IBM Patient Care and Insights Brief Overview

Advanced Analytics and Dynamic Care Coordination

*An Integrated Solution for the Healthcare Life Cycle*

Chris Fawbush
Business Unit Executive, ECM Industry Solutions
cfawbush@us.ibm.com
Disease and Cost of Care Progression

- Healthy Low Risk
- At Risk
- High Risk
- Early Clinical Symptoms
- Active Disease

Health Status → Identify and Act on Early Intervention Opportunities

Health Care Spending → Identify and Act on Early Intervention Opportunities

- 20% of People Generate 80% of Costs
- 70% of US Deaths from Chronic Diseases
Transforming Care: Strategies necessary to improve outcomes

- Understanding & influencing their populations
- Engaging & empowering individuals
- Care planning that is evidence-driven, standardized, personalized
- Coordination across boundaries to share care, accountability & risk
- Transparent quality & performance reporting
IBM Patient Care and Insights – An Integrated Approach

1. Build Data Driven Evidence Based Insights
   By building comprehensive data-driven population-evidence based insights (from both structured and unstructured data sources) by using IBM Content Analytics, including Natural Language Processing technology (same as IBM Watson)
   Identify trends, patterns, anomalies, deviations and complex relationships to medical outcomes

2. Enable Intervention Opportunities
   Use predictive analytics to surface previously unknown risk factors, predict condition deterioration, readmission events and disease onset
   Use similarity analytics to more accurately identify earlier intervention opportunities based on multi-factorial risk stratification schema

3. Deliver Outcomes Based Coordinated Care
   Deliver case-based, work flow automation using patient centered models, while maintaining the ability to support the ad-hoc nature of care delivery across multiple care settings
   Proactively plan, monitor, manage and collaborate using a share-able, digital patient care plan that is web based and EMR neutral, and can be used regardless of care setting by the patient, his/her doctors and family members.
Gartner positions IBM Patient Care and Insights as next generation clinical decision support

IBM's Patient Care and Insights: A Promising Approach to Healthcare Big Data
Published: 27 November 2012

Analyst(s): Wes Rishel, Jeff Cribbs

Claims about the potential of big data in healthcare have been long on optimism and short on specifics. The announcement of IBM's Patient Care and Insights offers specific progress toward realizing the potential.

Key Findings
- IBM Patient Care and Insights (IPCI) technology meets Gartner's definition of "big data" by using volume, velocity and a variety of information assets for innovative approaches to using analytics in care delivery, care management and quality improvement workflows.
- The IPCI announcement includes using IBM's similarity analytics (SA), to auto-select a cohort of clinically similar patients for analysis. Applications of patient SA (PSA) include risk categorization, identifying best practices, matching referred patients to physicians and
What is IBM Patient Care and Insights?

- An integrated and highly configurable solution designed to surface personalized insights from patient population data ... and enable personalized proactive care delivery ...

**Configurable and Customizable Solution Options**

- **Advanced Care Insights** Solution Models
  - Readmission Prediction
  - Condition Onset and Deterioration Prediction
  - Drug Treatment Efficacy / Effectiveness
  - Physician / Care Team Matching
  - Resource Utilization

- **Advanced Care Management** Solution Plans
  - Template Care Plans

- **Visualizations** (both)
  - Care Pathways
  - Custom for Population Analysis

**IBM Content Analytics with Enterprise Search Platform**
- Healthcare Annotators
- Semantic Data Store

**IBM Case Manager Platform**
- Case Management Accelerator
- IBM Care Manager
IBM Patient Care and Insights

Advanced Care Insights

Advanced analytics combining IBM Content Analytics, SPSS modeler and Similarity Analytics

- **IBM Content Analytics for Healthcare**
  - Built on Watson Unstructured Information Analysis Architecture (UMIA) natural language processing technology
  - Trend, Pattern, Anomaly, Deviation and Context Analysis
  - Enterprise Search Capabilities
  - Studio Workbench to Build Annotators and Rules
  - Medical Fact, Relationship and Outcome Annotation
  - LPR Semantic Augmentation and Storage for Unstructured Data
  - Content Lineage and Traceability
  - Selective Analytic Processing

- **SPSS Modeler**
  - Predictive Modeling and Scoring for Probability and Outcome Analysis

- **IBM Similarity Analytics**
  - Multi Dimensional Personalized Patient Analysis Based on Machine Learning
  - Resource Utilization Analysis
  - Disease Onset Prediction
  - Treatment and Physician Comparative Effectiveness
  - Dynamic Configurable User Experience / Population Visualizations
  - Out Flow Visualization for care pathway recommendations
IBM natural language processing technology ...

- Annotators are used to identify valuable facts in unstructured documents (e.g. clinician notes, consult reports, free text fields in EMRs) and convert to a structured form.
- Annotators execute in a sequence called the UIMA or Unstructured Information Management Architecture pipeline.
- IBM Patient Care and Insights Annotators use UMLS to normalize discovered facts to coding systems.
- Excellent application training services / annotators can be developed in IBM Content Studio.

- Physician notes and discharge summaries
- Patient history, symptoms and non-symptoms
- Pathology reports
- Satisfaction surveys
- Claims and case management data
- Forms based data and comments
- Emails and correspondence
- Trusted reference journals
- Paper based records and documents

Unified Medical Language System
Delivers out of the box value …

- **Problems**
  - Result of a series of interim annotations that identify diseases, symptoms, and disorders
  - Normalize to standard terms and standard coding systems including SNOMED CT, ICD-9, HCC, CCS
  - Capture timeframes of the problem
    - determine if past or current problem
    - Information validity ; “two packs to one pack/day”

- **Procedures**
  - Identify compound procedures
    - example: direct extensive adhesiolysis and enterolysis left side
  - Normalize to standard terms and standard coding systems including SNOMED CT, CCS, CPT
  - Capture timeframes of the procedure
  - Determine confidence
    - Positive, Negative, Rule Out
    - Negation example
      - “abdominal pain”

- **Medications**
  - Result of a series of interim annotations that identify drugs, administrations, measurements
  - Normalize to standard terms and can normalize to RxNorm

- **Demographic and Social**

- **Compliance & Noncompliance**
  - Patient's history of medication compliance
  - Noncompliance - Patient's history of medication noncompliance with directions.

- **Labs results**

- **Ejection Fraction** – in support of CHF use cases

- **Multiple Coding Systems** – can identify these codes
  - CPT
  - CCS
  - HCC
  - NDC (National Drug Codes)
    - Breaks out by components - example, Lortab 5 contains 5 mg of hydrocodone and 500 mg acetaminophen. This would result in 2 Ndc Code annotations.
Case Study: What Really Caused Readmissions at Major Provider

The Data We Thought Would Be Useful ... Wasn’t

• 113 candidate predictors from structured and unstructured data sources

• Structured data was less reliable than unstructured data – increased the reliance on unstructured data

New Insights Uncovered by Combining Content and Predictive Analytics

• LVEF and Smoking are significant indicators of CHF but not readmissions

• Assisted Living and Drug and Alcohol Abuse emerged as key predictors (only found in unstructured data)

• Many predictors are found in “History” notations and observations

Top 18 Indicators

18. Jugular Venous Distention Indicator
17. Paid by Medicaid Indicator
16. Immunity Disorder Disease Indicator
15. Cardiac Rehab Admit Diagnosis with CHF Indicator
14. Lack of Emotion Support Indicator
13. Self COPD Moderate Limit Health History Indicator
12. With Genitourinary System and Endocrine Disorders
11. Heart Failure History
10. High BNP Indicator
9. Low Hemoglobin Indicator
8. Low Sodium Level Indicator
7. Assisted Living (from ICA Extract)
6. High Cholesterol History
5. Presence of Blood Diseases in Diagnosis History
4. High Blood Pressure Health History
3. Self Alcohol / Drug Use Indicator (Cerner + ICA)
2. Heart Attack History
1. Heart Disease History

<table>
<thead>
<tr>
<th>Predictor Analysis</th>
<th>% Encounters Structured Data</th>
<th>% Encounters Unstructured Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejection Fraction (LVEF)</td>
<td>2%</td>
<td>74%</td>
</tr>
<tr>
<td>Smoking Indicator</td>
<td>35%</td>
<td>81%</td>
</tr>
<tr>
<td></td>
<td>(65% Accurate)</td>
<td>(95% Accurate)</td>
</tr>
<tr>
<td>Living Arrangements</td>
<td>&lt;1%</td>
<td>73%</td>
</tr>
<tr>
<td></td>
<td>(100% Accurate)</td>
<td></td>
</tr>
<tr>
<td>Drug and Alcohol Abuse</td>
<td>16%</td>
<td>81%</td>
</tr>
<tr>
<td>Assisted Living</td>
<td>0%</td>
<td>13%</td>
</tr>
</tbody>
</table>
Physicians have limited time and resources to focus on complex care dilemmas, yet many patients have multiple conditions.

Clinical trials and health research typically focus on single diseases.

Treatment guidelines are usually developed with “standardized” reference data.

Care delivery tends to be ad hoc in nature; care guidelines not followed 40% of the time.

83% of Medicaid patients have at least one chronic condition (almost 25% have at least 5 co-morbidities) \(^1\)

Medicare patients with 5 or more chronic conditions accounted for 76% of all Medicare expenditures \(^2\)

Innovators want to augment care delivery guidelines with population specific insights- including those derived from unstructured data- to enhance decision making.

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2. *The Rise in Spending Among Medicare Beneficiaries: The Role of Chronic Disease Prevalence and Changes in Treatment Intensity* from Health Affairs, August 2006
How Similarity Analytics Work, Part 1

- For this patient...
- Analyze longitudinal data to develop profile across 30,000+ possible points of comparison
- Determine the individual risk factors for this patient based on the desired outcome
- Create an outcomes based personalized profile for this patient
How Similarity Analytics Work, Part 2

- Based on this patient’s personalized profile ...
- Find the most similar patients (or dynamic cohort) from entire population
- Analyze what happened with the cohort and reasons why (30,000+ dimensions)
- Predict the probability of the desired outcome for this patient
- Create personalized care plan based on unique needs of this patient
Enabling Personalized Insights at The Point of Transitions and Care

Evidence Based Patient Centered Care Across Settings
Gartner Model for Care Management

Figure 1. The Six Component Processes of a Care Management Program

- Program Design and Governance
- Reporting, Evaluation, and Change
- Intake
- Intervention Referral
- Interventions
- External Data Coordination

Source: Gartner (August 2012)
Do You Want Software That Drives Your Care ... or The Other Way Around?

1st Generation Solutions Tend To
- Be Tied To Disease by Disease Care Plans ... Limits Scenarios and Ties Care to the Vendor
- Become Inflexible During Care Delivery When Things Needs to Change
- Are Limited To Structured Data and Don’t Leverage Unstructured Field, Paper/Fax Based Information
- Limit Analysis and Reports to “Known” Measures and Gaps in Care
- Not Leverage Case Outcomes and Process Data for Improvement

Figure 1. The Six Component Processes of a Care Management Program

Source: Gartner (August 2012)
Do You Want Software That Drives Your Care ... or The Other Way Around?

**Figure 1. The Six Component Processes of a Care Management Program**

**Why IBM is Different**
- Focus on transitions
- Focus on care delivery
- Focus on using patient data to complement guidelines
- Focus on reducing integration hurdles

**Why IBM is Not Reinventing The Wheel**
- Not Dependent on Disease Specific Data, Processes and Plans ... Address New Scenarios Like Multiple Co-morbid and Chronic Disease Scenarios
- Not Dependent on Workflow – Ad-Hoc Approach Enables Maximum Flexibility
- Best-of-Breed NLP and Leverage of Unstructured Data (Text) Including Field, Fax, Paper and Image
- Advanced Analytics Complement Traditional Reporting to Surface the “Unknown”
- Embedded Analytics into Care Management Leverages Outcomes and Process Data
IBM Patient Care and Insights

Care Manager

Dynamic Care Coordination driven by IBM’s award winning Case Manager platform

- Application mobile device friendly
- Sharable patient centered are Plan with extensible template that is customizable for individual patient needs and preferences
- Calendaring Service for care plan related activities
- Patient, Caregiver and Provider/Payor Portal
- Telehealth Command Center can apply logical next steps and analytics to multiple data streams
- Profiles and Role Based Views, Security and Management
- Alerting & Notification Services, Events, Triggers and Subscriptions
- Audit logs for care process validation and work load productivity
- Home and Transitional Care Management
- Analytics driven care management pre-enroll

- Forms, Assessments and Workflow
- Electronic folders / Care/Case Management
- Plan deviation messages, assessment launching, and ad-hoc tasking
- Paper / Fax Capture and Conversion
Rapid solution design

- Easy to use, “Interview Mode” (wizard-driven)
  Case designer allows a business user to very quickly build a solution

- Comprehensive across case assets
  Case designer can provide 360° view of case

- Leverage templates for a fast start - Represent industry best practices
  Significantly shortens time-to-value for case-style applications

**Bottom line:**
Deliver end users the solution in a fraction of time of other approaches
Care worker user experience

- **Role-based and personalized**
  
  *End user gets exactly the information they need to progress the case*

- **Flexible and extensible**
  
  *Can be configured to meet unique business requirements*

- **Provides deep context for case work**
  
  *No more disjointed jumping between application*

- **Brings people, process and information together to drive case progression and better outcomes**

**Bottom line:**

*A care worker has all the information they need to improve care outcomes*
Powerful analytics for better outcomes

- Comprehensive reporting and analysis
  Gives case managers visibility across all information types to assess and act quickly

- Real-time dashboards
  Understand issues before they become a problem

- Unique content analytics for discovering deeper case insight
  Crawl and index case content and metadata. Discover patterns, trends and insights across cases

Bottom line:
Care managers need insight in order to impact results.
The power of a task

A variety of events can trigger case tasks

- Care Worker Actions
- New Content
- Care Updates

Drive dynamic activities

- Uses structured processes fragments

- Repeatability
  *Tasks can be repeated at will*

- Grouping
  *Inclusive and Exclusive*

- Optional
  *User directed launching or skipping*

- Ad hoc
  *User dealing with unknown*

- Event driven
  *Tasks launched via events*

**Bottom line:**
Task object model enables a great deal of flexibility to empower the knowledge worker productivity
Generate sub-populations - high risk lists
Choose a care template based on the results of the model
The electronic care plan resides in IBM Care Manager and is informed and updated by Advanced Care Insights.
IBM Care Manager enables operational reporting on care management processes

**Care Plan Reporting**
Measures the current number of active and inactive care plans, and the average time to complete plans during a specified period. Other examples include:

- Number of plans created during time period
- Number of plans In progress during time period

**Work Queue Reporting**
Measures the current number of open tasks and the average time to complete tasks during a specified period. Other examples include:

- Number Of New Work Items
- Number Of Completed Work Items
- Number Of Work Items In Queue
- Time Spent To Complete Work Items
IBM Care Manager operational reporting enables incentives and improvement

Task Reporting
Measures the current number of tasks and average time to complete tasks. Other examples include:
- Care Team tasks such as: patient enrollment, care plan updates or review
- Patient tasks such as: enter data for a form, survey or assessment
- Number of tasks in progress, completed or past due

Process Step Reporting
Measures work items at various steps, such as the average time to complete work. Other examples include:
- Number of work items at various steps, i.e., patient enrollment
- Average time spent to complete care plan review
- Average time spent to complete a health risk assessment
- Average percentage of care plan rejections
Embedded population analysis drives continuous care improvement as new data surfaces over time and across settings.

Unstructured and structured data from multiple systems is captured, enriching the patient record and informing the care plan.

Advanced Care Insights surface hidden intervention opportunities, allowing the Care Team to react sooner.

The Care Manager workflow engine supports adaptive and patient centered care delivery, automating tasks and driving efficiency.
Thank you!
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Advanced Analytics and Dynamic Care Coordination in the Healthcare Life Cycle

Chris Fawbush
Business Unit Executive, ECM Industry Solutions
cfawbush@us.ibm.com
Use Cases for Advanced Care Insights

**Population Analysis**
- Readmission analysis and prevention
- Early onset disease or condition detection and prediction
- Condition deterioration analysis and prediction
- Complex or chronic disease analysis and prediction
- Comparative treatment effectiveness and care team matching
- Analysis and detection of related conditions and co-morbidities
- Similarity and cohort analysis including risk based population stratification

**Process Improvement and Analysis**
- Document Analysis for accurate Coding
- Detection of Error, Indicator, Change, Deviation or Anomaly in a Given Situation or Process
- Detection of Changes in Treatments, Medications, etc.
- Evidence Based Personalized Care Plans