Wearable's Health and Voice
The Perfect Storm

Nick van Terheyden, MD (aka @drnic1)
Chief Medical Information Officer
Nuance Communications, Inc.
Technology has become an integral part of our daily lives...
Modifiable Health

- Unpredictable Health
- Predictable (Rules-based) Health

60-80% Lifestyle
To put it another way....
What Are the Solutions?

- Patient Centered Healthcare and Monitoring
- Increased efficiency of healthcare delivery which includes
  - Self management
  - Patient data capture
  - Home Health and Telemedicine
- Improved Personalized Medical Treatment
Quantified Self

- Ubiquitous, low cost, always on sensors
- Seamless tracking, minimal friction, no behavior change
- Interactive, easy data that influences behavior
  - Activity and Weight
  - Heart, Blood Pressure and EKG
  - Sleep, Mood
  - Bloods including Glucose
  - DNA and MicroBiome
BIOSENSING WEARABLES LANDSCAPE

Source: Rock Health review of 75+ companies (companies are selected, not comprehensive)
NY Times: Technology That Prods You to Take Action, Not Just Collect Data

Technology That Prods You to Take Action, Not Just Collect Data

By NATASHA SINGER APRIL 18, 2015

Natasha Dow Schüll wearing a Muse, a headband that tracks mood. Kayana Szymczak for The New York Times

The bookshelves in Natasha Dow Schüll’s office at the Massachusetts Institute of Technology are punctuated here and there with kitchen timers:
Patients and technology used by physicians

Physicians feel EHRs interfere with face-to-face communication and slow them down.

How do patients feel about IT?

• They notice an increase in last 5 years
• Like tech used to explain or educate
• Get annoyed with downtime and lack of data sharing
• Low use of patient portals

http://www.nuance.com/artofmedicine
The doctor has no time to see you now

40% of patients feel rushed during their visit
More than a third spend 10 minutes or less with their doctors

In a different study, 30-40% of doctors said they feel rushed
“Clear communication, responsiveness and follow-up are important. Most physicians need to spend more time in discussion with patients and not rush the visit or discussions during a visit.”

Female, age 25-34
Maryland, U.S.
Patient engagement & behavior

Patients are taking a more active role. They are looking to connect with clinicians in new ways related to their health.

With only 12 minutes in the average patient visit, what can physicians do that matters most to patients?
3 things doctors can’t ignore when it comes to quality care

Patients believe time for discussion & communication lead to better medical care

Respondents were able to choose multiple items.

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Would you be more honest with a virtual assistant on a computer/online than you would be with your physician/GP when reporting your health-related habits and behaviors (for example, smoking, diet, drug/alcohol, or exercise frequency)?

<table>
<thead>
<tr>
<th>Response</th>
<th>U.S.</th>
<th>UK</th>
<th>Germany</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
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<td>124</td>
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<tr>
<td>No</td>
<td>647</td>
<td>657</td>
<td>730</td>
</tr>
<tr>
<td>Not sure/maybe</td>
<td>253</td>
<td>220</td>
<td>185</td>
</tr>
</tbody>
</table>

Note: percentages in parentheses.
I’d Never Admit That to My Doctor. But to a Computer? Sure

“This is way better than talking to a person”

“I don’t really feel comfortable talking about personal stuff to other people”

Everyday consumer understands the power of a mobile virtual assistant. A recent consumer-focused survey found:

- 60% of people are interested in using a virtual assistant on their phone*
- 80% of those who are currently using mobile virtual assistants find them useful*
- 8 out of 10 physicians believe virtual assistants will change the way they interact with technology by the year 2018**

**Series of surveys conducted between January and July 2013.
The New Age of Wearable Computing

- Today, wearable tech is a $700m industry (sports and activity trackers)
- Growth is exploding; $3B in 2014 (with new categories representing $2B in sales)
- 52% of people polled said they’re aware of wearable, with 1/3 of those saying they’d buy one
- One in six consumers currently use wearable tech in their daily lives
- Total wearable device shipment volumes will reach 19 million units in 2014, growing to 111.9 million in 2018
- The market (today): 48% of owners are 18-34 years old
- The data: when an earthquake of magnitude 6.0 struck NorCal on 8/24 at 3:20am, it shook people awake. Jawbone UP was able to pinpoint the epicenter by looking at UP sleep data, and saw that 45% of people within 15 miles of the epicenter didn’t return to sleep that night.
Wearables Segments

- Fitness / Single-Purpose
- Smartwatch / General-Purpose

Head-mounted AR / Glasses
Head-mounted VR / Fully immersive
Technology Advantages

- Wake up Word; always available with lower power drain
- Voice Biometrics; Authentication and customizable experience
- Powerful Understanding and Interaction based on Speech and NLP
- Cloud Based and Embedded
- Deep Meaning – conversation and Direct Access to Functions with Easy Access to Multiple Resources
- Text-to-Speech; Expressive, natural sounding and customized
End to End

Wakeup Phrase

Speech Recognition
ASR / SLMs

Interpretation
NLU / SSMs

Dialog

Intelligence
Context / Knowledge

Output

"Hey Galaxy," = system knows to start listening

System figures out the words spoken

System determines the intent and key concepts of the request

As appropriate, gather any more required information

Personal playlists, address book names, etc.

"Hey Galaxy, put on my trip hop station."
The Quantifiable Health Movement

- **Today**
  - 69% of American adults track areas of their health in some shape or form – including weight, diet, exercise and symptoms
  - 21% use digital technology to do this, but set to rise significantly by 2020.
  - $11B in revenue from 35 million homes using home ‘health’ automation platforms across the globe by 2017***

- **Future**
  - Global market for wearables in health and fitness could reach 170 million total devices by 2017*
  - By 2020, a number of biotechnologies will be available on a nano scale, embedded in devices and as sensors within the human body**
Common Use Cases

- **Activity Tracking**
  - New activity
  - Start recording a new activity
  - During activity
  - Request information about the current activity
  - Get real-time stats on progress
  - Pause and resume activity recording
- **Post-activity**
  - Log something if you weren’t wearing your band or if you forgot to set the activity at the time
- **Meal Logging**
  - Input meals, food items, quantities and more
  - Get nutritional information about food items
  - Track your daily, weekly, and monthly intakes against your goals
- **Reminders**
  - Get reminders to take medications, supplements and vitamins, prepare for bed, and more
UI Challenges

- High reliance on companion applications means multiple device usage (band+smartphone) during activity
- Daily progress, milestones, etc.
- Difficult to retrieve information during activities
- Food logging still incredibly cumbersome
- Lack of visual display requires companion device for reminders
- Devices with small screens still face challenges in navigating menu hierarchies
Speech for Quantifiable Health Uses

- Easily input information
  - Food / meals
  - Past activities
  - Untracked sleep
- Query information
  - Current activity stats
  - Past activity stats
  - Aggregated snapshots of data
- Adherence/reminders
  - Prescriptions, supplements, others
Gear S Smart Health Demo

Activity tracking
- Log a new activity (run/cycling/etc…, started at 7AM, ended at 9AM ran for 5 miles) and mapping activity to what is on the pedometer
- Or "start run" and automatically be logged
- With visual UI and a receipt that comes back displaying results
- Ask a question about the activity already completed, i.e. How much did I run yesterday?
- While you're running, ask a question and get TTS back i.e. How much more do I have to run? You have 3 miles left.

Food logging
- Log a new meal, breakfast, 2 eggs & UI would ask if I want to add anything else. We'll have some defaults associated with quantities.

Prescription reminders
- Workflow around compliance. So you have a reminder set that every morning you have to take a specific medication, and then have an explicit action confirming you have taken the medicine.
- Might have something that continues to nag you based on importance of medication. Or by voice say, remind me in 5 mins.
Visual Flow Examples

Which activity?  Duration?  Start Time?  End Time?

9:21 AM  00:00  00:00 AM  00:00 AM

Home  Choice  Duration  Start  End  Confirmation

Weekly Graph  Activity Log  Idle  Main Processing  Listening Hints  Main Listening

12,943 STEPS  160 BPM

6:00PM START TIME  7:00PM END TIME

4.00 miles DISTANCE

1 hour DURATION

12,943 STEPS  160 BPM

16.13 MILES  267卡路里

"Log a run"

"Log breakfast"

"Went for a 2 mile jog from 5-6"

"I had a banana for a snack"

"Remind me to..."
UIs in Action: Consumer Health
Real-world examples of conversational user interfaces

**AskMD by Sharecare**
*Voice-driven consultation and health management in your hand*

- Simply use your voice to initiate a series of questions relevant to your issue
- Helps you understand more about your health day-to-day
- Takes the guesswork out of getting better and being well
- Manage your own health and the health of others for whom you care for

**Talk-to-Doc**
*Voice-driven consultation and health management in your hand*

**CVS**
*Voice-driven interface for virtual pharmacy via iPad*

**Bon’ App**
*Voice-driven food database and weight loss app*

Try it for yourself!
Free download via iTunes
Questions
Where You Can Find Me

Nick van Terheyden, MD  
CMIO, Nuance Communications

Twitter  
http://twitter.com/drnic1

LinkedIn  
http://www.linkedin.com/in/nickvt

Voice of the Doctor  
http://drvoice.blogspot.com/

My Activity  
http://DrNick.vanterheyden.com

AboutMe  
http://about.me/obiwan

FaceBook  
http://profile.to/drnick

E-Mail  
drnick@nuance.com, drnic1@gmail.com

GoogleVoice  
(301) 355-0877
Thank you
Wearable's Health and Voice
The Perfect Storm

Nick van Terheyden, MD (aka @drnic1)
Chief Medical Information Officer
Nuance Communications, Inc.