NC HIMSS

Utilizing a Data Strategy to drive the Analytics Program at Massey Cancer Center

May 3, 2017
Abstract

Hear a case study from the Massey Cancer Center on utilizing a data strategy to drive their analytics program; example outcomes include gathering the data needed to make the case for creating, sustaining and expanding palliative care services. Many healthcare organizations struggle with palliative care. By using data and analytics, palliative care programs can grow and advance. This case study will highlight using analytics to improve outcomes, improve care delivery, and reduce costs. We conclude the presentation with a retrospective look at applying the newly developed HIMSS Adoption Model for Analytics Maturity (AMAM) to the Massey case study. This will help to further introduce the AMAM to the HIMSS membership and provide another dimension for reviewing the case study approach.
Session Presenters

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Associate director, cancer informatics core
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Data & Analytics Practice Lead
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About Massey Cancer Center

❖ NCI Designated Cancer Center
❖ Associated w/ Virginia Commonwealth University Healthcare System
❖ Multidisciplinary Care
❖ Clinical Trials
❖ Bone Marrow Transplant Center
❖ Nationally Recognized Palliative Care Program

15,000 PATIENTS
2,600 SURGICAL PROCEDURES
44,900 CANCER TREATMENTS
160 BONE MARROW TRANSPLANTS
450 CLINICIANS & 200 RESEARCHERS
Developing Analytics at Massey

- Crawl, Walk, Run Approach
- Data Strategy enabled re-use and scale
- Use case driven solutions
- Ad hoc analyses key for research
- Cancer center leadership support

Operating Model
- Demand mgmt. / Engagement model
- Deliver value / Mature

Develop Strategy
- Comprehensive approach
- Roadmap development

Organic Start
- Develop manual analytics process
- Use case driven

No Infrastructure
- No existing data platforms
- Limited data sources

Unanswered Questions
- Patient outcomes
- Financial performance
Massey's Analytics Solution

**MDAS Supports:**

- Clinical inquiry and reporting
- Operational reporting
- Research inquiry
- Outreach efforts
- Financial reporting
- Maps
- Business development

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**VCUHS Internal Data Sources – linkable at patient level**

- **US Census Population Data**
- **Outpatient Pharmacy DB**
  - Drug Utilization Details
- **Appointment data**
  - From IDX, actual vs. scheduled
- **Hospital billing claims**
  - IP & OP encounter data
  - Cost, charge, reimbursement, & utilization data
  - ICD-9 diagnosis, CPT procedure, UBC revenue codes
- **Physician billing claims**
  - IP & OP encounter data
  - Utilization & charge data
  - ICD-9 diagnosis, CPT procedure codes
- **Massey's Data & Analytics System (MDAS)**
  - Sponsorship: Massey’s Data & Analytics System (MDAS)
  - Source: Massey’s Data & Analytics System (MDAS)
  - Institution: Massey’s Data & Analytics System (MDAS)

**External Data Sources**

- **Social Security**
  - Dates of death
  - Linkable to VCUHS data
- **Bone Marrow Transplant DB**
  - Clinical data on donors & recipients
- **VCU Cancer Registry**
  - Site, stage, pathology details
  - Initial Treatment
- **Palliative Care Program**
  - Consultations / encounters
  - Reason, place, disposition
- **Public Health Data**
  - BRFSS
  - SEER
  - VCR
  - Vital Statistics
- **UHC**
  - IP data for Academic Medical Centers
  - ICD-9, CPT, DRG codes, costs, LOS, mortality, re-admits
- **Intellimed / VHHA / Truven**
  - IP data for VA, NC, MD hospitals
  - Can expand to other states as well (AHRQ-HCUP)

---

**Internal Data Sources – linkable at patient level**

- **VCU Patient Satisfaction**
  - Clinical data on patients
- **Bone Marrow Transplant DB**
  - Clinical data on recipients
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**Clinical EMR systems**

- Lab & chemistry results
- Patient height, weight, BMI
- Orders and prescriptions
- Radiation doses and tissues treated

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Broad View of Data and Analytics

**Data discussions with 200+ organizations**
- Healthcare; Financial Services; Supply Chain Mgmt.; Non-profit; Government

**Common patterns**
- Challenges
- Solutions
- Missteps

**Repeated behaviors of data-driven organizations**
- Business focused data needs
- Comprehensive solutions – people, process, data, culture & technology

**Trends**
- Industry-specific data & analytics maturity models
- Industry-specific data sharing exchanges – “Rising tide lifts all boats”
Repeating Pattern: What Analytics Often Looks Like

- Not scalable
- Difficult to validate results
- Difficult to collaborate
- Increased “data wrangling” costs
- Compliance & security challenges when PHI involved

Source: Data Blueprint: www.datablueprint.com
The Good and the Bad

**Good Data Practices**

- **Identify your most important data**
  - Don’t just collect all the data, segment the most important data.

- **Get data correct the first time**
  - “The quality of data is fixed at the moment of creation. But we don’t actually judge that quality until the moment of use.” Dr. Tom Redman

- **Connect data creation & consumption**
  - Data consumption needs drive data creation rules. Data-driven org’s proactively manage data lineage.

- **Strategy & Leadership**
  - How data are used – e.g. Context – matters a lot when defining the data.

**Bad Data Practices**

- **Thinking about Data as an IT Problem**
  - Results in non-value added solutions. “data for data sake”

- **“Find & Fix” Data Quality Issues**
  - It’s a losing battle. Limited ROI & not sustainable. Long term value must focus on solving root cause issues.

- **Shadow Data Solutions**
  - Happens when there is a lack of trust in the data. Result: death by a 1000 cuts and lose control of the data.

- **No data ownership or strategy**
  - Data efforts must be coordinated. Data-driven agencies require senior leadership, thinking & planning.
Data Strategy Framework

HEALTHCARE NEEDS
Mission & Values | Operating Model | Strategic Goals | Performance Measures (KPI’s)

DATA NEEDS
Roles & Accountability | Processes | Culture | Data | Technology

Starting Point

SOLUTION DESIGN
Strategic Imperatives | Gap Analysis | Target End State

BUSINESS VALUE

ROADMAP & PLANS
Milestones | Est. Budget & Time | Benefit Measurement | Project Plans

NEW DATA CAPABILITIES

Impactmakers
Massey’s Data Strategy for Analytics

Business Needs
• Bone Marrow Transplant Center
• Palliative Care
• Service line performance
• Supporting research

Data Needs
• Data & analytics infrastructure
• Governance & engagement processes
• Resources, skills & experience
• Org. Adoption of a new capability

Engagement Model
• Establish engagement lifecycle
• Design processes and standards
• Templates, tools, SLAs

Develop an Analytics Capability
• Design & build the infrastructure
• Source data and manage lineage
• Deliver data and analytical results

Capability Roadmap
• Document dependencies, timelines
• Identify core data integration points
• Prioritize and commit to features

PROGRAM MANAGEMENT
Example Case: Palliative Care integrated with cancer care

- 49 yo female diagnosed with stage IV NSCLC (brain mets) develops severe nausea/vomiting & vertigo 4 months into treatment.

- Aggressive management of symptoms in supportive care clinic allowed her to improve & continue with cancer treatment while avoiding admission.

- Followed concurrently in supportive care clinic & MedOnc clinic.

- Currently she is alive on home hospice, 20 months after diagnosis and 16 months after first PC visit.
### Remarkable range of positive outcomes achieved through Palliative Care

<table>
<thead>
<tr>
<th>Study</th>
<th>Description</th>
<th>Improved Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabow Arch Intern Med 2004, JPSM 2003</td>
<td>PC in primary care clinic for late-stage COPD, CHF, Ca patients</td>
<td>dyspnea, anxiety, spiritual well-being, sleep quality, satisfaction with care</td>
</tr>
<tr>
<td>Temel NEJM 2010 / JPM 2016</td>
<td>Outpatient PC for late-stage NSCLC patients</td>
<td>survival, quality of life, depressive symptoms</td>
</tr>
<tr>
<td>Brumley JAGS 2007 (see also Cassel Kerr Johnson Hoefer JAGS 2016)</td>
<td>Home-based PC for home-bound patients with Ca, CHF, COPD</td>
<td>satisfaction, at-home deaths, fewer ED visits and hospitalizations</td>
</tr>
<tr>
<td>Lukas JPM 2013</td>
<td>Home-based PC for patients with advanced complex illness</td>
<td>Fewer hospitalizations, lower costs, fewer 30-day readmissions</td>
</tr>
<tr>
<td>Bakitas JAMA 2009 (ENABLE II)</td>
<td>Psychoeducational sessions for patients with advanced cancer</td>
<td>quality of life, depressive symptoms</td>
</tr>
<tr>
<td>Bakitas JCO 2015 (ENABLE III)</td>
<td>Tele-health psycho-educational sessions for patients with advanced cancer</td>
<td>Survival</td>
</tr>
</tbody>
</table>

Cost-avoidance in drugs (-77%), labs (-95%), imaging (-95%), supplies (-60%).
So what’s the problem?

**Palliative Care Challenges**

- **Insurance**
  - Unlike hospice, no dedicated insurance benefit or specific revenue stream

- **Cost Avoidance**
  - Reduce costs for hospital in context of case-rate payments for admissions

- **Multi-disciplinary teams**
  - Require more funding than clinical revenue can cover
PC programs struggling to prove their outcomes

Overcoming the Challenges at Massey

❖ Start by understanding what questions need to be answered
❖ Take a crawl, walk, run approach
❖ Think and plan strategically about data solutions
❖ Understand the current environment – what to leverage and gaps to close
❖ Implement foundational data management capabilities for scalability and repeatability
❖ Make solutions easy to use – integrate into workflows
Massey’s Palliative Care program was in trouble

- VCU Massey opened one of first Palliative Care Units in the nation in May 2000.
- Consultants recommended closing it in 2002 because PCU cases cost a lot more than reimbursement.
- Detailed financial analyses of PCU patients, compared to other EOL admissions, convinced consultants that the unit produced significant cost-reduction.
- Unit stayed open; financial analyses became core part of training curriculum for > 1,000 other programs in the country.
## Palliative care is unfolding in three steps

### Inpatient Programs
- **Late 1990’s forward**
- **Passive**
- **Reactive**
- **Waiting for patients to be admitted & referred**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Decision to be made</th>
<th>Data Needed</th>
<th>Data Management</th>
<th>Analytic capability</th>
<th>Subject matter expertise</th>
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<tbody>
<tr>
<td>1 – inpatient</td>
<td>Yes/No, $</td>
<td>Inpatient fiscal</td>
<td>Ad hoc</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2 – outpatient</td>
<td>Yes / No, How, How much, $</td>
<td>All settings, death date</td>
<td>Tactical</td>
<td>✓✓✓</td>
<td>✓✓✓</td>
</tr>
<tr>
<td>3 – precision</td>
<td>When to proactively trigger PC for Mrs. Smith</td>
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Palliative care is unfolding in three steps:

- **Inpatient Programs**
  - **Late 1990’s forward**
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Inpatient Programs:

- **Late 1990’s forward**
- **Passive**
- **Reactive**
- **Waiting for patients to be admitted & referred**
Early Success (w/ Inpatient) by Asking the Right Questions

❖ How do PC-relevant cases compare to others in terms of costs and PC use?

❖ What are the daily costs before and after PC encounter?

❖ What are the costs, quality metrics, and involvement of PC in final months of life?

❖ How do we get and manage the data necessary for answering these questions?
178 Transitions pts enrolled for at least six months prior to death and 515 matched comparison patients. Does not include hospice or Transitions program costs.

<table>
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<th>Month prior to death (p-value)</th>
<th>Transitions pts</th>
<th>Comparison pts</th>
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<tr>
<td>6 (p=.957)</td>
<td>$1,733</td>
<td>$1,708</td>
</tr>
<tr>
<td>5 (p=.179)</td>
<td>$1,483</td>
<td>$2,165</td>
</tr>
<tr>
<td>4 (p=.118)</td>
<td>$1,550</td>
<td>$2,631</td>
</tr>
<tr>
<td>3 (p=.100)</td>
<td>$1,457</td>
<td>$2,697</td>
</tr>
<tr>
<td>2 (p=.008)</td>
<td>$2,398</td>
<td>$5,640</td>
</tr>
<tr>
<td>1 (p&lt;.001)</td>
<td>$3,711</td>
<td>$17,006</td>
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Mean healthcare costs per patient per month

Mean costs per patient per month

Mean costs per patient per month
## Outpatient Programs

- **2007 forward**
- **Earlier in disease course**
- **Meeting patients in ambulatory settings and home**

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What are utilization, costs, revenue of PC-relevant patients in months prior to death?

Which patients are receiving palliative care, and when?

How many patients could be met earlier by PC proactively?

What would it take to provide PC for them?

Data challenges: Need to know date of death, and to use population health / longitudinal analytic approach
Admissions spike in final month of life
Analysis of decedent admission patterns, VCU, FY10-12

Frequency of hospitalizations

- Kidney
- Liver
- Neuro
- HIV
- COPD

6 mo: 140
5 mo: 153
4 mo: 191
3 mo: 224
2 mo: 295
1 mo: 453

758
105
453

Impactmakers
Total loss these 2 conditions, 2 months preceding death = $900,000 annually

## Precision-based Palliative Care

- **2015 forward**
- **Proactive**
- **Available broadly**
- **Triggered**
- **Prompted**

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How do we identify the next patient who will need PC, before it’s “too little, too late”?

- Redesign from cancer data mart to enterprise data warehouse
- Build out foundational data management capabilities
- Easy integration of clinical (biometric, biomarker, laboratory, orders, prescriptions) and utilization / fiscal data
- Incorporate external data if possible via health information exchanges or payer data
- Robust statistical modeling that is setting and population-specific
Success metrics from PC case study

❖ Clinical, financial, and academic outcomes justify VCU program and its expansion over the years

❖ VCU program a training center for specialists and >150 teams

❖ Palliative care financial models central to expansion of PC field to over two-thirds of US hospitals

❖ VCU palliative care papers published since 2003 cited by over 1,400 others
Google invests in Frist-founded Aspire Health

Oct 3, 2016, 10:03am CDT

Aspire Health, the palliative care company co-founded by former Senate Majority Leader Bill Frist, has closed a $32 million funding round that was led by another big name: GV (formerly Google Ventures), the venture capital arm of tech giant Alphabet Inc. (Google’s parent company).

“ Their investment will allow Aspire to continue improving the way we care for our patients, including enriching our use of innovative data analytics and technology to enhance the support our clinicians can provide patients at home.” – CEO Brad Smith
Palliative Care - much more could be done

- Reduces pain, distress; improves quality of life; maintains or enhances survival

- Estimated 4.03 million patients who might benefit from inpatient PC services are not being served

- These 4.03 million patients could expect savings of $2,131 per admission, at $8.59 billion annually.

- Estimated 5.8 million individuals who might benefit from community-based PC are not being served

- These 5.8 million individuals could expect an average reduction in health care costs ($18,140 per) is estimated at $106.6 billion, annually.

Sources:
National Palliative Care Registry™ Annual Survey Summary, 2014; VHA-UHC Alliance Research Institute
Analytics Value Curve

**Value & Difficulty**

**Less**
- Standard Reports
  - "What happened?"

**More**
- Ad Hoc Reports
  - "How many, how often, where?"
- Diagnostic Analytics
  - "What exactly is the problem?"
- Randomized Testing
  - "What happens if we try this?"
- Predictive Analytics
  - "What will happen next?"
- Predictive Modeling/Forecasting
  - "What’s the best that can happen?"
- Alerts
  - "What action is needed?"
- Query/Drill Down
  - "What’s the best that can happen?"
- Prescription
  - "Can we make “X” happen?"
- Prescriptive Analytics
  - "Can we make “X” happen?"
- Optimization
  - "What’s the best that can happen?"

**Hindsight**
- Hindsight
  - "What happened?"

**Insight**
- Insight
  - "What exactly is the problem?"

**Foresight**
- Foresight
  - "What happens if we try this?"
  - "What will happen next?"
Model Overview

❖ Capability oriented approach (not technology oriented)

❖ Healthcare industry specific, internationally applicable

❖ Leverages an 8 stage maturity model, like EMR Adoption
  ❖ Prescriptive
  ❖ Each stage has specific compliance goals
  ❖ Bullet point description of compliance requirements
  ❖ Clearly defined requirements
  ❖ Standard terminology

❖ Simple assessment outlines a clear path to analytics maturity
Key Focus Areas Across All Stages

1. Data content growth
   - Basic data to advanced data
   - Aligned with clinical, financial, and operational analytics activities

2. Analytics competency growth
   - Start simple and work to master specific competencies
   - Enhance performance tracking / clinical decision support
   - Appropriate analytics maturation for individual parts of the organization

3. Infrastructure growth
   - Flexible approaches to accommodate a wide variety of situations
   - Vendor neutral
   - Timely data, centrally accessible

4. Data Governance growth
   - Quality data and resource management
   - Executive suite and strategic alignment
## AMAM Stages

<table>
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<tr>
<th>STAGE</th>
<th>Description</th>
<th>Analytics Maturity Cumulative Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Personalized medicine &amp; prescriptive analytics</td>
<td>Mass customization of care</td>
</tr>
<tr>
<td>6</td>
<td>Clinical risk intervention &amp; predictive analytics</td>
<td>Advance clinical, operational, and financial analytics</td>
</tr>
<tr>
<td>5</td>
<td>Enhancing quality of care, population health, and understanding the economics of care</td>
<td>Build a strong foundation</td>
</tr>
<tr>
<td>4</td>
<td>Measuring &amp; managing evidence based care, care variability, and waste reduction</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Efficient, consistent internal and external report production and agility</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Core data warehouse workout: centralized database with an analytics competency center</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Foundation building: data aggregation and initial data governance</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Fragmented point solutions</td>
<td></td>
</tr>
</tbody>
</table>
Data Content Maturation

Stage 7 • 7x24 biometrics, behavioral health outcomes data
Stage 6 • Social determinants of health, patient reported outcomes data
Stage 5 • Bedside devices, monitoring, home care, and pharmacy data
Stage 4 • Data marts, expanded payment data, holistic view of patient
Stage 3 • Wide reaching clinical, financial, operational, and external content
Stage 2 • Insurance claims, historical data
Stage 1 • EHR, revenue cycle, GL, supply chain, patient experience data
Example Baseline Achievement

- Achieved Stage 2 compliance
- 32% model compliance
- Has made progress through Stage 6
For each of the 4 AMAM Focus Areas

- Stage achievement
- Overall compliance
- Stage progress

<table>
<thead>
<tr>
<th>Focus Area Details</th>
<th>Data Content</th>
<th>Infrastructure</th>
<th>Data Governance</th>
<th>Analytics Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus Area Stage Achievement</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Focus Area Compliance</td>
<td>48%</td>
<td>79%</td>
<td>88%</td>
<td>39%</td>
</tr>
</tbody>
</table>

- Stage 7: 0% - 25% - 25% - 0%
- Stage 6: 20% - 25% - 50% - 21%
- Stage 5: 19% - 75% - 75% - 22%
- Stage 4: 80% - 88% - 94% - 94%
- Stage 3: 46% - 75% - 88% - 50%
- Stage 2: 100% - 92% - 100% - 83%
- Stage 1: 71% - 94% - 100% - 75%
Focus Area Opportunities

Infrastructure Achievement

<table>
<thead>
<tr>
<th>Infrastructure Achievement</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>Focus Area Compliance</td>
<td>79%</td>
</tr>
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<th>%</th>
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<tbody>
<tr>
<td>7</td>
<td>25%</td>
</tr>
<tr>
<td>6</td>
<td>25%</td>
</tr>
<tr>
<td>5</td>
<td>75%</td>
</tr>
<tr>
<td>4</td>
<td>86%</td>
</tr>
<tr>
<td>3</td>
<td>75%</td>
</tr>
<tr>
<td>2</td>
<td>91%</td>
</tr>
<tr>
<td>1</td>
<td>94%</td>
</tr>
</tbody>
</table>

Example

- Updates from system of record in < 24 hours
- Updates from system of record in < 1 week
- Updates from system of record in < 2 weeks
- Widely accessible analytics driven dashboards track KPI’s
- Broadly accessed reporting solution, database schema in place
- Centralized formal repository, enterprise-wide ad-hoc & reporting
- Historical data, metadata, centralized operational data store

Opportunities

Opportunities identified by *green* highlighting are those that represent the next logical step on the analytics journey. Those highlighted in *red* represent opportunities to strengthen the analytics foundation.

<table>
<thead>
<tr>
<th>Compliance Statement</th>
<th>Compliance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary data sources are updated less than 24 hours from when there are system of record change</td>
<td>Minimally Enabled</td>
</tr>
<tr>
<td>Primary data sources are updated less than 1 week from when there are system of record change</td>
<td>Minimally Enabled</td>
</tr>
<tr>
<td>Primary data sources are updated less than 2 weeks from when there are system of record change</td>
<td>Mostly Enabled</td>
</tr>
<tr>
<td>Widely accessible analytics driven dashboards are regularly monitored in order to track high volume and high risk clinical activities, patient cohorts, and critical organizational processes</td>
<td>Mostly Enabled</td>
</tr>
<tr>
<td>The data warehouse has a wide reaching database schema inclusive of clinical, financial, operational data</td>
<td>Mostly Enabled</td>
</tr>
<tr>
<td>There is a data warehouse driven reporting solution that allows organization staff from the front lines to the executive suite have a responsive electronic and dynamic method for accessing current and historical key performance indicators (KPIs)</td>
<td>Mostly Enabled</td>
</tr>
<tr>
<td>The data warehouse supports an enterprise wide reporting solution(s)</td>
<td>Mostly Enabled</td>
</tr>
<tr>
<td>There is a searchable metadata repository for all collected data available and accessible across the enterprise</td>
<td>Mostly Enabled</td>
</tr>
</tbody>
</table>
BACKUP SLIDES
Infrastructure Maturation

Stage 7  • Updates from system of record in < 24 hours
Stage 6  • Updates from system of record in < 1 week
Stage 5  • Updates from system of record in < 2 weeks
Stage 4  • Widely accessible analytics driven dashboards track KPI’s
Stage 3  • Broadly accessed reporting solution, database schema in place
Stage 2  • Centralized formal repository, enterprise-wide ad-hoc & reporting
Stage 1  • Historical data, metadata, centralized operational data store
Data Governance Maturation

**Stage 7**  • Tightly aligned with org. strategic, financial, and clinical leadership

**Stage 6**  • Accountable for managing the economics of care (cost & quality)

**Stage 5**  • Supporting org. wide quality-based performance measurements

**Stage 4**  • Widely accessible analytics driven dashboards track KPI’s

**Stage 3**  • Standard terminologies, external data release policy & process

**Stage 2**  • Patient registry evolution, Master Data Management, data literacy

**Stage 1**  • Analytics strategy with executive support, regular meetings
Analytics Competency Maturation

Stage 7 • Prescriptive analytics, mass customization of care, wellness mngmt.
Stage 6 • Analytic motive addresses high volume diagnosis-based cohorts
Stage 5 • Pop health, sig. enabled at point of care, precision registries
Stage 4 • Focused on best practices, minimizing waste, & reducing variability
Stage 3 • Consistent, efficient rpt. production supporting ops. & mngmt.
Stage 2 • Analytics competency center, registry portfolio buildout
Stage 1 • Education, skills of analytics resources are profiled and inventoried