New Applications for Biomarker Measurement

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Consumer Health Tracking Devices

• Portable, wireless, wearable devices to monitor/track
  – Blood pressure, pulse
  – Blood oxygen
  – Physical activity
  – Sleep
  – Etc.

• What can we learn from these devices?
• Can they be integrated in population surveys?
• Are these devices better than what we currently use?
Connectivity

• Devices link to
  – Phones via bluetooth
  – Laptops via dongle

• Data input
  – Manual entry
  – Cloud
Wireless Body Analysis Scale

- Weight
- BMI
- Fat (%)
- Lean mass
- Bone mass
- Muscle mass
- Water
Wireless BP Wrist Monitor

• Systolic blood pressure
• Diastolic blood pressure
• Pulse
Apply the cuff 1/2“(2cm) above the wrist joint

Please sit still and relax

Waiting for the right position

Please sit still and relax
Wireless Pulse Oximeter

- $\text{SpO}_2$ (oxygen saturation)
- Pulse
- Perfusion rate
How accurate are the iHealth devices?
Systolic Blood Pressure

$r^2 = .89$
Diastolic Blood Pressure

\[ r^2 = .76 \]
Pulse

$\text{iHealth Device}$

$\text{Omran Device}$

$r^2 = .92$

Age <40

Age 40+
Pulse - Comparison

BP Cuff (wrist)

Pulse Oximeter (finger)

$r^2 = .92$

$r^2 = .54$
Wireless iHealth vs Omran

✓ Pros

– Compact design
– Built-in instructions for device positioning
– User preference for smaller devices
– Less obtrusive (smaller white coat effect?)

✓ Cons

– Precision and calibration still unknown
– Requires blue tooth device (android still iffy)
– Technology malfunction

iHealth wrist BP monitor @ $80
iHealth pulse oximeter @ $70
iHealth scale @ $110
Activity Trackers
Fitbit

- Daily tracking using accelerometer
  - Physical activity
  - Sleep
- Cost is $99
Fitbit Components

• Wrist band (w/ clasp)
  – small and large
• Removable battery
• Charger
  – usb
• Dongle
  – No need for a phone
Daily Activity

Activity History

Daily Totals: 10,909 steps, 0 floors, 4.84 miles, 2,226 calories
Sleep Tracker

Early wakening

Disruption
Accelerometer ‘X’ vs. Fitbit

• **Pros**
  – Cost
  – Wearability

• **Cons**
  – Accuracy
  – Obtaining data from commercial company?
  – Tracking tech may influence behavior
  – Set up issues
  – Syncing/obtaining data
Devices coming down the pipeline….

- **Continuous heart monitor:**
  - wireless ambulatory ECG device
  - sticks to the user’s chest using disposable, adhesive patch
  - used for detecting arrhythmia or abnormal heart rate or rhythm
  - stores 72 hours of data

- **Wristworn pulseox:**
  - continuous monitor pulse oximeter device
  - blood oxygen saturation & pulse rate
  - fingertip sensor connected to wristband
  - used to detect obstructive sleep apnea syndrome and chronic obstructive pulmonary disease