What if we had a Care-Pathway Navigation App?

Prepared for Harnessing Technology for Aging-in-Place
Vancouver, BC | May 14, 2015

Stephen B. Wilcox, Ph.D., FIDSA
One Enabler: Big Data
Personalized medicine
• Improving diagnostics and therapy by using DNA-based and demographic-based algorithms

Outcomes research
• Gathering comprehensive data on the outcomes associated with institutions and HCPs as well as therapies
Therapeutic interactions

• Building massive databases of actionable information regarding drug interactions and therapeutic interactions, in general
Another Enabler: The Internet of Things
The Internet of Things

Jeremy Rifkin: 
*The Zero Marginal Cost Society*
3 components of the internet of things:

- **Energy**, based on renewables
- **Logistics**, using 3D printing, drones, and free energy for transportation
- **Communication**, via sensors and actuators to connect things to the net
The Internet of Things

Complexes/revolutions:

1. **1500:** Wind/water + horses/boats/crafts + the printing press

2. **1850:** Coal + trains/steam-driven mfg. + telegraphs/auto. printing

3. **1920:** Oil + cars/trucks/auto. mfg. + telephones/copiers

4. **2015:** Renewables + dist. mfg./free transportation + the internet
The Internet of Things

Societal/economic organization:

1. 1500: Local government + collective commons
2. 1850: Centralized government + market capitalism
3. 1920: Centralized government + market capitalism
4. 2015: Collective commons
The Internet of Things

A few facts:

• The 1990 Cray 1A cost $9,000,000, and had 0.0001 the computing power of your iPhone.

• 88 min. of the energy that hits the earth from the sun = 1 year of total global energy use.

• Renewables are on a More’s-Law-like trajectory.

• Open-source 3D printing is on a tear.
The Internet of Things

The Napsterization of Product Development:

• We put our IP into the internet and make a living by creating a personal brand...like musicians, like journalists, like writers.
The Internet of Things

The Napsterization of Product Development:

• When the manufactured thing goes away—due to 3D printing, automatic assembly, etc.—so does our ability to protect our IP.
The Internet of Things

Key changes:

• Near zero marginal cost of design, manufacturing, marketing, and delivery of goods
• Elimination of profit
• Person as node—receiving and transmitting data
• *Access* instead of *ownership*
The Internet of Things

So, what will the internet of things lead to in healthcare?
The Internet of Things

So, what will the internet of things lead to in healthcare?

• Wikipedia-like healthcare information

Some initial evidence suggests that crowd-sourced diagnosis can outperform physicians.
The Internet of Things

So, what will the internet of things lead to in healthcare?

• Real-time personal health data with closed-loop therapy and connection to the web
The Internet of Things

So, what will the internet of things lead to in healthcare?

• Drugs made on your home drug-making device
So, what will the internet of things lead to in healthcare?

- Locally-made personalized implants and assistive devices
The Internet of Things

So, what will the internet of things lead to in healthcare?

- Crowd-sourcing of research, diagnosis, and therapy …self-organizing patient communities
  - LAM Treatment Alliance
  - Association of Cancer Online Resources
  - PatientsLikeMe
The Internet of Things

Some other terms:

• Patient-driven healthcare
• Open-source health commons
• Participatory medicine
• Crowd-sourced medical research
And…Care-Pathway Navigation Apps
Care-pathway App

3 Main Sections

- My Health
- Diagnose
- Treatment Options
Welcome, Emily!

- My Health
- Diagnose
- Treatment Options
My Current Health

Height: 5'4"
Weight: 180 lbs.
BMI: 30.9

DIAGNOSES
- Influenza
- Eczema

Medications

Antiviral medication: 75mg, twice daily.
One-A-Day Women's Multivitamin, 250-Count Bottle (over the counter)

Insurance

Independence Blue Cross
Personal Choice PPO
ID Number: 325672B2V2C          Group ID: BG452

COVERAGE
Vision benefits: $0 for yearly appointment. $100 reimbursement for contacts or glasses over a $50 vision center.
Family History

- Phil D. - Father
- Joy D. - Mother
- Brent D. - Brother
- Elise S. - Sister

Diagnostic Implications

- Increased risk of breast cancer.
- Increased risk of heart disease.
- Increased risk of thyroid disease.

Medical History

- Sprained Ankle: July 2014
- Sleep Apnea Study: May 2014
- Hernia Surgery: Sep 2013
- Root Canal
- New Contacts
- Sleep Apnea Diagnosis
Treatment DNA: Priorities

Based on your preferences, finding an inexpensive treatment plan is the highest priority, then having a high likelihood of total recovery. The next focus will be on reducing the length of your recovery. Finding a plan with minimal discomfort is the lowest priority.

Treatment Preferences

“1” represents your highest priority.

<table>
<thead>
<tr>
<th>Low cost</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. recovery time</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>High % of recovery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Minimal discomfort</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Treatment DNA: Priorities

Based on your preferences, treatment recommendations will prioritize minimizing your discomfort, then on likelihood of total recovery. The next focus will be on reducing the length of your recovery. Finding an inexpensive treatment plan is the lowest priority.

Treatment Preferences

“1” represents your highest priority.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
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</tbody>
</table>
Treatment DNA: Priorities

Based on your preferences, recommendations will prioritize finding a treatment with a high likelihood of recovery, followed by minimizing discomfort. The next focus will be reducing the length of your recovery. Finding an inexpensive treatment plan will be the lowest priority.

Treatment Preferences

“1” represents your highest priority.

<table>
<thead>
<tr>
<th>Priority</th>
<th>1</th>
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</table>
My Current Health

- Height: 5'4"
- Weight: 180 lbs.
- BMI: 30.9

Diagnoses:
- Influenza
- Eczema

Medications

- Antiviral medication: 75mg, twice daily.
- One-A-Day Women's Multivitamin, 250-Count Bottle (over the counter)

Insurance

- Independence Blue Cross
- Personal Choice PPO
- ID Number: 325672BV2C
- Group ID: BG452

Coverage:
- Vision benefits: $0 for yearly appointment. $100 reimbursement for contacts or glasses every 2 years.
Do you still have influenza (flu) symptoms?

Yes  No

Review Symptoms
Outcome: Influenza (flu)

Diagnosed: April 16, 2015
Recovered: April 25, 2015

SYMPTOMS
Headache
Chills
Vomiting

TREATMENT PLAN
Antiviral medication: 75mg, twice daily.
Bed rest with a stead intake of high-electrolyte beverages.

Okay, got it!
Family History

- Phil D.
  Father
- Joy D.
  Mother
- Brent D.
  Brother
- Elise S.
  Sister

Diagnostic Implications

- Increased risk of breast cancer.
- Increased risk of heart disease.
- Increased risk of thyroid disease.

Medical History

- Influenza (Flu) - April 2015
- Sprained Ankle - July 2014
- Sleep Apnea Study - May 2014
- Hernia Surgery
- Root Canal
- New Contacts
Welcome, Emily!

- My Health
- Diagnose
- Treatment Options

Not you?
Symptom Input
Click a field below to get started.
<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal pain</td>
</tr>
<tr>
<td>Allergy</td>
</tr>
<tr>
<td>Altered mental status</td>
</tr>
<tr>
<td>Anal itching</td>
</tr>
<tr>
<td>Anemia</td>
</tr>
<tr>
<td>Ankle pain</td>
</tr>
<tr>
<td>Anxiety</td>
</tr>
<tr>
<td>Aphasia (loss of speech)</td>
</tr>
<tr>
<td>Arm pain</td>
</tr>
<tr>
<td>Attention deficit (inattention)</td>
</tr>
<tr>
<td>Dark circles under eyes</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Dark urine</td>
</tr>
<tr>
<td>Delusions</td>
</tr>
<tr>
<td>Depression</td>
</tr>
<tr>
<td>Diarrhea</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
</tr>
<tr>
<td>Difficulty urinating</td>
</tr>
<tr>
<td>Difficulty talking</td>
</tr>
<tr>
<td>Dilated pupils</td>
</tr>
<tr>
<td>Discharge</td>
</tr>
<tr>
<td>Distended stomach</td>
</tr>
<tr>
<td>Dizziness</td>
</tr>
<tr>
<td>Double vision</td>
</tr>
<tr>
<td>Drooling</td>
</tr>
<tr>
<td>Drooling</td>
</tr>
<tr>
<td>Dry eye</td>
</tr>
<tr>
<td>Dry eye</td>
</tr>
<tr>
<td>Dry mouth</td>
</tr>
<tr>
<td>Dry skin</td>
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</tbody>
</table>
Symptom Input
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Difficulty concentrating
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<tr>
<td>Symptom</td>
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<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Seizures</td>
</tr>
<tr>
<td>Shaking hands</td>
</tr>
<tr>
<td>Shortness of breath</td>
</tr>
<tr>
<td>Shoulder pain</td>
</tr>
<tr>
<td>Sinus infection</td>
</tr>
<tr>
<td>Sneezing</td>
</tr>
<tr>
<td>Snoring</td>
</tr>
<tr>
<td>Sore throat</td>
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<tr>
<td>Sore tongue</td>
</tr>
<tr>
<td>Stiffness (joints)</td>
</tr>
<tr>
<td>Stiffness (neck)</td>
</tr>
<tr>
<td>Stomach cramps</td>
</tr>
<tr>
<td>Suicidal thoughts</td>
</tr>
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<td>Swelling</td>
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</table>
Symptom Input
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Hair loss
Hallucinations
Hand pain
Headache
Hearing loss
Heartburn
Heel pain
High blood pressure
Hip pain
Hoarseness
Hot flashes
Hyperactivity
Hyperthermia
Hyperventilation
Hypothermia
Symptom Input
Click a field below to get started.

- Difficulty concentrating
- Snoring
- Headache

Submit
<table>
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Diagnose

- Dark circles under eyes
- Dark urine
- Delusions
- Depression
- Diarrhea
- Difficulty concentrating
- Difficulty urinating
- Difficulty talking
- Dilated pupils
- Discharge
- Distended stomach
- Dizziness
- Double vision
- Drooling
- Dry eye
- Dry mouth
- Dry skin
Symptom Input
Click a field below to get started.

- Difficulty concentrating
- Snoring
- Headache
- Dry mouth
Do you have a stuffy or runny nose?

- Yes
- No

Edit symptoms
Has anyone told you that your snoring is interrupted by gasps?

Yes  No

Edit symptoms
Diagnosis: Sleep Apnea

Definition: Pauses in breathing of more than 10 seconds while asleep, occurring at regular intervals throughout the night.

DIAGNOSIS REASONING

- Family History
  - Mother has sleep apnea
- Symptoms
  - Dry mouth in the morning.
  - Sleepiness during the day. Gasps during sleep. Morning headaches.

Treatment Options
Treatment Options
Diagnosis: Sleep Apnea

**DEFINITION**
Pauses in breathing of more than 10 seconds while asleep, occurring at regular intervals throughout the night.

**WHY TREAT IT?**
Untreated sleep apnea can cause high blood pressure.

Your Treatment Preferences

Based on your preferences, recommendations will prioritize finding a treatment with a high likelihood of recovery, followed by minimizing...

Treatment Options

- Surgery
- Drug Therapy
- Chronic Device
- Lifestyle Change
- No Treatment
- Experiment
Diagnosis: Sleep Apnea

**DEFINITION**
Pauses in breathing of more than 10 seconds while asleep, occurring at regular intervals throughout the night.

**WHY TREAT IT?**
Untreated sleep apnea can cause high blood pressure.

Your Treatment Preferences

Based on your preferences, recommendations will prioritize finding a treatment with a high likelihood of recovery, followed by minimizing the impact on daily life.

**Treatment Options**

- Pillar Procedure
- Tracheostomy
- UPPP
Pillar® Procedure

The Pillar Procedure is a simple, effective treatment for chronic snoring and mild to moderate obstructive sleep apnea (OSA). The Pillar Procedure can be performed in a single, brief visit to the doctor’s office or in combination with additional procedures to treat other areas of discomfort.

**DISCOMFORT**

The procedure causes minimal discomfort. Patients often resume normal activities that day.

**% OF RECOVERY**

80% of patients report a reduced AHI. Many report significant lifestyle improvements.

**RECOVERY TIME**

The procedure takes 20 minutes and doesn’t require hospitalization. Patients report improvements within weeks or up to three months.

**COST**

Because the Pillar Procedure is considered cosmetic, it is not covered by your insurance.

ège Find a Provider
Treatment Options

Providers

Dr. Michael Zhang, MD
Bariatric Surgery
Morristown, NJ (7.6 miles away)
PATIENT SATISFACTION

Sleep Apnea Results
READEMISSION/COMPLICATION SUCCESSFUL RECOVERY
15% 60%

Dr. Brian F. McGottigan, MD
Ear, Nose, and Throat
Middletown, PA (21.8 miles away)
PATIENT SATISFACTION

Sleep Apnea Results
READEMISSION/COMPLICATION SUCCESSFUL RECOVERY
11% 94%

Dr. Jacqueline E. Armstrong, MD
Ear, Nose, and Throat
Brooklyn, NY (60.3 miles away)
PATIENT SATISFACTION

Sleep Apnea Results
READEMISSION/COMPLICATION SUCCESSFUL RECOVERY
21% 87%

Dr. James Stefan, MD
Ear, Nose, and Throat
Shrewsbury, NJ (77.2 miles away)
PATIENT SATISFACTION

Sleep Apnea Results
READEMISSION/COMPLICATION SUCCESSFUL RECOVERY
31% 89%

Dr. Steve Jascowitz, MD
Sleep Medicine
New York, NY (92.4 miles away)
PATIENT SATISFACTION

Sleep Apnea Results
READEMISSION/COMPLICATION SUCCESSFUL RECOVERY
12% 76%
Dr. Brian F. McGettigan, MD
Ear, Nose, and Throat
Meadowbrook, PA (21.6 miles away)

PATIENT SATISFACTION
⭐⭐⭐⭐⭐ 29 responses

Sleep Apnea Results
 READMISSION/COMPLICATION  SUCCESSFUL RECOVERY
11%  94%

Reviews

“I first visited Dr. McGettigan a year ago when I was diagnosed with sleep apnea. He was great with talking through my different options with...
Would you like to send your diagnosis and medical history?

- Yes
- No

Cancel Request
Thank you! You will receive a call with possible appointment times.

Return to Menu
Welcome, Emily!

- My Health
- Diagnose
- Treatment Options

Not you?
Prototype in Action