

THE INTEGRATION OF VIRTUAL MONITORING TECHNOLOGY

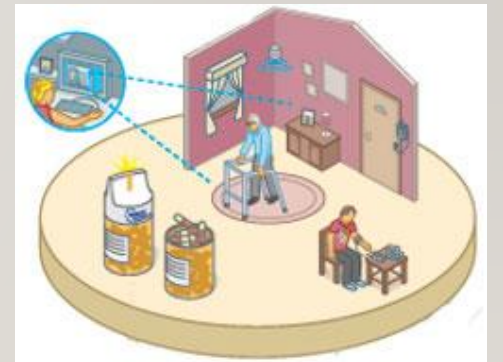
EMPOWERING ADVANCED PRACTICE NURSES TO OPTIMIZE HEALTH OUTCOMES

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DISCLOSURE STATEMENT

The speakers have no actual or potential conflict of interest in relation to this program/presentation.

No sponsorship or commercial support was given.



OBJECTIVES

- Provide health monitoring at home, which is particularly useful for patients, who have to live alone, home bound, or in rural areas where little or no healthcare is available.
- This program aimed to implement the feasibility and acceptability of virtual symptom and compliance management systems with patients in rural communities receiving Home Based Primary Care, Assessment in the changes of patient outcomes from baseline and implementation of the virtual monitoring will be evaluated for effectiveness, cost reduction and hospitalizations.
- Empower full licensure authority and Scope of Practice.





Bedroom

Smart books interact with the house's 3D and virtual reality system, bringing to life what you read.

Bathroom

Doctors will be able to give you virtual medical checks
Toilets will analyse waste for medical problems such as colon cancer.



Roof

Power collected through solar panels and stored in backup resources to power house and car.



Bedroom

Clothes made with smart fabrics regulate your temperature and monitor your health
E-commerce will become F-commerce - online consumers will be able to enjoy a tailored shopping experience based on Facebook 'Likes'.

Kitchen

Smart surfaces identify what's on them and have the ability to react accordingly - keeping coffee cups warm and iced-tea cold.
Refrigerators will advise on recipes based on what's in stock and creates personal diets.



Living Room

All appliances connected through invisible networking system
Entertainment system creates life like sounds, images and experiences to completely envelop you in near 4D experience.



Garage

Camera at entrance has facial recognition software which is linked to criminal database
Car which is able to drive itself.



Office

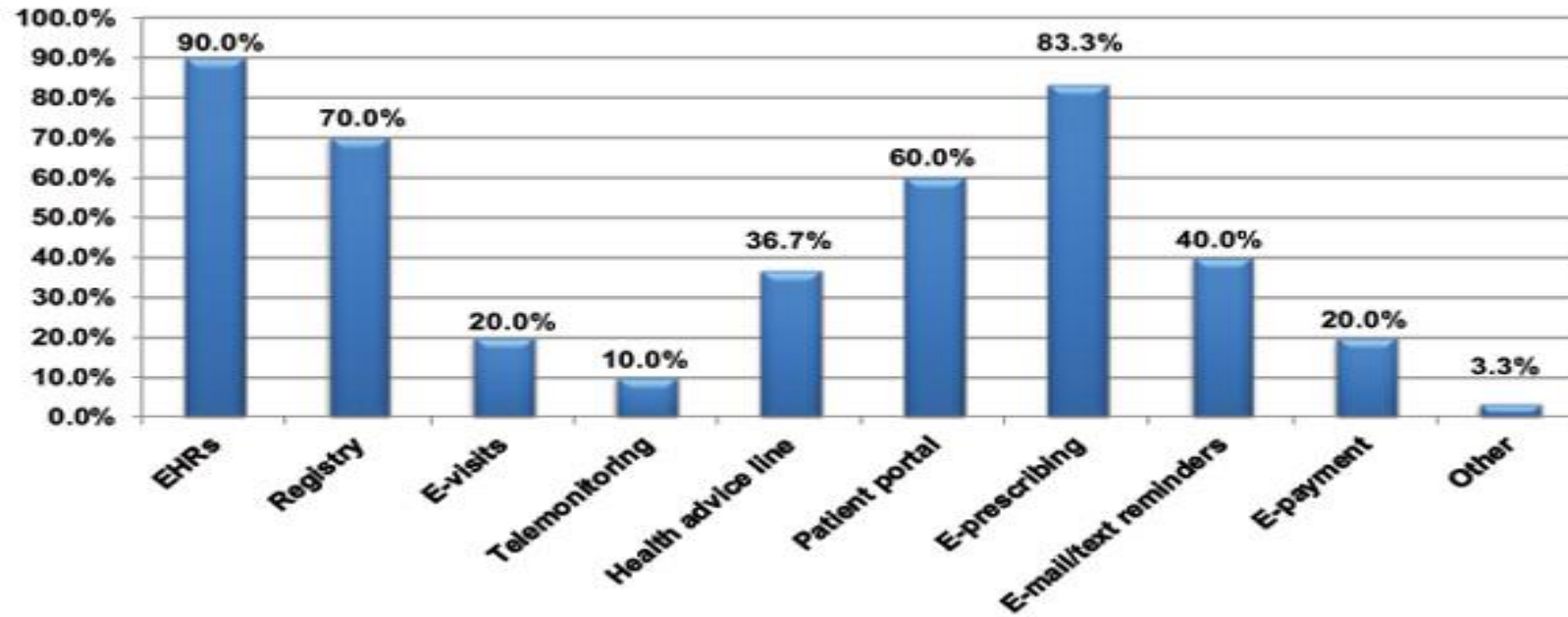
See-through electronics, screens, touch panels and tactile displays deliver 3D holographic experiences
Contact lenses allow you to access infinite information resources instantly before your eyes.



BACKGROUND

- The use of virtual monitoring in Homebased primary care through technology enhanced patient reporting provides automated environmental monitoring to monitor symptoms and medication compliance is an effective way for Advanced Practice Nurses to provide timely care, practice to full scope of practice and serve populations with limited access.
- The use of telecommunications and information technology provides services in health care whenever a large physical distance exists between patient and care providers.

Top Health Technologies Used in Medical Homes



Source: HIN Patient-Centered Medical Homes in 2012
May 2012

THE NEED AND DISTRIBUTION OF WORK FORCE

- Based on World Health Organization's Statistics (WHO) and other sources, chronicle diseases and psychological pressures are behind the death of 80% of elderly people
- The five most common readmission diagnoses accounted for 55.9 percent for heart failure readmissions, 44.3 percent of acute myocardial infarction readmissions and 49.6 percent of pneumonia readmissions.
- In 2010, approximately 56,000 nurse practitioners and 30,000 physician assistants were practicing primary care in the U.S
- Primary care physicians, nurse practitioners, and physician assistants are more likely to practice in rural areas than are non-primary care specialists.

WHY VIRTUAL HEALTH MONITORING

- Focused on the automatic and unobtrusive measurement of biomedical signals and activities of patients.
- Ubiquitous health monitoring is an important foundation for analysis, diagnosis, and treatment, as it allows biomedical signals to be measured without the individual's awareness.
- Provide behavioral feedback about someone's health in order to prevent diseases.
- Empower Advanced Practice Nurses to optimally care for populations with limited access and provide quality life.

FEATURES OF USING TECHNOLOGY IN REAL TIME

- Wearable health monitoring systems integrated into a telemedicine system
- Use of Smart Phone and self monitoring Aps that communicate to provider
- Continuous monitoring as a part of a diagnostic procedure
- Support **Early Detection** of abnormal events, conditions and prevention of the acute outcomes or consequences
- Provides managed recovery from an acute event, or surgical procedure
- Just in time treatment and prevention of emergency services

MONITORING SYSTEMS

- **ECG Signal measurement on bed or wrist band -**
 - ✓ Signal obtained by using a conductive sheet or wrist band.
 - ✓ ECG signals are measured by a conductive textile electrode attached to the bed sheet.
- **Respiratory Problems: Snoring -**
 - ✓ Health risks of sleep apnea; a respiratory condition in which the throat narrows or closes during sleep.
 - ✓ Condition can increase the risks of high blood pressure, coronary heart disease, stroke and diabetes.
 - ✓ Uses electret microphones; a fusion of electrode and magnet.
- **Wound Monitoring -**
 - ✓ Pictures and measurements obtained by using an device and /or Tablet
- **Bio Sencing -**
 - ✓ The application gathers clinical and non clinical data like Heart Rate, Temperature, body weight, glucose levels, GPS location of the person.

MONITORING SYSTEMS

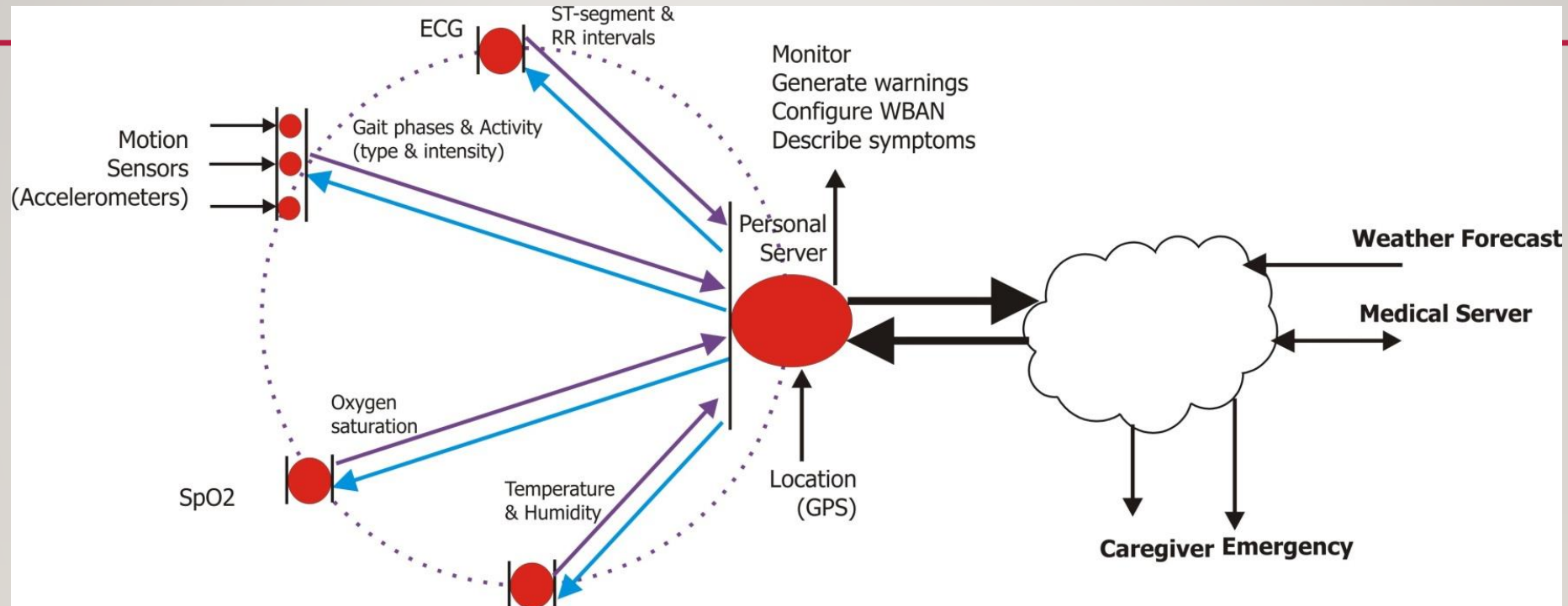
- **Monitoring day-to-day activities –**

- ✓ Routine exercise on a day to day basis.
- ✓ Blood sugar levels.
- ✓ Use of accelerometer and gyro meter.
- ✓ INR levels

- **Blood-Oxygen saturation –**

- ✓ Checks the level of oxygen in blood.
- ✓ Uses the phone's built-in video camera.
- ✓ The patient's fingertip is pressed against the lens of the camera.
- ✓ Captures small changes in light reflected by the pulsing blood in the capillaries.

DATA FLOW IN AN WBAN



Sensor level

Personal Server Level

Medical Service Level

PERSONAL SERVER

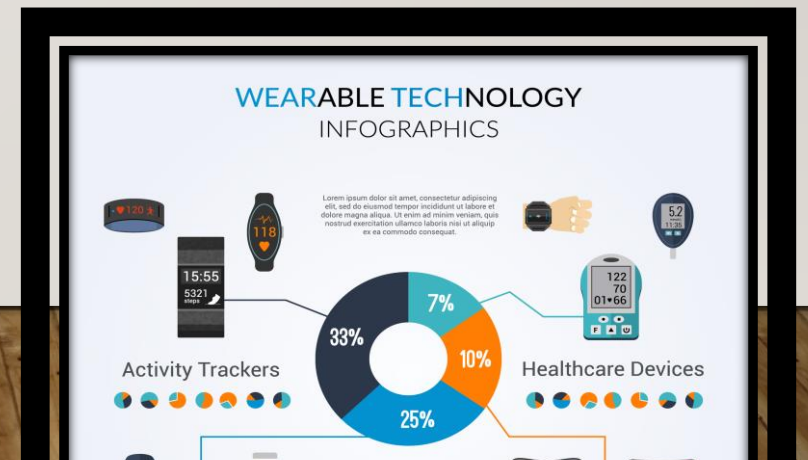
- Secure communication with remote healthcare provider servers like
 - Internet-enabled Smart Phone or Tablet
 - 3G cell phone
 - A home personal computer
- Initialization, configuration and synchronization of WBAN nodes
- Control and monitor operation of WBAN nodes
- An audio and graphical user-interface for early warnings or guidance

HEALTHCARE PROVIDER INDICATIONS AND SERVICE LEVEL

- An emergency service
 - If the received data are out of range (from normal) or indicate an imminent medical condition
- The exact location of the patient
 - If the personal server is equipped with GPS sensor
- Monitoring the activity of the patient
 - By healthcare professionals remotely and in Real time
 - Plan of Care based on the new information
 - Minimal delays in treatments

METHODS

- Repeated patient measures
- Chart abstractions, and interviews
- Completion of reported outcomes measures at baseline and annually are assessed
- Patient and Family reports
- Advanced Practice Nurse survey and interviews.



RESULTS:

Dramatic improvements were seen in the continuity of care, compliance with medications, and significant reduction in hospital admissions.

- Clinical improvements in patient blood pressure, glucose, and Drug levels,
- Reduction of anxiety and self-care self-efficacy were observed.
- Clinicians perceived the use of "real-time" monitoring data and risk algorithms positively contributing to improved clinical care.
- Improved time efficiency and satisfaction.
- Reducing the complexity of the system was seen as important to promote the utility of technology by both patients, families and providers
- Assist in independent living of the people.
- Smarter communication with medical personnel.
- Large data for agencies to mine upon and research for patterns and solve complex problems.
- Cheaper add on devices with sensing capabilities.
- Building social networks.
- Improved mobility of users and better connectivity.
- Medication compliance improvement increase by 40%
- 50% reduction of chronic illness exacerbations.

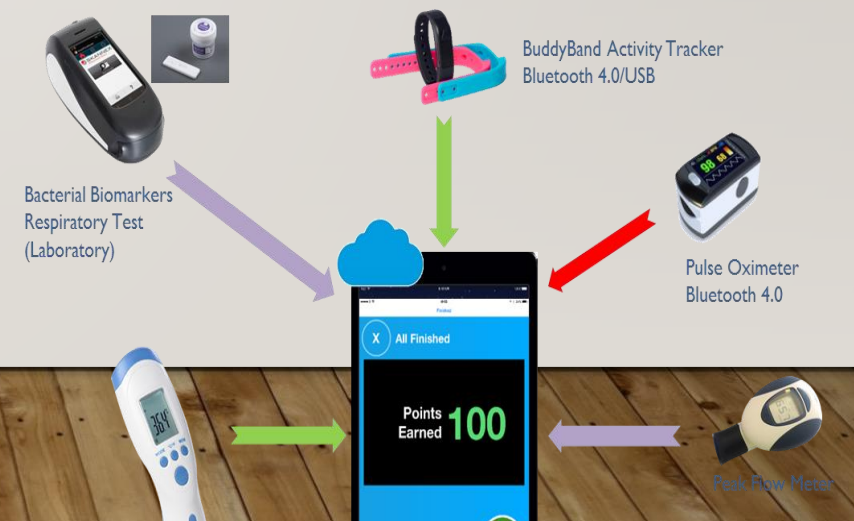
CHALLENGES



- The technology is not always designed with end users in mind.
- The usage of the smart phones can be over whelming to older patients.
- The technology may be useable to some set of users due to disabilities (ex: color blindness)
- The devices are considered to be present always with the end user while tracking.
- The current applications may not be useful if the user the user is unconscious.
- The technology must be explicitly started by the user for tracking.

CHALLENGES

- The smart phones being used currently have limited battery life and the technology may be delayed or of no use if the device turns off. So there is need for low power consuming apps and technology.
- Most of the technology applications require a network to convey the data and the framework is not so robust in remote areas where the network is not proper.



CONCLUSIONS

- Information Technology in health care is not just monitoring, it will and should grow as a user community to empower patients and providers serve efficiently during daily, chronic and emergency situations.
- The connection between the Advanced Practice Nurse, clinical staff and the patient is critical to the success of the virtual monitoring program in Home Based Primary Care. Integrating monthly visits to the home into the clinical program reinforces the importance of using the virtual monitoring equipment to the patient.
- The results annually suggest that monitoring patient symptoms using technology, computer or mobile based is feasible in rural communities and acceptable in practice

IMPLICATIONS FOR PRACTICE

- Future research would be most beneficial if the use of this technology expanded the number of applications and expanded the scope of the system to encompass a wider range of supportive care needs.
- Opportunities for a limitless number of technology enhanced applications.



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