Tactics to Make Telehealth Pay Off

Lin Li, Ph.D.  
Philips Research North America

Kathleen Sullivan, RN, MSN  
Dignity Health

2013 NAHC Annual Meeting  
Oct, 2013

Today’s discussion

• Insights gained from market research

• Home Monitoring Economic Modeling

  Lin Li, Ph.D.  
  Member Research Staff  
  Philips Research North America

• Techniques for Making Telehealth Pay Off – A Provider’s Perspective

  Kathleen Sullivan, RN, MSN  
  Vice President, Post Acute Care Services  
  Dignity Health
I. Introduction

Healthcare Landscape across the Care Continuum

- Financial Risk
- Population Health Management
- Need Resources, Tools, and Expertise for Economic Modeling to Evaluate Intervention Effectiveness (e.g. Telehealth Technology)

- Government Agencies
- Insurance Companies
- Hospitals
- Primary Care
- Home Health Agencies
- Skilled Nursing Facilities
- Senior Living Community
- Seniors
Research Objective

- Model and quantitatively evaluate the
  - Intrinsic value
  - Commercial viability

  of a home monitoring technology
- Help care provider make better-informed decisions:
  - Exert the right efforts to the right direction
  - Allocating resources to those patients in greatest need
  - Accelerate time to ROI

Payers perspective: Clinical impact and cost impact of home monitoring

- Clinical effects lie in reduction in:
  - Mortality rate
  - Re-admission rate
  - Reduction in length of stay (LOS)

- Economic effects:
  - Incur cost through HM infrastructure and services
  - save cost through reduction of admission and LOS

Whether the cost saving (through avoid admissions) will offset the costs of launching and maintaining the home-based monitoring is a key consideration (and can be modeled)
Market restraints of home monitoring

<table>
<thead>
<tr>
<th>Reimbursement</th>
<th>Cost</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lack of Direct Reimbursement Greatly Restrains the Market</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>2. High Cost of Systems Limit Revenue Potential</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>3. Customer Dissatisfaction with the Technical Performance of Devices Depresses Growth</td>
<td>Medium</td>
<td>Low</td>
</tr>
</tbody>
</table>

These restraints force the market participants to take a sterner look at the actual performance and economic impact of their systems.

Major competitive factors are mainly focused on the capability for the system to be cost effective and easily explained as cost efficient.

- Early analysis of net cost benefits and impact on payers’ healthcare budget are of great importance in the current economics and healthcare marketplace.

II. Home Monitoring Economic Modeling
Generic Healthcare economics methods: comparative effectiveness analysis

Determine better strategy to manage patients

No intervention or current state-of-the-art intervention

New intervention

\[ \Delta \text{Cost} \]
\[ \Delta \text{Effect} = \text{ICER} \]

Model and compare the two or more alternative management strategies

Markov Model is the MOST commonly used decision-analytic model to simulate health outcomes and costs in CHF.

- 80% of heart failure economics journal papers are utilizing Markov Model

Economic Model on CHF

CHF Markov Process

Death

H=0 H=1 H=2 H=3 H=4

No intervention

New intervention

\[ \Delta \text{Cost} \]
\[ \Delta \text{Effect} \]
Model structure derived from a peer-review journal paper

Heart failure disease management programs: A cost-effectiveness analysis

David C. Chan, MD, MSc,* Paul A. Beilinich, MD, MSc,* Milton C. Weinstein, PhD,* and Gregg C. Fonarow, MD* Boston, MA and Palo Alto and Los Angeles, CA

Background  Heart failure (HF) disease management programs have shown impressive reductions in hospitalizations and mortality, but in studies limited to short time frames and high-risk patient populations. Current guidelines thus only recommend disease management targeted to high-risk patients with HF.

Methods  This study applied a new technique to infer the degree to which clinical trials have targeted patients by risk based on observed rates of hospitalization and death. A Markov model was used to assess the incremental life expectancy and cost of providing disease management for high-risk to low-risk patients. Sensitivity analyses of various long-term scenarios and adjusted effectiveness in low-risk patients were also considered.

Our approach:
- We first duplicated the results of Chan's model to make sure our model structure is correct.
- We then modify the model inputs and refine the structure to meet our business need.


Methodology Overview - CHF

All models have to be at certain level of abstraction.
Methodology Overview - Home-based monitoring

"Test" = the home-based solution to test of possible exacerbations. It includes one or more of the following:
- Activity/symptoms/biomarkers/monitoring
- Questionnaire
- Smart algorithms

"Treat" = the home-based early intervention upon the detection of the exacerbation. It includes one or more of the following:
- Healthcare professionals to review data
- Telephone triage
- Personal home visit
- Initiation of home medication package

Abstract the Efficacy/Cost of our Technology with 6 Parameters

Clinical parameters:
- Sensitivity of the home exacerbation detection (SEN)
- Specificity of the home exacerbation detection (SPE)
- Acute exacerbation reversion ratio (ERR), or, reduction rate of hospitalization
- LOS reduction ratio (LRR) through early detection and early intervention

Economic parameters:
- Cost of “Test” (Cost of Early Detection, or CED)
- Cost of “Treat” (Cost of Early Treatment, or CET)

Clinical impact and cost impact of home monitoring

Severity of exacerbation has been reduced (reflected in reduced LOS)
- Exacerbation (re-admission) is successfully reverted
- FPs will incur unneeded treatment, thus incur unnecessary cost
- FNs (missed diagnosis) will be omitted from the early treatment to prevent exacerbation, and thus will not save the hospitalization cost (but incur monitoring cost)
Model inputs derived from our 10-year literature meta-analysis

A Meta-Analysis of Remote Monitoring of Heart Failure Patients

Catherine Klieser, MD, MSC, Amalia De Shepper, MSC, Gabriele Galeni, MA
Pavis, Italy, and Lugano, Switzerland

Objectives
- The purpose of this study was to assess the effect of remote patient monitoring (RPM) on the outcomes of chronic heart failure (CHF) patients.

Background
- RPM can regularly scheduled telephone contact between patients and health care providers or electronic transfer of physiological data using remote access technology via remote external, wearable, or implanted data recording devices in a growing trend to manage patients with chronic illness.

Our approach:
- We found most of meta papers have included trials prior to 2008.
  • What we did is we first duplicate Klersy’s paper to make sure our methodology is correct (we verified the results which are consistent with the publication results)
  • We extended the meta-analysis from 2008 to 2012 with more trials included
  • We now have an excel sheet with all the raw data for all the literatures: we can continue expand our data pool as needed, and perform all kinds of analysis.

10-year literature meta-analysis of HF Telehealth: articles selections

• Rui Xiang, Lin Li, Sheena Liu, “Meta-analysis and meta-regression analysis of home-based management of heart failure patients”, Journal of Telehealth and Telecare (Accepted), 2013
Total papers:
- 33 randomized control trial (RCT)
- 26 (78.8%) papers tele-monitoring
- 7 (21.2%) papers case management

Year distribution:
- 2001-2003: 8 (24.2%)
- 2004-2007: 7 (21.2%)
- 2008-2009: 5 (15.2%)
- 2011-2012: 6 (18.2%)

Trial Country distribution:
- Germany: 4 (12.1%)
- Italy: 4 (12.1%)
- Netherlands: 2 (6.1%)
- UK: 5 (15.2%)
- USA: 14 (42.4%)
- Austria Belgium Sweden Canada: 4 (12.1%)

Patient characteristics:
- Total trial patients: 7530+
  - Average age: 69
  - Average male percentage: 65.8%
  - 21 out of 33 (63.6%) papers had reported NYHA information:
    - NYHA I: 1.9%
    - NYHA II: 40.3%
    - NYHA III: 46.9%
    - NYHA IV: 3.8%

Follow up duration:
- 32 months: 17 (51.5%)
- 24 months or more: 2 (6.1%)
- 6 months: 11 (33.3%)
- Less than 6 months: 3 (9.1%)

A sample table:

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Sample Size</th>
<th>Age/SD</th>
<th>Male %</th>
<th>NYHA I (%)</th>
<th>NYHA II (%)</th>
<th>NYHA III (%)</th>
<th>NYHA IV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones et al., 2008</td>
<td>USA</td>
<td>50 (17.7)</td>
<td>65</td>
<td>50</td>
<td>2</td>
<td>40</td>
<td>40</td>
<td>8</td>
</tr>
</tbody>
</table>

Meta-analysis Random Effect Model using REML for All Cause Mortality
- Tele-health group has 24% mortality reduction as compared to control group. Results are statistically significant.

Tele-health group has 28% readmission reduction as compared to control group. Results are statistically significant.

• Rui Xiang, Lin Li, Sheena Liu, “Meta-analysis and meta-regression analysis of home-based management of heart failure patients”, Journal of Telehealth and Telecare (Accepted), 2013
Model inputs/output

**INPUTS**
- # of Months on Tele-health
- Patients Risk Distributions (admission history + NYHA)
- Technology Choice
- Infrastructure and Service Cost

**OUTPUTS**
- # of Admissions Saved
- Mortality/Life Years Saved
- Net Cost Saved
- Customers economic viability

META-ANALYSIS: CUMULATIVE EFFICACY OF TELE-HEALTH

II. Prototype Tool
Sensitivity Analysis

Key question:

- What is the maximum monthly recurring service price to make our solution long-term cost-saving for the payers:
  - for different patient risk categories
  - in different product performance scenarios

- Economic effects considered:
  - Incur cost through HM infrastructure and services
  - Save cost through reduction of admission and LOS
Telehealth Planner

Cost vs Benefit Relative to Current State

Cost-effectiveness analysis cross candidate scenarios

Return on Investment for X months

Identify the target patient group with the best ROI
**Conclusion**

- **Model:**
  - Structure: peer-reviewed journal
  - Data: peer-reviewed updated meta-analysis

- **Generalize the model:** The model can be extended to other technological solutions

- **It is important to stratify patients** based on their clinical conditions and demands, and apply different levels of services efficiently and cost-effectively.
  - Whether the cost saving (through avoid admissions) will offset the costs of launching and maintaining the home-based monitoring is a key consideration (and can be modeled)

- **To achieve sustainability, the focus must be on identifying the financial risk holders’ return on investment (ROI)** and demonstrating economic viability.
Value Proposition

• Reduced hospitalizations and emergent care
• Improved clinical outcomes
• More effective disease management across the continuum
• Enhanced quality of life for patients
• Better aftercare for acute patients with heart failure
• Care transitions support
• Support for a stretched primary care system
• Reduced skilled nursing visits; overall cost savings to home health agencies
History of the Program

- Robert Wood Johnson Foundation Grant to develop web-enabled Care Management System for CHF – 2002
- Telephonic Care Management Program for CHF in place for 8 years
- Center for Technology and Aging Remote Patient Monitoring Grant Awardee 2011
- Remote patient monitoring in place for two years

Goals of the Remote Patient Monitoring Program

- Build a network of distance health service delivery using integrated technology that supports patient and clinician allies
- Improve patient compliance with medications, diet, weight monitoring and symptom management
- Contribute to the development of system-wide innovations: telemedicine using IPAD/Web-Ex, text messaging with Diabetes Care, Asthma Care using GPS inhalers and building e-health communities
- Reduction in avoidable hospitalization
Patient Monitors

Selection Criteria

- 60 years or older
- Hx non-compliance
- Prior hospitalization(s) within six months
- More than two co-morbidities
- Stage III-IV Heart Failure
- Multiple ED encounters within six months prior to referral
Heart Failure

Dignity Health Central Coast
Chronic Care Management Model

Center for Technology and Aging Grant - Results

- 51 Patients placed on monitors
- 39 Patients Monitored for > 6 Months
- 27 Patients Discharged:
  - 7 Stable
  - 6 Graduated
  - 6 Expired
  - 3 Hospice
  - 2 No longer wanted
  - 2 Fractured hip
  - 1 Declined
- NYHA Classification:
  - 20% Class II
  - 59% Class III
  - 22% Class IV
- Average Age: 75
- Gender:
  - 37% Male
  - 63% Female
Results

**TELEHEALTH PATIENT SATISFACTION SURVEY - 8 Weeks**

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**Results, cont.**

**Reduction in Re-Hospitalization (07/01/11 thru 06/30/12)**

- **58% reduction** in hospitalization within 30 days as compared to control group
  
  (The monitored patients experienced an 9% readmission rate within 30d while the non-monitored group experienced a 21-22% readmission rate)

- **59% reduction** in post-intervention re-admissions at six months as compared to prior 6 months*

- **58% reduction** in cost of care (ACF and E.D.) post intervention at six months as compared to prior 6 months*

* Test group
Lessons Learned

Planning
- Vendor selection and contract process
- Program Infrastructure
- I.T. Support
- Clarity with patient selection

Lessons Learned, cont.

Implementation
- Timely deployment post-hospitalization
- SNF patients
- Role of Palliative Care
- Telephonic vs. RPM
- Home Health vs. Outpatient Model
Lessons Learned, cont.

Next Steps

• Embed into Population Health Strategy
• Define future program state
• Sustainability
• Complete ROI

Thank You