Role of Health Information Technology in Implementing Disease Management Programs

Disease Management Colloquium
Philadelphia, PA – May 10-12, 2006

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Agenda

• The employer’s perspectives on DM
• Measuring DM outcomes – what’s important?
• Proving that programs work -- measuring financial impact and return on investment (ROI)
U.S. Business Concerns About Healthcare

- The United States spent over $2.0 trillion in healthcare in 2005—$6,683 for every man, woman, and child.
- Employers pay over one-third of these costs.
- National health expenditure growth trends are expected to average about 7% per year through 2015.
- Health expenditures as percent of GDP:
  - 15.4 percent in 2002
  - 15.9 percent in 2003
  - 16.0 percent in 2004
  - 16.2 percent in 2005
  - 16.5 percent in 2006

Source: Borger et al., Health Affairs, 22 February 2006
What To Do?

• Manage disease
• Manage disability and absence
• Manage health and demand
• Manage stress
• Strengthen employee assistance programs
• Re-engineer
• Reorganize
• Create incentives
• Cut pharmacy benefits
To evaluate DM programs’ impact...

Understand the sequence of critical success factors:

1. Awareness
2. Participation
3. Increased knowledge
4. Improved attitudes
5. Behavior change
6. Risk reduction
7. Reduced utilization
8. Financial Impact/ROI
Evaluating Disease Management Programs

Clinical Measures

• Adherence to evidence based medicine guidelines, e.g.:
  - Asthma – rate of inhaled corticosteroids
  - Diabetes –
    • PCP office visit rate
    • Ophthalmology office visit rate
    • Hgb A1C test rate
    • Urinalysis test rate
    • Triglyceride test rate
    • Total/HDL cholesterol test rate
  - Heart Failure (newly diagnosed patients)
    • Diuretic drug prescription
    • Ace inhibitor prescription
    • Echocardiography
    • Radionuclide ventriculography

Source: HEDIS 3.0, DEMPAQ, AHCPR
Health and Functional Status Measures

- Biological measures (e.g., blood pressure, cholesterol levels, blood glucose, weight)
- Behavioral health measures (e.g., exercise, smoking, nutrition, alcohol consumption, stress management, depression)
- Disease specific measures (e.g., finger mobility for arthritis patients, nausea and vomiting for cancer patients, bodily pain for back patients)
Humanistic Measures

• Quality of life measures (SF-36)
  ▪ Physical functioning
  ▪ Role functioning
  ▪ Bodily pain
  ▪ General health
  ▪ Vitality
  ▪ Social functioning
  ▪ Emotional well being
  ▪ Change in health

• Patient satisfaction

• Provider satisfaction
Financial Measures

• Utilization and cost trends
  ▪ Participants vs. non-participants
  ▪ Pre vs. post intervention

• Cost savings estimates
  ▪ Medical, Rx
  ▪ Disability
  ▪ Workers’ compensation
  ▪ On the job productivity

• Return on investment (ROI)
Research design

• Pre-experimental
• Quasi-experimental
• True experimental
Research design: Non-experimental (pre-experimental)

One group posttest only

\[ X \quad 0_2 \]

One group before and after (pre-test/posttest)

\[ 0_1 \quad X \quad 0_2 \]
Research design: Non-experimental (pre-experimental)

Longitudinal or time series analysis

\[ 0_1 \ 0_2 \ 0_3 \ 0_4 \times 0_5 \ 0_6 \ 0_7 \ 0_8 \]
Research designs: quasi-experimental

Pretest posttest with comparison group

\[ 0_1 \times 0_2 \]

\[ \text{--------------------------} \]

\[ 0_1 \quad 0_2 \]
Research design: Experimental

True experimental – Randomized Clinical Trial (RTC)

\[
\begin{array}{cc}
0_1 & X & 0_2 \\
(R) & \text{---------------} \\
0_1 & 0_2
\end{array}
\]
Economic Evaluation Methods

• Cost-Benefit Analysis
  – intervention outcomes expressed as monetary values (benefits)
  – money values assigned to intervention expenses (costs)
  – study results expressed as net present value (NPV) -- benefits minus costs or benefit/cost ratio – return on investment (ROI)

• Cost-Utility Analysis
  – outcomes expressed as qualitative health metric (e.g., QALYs)
  – values based on individual or community preferences.
  – study results: (net costs)/(quality-adjusted life year saved)

• Cost-Effectiveness Analysis
  – outcomes expressed in natural health units (e.g., per person achieving healthy weight, per smoker who quit smoking, per heart attacks avoided)
  – study results: (costs)/(unit of health gained)

Source: Green, Fellows, Woolery, The Economics of Health Promotion and Disease Prevention: Lessons from Tobacco Control
Choosing Among Evaluation Methods:

- **CBA**
  - Use when: Most or all benefits of major interest can be easily monetized.

- **CUA**
  - Use when: Benefits cannot be monetized.

- **CEA**
  - Use when: Benefits cannot be monetized.

Source: Green, Fellows, Woolery, modified
Retrospective ROI Estimation: Pre-Experimental Design

- The most simple analysis may produce the wrong answers

> But regression to the mean and selection bias may skew results
Retrospective ROI Estimation: Quasi-Experimental Design, A Better Approach

- Compare intervention and non intervention groups over time:
  - Groups must be demographically, clinically, and motivationally similar.
  - The more similar they are, the less likely regression to the mean and selection bias will be problematic – therefore, apply propensity score matching procedures to match treatment and comparison group subjects.
  - Generally, the longer individuals can be followed, the more accurate the savings estimate (and hence the ROI estimate) will be.

<table>
<thead>
<tr>
<th>Before Intervention</th>
<th>Intervention Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention Group Avg. $</td>
<td>= Savings</td>
</tr>
<tr>
<td>Matched Comparison Group Avg. $</td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{Savings} = \text{Intervention Group Avg. $} - \text{Matched Comparison Group Avg. $}
\]
Stratification Method

Treatment

Control
Citibank, N.A.

Health Management Program Evaluation

- **Title**: Citibank Health Management Program (HMP)
- **Industry**: Banking/Finance
- **Target Population**: 47,838 active employees eligible for medical benefits
- **Description**: A comprehensive multi-component program that aims to help employees improve health behaviors, better manage chronic conditions, and reduce demand for unnecessary and inappropriate health services, and in turn, reduce prevalence of preventable diseases, and show significant cost savings and positive ROI.

- **Citations**:
Citibank High Risk Program Modules

- Arthritis
- Back pain
- Smoking
- Diabetes
- Obesity
- High BP
- Heart conditions and other chronic conditions
- Combinations of risky behaviors
Program Participation

• All 47,838 active employees were eligible to participate.
• The participation rate was 54.3 percent.
• Participants received a $10 credit toward Citibank’s Choices benefit plan enrollment for the following year.
• Approximately 3,000 employees participated in the high risk program each year it was offered.
Citibank: Medical Savings-Adjusted Mean Net Payments

Total savings associated with program participation for 11,219 participants over an average of 23 months post-HRA is $8,901,413*

* Based on $34.03 savings and 23.31054 months post-HRA for 11,219 participants
Citibank Health Management Program ROI

- Program costs = $1.9 million*
- Program benefits = $8.9 million*
- Program savings = $7.0 million*

ROI = $4.7 in benefits for every $1 in costs

Notes:
- 1996 dollars @ 0 percent discount
- Slightly lower ROI estimates after discounting by either 3% or 5% per year.
- Results very similar to RCT conducted of same Healthtrac program, by Fries, et al.
A Review of the Literature: Return on Investment for Selected Disease Management Programs

Methods

• We reviewed 44 studies in the literature that provided enough information to comment on ROI

• Diabetes, asthma, CHF, depression and multiple risk studies were reviewed

• All had randomized, quasi-experimental, or controlled pre-post designs
ROI from Asthma Programs

Table 2: Summary of Disease Management ROI Analysis for Asthma

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Number</th>
<th>Average Sample Size for Intervention</th>
<th>Average Evaluation Period (yrs)</th>
<th>Average Per Participant Cost and Savings</th>
<th>Total Benefits / Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT (A)</td>
<td>2</td>
<td>34</td>
<td>1.0</td>
<td>$292.54 $1,067.74</td>
<td>3.65</td>
</tr>
<tr>
<td>RCT (B)</td>
<td>5</td>
<td>149</td>
<td>2.3</td>
<td>$525.10 $(98.48)</td>
<td>-0.19</td>
</tr>
<tr>
<td>CBA</td>
<td>2</td>
<td>1471</td>
<td>1.1</td>
<td>- $557.29</td>
<td>N/A</td>
</tr>
<tr>
<td>Pre-Post</td>
<td>3</td>
<td>144</td>
<td>0.8</td>
<td>$256.36 $1,390.64</td>
<td>5.42</td>
</tr>
<tr>
<td>Total</td>
<td>Average</td>
<td>449</td>
<td>1.3</td>
<td>$268.50 $729.30</td>
<td>2.72</td>
</tr>
</tbody>
</table>

Key:
RCT=Randomized Clinical Trials
CBA=Controlled, Before and After Study Design
# ROI from Congestive Heart Failure Programs

## Table 4: Summary of Disease Management ROI Analysis for Congestive Heart Failure

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Number</th>
<th>Average Sample Size for Intervention</th>
<th>Average Evaluation Period (yrs)</th>
<th>Average Per Participant Cost and Savings</th>
<th>Average ROI Total Benefits / Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT (A)</td>
<td>4</td>
<td>92</td>
<td>0.7</td>
<td>$464.50</td>
<td>$1,700.25</td>
</tr>
<tr>
<td>RCT (B)</td>
<td>1</td>
<td>49</td>
<td>1.5</td>
<td>Aust $190</td>
<td>Aust $5,500</td>
</tr>
<tr>
<td>CBA</td>
<td>4</td>
<td>314</td>
<td>0.6</td>
<td>$1,018.00</td>
<td>$1,490.09</td>
</tr>
<tr>
<td>Pre-Post</td>
<td>3</td>
<td>226</td>
<td>0.6</td>
<td>$2,715.15</td>
<td>$8,461.75</td>
</tr>
</tbody>
</table>

**Total** 12 Average 170 0.9 $1,399.22 $3,884.03 2.78

**Key:**
- RCT = Randomized Clinical Trials
- CBA = Controlled, Before and After Study Design
- Aust = Australian dollar estimate
# ROI from Depression Studies

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Evaluation Period (yrs)</th>
<th>Intervention Program Cost</th>
<th>Intervention Program Savings</th>
<th>ROI Total Benefits / Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental Design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Von Korff et al., 1998</td>
<td>RCT</td>
<td>169</td>
<td>1.0</td>
<td>$201,279</td>
<td>$1,191.00</td>
<td>$(80,824.25) $(478.25) $(0.40)</td>
</tr>
<tr>
<td>Katon et al., 2002</td>
<td>RCT</td>
<td>95</td>
<td>2.3</td>
<td>$</td>
<td>$57,665.00</td>
<td>$607.00 $(1.65)</td>
</tr>
<tr>
<td>Simon et al., 2000</td>
<td>RCT</td>
<td>188</td>
<td>0.5</td>
<td>$9,588</td>
<td>$51.00</td>
<td>$(15,792.00) $(84.00) $(1.65)</td>
</tr>
<tr>
<td>Simon, Katon et al.,</td>
<td>RCT</td>
<td>110</td>
<td>0.5</td>
<td>$38,500</td>
<td>$350.00</td>
<td>$(32,560.00) $(296.00) $(0.85)</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simon, Manning, et al.,</td>
<td>RCT</td>
<td>205</td>
<td>1.0</td>
<td>$1,137,545</td>
<td>$5,549.00</td>
<td>$(336,200.00) $(1,640.00) $(0.30)</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>169</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simon et al., 2002</td>
<td>RCT</td>
<td>194</td>
<td>1.0</td>
<td>$49,664</td>
<td>$256.00</td>
<td>$(13,968.00) $(72.00) $(0.28)</td>
</tr>
<tr>
<td>McCaffrey et al., 2001</td>
<td>RCT</td>
<td>440</td>
<td>0.5</td>
<td></td>
<td>$737,000.00</td>
<td>$(1,675.00) $(454.00) $(0.35)</td>
</tr>
<tr>
<td>Sherbourne et al. 2001</td>
<td>RCT</td>
<td>913</td>
<td>2.0</td>
<td></td>
<td>$414,502.00</td>
<td>$(454.00) $(454.00) $(0.35)</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td>289</td>
<td>231</td>
<td>$239,429</td>
<td>$1,479.40</td>
<td>$(196,647.66) $(511.53) $(0.35)</td>
</tr>
</tbody>
</table>

**Key:**
- RCT = Randomized Clinical Trials
- CBA = Controlled, Before and After Study Design
## ROI from Diabetes Programs

Table 6: Summary of Disease Management ROI Analysis for Diabetes

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Number</th>
<th>Average Sample Size for Intervention</th>
<th>Average Evaluation Period (yrs)</th>
<th>Average Per Participant Cost and Savings</th>
<th>Average ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT</td>
<td>4</td>
<td>608</td>
<td>2.1</td>
<td>$1,862.33</td>
<td>$(1,013.25)</td>
</tr>
<tr>
<td>CBA - Sidorov, et al., 2002</td>
<td>1</td>
<td>3,118</td>
<td>2.0</td>
<td>$580.50</td>
<td>$1,294.32</td>
</tr>
<tr>
<td>CBA - Wagner, et al., 2001</td>
<td>1</td>
<td>732</td>
<td>5.0</td>
<td>-</td>
<td>$817.50</td>
</tr>
<tr>
<td>Pre-Post</td>
<td>2</td>
<td>3,585</td>
<td>0.9</td>
<td>-</td>
<td>$637.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8</td>
<td><strong>Average 2,011</strong></td>
<td><strong>2.5</strong></td>
<td><strong>$610.71</strong></td>
<td><strong>$434.02</strong></td>
</tr>
</tbody>
</table>

**Key:**
- RCT = Randomized Clinical Trials
- CBA = Controlled, Before and After Study Design
ROI from Studies of Multiple Risks

Table 10: Summary of Disease Management ROI Values for Studies of Multiple Risk

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Number</th>
<th>Average Sample Size for Intervention</th>
<th>Average Evaluation Period (yrs.)</th>
<th>Average Per Participant Cost and Savings</th>
<th>Average ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Interv.</td>
<td>Cost</td>
<td>Savings</td>
<td>Total Benefits / Costs</td>
</tr>
<tr>
<td>RCT</td>
<td>2</td>
<td>96</td>
<td>N/A</td>
<td>$581.00</td>
<td>6.65</td>
</tr>
<tr>
<td>CBA</td>
<td>1</td>
<td>683</td>
<td>$135.00</td>
<td>$590.00</td>
<td>4.37</td>
</tr>
<tr>
<td>Pre-Post</td>
<td>1</td>
<td>188</td>
<td>$324.00</td>
<td>$3,520.68</td>
<td>10.87</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>Average</td>
<td>$229.50</td>
<td>$1,563.89</td>
<td>6.81</td>
</tr>
</tbody>
</table>

Key:
RCT = Randomized Clinical Trials
CBA = Controlled, Before and After Study Design
Summary of Our Literature Review on DM ROI

• Return on Investment varied by condition
• CHF, asthma and multiple condition programs show promise
• Diabetes and depression programs may cost more than they save, at least in the short run
• Productivity impacts have not been well evaluated for DM programs
• Interventions and studies vary in quality
So, what is important to payers?

• Financial outcomes
  – Cost savings, return on investment (ROI) and net present value (NPV)
  – Where to find savings:
    • Medical costs
    • Absenteeism
    • Short term disability (STD)
    • Presenteeism

• Health outcomes
  – Adherence to evidence based medicine
  – Behavior change, risk reduction, health improvement

• Humanistic outcomes
  – Improvement in quality of life
  – Improved “functioning”