medical staff to access patient data and communications tools from any location while nanotechnology in healthcare is all set to revolutionise the entire gamut of services and the delivery thereof.

M – Health

The rapid rise in penetration of mobile communication devices has led to an increased access to Healthcare and health-related information. M-Health offers a real-time disease management technology, especially for chronic diseases. The program, developed using mobile phones and other digital media, is designed to collect health information, thereby motivating people to maintain good health. It enables doctors to access patient records instantly and take informed decisions about disease management.

An online portal provides a simple & clean interface for monitoring vital medical information and spotting dangerous trends, thus leading to better lifestyle & health. It also sends customised medication reminders and motivational and behavioural trigger messages to patients' communication devices..

Such programs are designed to benefit all stakeholders – patients, doctors & healthcare vendors. Patients can subscribe to health-related applications to improve lifestyle, manage chronic diseases and reduce cost of care. Doctors can use the services to improve treatment outcomes with real-time patient monitoring & counselling services. For healthcare providers, the benefits include better patient compliance, measurable outcomes, effective data management and improved customer care.

As the mobile phone becomes a virtual clinic, capturing medical data and sending motivational messages for improving compliance with medication, diet & exercise regimens, patients can maintain the prescribed regime stemming from higher awareness levels..

Some other M-Health technologies are Patient-monitoring devices, Mobile telemedicine/telecare devices, MP3 players for M-Learning, Health vouchers, payments through mobile interface and Data collection software.

The advantages offered by these mobile communication technologies include “on-the-move” communication, irrespective of time and place. This is particularly beneficial for work in remote areas where these communication devices results in improved access to information leading to better health outcomes.

Telemedicine

This technology allows healthcare professionals to evaluate, diagnose and treat patients in remote locations, while offering them convenience and comfort. Patients can avail access to medical expertise quickly and without travel. This also helps in creating a large patient base for the providers and makes more efficient use of limited resources as the physicians can see patients from multiple locations. At the same time it allows organisations to utilize their resources optimally. It is also cost-effective for patients and healthcare providers as care is delivered to distant areas without the need for physical structures and staffing.

Telemedicine is mainly used for

a) Remote patient monitoring – Patients with chronic diseases can be monitored at their homes through the use of devices that collect data related to blood sugar levels, heart rate, blood pressure & other vital statistics which can be reviewed instantly by remotely-located caregivers.

b) Store and forward technology - The patients' clinical data, including X-rays and other imaging reports, can be stored and forwarded to other locations for evaluation.

c) Interactive telemedicine – This feature allows physicians and patients to communicate in real time. Such sessions are easily & effectively conducted in the patient's home or in a nearby medical facility. Typical activities for these sessions include medical history review, psychiatric evaluations, ophthalmology assessments and other activities that do not require direct physical contact.

Developed countries utilise telemedicine applications for "virtually realistic transportation" in critical situations, which can be vital to the patient's survival and quality of life. On the other hand, in resource-impooverished countries, telemedicine improves care and enhances access to healthcare. This makes telemedicine truly instrumental in enhancing healthcare delivery services to the masses.

Nanotechnology

Nanotechnology can lead to the creation of cell repair machines (possibly true nano-robots), facilitating faster action of drugs in smaller doses, doing away with surgical blood loss, revolutionizing early-stage disease detection and terminating cancerous cells without affecting the rest of body. Three key areas in which Nanotechnology can work wonders are Prevention, Diagnosis & Treatment.

Prevention

Today, healthcare mostly follows a remedial rather than a preventive approach. This often results in a substantial amount of damage to the body and its functions, which are sometimes even irreparable. The future of healthcare lies largely in the preventive domain: identifying and stopping potential causes of disease/illness in the body before they begin to proliferate. Nanotechnology can contribute majorly to this area by preventing the occurrence of diseases. This is possible through more effective monitoring of individuals' health (allowing diseases to be diagnosed at an early stage) and more sterile hospital environments (limiting the chance of secondary diseases caused by bacteria, viruses and other microbes).

A sterile environment can be achieved through use of antimicrobial coatings and filters, which can help minimise the ability of microbes to bind and start growing on surfaces exposed to patient body fluids. Silver and titanium dioxide nanoparticles can kill microbes directly. Silver nanoparticles have already entered our homes in the form of coatings inside refrigerators. This anti-bacterial surface helps keep the contents of the refrigerator fresh for a longer time. Filters with nano scale pores also prevent viruses from entering through the surface. This technique will provide sterile surfaces by means of filtration of air and liquids that a patient is exposed to during treatment.

Another domain where nanotechnology has a promising role is monitoring. This will not only aid in the treatment of existing patients but also for the routine check-up of healthy individuals. Point-of-care (POC) and Lab-on-a-chip devices offer basic as well as advanced care at the patient's location.

Treatment

Nanotechnology promises to address the issues of standard treatment protocols which sometimes result in rejection or adverse reaction to, for example, a transplant. It will be possible to provide personalised medicine designed for individual patients and particular illnesses. The danger of implant rejection can be minimised through 'body-friendly' nano coatings.

While scientists are working on delivering personalised medicine, where drug doses are tailored to the individual, there are also new techniques being developed to allow accurate targeting of drugs. The sequencing of the human genome, identification of gene families and a greater understanding of the role of genetics in disease and response to drugs will take the doctors nearer to their goal.

A successful implant is one which interacts closely with the biological tissues of specific organs. This has been realized in the form of titanium bone implants that have a coating of nanostructured titanium dioxide which improves integration in the bone, and diamond-like coating of stents and catheters which are smooth and have markedly decreased adhesion of blood proteins and cells.

Ensuring that a drug reaches the intended tissue or organ and is given in the correct dosage is among the most important issues in modern medicine. This is particularly important for cancer treatment, as most chemotherapy drugs are toxic to both normal and cancerous cells. Nanotechnology offers solutions to these problems.

In future, we will have surgical tools that are molecular both in size & precision with computers much smaller than a single cell to guide them.

The impact of nanotechnology in indicative healthcare will be in diagnostics and therapies for cancers and disorders of the central nervous system. Eventually, many other major diseases, as well as injuries, will be detected and treated routinely by products based on nanosized ingredients.

Diagnosis

The earlier the disease or damage to part of the body is diagnosed, the more likely the success of treatment. In medicine, bioassays are used to detect the presence of disease. Through linking the biomolecule with a nanoparticle, bioassays have become more sensitive, easier to work with, and are able to detect more target biomolecules and hence more diseases (or their effects).

Nanotechnology used in the form of an imaging agent can accurately seek out and bind to the target (diseased or damaged) tissue after injection into the patient, allowing doctors to identify the location and extent of disease or damage.

With such a promising future, Nanotechnology is surely the next big thing.

Authored By:

Sonal Pahwa - Associate Director, Healthcare