Connected Medical Devices

Bringing Home Health Care into the 21st Century

What We Will Discuss

- Measurement and logging in home-based healthcare
- Home-based medical devices
- Keeping track of the measurements
- Making sense of the numbers
- Connecting with healthcare providers

Home-Based Health Measurement

- Empowering people towards better health

Why Measure?

Keeping track of health goals such as:

- Weight loss
- Exercise and physical training
- Quitting smoking

Management of specific chronic medical conditions, including:

- Cardiovascular
- Diabetes
- Respiratory
- Cancer / pain management

Reasons for Home-Based Care

- Condition does not require hospitalization
- Chronic conditions
- Manageable by patient
- Manageable by family-member (caregiver)
- Reportable
- Cost
- Patient mental health

Measuring, Monitoring, and Health-Management Devices

- For ongoing health management and/or large-data-series diagnostics

Measuring and Monitoring Devices

- Scales
- Blood Pressure Monitors
- Glucometers
- CPAP and BiPAP
- Pulse oximeters
- Peak flow meters
- Holter monitors
- Portable EKGs
- Pedometers and Heart-Rate Monitors

Medication and Health-Management Devices

- Insulin pumps
- Cardiac pacemakers and defibrillators
- Outpatient/portable intravenous medications
- Other injected, infused, or perfused medications

Keeping Track

- The first step in making information useful is to save it and look at it

Who's Keeping Track?

- Patients
- Family members
- Healthcare professionals
- Health insurance

Where Are We Keeping Track?

- Paper or computer-based logs (manual)
- Device memory
- Computer and smartphone applications
- The Internet

Connecting the Devices

- Letting health management tools handle the workload

Connections and Protocols

- Wired
- Wireless network protocols
  - 802.11
  - Bluetooth
  - Optical (laser, infrared, etc.)
- Other wireless protocols
  - ANT+
  - Proprietary

Computers and Smartphones

- Proprietary connections
- Serial connector cables
- USB connector cables
- iOS connector cables
- Audio connection
- Built-in USB connection
- Built-in Bluetooth connection

To the Internet (or the Doctor)

- Through the computer
  - Direct upload
  - Via e-mail
- Via telephony
  - Using existing POTS or cellular lines
  - Using M2M medical cellular connectivity
- Direct wireless connection
  - Bluetooth
  - ANT/ANT+
  - Proprietary protocols

Making Sense of It All

- The difference between a clerk and an empowered patient is knowing what the data mean

Logging and Management Software

- Local programs
  - Proprietary to device/manufacturer
  - Open data systems (pre-alpha)
- Telehealth systems (HCP- or manufacturer-owned/monitored)
  - Multiuser/HCP versions of device-associated software
  - Clinical software for healthcare providers
- Personal health records (PHRs)
  - Microsoft Health Vault
- Electronic health records (EHRs)
  - HCP/insurer-owned and operated

Helpful Analysis

- Meaningful results
  - Programs put readings in human perspective
    - Multiple graphs and charts
    - Results grouped by day, time of day, etc.
  - Results help refine patient's therapy
  - Logged results provide evidence of effectiveness
- Telemedicine and Integrated Care
  - Send results to healthcare providers for help
  - Healthcare providers, caregivers can keep an eye on distant patients/loved ones
  - Patients become participants in their own health outcomes

Connecting Patients with Providers

- Shut-ins
  - Telemedicine allows patients to remain at home during care
  - The ability to share data helps allay fears of family and friends
- Collaborative health
  - Patients and providers share information to improve outcomes
    - Dose and therapy management
  - Quantitative evidence of therapeutic outcomes
    - Mining data from PHRs, EHRs, and engaged patients

Where Do We Go From Here?

- Smarter devices, greater connectivity, and more meaningful data

Wishlist

- More smartphone-connected and -managed devices
- More Bluetooth-connected devices
  - Wavesense Jazz Bluetooth
- More multifunction devices
- Improved device and connection security
  - To stay ahead of malicious attacks
- Data standards
  - To analyze devices using one's operating system and software of choice
- Integrated information analysis
  - From multiple classes of device
  - Aggregated data, data mining from groups of consenting users

On the Go

- Smartphone-connected and -managed devices
  - iBGStar – iOS attached glucometer
  - Glooko – iOS-based glucometer cable and software
  - iHealth and Withings iOS-attached blood pressure cuffs and wireless scales
  - Telcare – glucometer with cellular data transmission and iOS log access
- Bluetooth-connected devices
  - Wavesense Jazz Glucometer with Bluetooth
- ANT
  - Heart-rate monitors, cycling and running computers

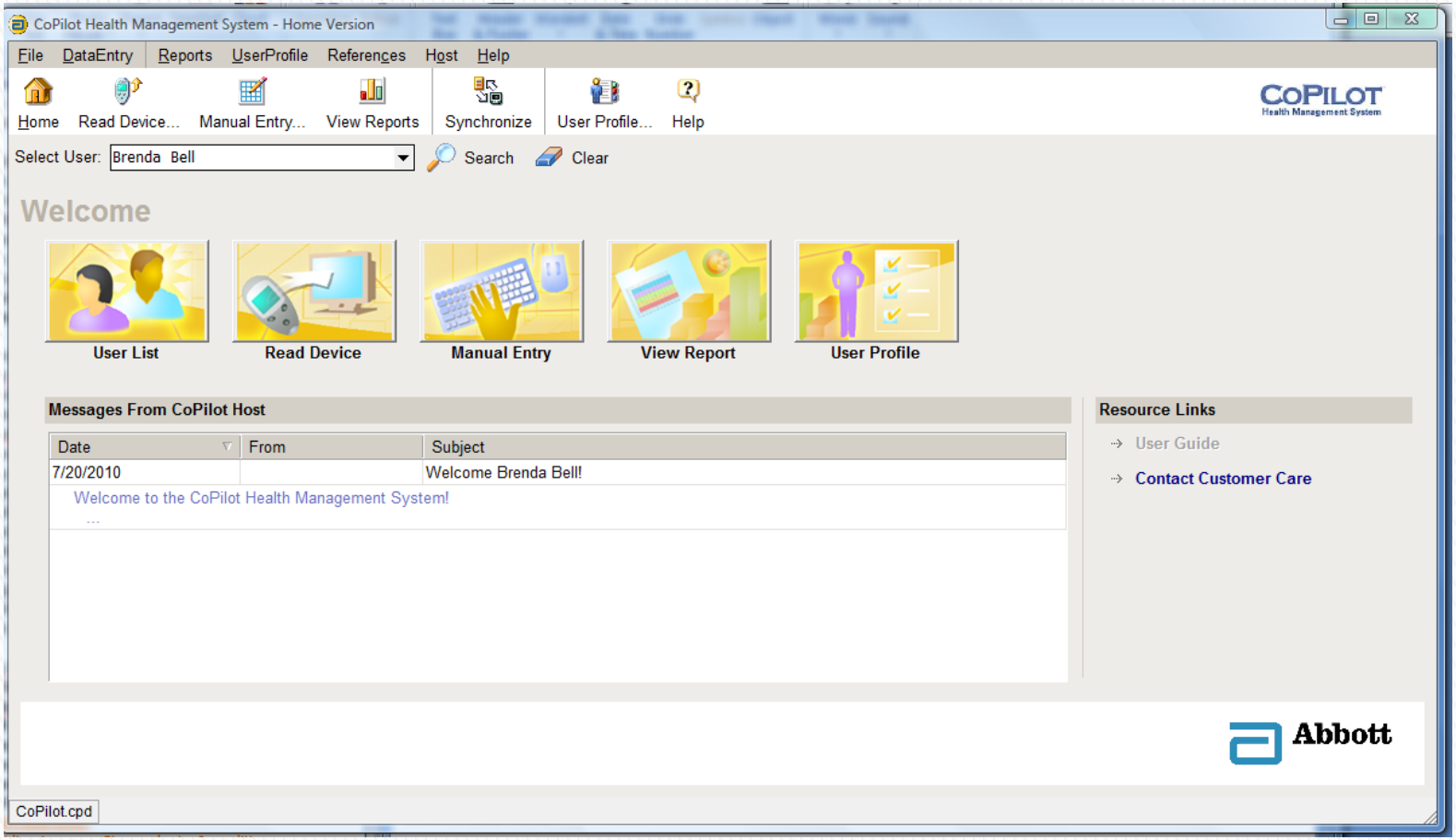
Multifunction and Delivery Devices

- Body-fat weight scale
- Insulin pump + CGM
  - e.g., Medtronic MiniMed “Paradigm Revel”, Animas “Vibe”
- Blood pressure cuff + glucometer
  - e.g., Advocate “Duo”

Wireless Security Issues

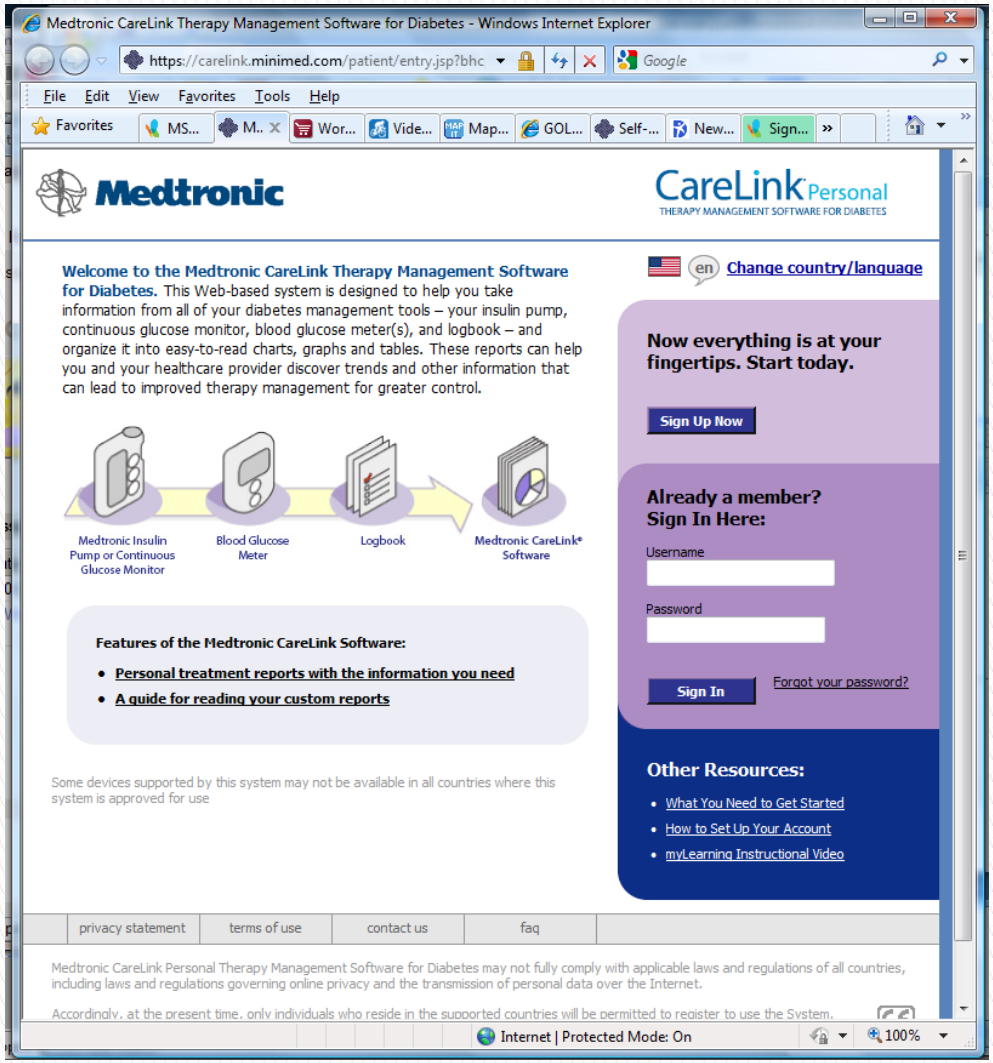
- Insulin Pump Hacking
  - Theory (BlackHat/DefCon 2011 conference)
    (Original papers have been removed for security and legal reasons)
  - Case Study
    - Article in *The Register* discussing presentation at Hacker Halted conference
    - Washington Post video on the same (2012 March 4)
- Implanted Cardiac Defibrillator Hacking
  (Article discussing white paper)

Websites and Demonstrations



Co-Pilot

http://www.abbottdiabetescare.com/copilot-health-management-system.html



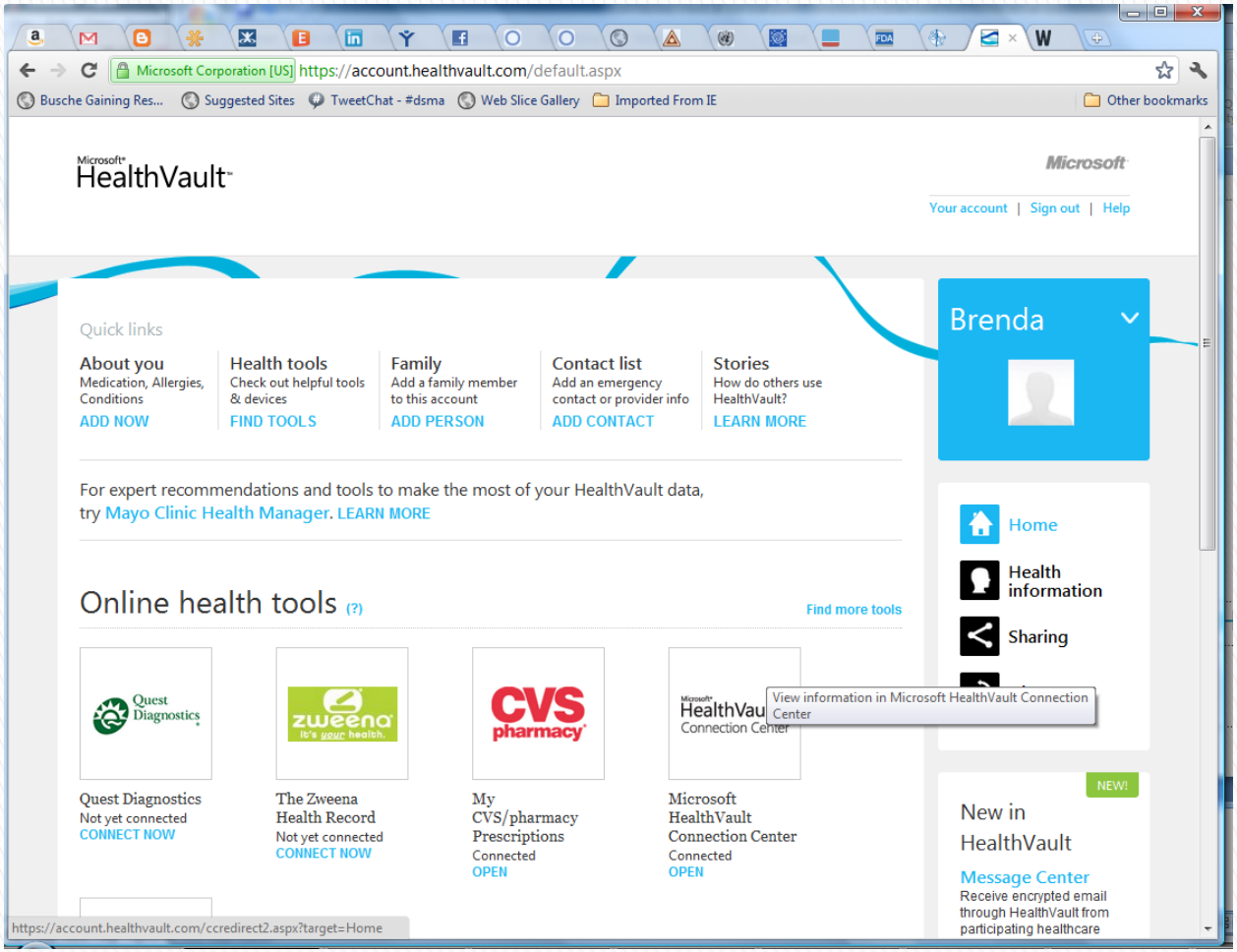
CareLink Site

Information at http://www.medtronic.com/health-consumers/diabetes/device/insulin-pumps/carelink-software/


www.medapps.com
Busche Gaining Res...
Suggested Sites
TweetChat - #dsma
Web Slice Gallery
Imported From IE
Other bookmarks
MedApps
MOBILE HEALTH MONITORING
About Us
Markets
Products
Media
Regulatory
Contacts
MADE IN U. S. A.
EDISON AWARDS
BEST NEW PRODUCT
2011 WINNER
Support
healthPAL
MOBILE HEALTH MONITORING DEVICE
CloudCare
Bluetooth
FOCUS ON THE PATIENT - NOT THE TECHNOLOGY
Simple to use, dedicated, devices automatically collect and transmit timely, accurate health data to an EHR – without a computer or smart phone.
No manual data entry, complicated user interface, or hand-written logs.
open up now
Select Language
Like 12 Send
Tweet 0
+1 0
Share
Live Chat Offline
Click to Leave a Message
Re-Hospitalization Avoidance
Accountable Care
Home Healthcare
Coagulation Monitoring
Clinical Trial
• Reimbursement policies
• Successful ACOs will
• Home Health Agencies will be penalized for poor
• Over 2 million new people start taking anticoagulation
• Clinical trials capacity is not meeting demand
www.medapps.com/markets.html

MedApp Site

TeleStation Site



Microsoft Health Vault

Questions?

Resources

- Download the slide deck and browse the Web links online

PHR and EHR Supported Devices

- Microsoft Health Vault: http://www.microsoft.com/en-us/healthvault/tools-devices/directory.aspx?type=device&condition=
- MedApp: http://www.medapps.com/devices.html

Blood Pressure Monitors

- Homedics http://www.homedics.com
- Withings http://www.withings.com
- Omron http://www.omronhealthcare.com
- iHealth http://www.ihealth99.com

Insulin Pumps

- OmniPod http://www.myomnipod.com/
- Minimed http://www.minimed.com/products
- Animas http://www.animas.com/
- Accu-Chek http://www.accu-chekinsulinpumps.com/ipus/products/insulinpumps/spirit.html

Glucometers

- Abbott Freestyle
- Bayer
- Lifescan OneTouch
- Roche Accu-Chek
- AgaMatrix Wavesense
- Home Diagnostics

  (Manufacturer of many store-brand meters)

Protocols and Hardware

- Bluetooth 4.0
  - http://www.bluetooth.com/Pages/Health-Wellness-Market.aspx
  - Bluetooth Health Device Profile
    - White Papers
      - http://www.ifoundrysys.com/downloads/6whitepapers/Designing%20Bluetooth%20Medical%20Devices.pdf
      - http://www.nickhunn.com/wp-content/uploads/2009/05/bluetooth-the-wireless-ecosystem-for-health-fitness-and-assisted-living.pdf
  - Bluetooth Low Energy
    - Discussion
      - Press Release
      - Platform pitch

Protocols and Hardware

- ANT
  - Wikipedia entry http://en.wikipedia.org/wiki/ANT_(network)
  - ANT main site http://www.thisisant.com/
  - ANT+ http://www.thisisant.com/ant/ant-interoperability

Other Devices

- Serial Port Adapter (for Operating Rooms)
  - http://www.pdacortex.com/fda_approves_bluetooth_med_system.htm
- Wireless EKG
  - http://www.youtube.com/watch?v=tEHhg1zEBUI

Crowdsourced Information

- TuAnalyze

  Public Diabetes Analysis based on shared HbA1c readings
- Quantified Self

  People taking control of their health via measurement
- Journal of Participatory Medicine

  Peer-reviewed journal of information from empowered patients
- e-Patients White Paper

  A discussion of how educated, empowered, engaged patients are improving medical outcomes

Regulatory Information

- HIPAA
- FDA Safety Submission Information