

BACKGROUND ON TELEHEALTH AND TELEMEDICINE, HOME AND MOBILE TELEHEALTH

Telehealth can be defined as the broad array of products and techniques using electronics to remotely deliver medical, health, and wellness services.

Telemedicine can be defined as a narrower segment of the telehealth field where medical personnel remotely diagnose, perform procedures and provide treatment/care. Many specialty areas have developed within it - e.g., teledentistry, teledermatology, teleophthalmology, telepsychiatry, teleradiology, telerehabilitation.

Senders, receivers and settings in telehealth vary greatly, including:

- Between or among doctors and other medical personnel located in hospitals, clinics, and professional offices;
- Professionals in medical settings and responders or medical personnel handling emergency/disaster events;
- Among researchers in academic locations;
- Medical/healthcare personnel and people in their homes, at school, at work, in community settings.

Processes used include gathering, analyzing, monitoring, sending and/or receiving various forms of data, video and sound. They can be transmitted live - in “real-time” - or stored and forwarded at a later time.

Equipment typically includes computers, videocameras and a broad array of specialized diagnostic and/or monitoring equipment.

Transmission takes place through a variety of connections - wired (standard telephone, DSL, cable, fiber optics), wireless, satellite, with most linkages connected to the Web.

Home telehealth can be defined as treatment, care or general health/wellness services remotely delivered where people live. The most basic is the growing ability to connect via the Web with a local clinic for handling certain general/ routine healthcare needs. A second type offers the capability for closely tracking post-acute or chronic care conditions.

Vital signs monitoring uses specialized “peripheral” equipment to track and report on various body functions/conditions - e.g., heart; lungs; blood level for sugar, oxygen, medications; weight gain or loss; wound healing, etc. Individual pieces of equipment from different manufacturers may be used, or many companies are

developing “suites” of integrated products that can be connected as a person’s situation requires.

Vital signs monitoring equipment only a few years ago required “wired” connections between the person/peripheral unit and the phone or computer for transmission. However, many products have migrated and are now using “wireless” radio frequency technology, which allows much more flexible placement/access within a home.

Vital signs monitoring results are typically transmitted to a computer and over the Web to a care provider and/or family members. Video interaction is often involved as well. The process is designed so that situations going beyond preset “acceptable” measurements are flagged as problems requiring follow up. Because monitoring can be done very frequently - sometimes daily - it can identify potential problems much earlier than routine office appointments or even in-home visits would.

Vital signs monitoring equipment offers a number of very important benefits, including the ability to:

- Prevent health conditions from escalating into serious episodes potentially requiring emergency, very expensive treatment and/or hospitalization;
- Enable persons with fairly major health conditions to continue living at home instead of requiring relocation to a care setting;
- Provide close care and support for persons living in locations where service delivery otherwise is limited by distance, weather, shortages of skilled personnel, budget reductions, etc.;
- Increase treatment compliance because cause/effect is very visible.

Remote sensing is a third key technology which tracks residents’ safety and wellness. Extremely small electronic sensor units are placed in various locations within a room or areas of a home. These sensors gather and report data on a wide range of environmental conditions - e.g., movement, temperature, vibration, pressure, sound, light, fluid flow through pipes and other conduits.

Sensors are powered by extremely small batteries and receive/broadcast using wireless radio frequencies. Single sensors can be deployed, but they’re much more commonly positioned and interconnected to create data gathering/reporting “networks.”

Sensors activate when the conditions they’re designed to monitor are triggered, and they typically transmit to a computer in the home that’s connected to the Web. Reporting is designed to provide alerts when conditions exceed preset limits – e.g., a possible fall, a pan catching fire on the stove, a person moving to an unsafe location, household fixtures commonly visited throughout the day not being used (e.g., toilet, bathtub, stove, microwave).

Original sensor monitoring products were marketed by vendors for use in nursing homes, assisted living and similar types of congregate care settings. As the industry evolves and expands, it's expected that "sensor kits in a box" will also become available so monitoring networks can be configured more individually/ uniquely.

Remote sensing technology is expanding beyond products placed in a home or on various features to being designed and manufactured into the structure and furnishing themselves. For example, sensors are now being integrated into carpet manufacturing so floor coverings can monitor residents' walking and minimize potential falls. Similar "ambient" sensor technology is being manufactured into other furnishings like draperies - to enable adjustment as light levels change - and housewares - such as sheets and pillowcases for monitoring cardiac performance.

The use of vital signs and remote sensor monitoring technologies parallels the growing array of electronics providing security, automation, and entertainment/ recreation in our increasingly "digital" homes. These fields now operate very separately, but it's likely they will more closely align over time to better coordinate operating controls and minimize transmission difficulties.

Mobile telehealth is the final category related by extension to the home. It's a broad label for the recent growth in "body-based" technologies that track/interact on personal medical, health and wellness needs. They can be roughly grouped into the following categories:

- Implantables inserted into the body that monitor a certain system or condition, and report on it via radio frequency signals to the user or transmit by cellphone to medical personnel. An example is a "chip" inserted under the skin of a person with diabetes to track and report on blood sugar levels, minimizing or doing away with the need for multiple skin-prick tests during a day.
- Wearables located in direct ("exosensor") contact on or with a person - e.g., wristbands, armbands, "patch" products, specially designed/ manufactured clothing such as cardiac "vests" and shoe with gait monitors.
- Portables carried in pockets and purses, some which are miniature versions of monitoring equipment that in the past was bulky or could only operate via electrical connections.

Mobile telehealth applications have expanded tremendously in the very recent past, in direct relationship to the explosive growth in cellphones' availability and capabilities. Cellphones have become the worldwide "platform" for many types of communications, including for mobile telehealth purposes.