Wearable Cardiopulmonary Devices

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Objectives

• Define wearable technology
• Identify the benefits of wearable technology
• Discuss the components of a device
• Explore various devices being introduced to the healthcare profession
• Identify the impacts technology can have on PT!
What is it?

• Wearable technology that can be worn by the consumer that can include information about health or fitness. (3)
  
  – Ex) Fitbit, Apple watch, Samsung Galaxy gear smartwatch

• Building blocks (3)
  
  – Sensing and data collection hardware to collect movement
  – Communication between hardware and software to relay data
  – Data analysis to extract clinically relevant information from movement
Why use it?

• Technology focuses on: (3)
  – Health and wellness
  – Safety monitoring
  – Home rehab (20%/9%)
  – Assessment of treatment
  – Early detection of disorders

• Long term monitoring can lead to improvements in diagnosis and treatment
What’s Necessary

• Typically 3 requirements for device (3)
  1. Low cost
  2. Small size of receivers
  3. Low power consumption

• Not visible (3)
  – Embedded in clothing
  – Circuit board on fabric
  – Jewelry
Wearable Unit

Study by Patel & et al. (3)
Limitations

• Battery technology
• Size of sensors
• Internet and phone capability
• Cost
• Accuracy (3)
• "Technophobia" (6)
CoVa Necklace

• What does it do?
  – Monitors vitals including HR, RR, SV, CO
  – Single lead EKG
  – Monitors pleural effusions/ fluid management

• Useful for:
  – CHF, HTN, End Stage Renal Disease, COPD

Photo: http://www.tosense.com
CoVa Necklace

• **Patient Benefits**
  – Only worn 15 minutes/day
  – Early detection of acute CHF (weight gain)
  – Bluetooth capability
  – No external wires
  – Information automatically sent to web based system

Photo: http://www.tosense.com/components/
Clinical Application

- Constant monitoring of patient values
- Obtain values prior to treatment sessions
- Home health: patient education on daily monitoring
- SNF: quick assessment for vitals prior, during and after treatment
HEXOSKIN

• Monitors (4):
  – HR and HR recovery
  – stress and fatigue
  – ECG
  – Respiratory rate
  – Minute ventilation

• Features:
  – 14 hour battery life, Bluetooth, machine washable, light weight, UV protection

• Data and Technology: breathing sensors, ECG data, acceleration detection, cardiac sensor

Photo: https://www.hexoskin.com/
HEXOSKIN CLINICAL RELEVANCE

• Real time vital signs: rest and response to exercise
• Monitors patients intensity level
• Patient self-monitoring: functional activities and exercise
• PT feedback: patient education
• One time cost of $400 dollars

Photo: https://www.hexoskin.com/
What is it?

Duo is a portable electronic stethoscope and EKG monitor that can detect heart/lung sounds and rhythms to assess cardiac and pulmonary function. (5)

How does it work?

Using the single lead EKG monitor and electronic stethoscope device, you can assess heart rhythms and sounds via the Eko Stethoscope app on your mobile device. (5)

Photo: https://ekodevices.com/duo/
• How is Duo beneficial?
  
  • Patients can use Duo to assess cardiac function and monitor for heart failure and/or atrial fibrillation. (5)
  • Clinicians can safely/securely live stream sounds and for multiple opinions or can save data directly to the patients EMR. (5)

• Features and Uses (5)
  
  • HIPPA Secure
  • Telemedicine
  • Bedside Care
  • Monitoring CHF
  • Save and Track Records
  • Real Time Waveforms
  • EMR Integration
  • Amplify sounds up to 60X
  • Smart Analysis (coming soon)

Photo: https://ekodevices.com/duo/
The study focused on self-monitoring to help improve patient's behaviors

Why use wearable device?
- some evidence that supports that people with more serious health problems are more likely to report benefits as a result of tracking their own health
- Enables providers and patients to gain insight on patient progression and impact on overall illness

As the population ages, there is increasing emphasis on:
- reducing the amount of hospital stays
- decrease readmission rates
- aid patients with managing their condition in their own environment

Conclusion:
- significant relationship between step count and early recovery, and hospital length of stay
- ability to use objectively captured data as early predictors of disease severity can have a profound impact on disease management and disease understanding
"Consumers and physicians agree that using wearables and apps helps patients better engage in their health, especially when patients are willing to share their personal data with their physicians"
Future for PT

• Technology based treatment
• Online monitoring
• Telemedicine
• Innovative devices to manage chronic diseases


Questions?

THANK YOU!