# The main challenges of m-Health: the most promising directions for research and development

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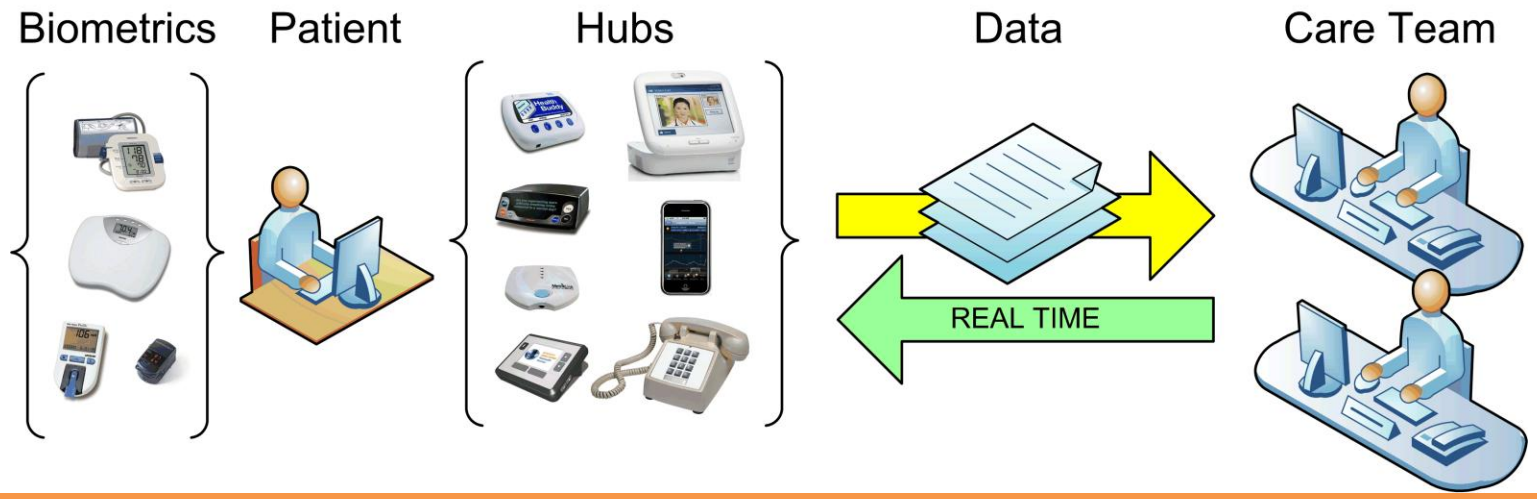
# Phase 1.

Wearable contact monitors with radio channel (5 KHz, ZigBee, Ant+, BlueTooth, BT LE, WiFi, GSM) . No analysis on the monitor

Data transmitted to the “cloud” DB (EHR). No analysis In the “cloud”

# Remote Patient Monitoring




| Modality | Pros | Cons | Comments |
|---|---|---|---|
| **Telemonitoring** | Better access<br>'Personalization'<br>Early detection<br>Fewer visits and hospitalizations<br>Members love it | Data issues<br>Integration issues<br>Rules engine issues | Multimodal by population<br>Team-based care<br>Requires initial in-person visit |

# Wearable Tech as Jewelry

## Nearest hot-point in m-health - Google Glass


Sergey Brin, Google

Carlo Allegri/Reuters

Sergey Brin helps the designer Diane von Furstenberg with a pair of Project Glass glasses before a fashion event in New York.

# Women at Google Looking Past the Glass Ceiling

Carlo Allegri/Reuters

Both attired in Google Glass, Diane von Furstenberg watches her models rehearse during New York Fashion Week last September with Sergey Brin, a Google founder.

By CLAIRE CAIN MILLER

Published: August 23, 2013

# Google Glass Moves into the OR:

http://www.youtube.com/watch?v=ssldTFWBv3E

# AliveCor Heart Monitor, A Smartphone Powered ECG: Product Review

*by* TOM FOWLER *on* Apr 23, 2014 • 4:03 pm


There is an ECG analysis service that is offered at varying tiers. A “Preliminary finding by a US based cardiac technician” for $2 (24 hr turnaround) or $5 (30 min turnaround). For $12 one can receive “Clinical Analysis & Report by a US Board Certified Cardiologist,” which includes a doctor recommended course of action.


GlucoTrack . It uses three independent technologies: ultrasonic, electromagnetic and thermal, to painlessly obtain blood glucose levels.

# Withings Pulse O2 Fitness Tracker with Blood Oxygen Saturation Monitoring

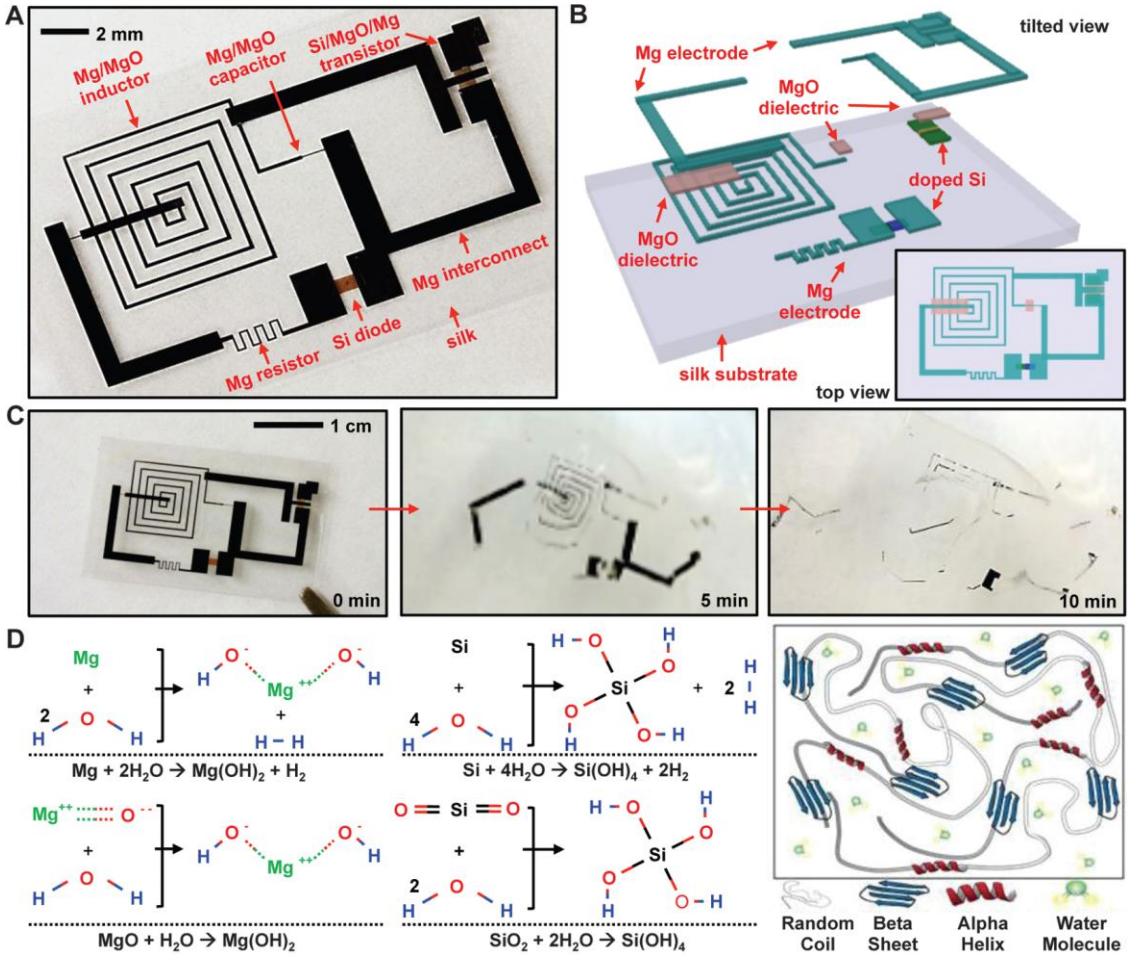
*by* EDITORS *on* Apr 22, 2014

**Withings** is releasing a new fitness tracker with both heart rate and blood oxygenation (SpO2) monitoring in a futuristic watch-like package. The Pulse O2, of course, also counts steps, calories burned, and watches how much you move during sleep.

It features a touchscreen which allows user to swipe through different readouts and can be worn like a watch or clipped onto a piece of clothing. The device is priced at $120 and is available in either black or blue.

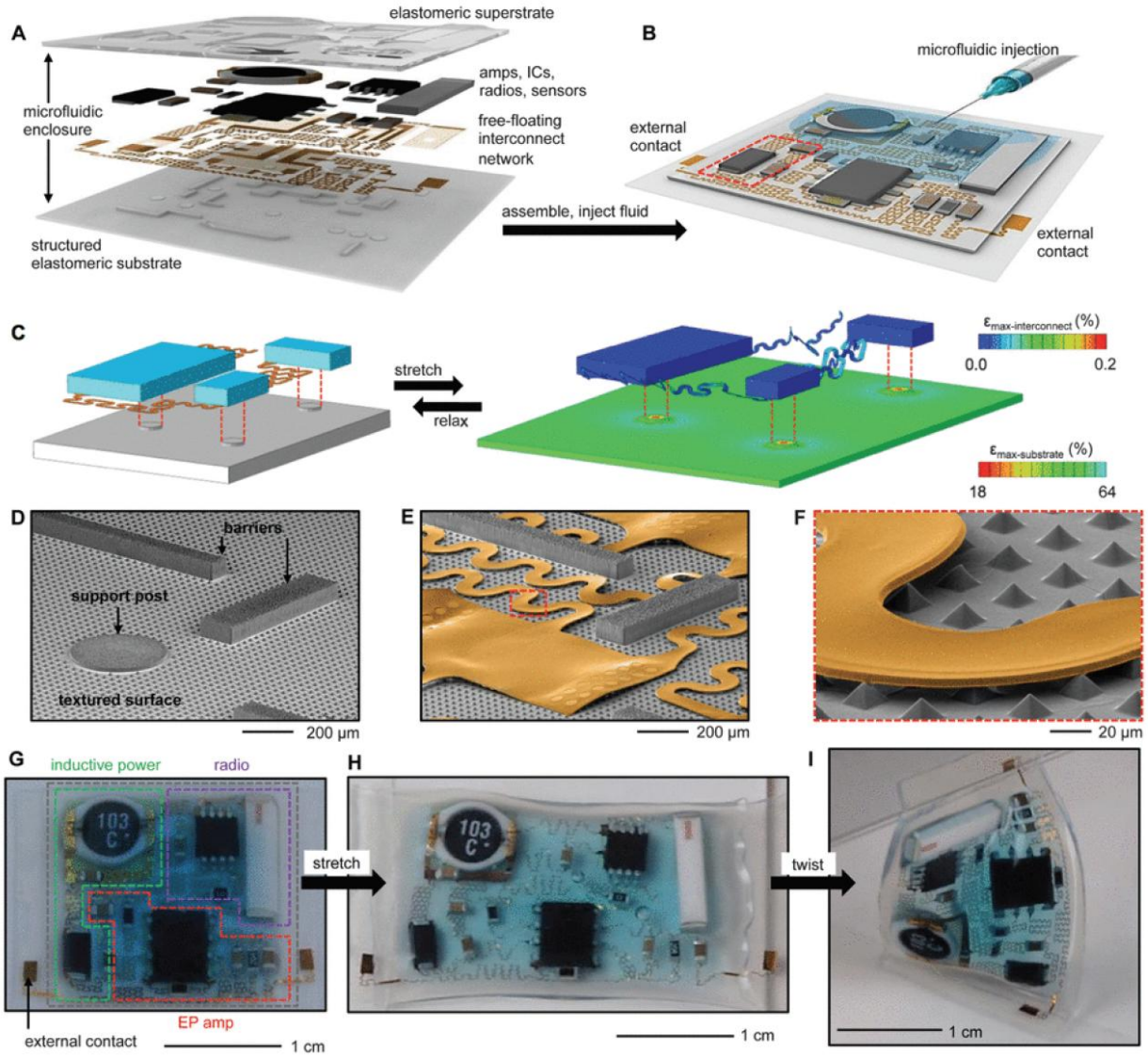
**Read More »**

# A Physically Transient Form of Silicon Electronics




28 SEPTEMBER 2012 VOL 337 SCIENCE

# Soft Microfluidic Assembliers of Sensors, Circuits, and radios for the Skin




4 April, vol. 344, 2014, Science

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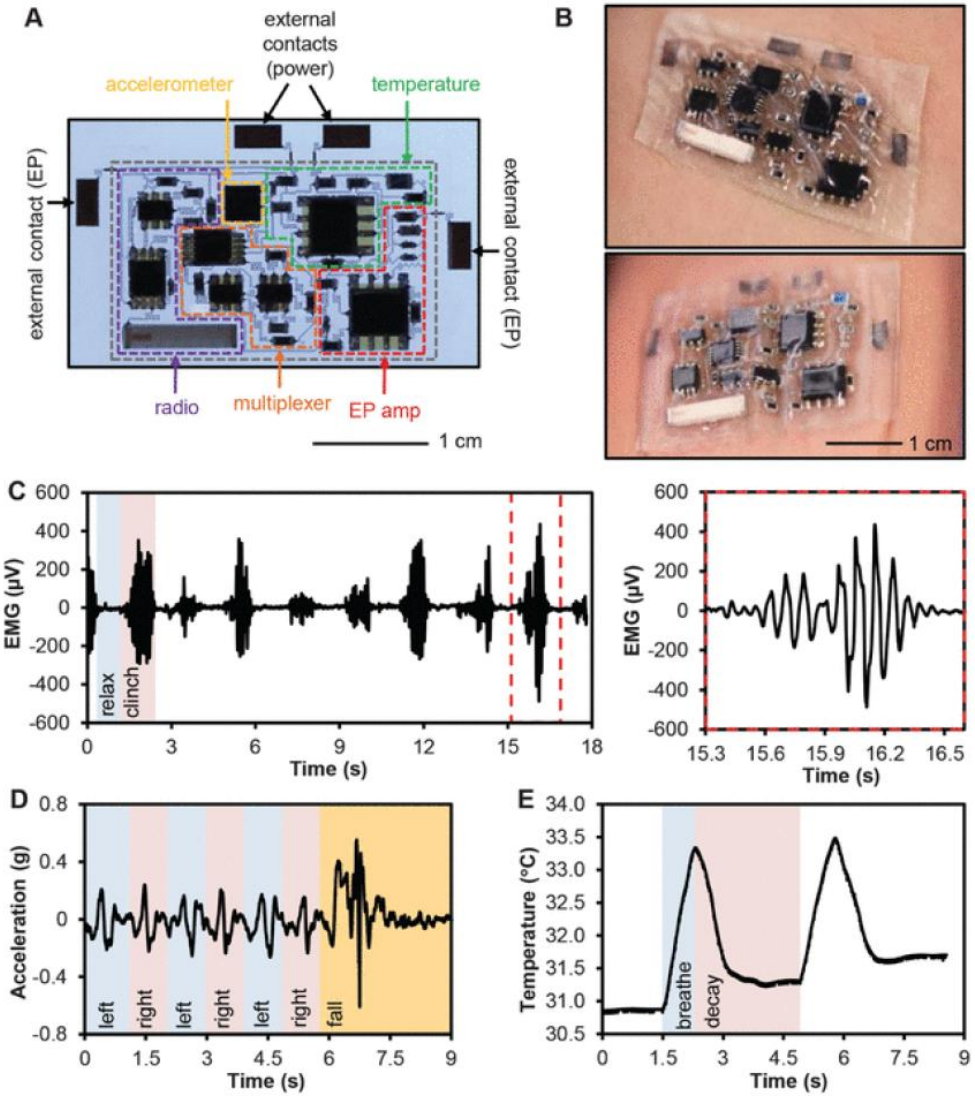
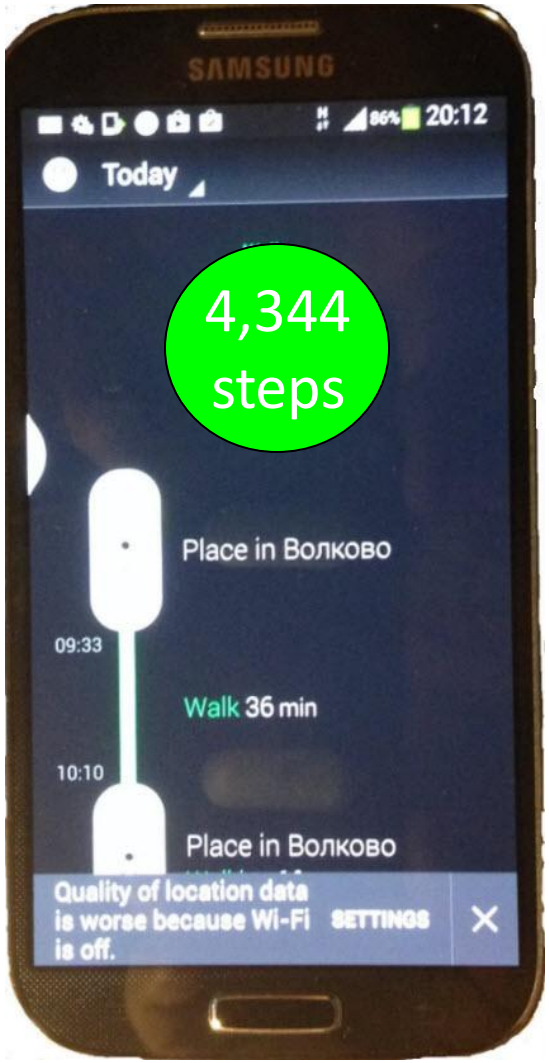



4 April, vol. 344, 2014, Science

# «Умные» ложка и вилка компании Hapilabs

# Power in your back pocket with new 'phone charging shorts'

# Бесплатная программа Moves для оценки уровня двигательной активности на смартфоне iPhone и на базе Android OS

# Часы фирмы Basis (США) для мониторинга ЧСС, двигательной активности, потоотделения, температуры кожи



www.mybasis.com

# Activity Details

Sunday 1 Dec

9:00p 9p 12a 3a 6a 9a 12p 3p 6p 9p 12a 2:14a

BIOMETRICS

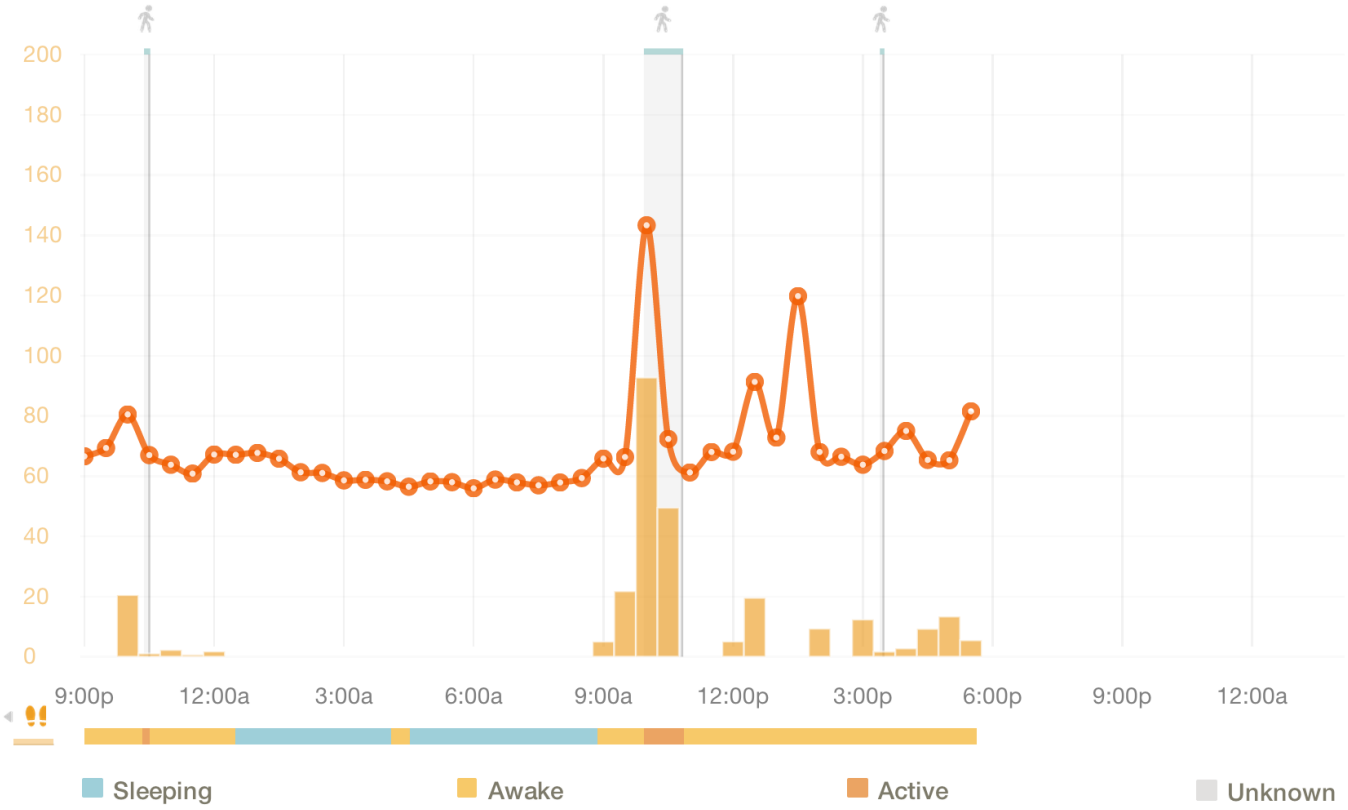
HEART RATE
65 avg ♥/min

STEPS
8227 👣
6 avg 👣/min

CALORIES

SKIN TEMP

PERSPIRATION




ACTIVITY

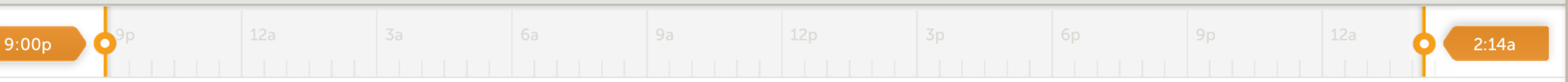
WALKING
5382 👣
84 avg 👣/min
1 hr 1 min total

RUNNING
0 👣
0 avg 👣/min
0 min total

BIKING
0 cal
0 avg /min
0 min total

# Activity Details

Sunday 1 Dec

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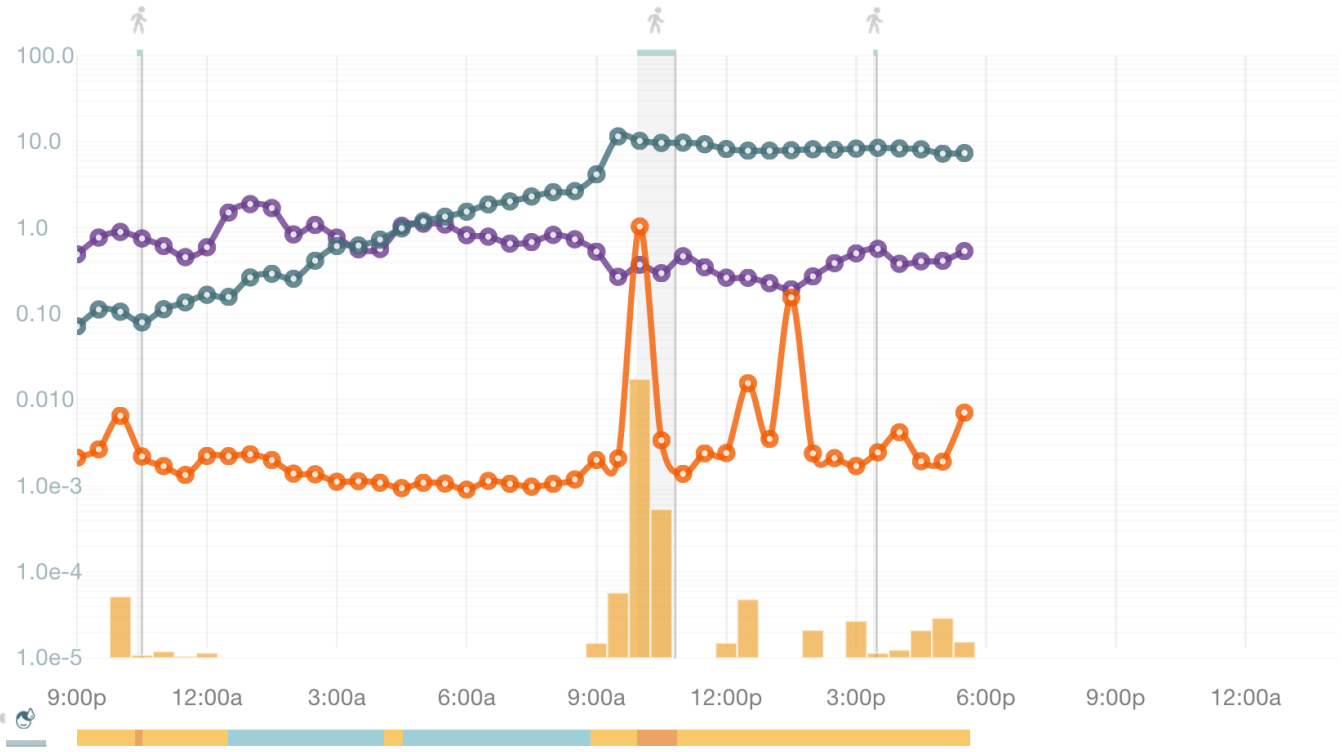


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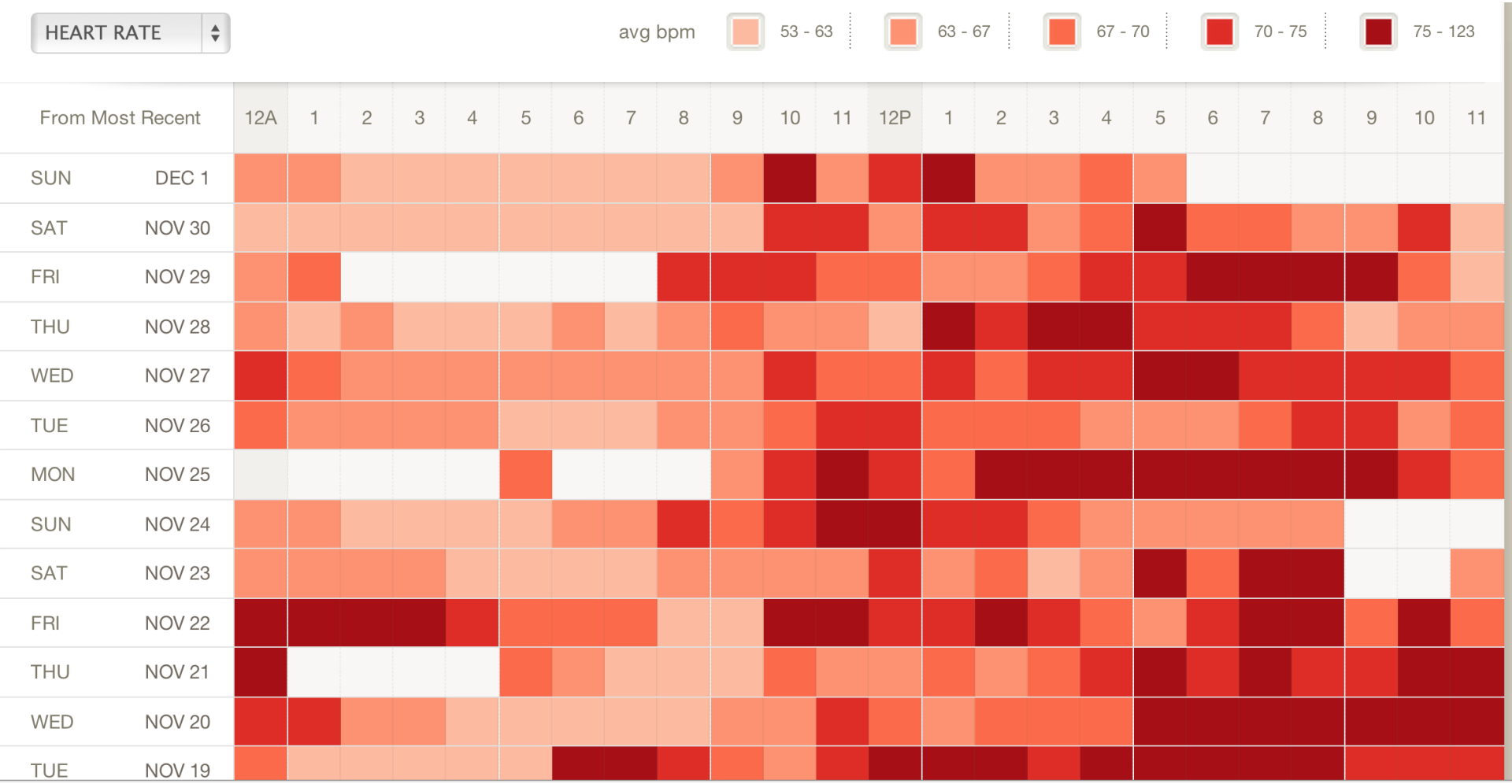
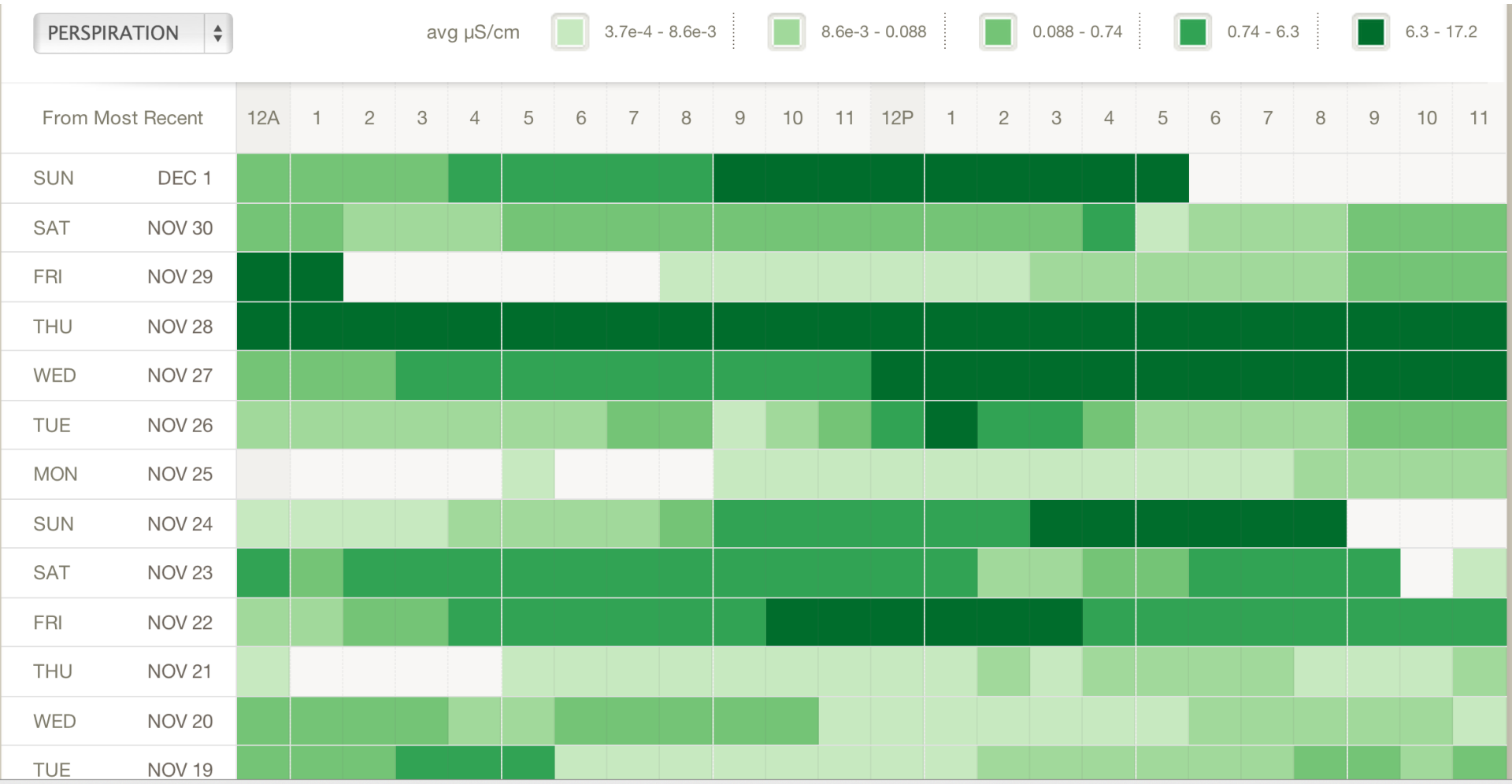

HEART RATE
avg bpm
53 - 63
63 - 67
67 - 70
70 - 75
75 - 123
From Most Recent
12A 1 2 3 4 5 6 7 8 9 10 11 12P 1 2 3 4 5 6 7 8 9 10 11
SUN DEC 1
SAT NOV 30
FRI NOV 29
THU NOV 28
WED NOV 27
TUE NOV 26
MON NOV 25
SUN NOV 24
SAT NOV 23
FRI NOV 22
THU NOV 21
WED NOV 20
TUE NOV 19


PERSPIRATION
avg µS/cm
3.7e-4 - 8.6e-3
8.6e-3 - 0.088
0.088 - 0.74
0.74 - 6.3
6.3 - 17.2
From Most Recent
12A 1 2 3 4 5 6 7 8 9 10 11 12P 1 2 3 4 5 6 7 8 9 10 11
SUN DEC 1
SAT NOV 30
FRI NOV 29
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THU NOV 21
WED NOV 20
TUE NOV 19

# HEALTH DEVICES at a glance

## WHICH HEALTH MONITORING DEVICE WOULD YOU WEAR?

- HANDHELD DEVICE
- STRAP
- SHIRT
- HEADBAND
- CLIP
- BRACELET
- KEYCHAIN
- SHOE SENSOR

### INSTRUMENTED

Automatic real-time monitoring of pressure, calories burned, motion, or temperature.

### INTERCONNECTED

Connects personal health record services, PCs, smart phones, and secure information with caregivers and doctors.

### INTELLIGENT

Analyzes data, tracks progress, and provides recommendations.

**HOWEVER,**

More than

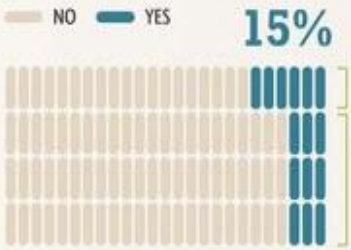
**10%**

consumers do not know if their device have these capabilities.

## WHAT SHOULD HEALTH DEVICES MONITOR?

**88%** physicians want patients to monitor health parameters **AT HOME**
Their top priorities:


## HAVE YOU EVER USED A HEALTH DEVICE?




**6%** use devices for monitoring **FITNESS**

**9%** use devices for monitoring **HEALTH CONDITIONS**

## WHAT HOLDS CONSUMERS BACK FROM HEALTH DEVICE PURCHASES?

**30%** consumers reported **PRICE** as their most concern


consumers willing to pay for a device less than $100

willing to pay in $100 to $200 range

willing to pay more than $200

# A LOOK INTO THE FUTURE of HEALTH CARE

## HOW PASSIVE SENSORS WILL SUPPORT PATIENT CARE OUTSIDE THE HOSPITAL

***Meet Ann R.*** She is 65 and has congestive heart failure and diabetes. Ann is able to live safely at home thanks to sensors that monitor changes in her health without the need for frequent visits to the doctor. The data from the sensors signal her care team (clinicians and family members) when support is needed.

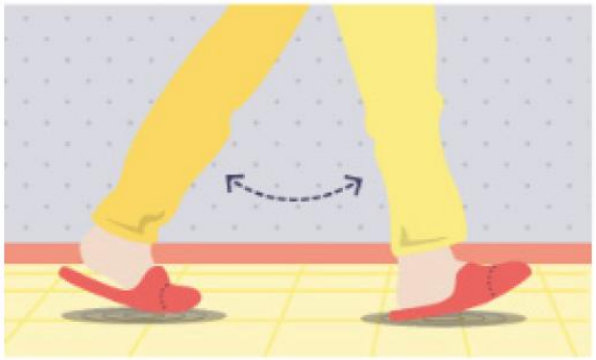
**Let's take a look at how these sensors assist Ann without her needing to do anything.**


As Ann steps out of bed, her weight is recorded by a Wi-Fi-enabled sensor under her floorboards.

As she brushes her teeth, sensors in the bathroom floor mat monitor pressure points in her feet to detect early signs of ulcers.

A patch on her arm monitors important signals such as:

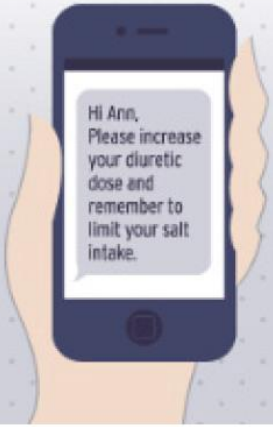
- Heart rate
- Blood-oxygen level
- Blood pressure
- Glucose level



Sensors in the floor and along the wall register her gait to assess risk of falling.

Her diuretic medication contains a tiny sensor that signals her arm patch that she has ingested the pill.

The signals detected by all sensors are automatically transmitted via a secure wireless connection and stored in Ann's personal health record. She can see the data and allow others to access it.




If any of the health measurement signals fall outside of a pre-determined normal range for Ann, the data are transmitted to her doctor and her daughter.

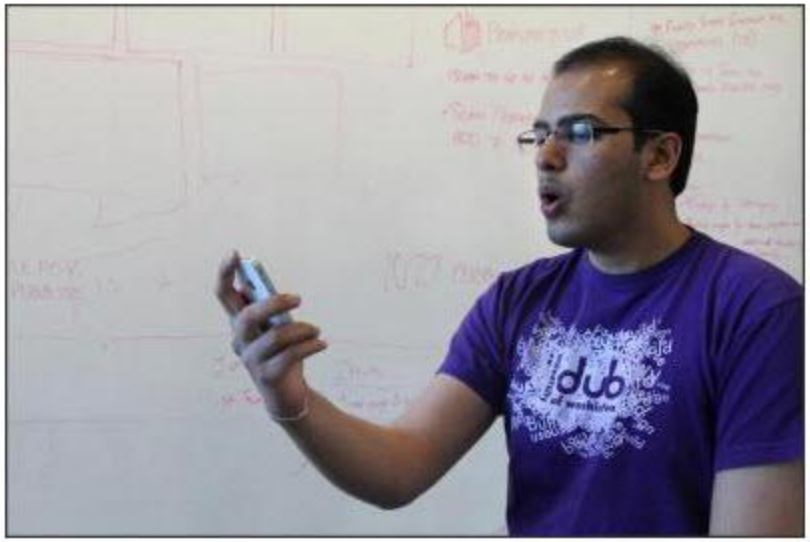
**This scenario will be achievable in the near future. Patients will be able to receive more personalized support from their care teams and live healthier lives on their own.**

For more information, see Making Sense of Sensors: How New Technologies Can Change Patient Care, **www.chcf.org/MakingSenseSensors**

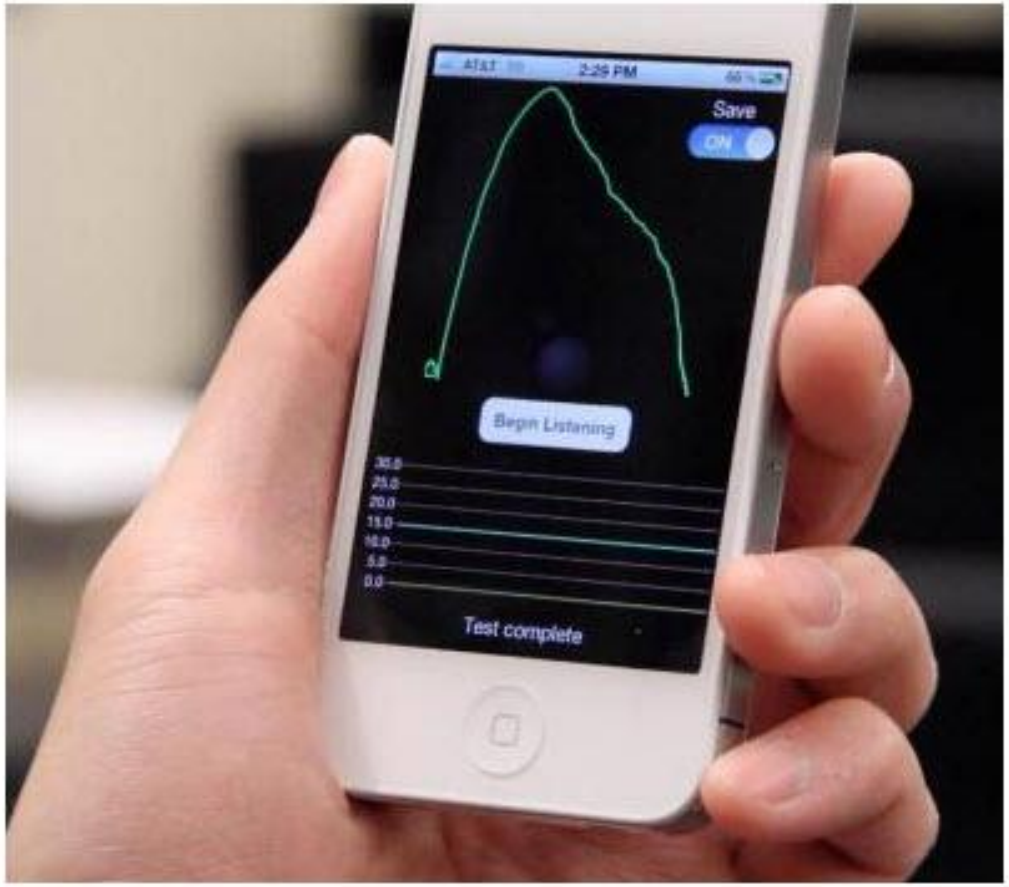
# SpiroSmart using iPhone

Contact: Hannah Hickey
hickeyh@uw.edu
206-543-2580
University of Washington

## Using SpiroSmart



## SpiroSmart




**Caption:** This shows the SpiroSmart phone.

**Credit:** S. Patel, Univ. of Washington

# Some Ideas:

Cough Analysis

Tremor Analysis in Parkinson Disease

Pupil Reaction to Light Analysis

Eye Tracing

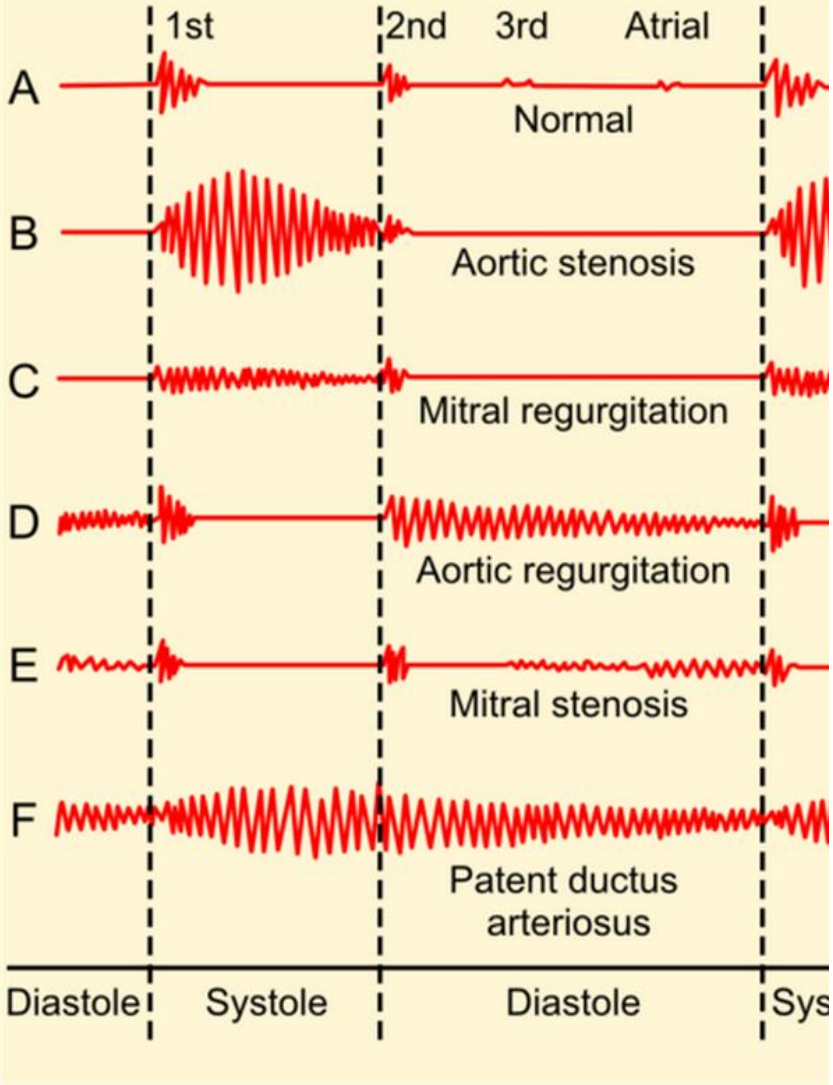
Face Assymetry Analysis (early stroke symptom)

Comparison of the typical words pronunciation (one-two-three-four)

Phonocardiography and Lung Sounds with multiplication of the original low frequencies

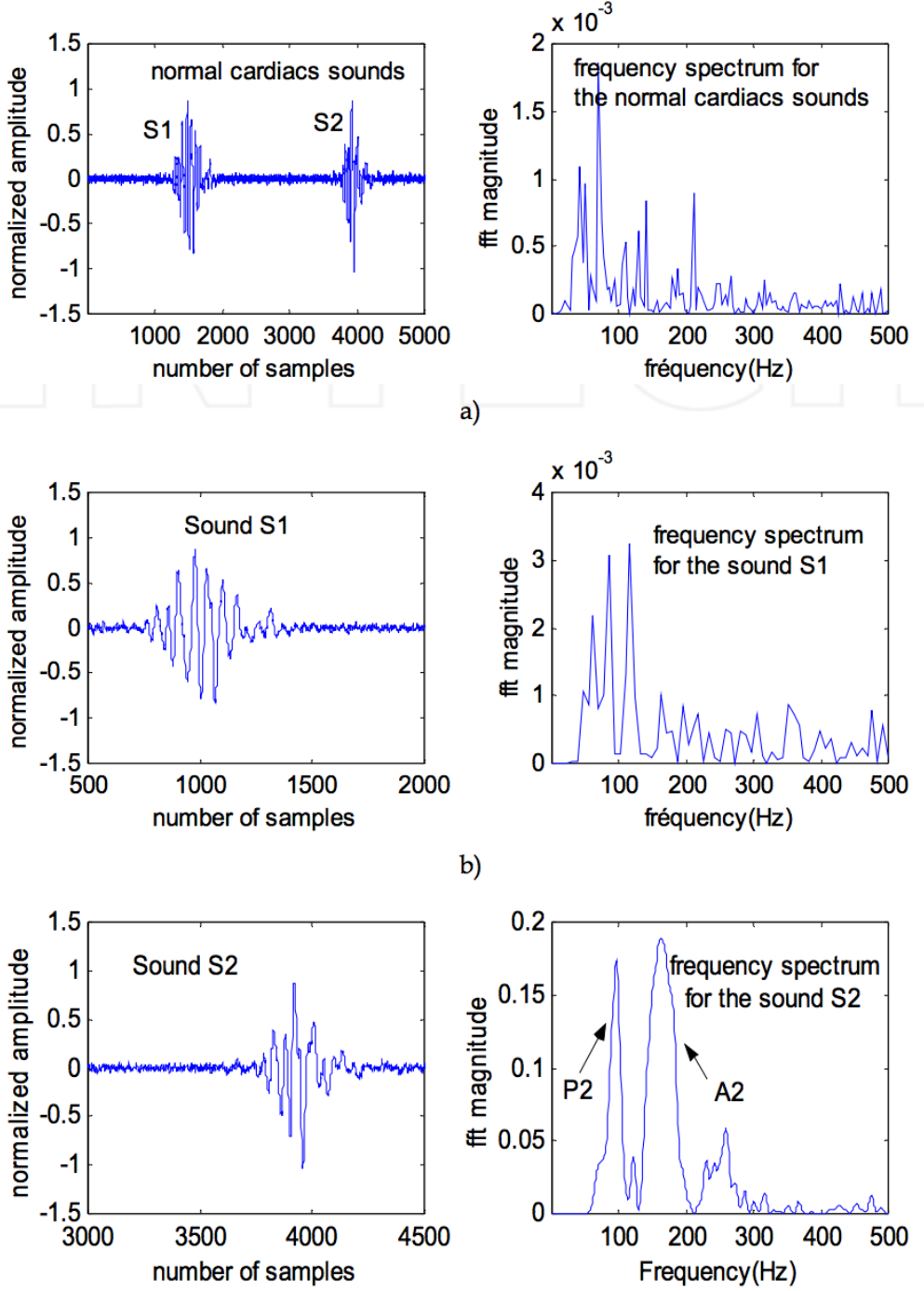
## Types of adventitious breath sounds [edit]

| Name | Continuous/discontinuous | Frequency/Pitch | Inspiratory/expiratory | Quality | Associated conditions |
|---|---|---|---|---|---|
| Wheeze or rhonchi | continuous | high (wheeze) or lower (ronchi) | expiratory or inspiratory | whistling/sibilant, musical | asthma, many others |
| Stridor | continuous | high | either, mostly inspiratory | whistling/sibilant, musical | epiglottitis, foreign body, laryngeal oedema, croup |
| Inspiratory gasp | continuous | high | inspiratory | whoop | pertussis (whooping cough) |
| Crackles (aka crepitations or rales) | discontinuous | high (fine) or low (coarse), nonmusical | inspiratory | cracking/clicking/rattling | pneumonia, congestive heart failure |
| Hamman's sign (or Mediastinal crunch) | discontinuous | | neither (heartbeat) | crunching, rasping | pneumomediastinum, pneumopericardium |




**Phonocardiograms from normal and abnormal heart sounds**

Auscultogram from normal and abnormal heart sounds.

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