Executive Summary for CAHSAH Members:

An Overview of Home Telehealth

Clinical Outcomes from Telemonitoring Studies
Why look at home health technologies such as Telehealth?

Chronic disease and cost of readmissions…
Chronic Disease costs will expand over time and increasingly burden ‘home health care’

- Individuals with one or more chronic conditions account for “the overwhelming majority” of medical expenses in the U.S. (e.g. heart failure, COPD, diabetes, hypertension, asthma), e.g. 98.8% of the costs for 65+
- Heart Failure (HF) represents $25-35 billion of healthcare expenditures each year and HF admissions have tripled in the past 26 years
- COPD accounted for $43 billion in U.S. healthcare costs in 2007

Heart Failure Incidence and Prevalence Growing

<table>
<thead>
<tr>
<th>Year</th>
<th>Incidence</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>550K</td>
<td>5M</td>
</tr>
<tr>
<td>2009</td>
<td>650K</td>
<td>5.9M</td>
</tr>
</tbody>
</table>

Estimated $30B per year spent on heart failure care in 2006

Sources:
Agency for Healthcare Research and Quality (AHRQ), 2005 report.
Journal of the American College of Cardiology, August 5, 2008 (Data from 1979-2004).
US Dept. of Health & Human Services, National Center for Health Statistics, National Hospital Discharge Survey - 2005
The impact of chronic disease on home care

For Americans over 65:
- 90% have at least one chronic disease
- 70% have two or more

Chronically ill served by home health agencies

<table>
<thead>
<tr>
<th>Chronic Disease</th>
<th>Persons Served</th>
<th>Number of Visits</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>295,000</td>
<td>18,191,000</td>
<td>2,284,877,000</td>
</tr>
<tr>
<td>Hypertension</td>
<td>138,000</td>
<td>2,878,000</td>
<td>358,451,000</td>
</tr>
<tr>
<td>COPD</td>
<td>71,000</td>
<td>1,534,000</td>
<td>194,496,000</td>
</tr>
<tr>
<td>CHF</td>
<td>181,000</td>
<td>4,014,000</td>
<td>515,913,000</td>
</tr>
<tr>
<td>Total</td>
<td>685,000</td>
<td>26,617,000</td>
<td>$3,353,737,000</td>
</tr>
</tbody>
</table>

Source: Health Care Financing Review, 2007 Statistical Supplement, Table 7.6, Persons Using Medicare Home Health Agency Services, Visits, Total Charges, Visit Charges, and Program Payments, by Principal Diagnosis Within Major Diagnostic Classifications (MDCs): Calendar Year 2006

Data provided by Fazzi Associates, researchers for Philips Chronic Disease / Telehealth Protocols expert design project
HF Patients Post-Discharge: High risk of readmission due to lack of home care and poor compliance

- Declined Quality of Life
- Family stress
- High hospital costs
- Payment denials for 30-day readmission

Majority of HF patients are discharged home with no caregiver


<table>
<thead>
<tr>
<th># Medicare inpatients/12 mo.</th>
<th>Average LOS</th>
<th>Average costs/day</th>
<th>Average costs/Stay</th>
<th>Average payment/Stay</th>
<th>Average loss per stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>371 w/Heart Failure primary diagnosis</td>
<td>6.7 days</td>
<td>$1,218</td>
<td>$8,160</td>
<td>$6,023</td>
<td>($2,137)</td>
</tr>
</tbody>
</table>

Sample data from Philips customer: hospital in a South East health system.
The impact of readmissions on healthcare costs is substantial, particularly in the Medicare population.

**Readmission rates and spending are significant...**
- ~18% of Medicare patients are readmitted within 30 days of discharge, resulting in $15B of spending in 2005

**Reducing readmission rates is both important and feasible...**
- Many readmissions viewed as preventable
  - 75% of all 30-day Medicare readmissions were potential preventable according to Medicare Payment Advisory Commission study (potential savings of $12B to Medicare)
- Wide variation in readmission rates between different cities and hospitals suggests room for improvement
  - Nationwide Medicare readmission rates vary from ~12% to ~22% by city in 2005
- Estimated that Medicare can generate over $100B in savings over next decade by bringing high-cost areas down to national average on 30-day readmissions

Source: Dr. Molly Coye, presentation at Partners Connected Health symposium Oct. 2008
Early intervention through post-discharge home telemonitoring can break this ‘frequent flyer’ cycle

- Daily monitoring of patient vital signs (weight, BP, etc.) and health status/symptoms can identify early signs of deterioration – allowing for clinical intervention before patient is critically decompensated

- Early intervention can prevent unnecessary hospitalization*
  
  *Circulation; October 2, 2007, Issue 1550

- Remote monitoring of CHF patients could save $10.1B / year according to Brookings Institutions report (Robert Litan, Kauffman Foundation economist)

- Home Health Agency outcomes show reduced re-hospitalization rate for telemonitored patients

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Events</th>
<th>Total Episodes</th>
<th>Your Rate</th>
<th>CMS Risk Adjusted Ref</th>
<th>SHP Benchmark</th>
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</thead>
<tbody>
<tr>
<td>1 May '08</td>
<td>2</td>
<td>8</td>
<td>25.0%</td>
<td>36.0%</td>
<td>25.4%</td>
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<tr>
<td>2 Jun '08</td>
<td>3</td>
<td>15</td>
<td>20.0%</td>
<td>36.7%</td>
<td>28.1%</td>
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<tr>
<td>3 Jul '08</td>
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<td>9</td>
<td>0.0%</td>
<td>36.6%</td>
<td>25.9%</td>
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<tr>
<td>4 Aug '08</td>
<td>2</td>
<td>13</td>
<td>15.4%</td>
<td>37.3%</td>
<td>20.1%</td>
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<tr>
<td>Totals:</td>
<td>7</td>
<td>45</td>
<td>15.6%</td>
<td>36.7%</td>
<td>25.2%</td>
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</tbody>
</table>

<table>
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<th>Date</th>
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<th>Total Episodes</th>
<th>Your Rate</th>
<th>CMS Risk Adjusted Ref</th>
<th>SHP Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 May '08</td>
<td>26</td>
<td>136</td>
<td>19.1%</td>
<td>32.1%</td>
<td>26.5%</td>
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<tr>
<td>2 Jun '08</td>
<td>24</td>
<td>116</td>
<td>20.7%</td>
<td>34.1%</td>
<td>26.5%</td>
</tr>
<tr>
<td>3 Jul '08</td>
<td>20</td>
<td>109</td>
<td>18.3%</td>
<td>35.7%</td>
<td>25.9%</td>
</tr>
<tr>
<td>4 Aug '08</td>
<td>23</td>
<td>118</td>
<td>19.5%</td>
<td>34.6%</td>
<td>26.8%</td>
</tr>
<tr>
<td>Totals:</td>
<td>93</td>
<td>479</td>
<td>19.4%</td>
<td>34.0%</td>
<td>26.1%</td>
</tr>
</tbody>
</table>

SHP benchmark data for patients on Philips telemonitoring devices, At Home Care (Medicare-certified agency in NY)

© Philips 2008
How does it work?

Home Telehealth Enables Post-Discharge Monitoring by Home Health Providers

Intelligent Automated Interactions – based on patient responses to health status surveys

Exception-based Interventions – Triggered by flags from out-of-range vital sign data
Benefits of Home Telehealth

Improved patient outcomes with early intervention

- Proven to reduce cardiac re-hospitalizations for CHF patients\(^1\)
- Leads to better clinical outcomes and financial performance\(^2\)
- Enhances patients’ compliance and self-care regimen

\(^1\) TEN-HMS Study published in JACC, May 17, 2005; John GF Cleland, MD, Aggie Balk, MD, et al clinical investigators
\(^2\) Philips National Study presented at NAHC Oct 8, 2007; Fazzi Associates BestWorks national database
How Disease Management can be applied in home care

Population Review

Data Analysis
- “Frequent Flyers”
- Hospitalized in past 3 months
- High utilizers of resources
- Non-compliance
- HF Stage 2 & 3
- Co-morbidities
- Hospital medical claims

Risk Stratification

Low visit frequency
Telephony
Shorter LOS

Set visits as appropriate
Telehealth
Education

High visit frequency
Telehealth
Higher visits
Education
Longer LOS

Physician Interventions

Low risk
- Need physician involvement
- Standing orders
- Monitoring/Intervention protocols
- Address co-morbidities, depression, case mgmt needs
- Frequent communication with the patient

Med risk
- Need physician involvement
- Standing orders
- Monitoring/Intervention protocols
- Address co-morbidities, depression, case mgmt needs
- Frequent communication with the patient

High risk
- Need physician involvement
- Standing orders
- Monitoring/Intervention protocols
- Address co-morbidities, depression, case mgmt needs
- Frequent communication with the patient

Patient Interventions

 Physician Interventions

Outcomes Tracking & Reporting

ROI Modeling
- LOS
- # of SN Visits
- Hospitalizations
- Re-admits
- ER utilization

Determine who is a risk & determine the right level of intervention

Communicate with patients and care providers to improve outcomes and promote patient self-management

Monitor & track cost/benefit ratio

Select the patients that would benefit

Adjust program

Philips Proprietary
Creating the Home Health infrastructure to deliver quality in-home Disease Management

**Hospital:**
Refer appropriate patients at discharge for telemonitoring to prevent readmissions

**Primary Care Physician:**
Reinforce patient’s care regimen and self-management behaviors

**Patient with chronic disease**

**Home Health Provider:**
Monitor patient status for earlier clinical intervention

Home Telemonitoring as Enabling Technology
Market research findings from the Philips National Study

The Philips National Study on Homecare Technology and Telehealth was the first representative market research survey of the U.S. home health industry, with telephone surveys conducted during Q3 2007 by Fazzi Associates of 976 home health agencies.
Telehealth Improved Home Health Quality Metrics

- 89% of agencies surveyed report telehealth led to an increase in quality outcomes, often used as part of a disease management program
  - 76.6% cite reduction in unplanned hospitalizations
  - 77.2% cite reduction in ER visits
- 76% of agencies also report improved patient self-care

**Impact on Quality Indicators**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Quality</strong></td>
<td>88.6%</td>
<td>3.6%</td>
<td>7.8%</td>
</tr>
<tr>
<td><strong>Emergent Care</strong></td>
<td>79.8%</td>
<td>8.9%</td>
<td>11.3%</td>
</tr>
<tr>
<td><strong>Unplanned Hospitalizations</strong></td>
<td>75.4%</td>
<td>14.4%</td>
<td>10.2%</td>
</tr>
<tr>
<td><strong>Patient Satisfaction</strong></td>
<td>70.8%</td>
<td>15.5%</td>
<td>13.7%</td>
</tr>
</tbody>
</table>

Disease Management and Telehealth Improved Outcomes

• 66.3% of agencies using telehealth do so as part of a disease management program

• Use of both disease management and telehealth leads to better clinical outcomes and financial performance
  – Better margins: 17.0% with vs. 10.4% without*
  – Improved quality: +38.4 with vs. -4.6 without*

Clinical proof of improved outcomes through Telehealth…
Telemonitoring reduces HF Hospitalization Rates and leads to ADL Improvements according to SHP data (Strategic Healthcare Programs, a leading home health outcomes and benchmarking firm)

“With proper protocols, implementation and accountability, home health agencies can decrease skilled nursing visits by 5-7 per 60-day Medicare episode.”

Source: SHP data on U.S. home health agencies (Strategic Healthcare Programs, a leading home health outcomes and benchmarking firm)
Cost reductions realized by Community Health Center

- Hospitalizations and ER visits decreased during home telehealth program
- Positive results continued after telehealth program ended
- Total hospital charges dropped 81% during telehealth and continued to decrease

\[ n = 40 \text{ In-home patients} \]

Analyzed charges are related to diseases being monitored.

Roanoke Chowan Community Health Center / PPCTN Cost Data Ending December 2007
Lower rehospitalization rates for telemonitored patients vs. non-monitored patients and much lower than CMS projections.

SHP benchmark data for home health agency (At Home Care in NY)
Tufts-NEMC SPAN-CHF II Telemonitoring Study

Study Design

• 188 patients recently hospitalized for heart failure
• 90-day prospective randomized controlled study
• Compared disease management approaches: telephonic-only vs. weekly telephone call + home telemonitoring
• Reported at AHA scientific sessions Nov. 2005

Results:

<table>
<thead>
<tr>
<th></th>
<th>% reduction for intervention group</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF hospitalizations (p=0.030)</td>
<td>72%</td>
</tr>
<tr>
<td>Cardiac hospitalizations (p=0.029)</td>
<td>63%</td>
</tr>
<tr>
<td>All Cause hospitalizations (trend)</td>
<td>20%</td>
</tr>
</tbody>
</table>
# Home Health Cardio-Pulmonary Telemonitoring Study

## Study Design
- 733 patients in cardio-pulmonary program
- Average of 230 patients in telemonitored group
- 87% over age 65, 51% female
- Two-year timetable ending April 2006
- Study performed by Philips customer, a large home health organization
- Shows impact of post-discharge monitoring continues after episode of care ends

## Results

<table>
<thead>
<tr>
<th></th>
<th>At time of admission</th>
<th>At time of discharge</th>
<th>16 weeks post discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Emergency Room</td>
<td>71%</td>
<td>10%</td>
<td>6%</td>
</tr>
<tr>
<td>Medication Compliance (understand their meds)</td>
<td>51%</td>
<td>96%</td>
<td>99%</td>
</tr>
<tr>
<td>Functional Improvement in Activities of Daily Living (ADL)</td>
<td>38%</td>
<td>92%</td>
<td>92%</td>
</tr>
</tbody>
</table>
Trans-European Network Home-care Management Systems (TEN-HMS) Study

Study Design

- 426 heart failure patients recently hospitalized, with LVEF < 40%
- 168 patients in telemonitored group
- 240-day prospective randomized trial
- Two-year timetable ending July 2002
- Clinical investigators were leading cardiologists in 3 European countries
- Presented by Dr. John GF Cleland at the 24th Congress of the ESC in 2002

Published in the May 17, 2005 issue of the Journal of the American College of Cardiology
European Telemonitoring TEN-HMS Study findings

Reduced Hospitalizations

<table>
<thead>
<tr>
<th>Hospital Days per member</th>
<th>Hospital Days/Hospitalization*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Telephone Support</td>
<td>14.8</td>
</tr>
<tr>
<td>Home Telemonitoring</td>
<td>17.5</td>
</tr>
<tr>
<td>Nurse Telephone Support</td>
<td>10.9</td>
</tr>
<tr>
<td>Home Telemonitoring</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Cost Savings

<table>
<thead>
<tr>
<th>Total Cost per Patient (Euro)</th>
<th>Nurse Telephone Support</th>
<th>Home Telemonitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>5000</td>
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</tr>
<tr>
<td>2000</td>
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<tr>
<td>7000</td>
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</tbody>
</table>

Home Telemonitoring led to:

- 26% fewer days in hospital than Nurse Support
- 10% cost savings over Nurse Support program
- ROI of 2.1 vs. Nurse Support
- 29% higher survival rate than Usual Care

Source: TEN-HMS Study, JACC May 17, 2005
Philips Home Healthcare Solutions
Extending the delivery of care from hospital to home

Supporting independent living

Lifeline
Medical alert services (PERS)

Home Telehealth Solutions
Post-discharge telemonitoring

Cardiac Monitoring Services
Arrhythmia, ICD, INR monitoring

Supporting remote monitoring

Sleep Apnea and Respiratory Products

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