Health Care at Scale

2017 and Beyond
Toward a Healthy Population

Social Determinants of Health

Employers

Community

Payors

Government

Personal Responsibility

Medical Care

GAP
Exhibit 1. Health Care Spending as a Percentage of GDP, 1980–2013

Notes: GDP refers to gross domestic product. Dutch and Swiss data are for current spending only, and exclude spending on capital formation of health care providers.

Source: OECD Health Data 2015

Cost Cutting

Expenses vs. Time

Graph shows the relationship between expenses and time.
Understanding Disruptive Redesign

Investing Ahead of Revenue
Waste
35-50% of Health Care Spend

• Inefficiencies in producing units of care (5%)
• Unnecessary or suboptimal use of care (50%)
• Cases within a patient population that are unnecessary or preventable (45%)
Changing Revenue Streams

<table>
<thead>
<tr>
<th>Year</th>
<th>FFS</th>
<th>FFS + Qual</th>
<th>SS</th>
<th>PMPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Volume to Value

New contracts will pay us to keep people healthy, not for “seeing them”

Equity is moving from volume to attribution
Clinically Integrated Network (CIN)

Population Management

Medical Neighborhood

Specialty Care

COMMON CARE PATHS

Attribution
Quality metrics
PMPM / Total Cost of Care
Risk / Capitation

Referred Patients/ Service Provider
Affordable and Differentiated
Volume /Episodes / Bundles
Transactional
Medical Neighborhood: Tools to Leverage

We must leverage:

Bricks & Mortar
- On site care
- Curbside consults
- Express Care
- Chronic Ds Clinics

Distance Health

EMR
- eConsults

HET
- Asynchronous consultation

Navigation
- Email, coordination of care
Guiding Principles

All patients will be cared for with the highest standards of:

Quality and Safety
Experience
Access
Affordability

Regardless of the method of reimbursement
When Times Change, Change your Business

• New organizational space for disruptive innovations and new business units to thrive
  - Old organizational boundaries impede creativity
  - New teams entirely dedicated to new tasks

• Preserve the success of existing model while gaining market relevance by creating a new one
  - Two businesses with appropriate priorities, processes and resources: one geared to the present and one to the future

• Evolving cost and reimbursement structures
  - Analog to Digital/Virtual
Health Care at Scale

• Team Sports
  - Team Play and Practice (Blocking and Tackling)
  - Shared Responsibility and Accountability
    • Individualized and shared Metrics

• Manufacturing
  - High Reliability – Quality and Safety
  - Standardization – Care Paths
  - Cost – Efficiencies
  - Adoption and Innovation of Technology

• Retail
  - CRM
  - Enrollment / Attraction / Propensity
  - Segmentation and Stratification / Prediction
  - Access - Experience - Loyalty
Health Care at Scale

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## Clinical Areas Inherent to Population Management

<table>
<thead>
<tr>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Medicine / Family Practice</td>
</tr>
<tr>
<td>General Pediatrics</td>
</tr>
<tr>
<td>Wellness</td>
</tr>
<tr>
<td>Express Care</td>
</tr>
<tr>
<td>Ambulatory Primary Care Nursing</td>
</tr>
<tr>
<td>Chronic Disease Clinics</td>
</tr>
<tr>
<td>Nurse on Call</td>
</tr>
<tr>
<td>Ambulatory Care Coordination</td>
</tr>
<tr>
<td>Ambulatory Pharmacist</td>
</tr>
<tr>
<td>Connected Care Practitioners</td>
</tr>
<tr>
<td>EHP</td>
</tr>
<tr>
<td>CMP</td>
</tr>
<tr>
<td>Quality Alliance</td>
</tr>
<tr>
<td>Nutrition</td>
</tr>
<tr>
<td>Outpatient Behavioral Health</td>
</tr>
</tbody>
</table>
Health Care at Scale

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Cleveland Clinic Care Pathways

Evidence based care and Structured documentation

Health status measures

Process / alerts

Cost

Patient satisfaction

Quality, Experience and Affordability
Care Path Development

- Organized around a Medical Condition
  - Standardized Approach over Time, Venue and Provider
  - Tie together Outcomes, Process, Costs and Patient Experience
  - Embed and enabled within the EMR
Care Path Development

• Build Lessons
  - Multidisciplinary
  - Base Case Costing
  - Productivity
    • Efficiency/Standardization/Technology - Automation
    • Case Management / Care Coordination / Navigation
  - Tool for Cultural Change / PI
Care Paths

131 Developed
Care Path Results

- Proven reduction in clinical variation
  - Decreased Utilization of Testing
  - Decreased LOS and Post Acute Use
  - Increased Capacity and Efficiency
- Identification of Cost opportunity
- Increased Shared Savings
- True Disease Process and Outcome Measures
- Reduction of Direct Revenue in a FFS Market
Low Back Pain Care Path Implementation

- Pilot at Twinsburg and Strongsville FHC
  - Allow natural disease progression to take its course (avoid intervention unless necessary)
  - Reduced imaging, narcotics
  - Appropriate provider type by phase of care (shift to lower cost providers where appropriate)
  - Critical to understanding workflow and implications of implementation and change
mRS at Discharge

Pre Stroke CarePath

mRS 0-1 – 26%

mRS 2-6

13% INCREASE in mRS of 0-1

Post Stroke CarePath

mRS 0-1 – 39%

mRS 2-6
Observed Mortality Rate
Ischemic Strokes
Health Care at Scale

- Team Sports
  - Team Play and Practice (Blocking and Tackling)
  - Shared Responsibility and Accountability
    - Individualized and shared Metrics
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Stratifying our Patient Population

- Clinical
- Billing
- Claims

Healthy

Rising Risk

High Risk
Stratifying our Patient Population

Clinical
Billing
Claims
Behavioral
Social
Functional

Healthy
Rising Risk
High Risk
Holistic Patient Care View

[Diagram showing a patient-centric approach with four quadrants: Medical, Cognitive and Behavioral, Functional, and Social.]

Patient Centric
<table>
<thead>
<tr>
<th>Biomedical</th>
<th>Functional</th>
<th>Psych / Behavioral</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comorbidities</td>
<td>Promis 10</td>
<td>Mini Cog</td>
<td>Marital status/Care partner</td>
</tr>
<tr>
<td>Admitting service</td>
<td>Health literacy impairment</td>
<td>Psychiatric comorbidities</td>
<td>Insurance type</td>
</tr>
<tr>
<td>Labs</td>
<td>PM&amp;R consult</td>
<td>PHQ9</td>
<td>Medication access issues</td>
</tr>
<tr>
<td>Vitals</td>
<td>Hospice referral</td>
<td>Alcohol/drug abuse</td>
<td>Transportation barrier</td>
</tr>
<tr>
<td>No. of meds, high risk meds</td>
<td>Discharge disposition</td>
<td>Psychiatry consult</td>
<td>Employment status</td>
</tr>
<tr>
<td>Previous utilization</td>
<td>6 clicks score</td>
<td></td>
<td>Disability status</td>
</tr>
<tr>
<td></td>
<td>Nutritional status</td>
<td></td>
<td>Social Media / Income</td>
</tr>
<tr>
<td></td>
<td>Fall risk score</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Italicized = for future inclusion & evaluation*
**MEDICAL**

### Recent Vitals

<table>
<thead>
<tr>
<th>Date</th>
<th>BP</th>
<th>Weight</th>
<th>Height</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/27/2016</td>
<td>130/78</td>
<td>97.5 kg (215 lb)</td>
<td>172.7 cm (5' 8&quot;)</td>
<td>32.89</td>
</tr>
<tr>
<td>2/9/2017</td>
<td>120/81</td>
<td>97.5 kg (215 lb)</td>
<td>-</td>
<td>30.06</td>
</tr>
<tr>
<td>6/9/2017</td>
<td>136/83</td>
<td>96.5 kg (212 lb)</td>
<td>166.3 cm (5' 6&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

### Recent Visits

<table>
<thead>
<tr>
<th>Date</th>
<th>Provider</th>
<th>Department</th>
<th>Primary Dr</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/05/2017</td>
<td>Nirmal Vakharla</td>
<td>Internal Medicine Main Campus</td>
<td>Prostatic muscle weakness</td>
<td>Neuropathy due to type 2 diabetes mellitus (HIC)</td>
</tr>
<tr>
<td>03/06/2016</td>
<td>Nirmal Vakharla</td>
<td>Internal Medicine Main Campus</td>
<td>DKA (diabetes on another)</td>
<td>OxyChemotho</td>
</tr>
<tr>
<td>08/21/2016</td>
<td>Nirmal Vakharla</td>
<td>Internal Medicine Main Campus</td>
<td>Dyspnea and respiratory abnormalities</td>
<td>CVD (peripheral vascular disease) (HIC)</td>
</tr>
<tr>
<td>08/28/2016</td>
<td>Nirmal Vakharla</td>
<td>Internal Medicine Main Campus</td>
<td>Type 2 diabetes mellitus with diabetic polyneuropathy (HIC)</td>
<td>PAD (peripheral arterial disease) (HIC)</td>
</tr>
</tbody>
</table>

### BEHAVIORAL

**PHQ Questionnaire**

- **Office Visit from 1/30/2016 in Internal Medicine Main Campus**
- **PHQ-9 Score**
  - 5 (a full depression screening is warranted)
- **Thoughts that you would be better off dead, or of hurting yourself in some way?**

### SOCIAL

#### Demographics and Employment

<table>
<thead>
<tr>
<th>City/State</th>
<th>Insurance</th>
<th>Marital Status</th>
<th>Employment Status</th>
<th>Occupation</th>
<th>Employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEVELAND, OHIO</td>
<td>HUMANA MEDICARE</td>
<td>Married</td>
<td>Retired</td>
<td></td>
<td>OHIO BROACH &amp; MACHINE</td>
</tr>
</tbody>
</table>

#### Vision/Hearing Impairments

- **No Show Percent**: No Shows: 0% (19/195)

### FUNCTIONAL

#### Pain Score

<table>
<thead>
<tr>
<th>Date</th>
<th>Office Visit from 2/24/2017 in Internal Medicine Main Campus</th>
<th>Visit (SP) Office from 12/05/2016 in Hematology/Oncology</th>
<th>Office Visit from 6/9/2016 in Pulmonary Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you having pain?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pain Score</td>
<td>2/10</td>
<td>2/10</td>
<td>2/10</td>
</tr>
</tbody>
</table>

#### Fall Risk

<table>
<thead>
<tr>
<th>Date</th>
<th>Office Visit from 2/9/2017 in Internal Medicine Main Campus</th>
<th>Visit (SP) Office from 12/05/2016 in Hematology/Oncology</th>
<th>Office Visit from 11/9/2016 in Pulmonary Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you had 2 falls in the past year or 1 fall with injury?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Patient Generated Data (PGD)

- **PED** - Electronic, EMR agnostic patient generated history, HSM, quality and safety data which are both generic (function and mood) and disease specific
- **PBD** - Biometric, physiologic, functional
- Paper, my chart, mobile devices or fixed HW
- Discrete, searchable and associated with or decoupled
## Examples of Risk Factor-Driven Interventions - Automation

<table>
<thead>
<tr>
<th>Moderate Clinical Risk</th>
<th>High Clinical Risk</th>
<th>High Clinical Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Socioeconomic Risk</td>
<td>Low Socioeconomic Risk</td>
<td>Low Socioeconomic Risk</td>
</tr>
<tr>
<td>Moderate Frailty Risk</td>
<td>High Frailty Risk</td>
<td>High Frailty Risk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Care Coordination Enrollment</th>
<th>Home Visits by NP’s or Internists</th>
<th>Frequent Clinician Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Work</td>
<td>Frequent HF Clinician Visits</td>
<td>LVAD and Transplant Education</td>
</tr>
<tr>
<td>Home Evaluation</td>
<td>Outpatient Goals of Care Planning</td>
<td>Aggressive Escalation of Therapy</td>
</tr>
<tr>
<td>Community Coaching</td>
<td>Assessment of Rehab Potential</td>
<td>HF Education Programs</td>
</tr>
<tr>
<td>HF education Programs</td>
<td>Palliative Care Co-Management</td>
<td></td>
</tr>
<tr>
<td>Quarterly HF Clinician Visits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Better Understanding of Behavior

• Capabilities
• Needs / Goals
• Choice
• Enablement / Incentives/ Rewards
• Loyalty
Segmenting Patient Access by Attitudes, Behaviors, & Needs

1. Convenience Seeker
2. Juggling Health & Work
3. Frequent Flyer
4. Doctor Knows Best
5. Consistent Customer
6. Experience-Driven Decider
7. Disengaged Family
## Summary of Key Characteristics & Solution Sets

<table>
<thead>
<tr>
<th>Segment</th>
<th>% of Gen. Pop.</th>
<th>Key Characteristics / Needs</th>
<th>Potential Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience Seekers</td>
<td>10%</td>
<td>• No convenient locations&lt;br&gt;• Need help navigating to right place</td>
<td>Education on access options relative to condition; telmed./tech-enabled access</td>
</tr>
<tr>
<td>Juggling Health &amp; Work</td>
<td>17%</td>
<td>• Low PROMIS10 w/ some clinical risk&lt;br&gt;• No loyalty, randomly access care&lt;br&gt;• Least satisfied with access routes</td>
<td>Tech.-enabled navigation to access pt.; work proximate access points</td>
</tr>
<tr>
<td>Doctor Knows Best</td>
<td>22%</td>
<td>• Low barriers to care&lt;br&gt;• Prefer in-person encounters</td>
<td>Standard access with health mgt. for higher risk sub-population</td>
</tr>
<tr>
<td>Frequent Flyers</td>
<td>11%</td>
<td>• Tech-averse&lt;br&gt;• High need patients&lt;br&gt;• ED frequent flyers&lt;br&gt;• Financial barriers</td>
<td>ED &amp; re-admit avoidance strategies; early signs education</td>
</tr>
<tr>
<td>Consistent Care</td>
<td>18%</td>
<td>• Healthier &amp; engaged&lt;br&gt;• Less convenience driven</td>
<td>PCP engagement strategies with concierge wrap around services</td>
</tr>
<tr>
<td>Experience-Driven Deciders</td>
<td>20%</td>
<td>• Experience driven decision making&lt;br&gt;• Well-managed health&lt;br&gt;• Physician loyal</td>
<td>Front-end process optimization; enhanced experience</td>
</tr>
<tr>
<td>Disengaged Families</td>
<td>10%</td>
<td>• Younger families&lt;br&gt;• Low needs&lt;br&gt;• Less engaged (PCP visit)&lt;br&gt;• Not loyal</td>
<td>Express / convenient clinics near work; tech. enabled access solutions</td>
</tr>
</tbody>
</table>
And Then ...

- Patient Biometric Data
- Public and Commercial
- Genetic
Let's solve this problem by using the big data. None of us have the slightest idea what to do with.
Realizing the Value (and Profitability) of Digital Health Data

David Blumenthal, MD, MPP

As clinicians click and tap at their electronic health records (EHRs), they may be unaware that they are fueling a huge public and private enterprise that will turn their patients’ digitized health data into enormously valuable—and potentially profitable—new products. All those patient reports, physical findings, problem lists, medication lists, and laboratory and imaging tests will not remain confined on local servers forever. Instead, once ethical, technical, and legal issues are resolved, those data will be sucked into cloud-based test beds, where machine learning and artificial intelligence will refine them into software algorithms that create vast new clinical capabilities. For the first time in human history, the global clinical experience of the health professions and their patients will be available to examine and repurpose in nearly real time to make clinicians smarter and people healthier; this all starts humbly with a harried health professional, a keyboard, and a patient.

The process of transforming raw electronic data into useful clinical products is neither straightforward nor inexpensive. Technologists, legislators, and lawyers must find ways to protect patients’ rights to their own information as well as their privacy and security. Technical methods for standardizing, aggregating, searching, and exchanging data must be improved. Machine learning and artificial intelligence are in their infancy. New algorithms must be validated in clinical experiments and then integrated into EHRs for daily application.

For-profit health care delivery systems likely will create products based on their own data warehouses. Academic health centers, with their deep benches of talented, computer-savvy young physicians, are well-positioned to spin off software companies that turn EHR data into useful clinical tools.

One way to think about the troves of digital health data now accumulating is as a new natural resource. To be useful, that resource must be extracted, transported, and refined. In the United States, we typically leave it to the private sector to exploit such resources. Private industry then recoups its investment plus a profit through sales in private markets. The same pattern likely will prevail in the digital health sector.

At the same time, the new digital health resources have unique attributes that must be addressed if we are to allow private markets to commercialize and distribute the resulting products. First, electronic health data are created not by anonymous physical forces but by human effort—in this case, the work of frontline clinicians. The federal Health Information Technology for Economic and Clinical Health (HITECH) Act rewarded some health professionals and hospitals for installing EHRs and accomplishing their meaningful use. Incentives under the Medicare and CHIP (Children’s Health Insurance Program) Reauthorization Act of 2016 (MACRA) continue to provide modest financial benefits for physicians who record and share their patients’ clinical information electronically (5). However, whether these programs adequately compensate individual cli-
Visualizing Readmission Risk

### Pt variables contributing to increased readmission risk

- **20** Most Recent BUN Result
- **17** Active Medication Orders
- **8.7** First Resulted Calcium During Admission
- **1** Previous ED Visit (6 mos.)
- **1** Number of Previous ED Visits (6 mos.)
- **1** Insurance - Medicare
- **1** History of Anemia
- **1** History of Chronic Kidney Disease
- **1** Active Anticoagulant
- **1** Barriers to Health Literacy Identified
- **1** Number of Hospitalizations (12 mos.)

### Attending Provider: Edward O Boleusz

Allergies: Amodarone, Nitroglyn (Nitroglycerin), Cipro (Ciprofloxacin)

Isolation: CONTACT CDIF
Infection: None
Code Status: Not on file

### Acuity Trending (Last 168 hours)

![Acuity Trending Graph]

Last Filed Score: 55
Current Score: 55

03/01/17 02:26

Grid Interval: 24 hour(s)
One Year Mortality
Jan - Jun 2016 CCHS Discharges (n=71033)
Actionability

• Predict
• Prescript
  - Automate
• Personalize
• Prevent
TECHNOLOGY
Distance Health/Digital Toolbox –

- eConsult
- eHospital
- Tele Stroke
- Physician
- Patient
- Secure Audio
- Text
- Synchronous Video
- Image /Photo
- Device output
- Transfer
- myConsult
- Tech Service Bar
- AI-assisted Triage
- Remote Patient Monitoring
- Apps
- eVisits
- Virtual SMAs
- myChart
- Patient Engagement
- Physician
- Physician
- Chronic Disease Management
- eEpic
- HealthKit
- myConsult
- Tech Service Bar
Orchard of Apps

- Concussion
- MS Performance
- Parkinson's Assessment
- Cognitive & Motor Training
- Spine
- Sleep
- Epilepsy
MyHealth: Spine

FOR PATIENTS
- Patient Login

Dashboard
- About My Spine
- Exercises
- Incident Journal
- My Reports
- Contact the Clinic

About Your Spine
The Basics of Back Pain

Ninety percent of American adults will experience an episode of back pain during their lifetime. Back pain is the second most common reason people visit their family physician (just behind upper respiratory infections). On any given day, almost four percent of the entire United States workforce is disabled by back pain. In people under 40 years of age, back pain is the most common reason for disability to perform daily activities.
Interoperability
Health Care IT

• 2009 Health Information Technology for Economic and Clinical Health Act (HITECH)
  • “Meaningful Use”
  • 34 Billion for promotion and purchase of EHRs by government
  • 8 years latter still no usable IT engine for high quality data

• 21st Century Cures Act
  • Requires EHRs to have APIs that allow health information to be accessed, exchanged and used without “special effort”

• Programs predicated on interoperability but lacked necessary incentives and penalties to produce it.
Health Care IT Needs

• Uniform, open, standardized health care API that would allow substitutable “plug and play” apps
  – Fast Health Care Interoperability Resource ((FIHR) standards
  – App stores for Health Care
Tools and Touches

- EMR
- Care Paths
- PGD
- Care Coordination
- Navigation
- Hours, frequency
- Locations
- SMAs
- Virtual
- Technology
- Retail

Touch
$$

High Touch
$$$$$$

Different Touch
$
Macro changes and their Implications

• **Economics**
  
  New contracts will pay us to keep people healthy, not for “seeing them.” Attribution is the new capital.

• **Digitalization**
  
  • Data is the new currency.
  • Integration and Interoperability of data sources and technology
  • Segmentation and Stratification of Populations
    • Prediction, propensity, prescription and personalization

• **Work Place Culture**
  
  Disruptive Innovation
  Relationship base balanced with Automation and Technology
  Equalization of the Team / Patient Engagement
  Legacy and Innovation
The Challenge
Take Aways

- Movement from FFS / events to populations / capitation
- Standardization and Measurements
- Equalization of the Care Team
- Data
- Solutions versus Tools
- Integration and Interoperability of data sources and technology
- Segmentation and Stratification of Populations
  - Prediction, propensity, prescription and tailored design of intervention
- Relationship based balanced with Automation and Technology
- Partnerships
- Legacy / Innovation