Driving Analytics to the Point of Care

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April 12, 2017

New England Nursing Informatics Consortium
Driving Analytics to the Point of Care

A Joint Program Offering
Conflict of Interest Disclosure

Mark D. Sugrue, MSN, RN-BC, FHIMSS, CPHIMS has no real or apparent conflicts of interest to report.
Objectives

- Discuss cognitive computing and artificial intelligence as methods for enabling decision making at the point of care.
- Explore the importance of capturing health and care data in a structured way to achieve clinical outcomes measurement.
- Discuss natural language processing and its future role in nursing documentation.
• Introduction/Definitions
• Historical Perspective
• Data & Analytics Today
• Applied Analytics
• Closing Thoughts
Analytics is the discovery and communication of meaningful patterns in data.

Wikipedia
The theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
Data: The Foundation

Nelson’s: Data to Wisdom Continuum

Data
- Naming collecting
- Organizing

Information
- Organizing, Interpreting

Knowledge
- Interpreting, Integrating
- Understanding

Wisdom
- Understanding, applying, Applying with Compassion

Increasing Complexity

Increasing Interactions and Interrelationships
A Look Back

Historical Perspective of Data and Analytics
By the time Florence left the Crimea in 1856, the conditions of the hospitals in Crimea improved drastically, with death rates dropping from 42% to 2%. The Russians were a minor enemy. The real enemies were cholera, typhus, and dysentery. Once the military looked at that eloquent graph, the modern army hospital system was inevitable.

Florence Nightingale, 1856
Suggested Reading.....beside Notes on Nursing

• *The Visual Display of Quantitative Information*

• Author Edward R. Tufte

• Best 100 Non-Fiction books of the 20th Century, Amazon.com
Dr. Codman’s “End Result System” began the medical outcomes movement in the US and led to the creation of the Joint Commission.
Evolution of Computing

1970-80s
- Mainframe Technologies

1990s
- Client Server Distributed Technologies

2000s
- World Wide Web (www) Technologies

2010s
- Transported Technologies (Anywhere, Anytime, Anyuser)
- Cloud Computing (OnDemand Metered Grid usage)

2020s
- Pervasive/Ubiquitous Computing (Embedding processor in every live object)
- Cloud & UbiComp
We believe a historic shift in technology has occurred.
Hidden Figures: Dorothy Vaughan
Fast Forward to the 21st Century

“BIG DATA” !!!!
How Target Figured Out A Teen Girl Was Pregnant Before Her Father Did

Data Today

- Ubiquitous
- The Internet of Things
- Privacy
- Social Media
- eCommerce
Healthcare Data and Analytics
EHR = Big Data?.... I Don’t Think So !!

If the average length of stay in a hospital is 4.8 Days

One Year in the Life of our Patients........

The other 360.2 Days !!
98.69%

Our EHR Data !!!
1.31%
“Healthcare data is getting bigger all the time, just look at EHRs alone: Medical records becoming electronic, with the ability to access vast amounts of data about patients and the health system, is increasing rapidly.

…..and when you start to combine that data with things like human resources, supply chain, characteristics of clinics and hospitals, provider training, reimbursement schemes – it just gets bigger.

When I was a graduate student, data was extensive and analysts were plentiful. Now, data is ubiquitous and the bottleneck is our analytic capacity.”
Reporting Maturity

- Descriptive Analytics
  - What happened?
- Diagnostic Analytics
  - Why did it happen?
- Predictive Analytics
  - What will happen?
- Prescriptive Analytics
  - How can we make it happen?

Value vs. Difficulty

Information → Hindsight → Insight → Optimization → Foresight

Gartner
Data: Drinking from the fire house!!
understanding the data deluge: comparison of scale with physical objects

1 megabyte
(A large novel)

1 gigabyte
(Information in the human genome)

1 terabyte
(Annual world literature production)

1 petabyte
(All US academic research libraries)

1 exabyte
(Two thirds of annual production of information)

A tiny ant
Height of a short person
Length of the Auckland Harbour Bridge
Length of New Zealand
Diameter of the Sun
Vast amounts of data that can have a great impact on our health remains.

IT IS ESTIMATED THAT

80%

OF CLINICAL DATA IS UNSTRUCTURED
Natural Language Processing

Soon... Many, Many Others....
Making Data Actionable

Applied Analytics
Lahey Health: Inpatient Influenza

69% → 98%

2015-2016 Performance Period

2016-2017* Performance Period
# MEWS (Modified Early Warning System)

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<th>3</th>
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<th>2</th>
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<tbody>
<tr>
<td><strong>Respiratory Rate per minute</strong></td>
<td>Less than 8</td>
<td></td>
<td></td>
<td>9-14</td>
<td>15-20</td>
<td>21-29</td>
<td>More than 30</td>
</tr>
<tr>
<td><strong>Heart Rate per minute</strong></td>
<td>Less than 40</td>
<td>40-50</td>
<td>51-100</td>
<td>101-110</td>
<td>111-129</td>
<td>More than 129</td>
<td></td>
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<tr>
<td><strong>Systolic Blood Pressure</strong></td>
<td>Less than 70</td>
<td>71-80</td>
<td>81-100</td>
<td>101-199</td>
<td></td>
<td>More than 200</td>
<td></td>
</tr>
<tr>
<td><strong>Conscious level (AVPU)</strong></td>
<td>Unresponsive</td>
<td>Responds to Pain</td>
<td>Responds to Voice</td>
<td>Alert</td>
<td>New agitation Confusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature (°C)</strong></td>
<td>Less than 35.0</td>
<td>35.1-36</td>
<td>36.1-38</td>
<td>38.1-38.5</td>
<td>More than 38.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hourly Urine For 2 hours</strong></td>
<td>Less than 10mls/hr</td>
<td>Less than 30mls/hr</td>
<td>Less than 45mls/hr</td>
<td></td>
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**EARLY WARNING SCORING SYSTEM FOR DETECTING ADULT PATIENTS WHO HAVE OR ARE DEVELOPING CRITICAL ILLNESS**

*IS THE SCORE FOR YOUR PATIENT 1-2? PERFORM 2 HOURLY OBSERVATIONS AND INFORM NURSE IN CHARGE*

*IS THE SCORE FOR YOUR PATIENT 3? PERFORM 1-2 HOURLY OBSERVATIONS AND INFORM NURSE IN CHARGE*

*IF THE MEWS SCORE IS DETERIORATING: THE WARD S.H.O. OR DUTY DOCTOR MUST ATTEND*

*IS THE SCORE FOR YOUR PATIENT 4 OR MORE? PERFORM OBSERVATIONS AT LEAST 1/2 HOURLY. ENSURE MEDICAL ADVICE IS SOUGHT AND CONTACT OUTREACH TEAM (see below)*
“Code Blue !!”

400 → 54

“Computer algorithm could aid in early detection of life-threatening sepsis”

- TREWS – Targeted, Real-time, Early Warning System
- Science Translational Medicine, August, 2015
- Combines 27 factors to assess patient risk
- Henry, Hager, Pronovost, Saria
John’s Hopkins

Better Medicine Through Machine Learning
Suchi Saria / Johns Hopkins University

Sepsis: Leading Cause of Death
- Very hard to identify
- Every hour counts

ML Allows Computers to Learn
- Teaching robots to walk
- Score each move
- Learn from others
- Get best possible score

What Do We Need?
- Smart engineers working in healthcare
- Open EHRs
- Quality based HC system

Targeted Real-Time Early Warning System (TREWS)
- Analyzes data from 1000s of patients using EHR
- Scalable
- Solving a small data problem
- Working 24/7
"Our methods are reaching a point where they can be a real aid to clinicians," Saria said, "especially in noticing subtle hints, buried deep in a chart, that a problem is developing."

"The tricky issue is thinking about how the clinical team is provided with the information," David Hager, MD said. A hospital’s electronic health records system could be set up to convey alerts to clinicians via pager or cellphone at regular intervals, he said.

"But we have to do this in a way that it is well-integrated into the existing clinical workflow and does not cause alarm fatigue," Saria said. That is the focus of ongoing study.
Alexa and Boston Children’s Hospital

‘Alexa, pull those lab results’: A hospital tries out virtual assistants
Florence Nightingale

“The real heroes are those who find a way to improve things around them through the course of their daily lives.

In the nursing industry, there are many heroes who leave fine imprints of positive change because they deliver exceptional care to patients than what’s expected of them.

Keep doing whatever you’re doing and you could be one of them.”
“In God we trust, all others must bring data.”

W. Edwards Deming
Thank You and Questions!!

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