Agenda

- Introduction
- Data Driven Medicine and Interoperability
- Case Studies
- Summary, Discussion, Q&A
Introduction
Global Healthcare Imperatives

- Create high value, sustainable health & care systems
- Enhance population health through empowered individuals
- Deliver safe, evidence-based care, efficiently & cost effectively
- Leverage information & technology
- Unleash innovation
Data-Driven Medicine and Interoperability
Data Driven Medicine

Today – well beyond tipping point of EHR installation

Challenges:
- interoperability “gaps”
- too much data, not enough information
- gaps in communication
- population health needs to happen where it matters

How do we…
- Get to what matters?
- Extract and deliver value from the electronic health records and systems?
- Keep promise to clinicians - “it will be worth it”
Personalized Population Health Management

Population health management takes place one patient at a time, in the context of a learning health system.
Patient

Physician

Hospital

Payer

Social service agency

Government

Pharmacy

Rehab

Child protective services

Home care agency

Pharma/device company

Senior center

Prison

Family

Laboratory

Genomics researcher

Nursing home

Ambulance

Schools
“People actively involved in their health and health care tend to have better outcomes – and, some evidence suggests, lower costs”

Health Affairs

“Importantly, the Government should be clear with the public that access to the NHS involves patient responsibilities as well as patient rights.”

Report to the House of Lords on the Long-term Sustainability of the NHS and Adult Social Care, April 2017

“Care should be provided by the most decentralized unit in the system: the patient. Policy makers should also invest in the development and diffusion of technologies that extend the patient’s capacity for self-care.”

Health Affairs http://content.healthaffairs.org/content/32/4/653.full.html
Data Driven Medicine: Data, Data and More Data

- Disparate data sources
- Structured & unstructured data
- Information overload vs. “What am I missing?”
- Expanding access to patient records
- Clinicians must consider increasing volumes of clinical research data
- Important information may be unstructured

“The volume of unstructured data present in most clinic-based systems is estimated at 80 percent and growing.”

Where can data be leveraged to make a difference?

- Providers and healthcare organizations need
  - Right information
  - At the right time
  - In the right format
- Provide relevant knowledge at the point of care
- Improve patient care delivery, increase efficiency
- Meet organizational goals and regulatory requirements
- Support population health initiatives
How do we enable providers to achieve these goals?

- Make it part of the normal workflow: Within the comprehensive community care record
- Provide relevant, actionable insight and value
- “Tell me something I didn’t know / need to know”
Case Studies
Leveraging Ontologies: Decision support when and where it counts

- Consolidated views of clinical data
- Building out clinical alerts (for gaps in care, missed procedures, vaccinations, labs, missing diagnoses, etc.)
- Clinical Inferences
Integration at Point-Of-Care
CliniGraphic Presentation: CHF
Clinical Inference: CHF

Losartan is commonly associated with CHF. Reported on 1-Sep-2015. Associated Symptom: Dyspnea was reported on 2-Sep-2015. Associated Symptom: Chest pain was reported on 15-Sep-2015. Natriuretic peptide B Ser/Plas MCnc Pt Qn value of 354 pg/mL on 16-Jan-2016. Natriuretic peptide B Ser/Plas MCnc Pt Qn value of 294 pg/mL on 13-Jan-2016. Natriuretic peptide B Ser/Plas MCnc Pt Qn value of 617 pg/mL on 22-Dec-2015. Left ventricular ejection fraction value of 35% was recorded on 8-Mar-2016. Left ventricular ejection fraction value of 20% was recorded on 5-Dec-2015. Left ventricular ejection fraction value of 25% was recorded on 1-Oct-2015.

Confirm Inference  Refute Inference
Ontological Reasoning

Ontologies allow software to summarize data and understand how the different pieces relate to one another.

- **Patient**
  - **Problems**: Congestive heart failure, Acute congestive heart failure
  - **Meds**: Losartan
  - **Labs**: Ejection Fraction
  - **Observations**: Atrial Flutter

- **Has symptom**: Congestive heart failure
- **Measured by**: Ejection Fraction
- **Treated with**: Losartan
- **Rolls up to**: Congestive heart failure
Ontological Reasoning

- InterSystems
- © 2016 InterSystems Corporation. All Rights Reserved.
Inferences leverage patient information, ontologies and logical reasoning to look for patterns of interest.

- **IF**
  - Type 2 Diabetes Mellitus
  - Hemoglobin A1c
  - Sulfonylurea

- **AND**
  - is not present
  - is greater than 7%
  - is present

- **THEN**
  - Patient may be undocumented diabetic
Healthix

Largest Public Health Information Exchange in the US
Knowing Where to Focus

Predictive risk models

Intervention cohorts

16 million patient records
### PATIENT PROGRAMS

<table>
<thead>
<tr>
<th>Fitness Challenge</th>
<th>Exercise Tracking for Overweight Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Healthy Nutrition</td>
<td>Nutrition Info for HTN Patients</td>
</tr>
<tr>
<td>HTN and Uncontrolled BP</td>
<td>Patients with HTN and Uncontrolled BP</td>
</tr>
</tbody>
</table>

### MEDICATIONS

<table>
<thead>
<tr>
<th>Medication</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrochlorothiazide 25mg</td>
<td>11/23/2015</td>
</tr>
<tr>
<td>Lipitor 10mg</td>
<td>11/23/2015</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>10/18/2015</td>
</tr>
<tr>
<td>Lisinopril-GA tablet 10mg</td>
<td>05/04/2015</td>
</tr>
<tr>
<td>Multivitamin</td>
<td>07/20/2012</td>
</tr>
</tbody>
</table>

### LABORATORY RESULTS

<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipid Profile</td>
<td>02/21/2016 16:00</td>
</tr>
<tr>
<td>Fasting Plasma Glucose</td>
<td>02/21/2016 16:00</td>
</tr>
<tr>
<td>HgA1C</td>
<td>02/21/2016 16:00</td>
</tr>
<tr>
<td>Lipid Profile</td>
<td>11/23/2015 11:00</td>
</tr>
<tr>
<td>HgA1C</td>
<td>11/23/2015 11:00</td>
</tr>
</tbody>
</table>

### PATIENT RISK

- Inpatient Admission: 3
- Emergency Visit: 47
- Diabetes: 32
- AMI: 0

### DOCUMENTS

- ER Visit
- Routine Visit
- ER Visit
- ER Discharge
- Ortho Consult

### DIAGNOSES

- Acute: Viral illness, Chest pain
- Chronic: Low back pain, Disorders of Lipid Metabolism
- Allergic Rhinitis
Elevated risks highlighted in red

- **47% likelihood of ED visit in next 12 months**
- **32% likelihood developing diabetes in next 12 months**
516,257
Clinical event notifications in January 2017

15% → 85%
Patient engagement rates in one IDN
Northwell Health

14th largest healthcare system in the U.S.
Care Tool
Patient-centered care management service model

- Clinical resource specialist
- Social worker
- Nurse care manager
Risk stratification

Initial care management programs should be targeted to people with **multiple disease conditions**, who are at **high-risk for unnecessary care**, and who have the greatest opportunity for reducing health care costs.

- **Top of the Pyramid**
  - ≥2 chronic conditions in an advanced state with functional impairment
  - Provide both curative and comfort care to patients at home and in the community to patients with 18-36 months to live.

- **Advanced Illness**
  - >1 chronic (incurable, but controllable) conditions
  - Provide proactive disease management to maximize quality of life and postpone complications.
  - Services typically provided for a minimum of 12 months, and can continue for decades.

Rule-based system
Coordinate My Care

Redesigning Urgent Care for Serious Illness
Conversation

Documentation

Communication
“With an urgent care plan, you’ll get your care, your way.”

Clinical Nurse Specialist

Start your CMC Plan
If you're ready to start creating your plan click here:

View your CMC Plan
If you already have a CMC plan, you can view and update it here:

Email address
Please enter your username

Password
Please enter your password (required)
25,000+ Care plans created

79% Died in their place of choice

£23.3M Cost savings
Summary
Actionable insight from patient data

UNCOVER undiagnosed patient conditions / undocumented diagnoses
BROADEN the circle of knowledge
IMPROVE information available to care providers
EXPAND information for population health efforts
- Quality improvement, gaps in care, etc.
- Disease registries
- Care coordination
AVOID unintended consequences

27.8% US diabetics Undiagnosed
Cost: $2864/pp/yr
THANK YOU!