The Third Annual Disease Management Summit

Next Generation Disease and Care Management: The Role of Technology

March 20, 2003
Geof Baker, President
Med-Vantage, Inc.
(415) 990-9501
www.medvantageinc.com

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Survey Methodology: Interviews, Literature Search

<table>
<thead>
<tr>
<th>Source (Function)</th>
<th>Count</th>
<th>Organization &amp; Contact Name</th>
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<tbody>
<tr>
<td>Healthplan (Actuarial, Medical Mgmt, Epidemiology, Medical Economics)</td>
<td>11</td>
<td>Humana, BCBS-SC, HealthNet, BCBS-FL, PacifiCare, BCBS-MN, BCBS-MA, Tufts Healthplan, Aetna, Harvard Pilgrim</td>
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<tr>
<td>Disease and Population Health Management Vendors</td>
<td>7</td>
<td>Qmed, Accordant, StatusOne, American Healthways, Active Health Management, Life Masters, Health Dialog</td>
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<td>Technology Vendors</td>
<td>13</td>
<td>Resolution Health, Quodvax, StatusOne, MEDecision, McKesson Health Solutions, Ingenix, Landacorp, Medstat, MEDAI, Pharmetrics, IHCIS, Medical Scientists, VIPs</td>
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<td>Thought Leader (DMMA, Venture Capitalist, Epidemiologist)</td>
<td>6</td>
<td>Dr. Victor Villagra, Al Lewis, Wilson Research, Innocal Capital, Bedrock Capital, Galen Associates</td>
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<td>Employer/TPA (HR Benefits, Employer Coalition)</td>
<td>3</td>
<td>Southwest Employer’s Coalition, Ohio Teachers, Wausau Benefits</td>
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<td>Subtotal</td>
<td>40</td>
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### Does Your Organization Face Any of These Issues?

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Concern</th>
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<tbody>
<tr>
<td>______</td>
<td>Returns on clinical resources and investment</td>
</tr>
<tr>
<td>______</td>
<td>Effective patient targeting and early intervention</td>
</tr>
<tr>
<td>______</td>
<td>Greater nurse productivity</td>
</tr>
<tr>
<td>______</td>
<td>Aligning clinical resources to patient condition</td>
</tr>
<tr>
<td>______</td>
<td>Efficient workflow (cross program coordination)</td>
</tr>
<tr>
<td>______</td>
<td>Managing patients with co-morbidities</td>
</tr>
<tr>
<td>______</td>
<td>Patient &amp; provider compliance</td>
</tr>
<tr>
<td>______</td>
<td>Outreach, communication and connectivity</td>
</tr>
<tr>
<td>______</td>
<td>Integrating DM workflow with existing legacy systems</td>
</tr>
<tr>
<td>______</td>
<td>Improved outcomes reporting</td>
</tr>
<tr>
<td>______</td>
<td>Other (State:) ____________________________</td>
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### Healthplan Care Management Strategy & Adoption

- **Utilization Management**
- **Population Health Management**
- **Nurse Based Complex/DM Mgmt**
- **Collaborative Change Mgmt**
- **Integrated Care Management**
- **Provider Outcomes Pay**

Aligning Provider Incentives with Care Management

Pay for Performance integrates with other delivery and payer program initiatives

Provider Network  Benefit Design
Quality Incentives  Integrated Care Management

Plus
Robust consumer information on provider performance and health care choices

Integrating Care Management Focus

Longer to Shorter Payback  Lower to Higher ROI

Wellness / Health Promotion  Demand Management  Disease Management  Catastrophic / Complex Case Management

High Touch / ROI  Low to High Touch

Patient Cost Percentile

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Higher Return with Integrated Care Management

Integrated Care Programs Can Increase Gross Savings by 16% and Reduce Admin Costs by 30%

<table>
<thead>
<tr>
<th>Gross Savings</th>
<th>Program Cost</th>
<th>Net Savings</th>
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<tbody>
<tr>
<td>$5.70</td>
<td>$2.93</td>
<td>$2.77</td>
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<tr>
<td>$4.93</td>
<td>$3.31</td>
<td>$1.62</td>
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<tr>
<td>$3.42</td>
<td>$1.51</td>
<td>$1.91</td>
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<tr>
<td>$1.00</td>
<td>$2.00</td>
<td>$3.00</td>
</tr>
<tr>
<td>$2.00</td>
<td>$3.00</td>
<td>$4.00</td>
</tr>
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</table>

Sources – (1) Medvantage research, Health Dialog client experience (Highmark), Gonzales, Ron Z.; Juday, Timothy R.; and Ozminkowski, Ronald J. Worksite Health, Association for Worksite Health Promotion’s (AWHP) Summer 1999, 6(3), 12-21. Al Lewis, DPMC.

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CMIT Defined

“Care Management Information Technology integrates data, and provides intelligence, automation, communication, and reporting to improve the administration of the care process for patients, physicians, and health administrators.”

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**Care Management Delivery... Technology Attributes**

- Action Lists
- Compliance Tracking
- Intervention
- Auto Routing
- Clinical Episodes
- Predictive Modeling
- Proactive Clinical Alerts (Rules Engine Driven)
- Outcomes & Epidemiological Analysis
- Clinical Report Cards
- Multi-Channel Communications
- Data Integration
- Enterprise Content Management
- Business Intelligence
- EAI Integration Portals
- Transform Data Mining
- RDBMS Patient Health Record
- Clinical Episodics
- Clinical Web Forms
- Personalized Patient Content
- Clinical Educational Content
- Evidence Based Medicine Guidelines
- Legacy System Interfaces

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**High Risk Patient Management**

1. Population Identification
2. Patient Stratification & Targeting
3. Outreach & Intervention
4. Outcomes / ROI / Retrospective Evaluation

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**Population & Patient Identification**

**Business Needs**
- Regression, Neural Net tools or Combination
- Additional data to improve predictive accuracy
- Stratify patient risk using dominant & secondary conditions
- Stratify cohorts with high present costs (top 5%)
- Stratify cohorts with high risk of future utilization (top 10%)
- Results must stratify cohort where intervention has high impact, relevance, and return on effort.

**Technology Requirements**
- Data Mining
- Predictive Modeling
- Business Intelligence
- Decision Support (Reporting)

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**Predictive Modeling**

**Actionable & Clinically Relevant**
- Baseline Prevalence
- Pareto Analysis
- Current Risk Factor
- Risk Progression
- Predicted Cost
- Intervention Opportunity?
- Patient Stratification
- Patient ID
- Patient Clinical Markers
- Patient Condition
- Validation Required

**Predicted Year +1 Cost =**

\[ k_1 \cdot \text{(age)} + k_2 \cdot \text{(gender=male)} + k_3 \cdot \text{(type of Rx)} + k_4 \cdot \text{(A1C test)} + k_5 \cdot \text{(relative risk score)} + k_6 \cdot \text{(age * relative risk score)} + k_7 \cdot \text{(type of Rx * MD specialty)} \]

Patient Risk Stratification Report

<table>
<thead>
<tr>
<th>Member ID</th>
<th>Inferred Condition</th>
<th>Age</th>
<th>Sex</th>
<th>Months Enrolled</th>
<th>Relative Risk Score (RRS)</th>
<th>Opport. Score</th>
<th>Actual Costs (PTD)</th>
<th>Pred Costs (RRS) Next 12 Months</th>
<th>Prob of &gt;1 Hospital Admit (Next 12 Months)</th>
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<tbody>
<tr>
<td>49493826</td>
<td>CHF/ICOD</td>
<td>61</td>
<td>M</td>
<td>7</td>
<td>15.8</td>
<td>7</td>
<td>$</td>
<td>$</td>
<td>75%</td>
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<tr>
<td>6874143</td>
<td>Co-Morbid</td>
<td>32</td>
<td>M</td>
<td>12</td>
<td>8.72</td>
<td>8</td>
<td>$</td>
<td>$</td>
<td>85%</td>
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<tr>
<td>168279008</td>
<td>CHF/Diab</td>
<td>47</td>
<td>F</td>
<td>3</td>
<td>6.34</td>
<td>5</td>
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<td></td>
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<tr>
<td>98987652</td>
<td>Co-Morbid</td>
<td>48</td>
<td>M</td>
<td>4</td>
<td>5.63</td>
<td>3</td>
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<td></td>
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<tr>
<td>49493826</td>
<td>CHF</td>
<td>56</td>
<td>M</td>
<td>9</td>
<td>4.21</td>
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<tr>
<td>148481478</td>
<td>Co-Morbid</td>
<td>55</td>
<td>F</td>
<td>18</td>
<td>3.41</td>
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<tr>
<td>732508625</td>
<td>Asth/CHF</td>
<td>54</td>
<td>F</td>
<td>8</td>
<td>2.89</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Work in Progress – Still Need Actionable Information Regarding Patients

Patient Risk and Opportunity Stratification Report (By Business Line, $Threshold)

This report shows patients sorted by relative risk stratification category. Patients are also sorted by highest to lowest opportunity scores. The report shows prospective savings associated with medical intervention (based on opportunity score), patient opportunity and risk scores, and the probability of the patient experiencing an acute exacerbation (hospital stay) in the next 12 months.

Results Reporting for Population & Patient ID

- **Population Disease Prevalence Report**
- Predictive Modeling ROC (Receiver Operating Characteristic) Report
- Prospective Population Savings Report by Condition
- Prospective Pareto Analysis Savings Report
- **Patient Risk Stratification Report**
- Patient and Population Risk Factor Trend Report
- Population Clinical Compliance Report by Risk Score

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**Patient & Population Identification**

**Challenges**

- Proof in concept
- Different methodologies for objective (actuarial vs. care management)
- Positive Predictive Value (PPV) – trade-offs between specificity and sensitivity
- False-positives: accurate identification of patient risk level / condition
- Predictive power of R2
- Insufficient data or population experience

**Limitations**

- Avoid focus on disease states, focus on co-morbid
- Rules based models suffers from bias & regression to mean
- Validation required (nurse survey intake)

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**Stratification & Targeting Requirements**

**Business Needs**

- Survey intake designed for co-morbid
- Stratification determines “light” or “heavy” lifting by care nurses and type of intervention required
- PHR results populate care plan, linked content
- CRM features to support enrollment mailing
- Enterprise & outside access to PHR
- Patients can self-report results to linked PHR

**Technology Requirements**

- RDBMS
- Enterprise Application Integration (EAI)
- Business Rules Engines (BRE)
- Patient Registry / Patient Health Record
- Business Intelligence
- Proactive Clinical Alerts (BRE)
- Multi-Channel Communication
- Integration Portals

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Patient Health Record Value

Patient health records (PHR) increase nurse productivity and improve care coordination
- Demographic & contact information
- Information regarding physicians caring for patient
- Patient specific alerts
- Patient action lists
- Initial care plan generation
- References to patient standards of care
- References to supporting evidence based medicine literature
- Patient history
- Patient risk condition
- HRA & functional assessment survey intake & results view
- Patient cost tracking
- Tracking of communication, intervention, clinical note taking, updates to care plan

Initial Outreach... Role of Technology

Results Maintained in Patient Health Record

Predictive Modeling
Claims Analysis

Customer Service
Nurse Help Desk

10-15% of patients identified outside of claims process

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### Summary of Early Patient ID Approaches

<table>
<thead>
<tr>
<th>Method</th>
<th>Cost</th>
<th>Response Time</th>
<th>Accuracy</th>
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</thead>
<tbody>
<tr>
<td>Admin Data (Predictive Modeling)</td>
<td>Low</td>
<td>Rx - High, Claims - Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Member Service Nurse Helpline (CRM)</td>
<td>Fair</td>
<td>High</td>
<td>Fair</td>
</tr>
<tr>
<td>MD Patient Registry (Medical Record)</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Member Reported HRA/PHR Care Manager (RN) HRA</td>
<td>Low</td>
<td>High</td>
<td>Fair</td>
</tr>
<tr>
<td>Recruitment through MDs</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

### Stratification and Targeting

#### Challenges
- Better alignment of patient condition with clinical resources
- Enrolling and disenrolling the right patients
- Early identification
- Single condition driven stratification process not equipped for co-morbidities

#### Limitations
- Patient & physician support
- Industry has not refined automated tools and content when mapping intervention for patients with multiple co-morbidities.

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**Provider Alert – Patient Exception Report**

- **Patient Demographic Information**
- **Medications**
- **Vital Sign Information**
  - Biometric monitoring (not applicable)
- **Comorbidity Tracking**
- **Alert Severity**
- **Nursing Note**

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**Results Reporting for Outreach Intervention**

- Patient & Provider Contact Fulfillment Report
- Patient Registry Report
- Patient Health Record Report (Includes Risk Profile)
- HRA Intake Summary Results Report
- Care Program Patient Participation Report
- Nurse Caseload Report
- Compliance Alert Follow-Up Report
- Changes in Patient Condition and Risk Factor Report
- Care Coordination Report
- High Cost Claimants Report

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Outreach and Intervention

Challenges

• Informed and educated patients (personalized education, self-care)
• Patient compliance, patient-physician-family participation
• Physician support
• Nurse productivity & workflow; stove-pipe processes
• Efficient coordination of co-morbid patients
• Current disease state focus of vendor applications

Limitations

• Multi condition, clinical guidelines not widely available for co-morbid conditions
• Alert rules based on co-morbidities
• E-reimbursement limits MD use of PHR
• 15% Patient Adoption of electronic PHR

Efficiency vs. Quality Measures

Utilization Measures

- Admits/1000 Diabetes Admits
- Diabetes Avoidable Admissions

Quality Indicator Measures

- Eye Exams / Diabetic Patients Seen
- Eye Exams / Assigned Diabetic Population
- Eye Exams / Assigned Diabetics "Under Control" (Lab Results)

Increasing Levels of Evidence

Clinical Actionability

Process / Outcome Linkage

Evidence Based Standards

- Norms
- Administrative Data + Enrollment, Pharmacy, Lab Results

Value to Physicians, Care Managers

+ + + + +
Outcomes / ROI / Retrospective Evaluation

Business Needs

- Defensible ROI and outcomes studies with industry standard methodology
- Comprehensive, process and outcomes measures reporting
- Robust financial, Rx, and utilization reporting
- ROI reporting with snapshot savings results
- Improved validation with normative benchmark comparisons

Technology Requirements

- RDBMS
- Patient Registry / Patient Health Record
- Data Mining
- Business Intelligence
- Decision Support Reporting

Pre and Post Baseline Analysis

NPV = $1,340 PmPm (15% DF, 21 Months)
IRR = 72%
Program Cost = $1,500 PmPm

PmPm Expense Trend Report (By Business Line, High Risk Population)
This report shows the value and impact of intervention for a high risk patient population group on a pmpm basis.
**Retrospective Evaluation Reports... Examples**

- DM Program Patient Satisfaction Report
- Medical Best Practice Report by Provider
- Process Measures Review Reports by Disease Condition
- Return to Work Evaluation Report
- Functional Status Report
- Patient Care Intervention Trend Report (Using Cohort Design)
- ROI Simulation by Clinical Intervention Program Report
- DM Program Outcomes Report by Key Compliance Measures
- Program Selection Bias Analysis Report
- Cost and Utilization Performance Reports by DM Program
- Pareto Analysis Report of Historical Experience
- Monthly DM Savings Report

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**Outcomes Measurement**

**ROI = Improved Clinical Outcomes**

- Reduced hospitalization (efficiency)
- Reduced ER utilization (efficiency)
- Reduced surgeries (efficiency)
- Reduced complications (safety, efficiency)
- Reduced outpatient procedures, imaging (efficiency)
- Improvised use of effective Rx, other treatments (quality)
- Improved compliance with treatment modalities (quality)
- Improved functional status, productivity (quality)
- Improved clinical lab measures (HbA1-C, quality)
- Improved self mastery, self-esteem (quality)
- Improved satisfaction with care (market share)

Source: PacifiCare criteria

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Challenges with Outcomes Measurement

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Credible results; quantifying, proving, and validating ROI and outcomes</td>
<td>• Commercial software unavailable to perform epidemiological analysis</td>
</tr>
<tr>
<td>• Epidemiological analysis</td>
<td></td>
</tr>
<tr>
<td>• Personnel with advance degrees in statistics</td>
<td></td>
</tr>
<tr>
<td>• Vendor contract reconciliation</td>
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</tbody>
</table>

Bottom Line: Investment in CMIT = Success

Translation

• Healthplan market leaders are making significant investments in care and disease management information technology

• Hits healthplan sweet spot: high perceived value and return
  – Reduced G & A (-1% to –1.5%), Lowered medical loss ratio (-2 to -4%)

• Interactive patient self-management provides highest opportunity
  – Patient self-care and web adoption will grow

• Focus is on Analytic/BI, BRM, ECM, and EAI applications
  – Required upgrades/replacement of current legacy investments
Bottom Line: Proceed with Caution and Due Diligence

Challenges

- Required: care management strategy
- Competing IT priorities
- Elusive business case: demonstrating ROI
- Legacy system integration requires significant customization
- Potentially disruptive process improvement & design
- Data security and privacy (addressed by HIPAA)
- No panacea: must balance technology with human intervention
- Great promise, but low web adoption (patients & physicians)
- No reimbursement for physician e-work