



CALIFORNIA  
HEALTHCARE  
FOUNDATION



Center for  
Technology and Aging



CENTER FOR  
CONNECTED HEALTH

## Return on Investment Model for Remote Patient Monitoring of CHF Patients

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Grantmakers in Aging

## CHCF interest in ROI for Remote Monitoring



- Good evidence remote monitoring works for Congestive Heart Failure but limited uptake
- An important technology to keep people healthy and reduce costs – alignment with CHCF mission
- ROI important in making purchase decisions for new technologies and services
- Leverage existing grantees of Center for Technology and Aging and expertise of Partners Healthcare
- Focus on sustaining and scaling important innovation



## Overall Goal

### Defining Return On Investment (ROI)

- A performance measure used to evaluate the [efficiency](#) of an investment or to compare the efficiency of a number of different investments.
- To calculate ROI, the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio.
- Develop a return on investment (ROI) model for congestive heart failure using remote patient monitoring technology.

## Center for Technology and Aging

- Dedicated to advancing use of technologies that improve home and community based care for older adults
  - Resulting in better care, better health, lower costs
- Accelerating Deployment of Proven Technologies
- Technology Diffusion Grants Programs
- Support from The SCAN Foundation and located at the Public Health Institute

## Center for Technology and Aging: *Diffusion Grants Program*

- Medication Optimization
- Remote Patient Monitoring
- Post Acute Care Transitions (Tech4Impact)
- mHealth



## Remote Patient Monitoring Diffusion Grants Program: Goals

- Demonstrate how to quickly and effectively expand the use of Remote Patient Monitoring technologies to:
  - Reduce preventable admissions and readmissions
  - Reduce the burden on providers and family caregivers
  - Improve quality of life
- Identify the business case
  - Positive and measurable impact on quality and cost of care
- Expand deployment
  - Sustainable program past grant cycle
- Influence public policies that can lead to improvements in long-term care and post-acute care
- Share successful diffusion strategies and lessons learned nationally

## ROI of RPM Program: Participating Grantees

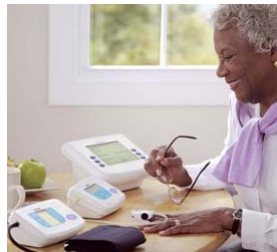
- Catholic Healthcare West
  - Centura Health at Home
  - HealthCare Partners Institute for Applied Research and Education
  - Sharp HealthCare Foundation
  - Veteran's Administration – Fresno
- ✓ All are using RPM + clinical support for patients with CHF
- ✓ Supplying costs of intervention and outcomes



## Catholic Healthcare West Catholic Healthcare West

### Expanding telephone based monitoring program to include Remote Patient Monitoring

- Philips TeleStation Monitoring System



- Transmits data using patient's land line including:
- blood pressure
  - pulse
  - oxygen saturation
  - weight
  - answers to disease specific health care questions

Targeting older adults (65+)  
with HF living in the  
community in Central CA

## Centura Health at Home



### Enhancing the Home Telehealth Program with Call Center Activities

- Dedicated 24/7 Call Center incorporates telehealth component to established Telehealth Program
- Daily Monitoring with American Telecare



### Outcomes:

- reduced the frequency of 30-day rehospitalizations by 62%.
- reduced the frequency of home RN visits from typically 2-3 visits a week down to 2.69 visits per 60-day period.
- increased the number of patients seen in the program from 100 to 200 patients with plans to expand to over 2,000 patients.

## HealthCare Partners Institute for Applied Research and Education

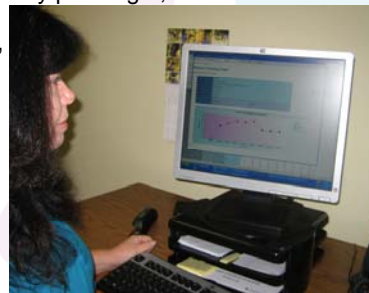


### Televox - Interactive Voice Response (IVR) Technology for COPD patients

- Telephone-based system
- Patients receive call 1-3 times a week
- 7-10 questions are asked, patients respond by pushing 1,2 or 3 on the keypad
- Clinicians monitor by exception – push “3”

### Preliminary results

- High patient satisfaction
- Reduced medical services utilization



# SHARP Remote Patient Monitoring Program - Reducing CHF Readmissions



Cardicom - Patient Management Products

### Telescale:

Transmits data daily using patient's land line

Clinicians monitor data by exception



### Commander Cellular with Medical Scale:

Uses integrated cellular modem and uses GPRS technology to transmit data



Medical Scale

### Preliminary Outcomes:

- 30 day readmission rate decreased to 8.75% (previously 20%)
- 98% of patients scored above 70% in their patient activation score for HF management

# Veterans Health Administration (Central CA)



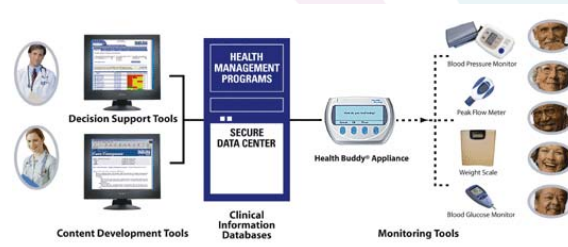
## Reducing CHF Hospital/ED Visits - Remote Patient Monitoring Program

### Health Buddy®:



Transmits blood pressure and weight data using patient's land line

Clinicians monitor by exception



VHA: world's largest telehealth user

200 veterans in RCT with CHF and > 1 hospital admission or ER visit in the last 24 months.

## ROI of RPM — The Premise

- **Invest** in innovations that improve home and community based care for people with complex, chronic conditions
  - Move out of high cost, acute settings, e.g., hospital to home
  - Monitor symptoms; early warning for deteriorating health
- **Return on Investment**
  - Better care, better health
  - Lower cost of care
- ROI is a simple **ratio**:

$$\frac{(\text{Gain from Investment}) - (\text{Cost of Investment})}{\text{Cost of Investment}}$$



## ROI Model Objectives

- Create a flexible ROI model for CHF home monitoring programs, targeted at program owners to **evaluate possible program expansion**
- Model is intended to allow program owners to determine how the various inputs and assumed outcomes impact the return on their expected investments in technology and resources

## ROI Model Objectives

- Model will be applied to 5-6 current CTA/CHCF grantees, to leverage the data that will exist in their current CHF telemonitoring pilots
- Create a user-friendly interface that will allow program owners to run their own ROI analyses and scenarios to understand better how the various assumptions and inputs **impact** their ROI
- Model is not intended to be the only decision-making tool in expansion of a CHF telemonitoring program, as other corporate factors such as organizational readiness, strategic alignment with other priorities, tax/capital availability considerations, and contracting issues, should ultimately be taken into account.

## ROI Model

### Investments:

- Technology and operations
- Human resources
- System-wide changes

### Return:

- Change in ER utilization
- Change in out-patient utilization
- Change in medication



## Key Components of the ROI Model

- **Labor Costs**
  - Staff costs
  - Caseloads
- **Technology Costs**
  - Device costs
  - Telecommunications and applications services
- **Implementation and Ongoing Costs**
  - Developing a program design and clinical protocols
  - Training staff
  - Outreach to patients to engage them in the program
  - Outreach to physicians and providers who will support patients in the program
  - The cost of getting hardware to the patient, installing it, and training the patient
  - The cost of retrieving the hardware when a patient dis-enrolls



## Model - Levers

### Eligible Patient Population and Enrollment

- Size of the total patient population, estimated eligibility percentage based on current criteria
- Model is based on one intervention for one eligible patient population
- Model accommodates different rates of enrollment before reaching a level of “scale”, and takes into account a conversion percentage to find the number of eligible, able, and willing patients.

## Model: Enrollment Numbers

www.cchchfroi.org

Enrollment > Growth > Summary

As the basis for calculating the return on investment for your tele-monitoring program, the first step is to calculate your current enrollment numbers and your planned expansion over the next 5 years. Fill in the numbers requested below.

Questions? Click on the ? to the right of each line if you need further explanation on what the tool is looking for.

Current number of CHF patients enrolled:	<input type="text" value="Input number"/>	?
How long is the intervention (4-12 months):	<input type="text" value="Input number"/>	?
Total number of CHF patients in catchment area:	<input type="text" value="Input number"/>	?
What percentage of patients are ineligible for your program?	<input type="text" value="Input number"/>	?
What percentage of patients refuse to participate?	<input type="text" value="Input number"/>	?

Clicking the ? will open box that explains question in more detail

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## Enrollment (continued)

www.cchchfroi.org

Enrollment > Growth > Summary

Now that we have some basic numbers on your current program, this section of the tool asks for information on the program's growth prospects.

What is the annual growth rate of CHF patients?	<input type="text" value="Input number"/>	?
Goal of enrolled patients in 5 years:	<input type="text" value="Input number"/>	?

Clicking the ? will open box that explains question in more detail

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## Enrollment summary screen

www.cchcfrai.org

Home  
Program  
Enrollment  
Technology Costs  
Human Resources  
Health Outcomes  
Scenarios  
ROI Analysis

[Enrollment](#) > [Growth](#) > Summary

Based on the data supplied in the previous two pages, below is an outline of the calculations made so far for your current enrollment numbers and growth potential.

Do they look accurate to you? If yes, click next at the bottom of the screen.

If not, click back to revisit and alter your assumptions.

Patient Enrollment Summary Data	Year 1	Year 2	Year 3	Year 4	Year 5
Total Number of CHF Patients in Catchment Area					
Number of patients enrolled					
Assumed ## of Concurrent Patients					

Back Up, I Forgot Something

Looks Good. Next

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## Model – Levers (continued)

### Technology Costs

- Technology costs can be entered either as fixed annual costs or variable (volume based).
- Model takes into account two different financing models for technology, either as an up-front purchase/lease or technology acquired as needed
- Additional costs that may be required, such as integration costs, can also be entered

## Model – Levers (continued)

### Staffing Resources Required

- Model assumes that a program that is integrated into the healthcare system will need management/overhead resources as well as variable resources
- Users will enter FTE percentage and salary/benefits for overhead resource
- Variable resources may include technical or customer support and clinical management resources. Variable resources are calculated based on number of patients enrolled at any given time.

## Model – Levers (continued)

### Outcomes and healthcare utilization changes

- CCH will evaluate the raw data from each grantee to determine the changes in healthcare utilization based on pilot outcomes.
- For costs associated with hospitalizations/healthcare utilization, model assumes national standard costs, but each grantee can change them to reflect the average costs in their own market.
- The focus will be on changes in hospitalizations for HF and non-HR related reasons, ED visits, and outpatient utilization
- *The final model will project utilizations at scale based on pilot outcomes*

## Summary Screen (page 3)

Window Name

Home

Program

Enrollment

Technology Costs

Human Resources

Health Outcomes

Sensitivity Analysis

ROI Analysis

Summary > ROI Analysis

Cost Categories	Year 1	Year 2	Year 3	Year 4	Year 5
Start-Up Costs					
Technology & Operating Costs					
Technology 1					
Technology 2					
Fixed Technology Costs					
Variable Technology Costs					
Resource Costs					
Fixed Human Resource Costs					
Variable Human Resource Costs					
Total Program Costs					
Healthcare Utilization Savings					

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## Using ROI as a business tool

- Decisions to take a program to scale depend on sustainable funding or cost savings.
- ROI model will not only evaluate performance of a program, but also reveal the points of maximum sensitivity.
- Tool designed to help business managers 'play' with various levers to determine best route to scale.
- Example to illustrate sensitivities in patient enrollment

# Sensitivity Screen

Window Name

Home

Program

Enrollment

Technology Costs

Human Resources

Health Outcomes

Sensitivity Analysis

ROI Analysis

Parameters to adjust:

Change 5 year enrollment goal to:

Change in eligibility. What's the new percentage?

Change in refusal rate. What's the new percentage?

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# Sensitivity Screen (continued)

www.cchcfroi.org

Home

Program

Enrollment

Technology Costs

Human Resources

Health Outcomes

Sensitivity Analysis

ROI Analysis

New Enrollment Numbers Based on Updated Parameters

Updated Enrollment Data 5 Year Growth	Year 1	Year 2	Year 3	Year 4	Year 5
Total Number of CHF Patients in Catchment Area					
Number of patients enrolled					
% Change in Growth					
Assumed # of Concurrent Patients					

Back Up. I want to change something.

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## Sensitivity Screen (continued)

www.cchcfroi.org

Home

Program

Enrollment

Technology Costs

Human Resources

Health Outcomes

Sensitivity Analysis

ROI Analysis

Cost Implications

Based on the updated you have made to the enrollment and growth parameters, here are the estimated cost changes in each cost category.

Updated Costs for Changes	Year 1	Year 2	Year 3	Year 4	Year 5
Technology					
Fixed Human Resources					
Variable Human Resources					
Other Costs					
Total					

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## Model Limitations

- Costs of hospital admissions, ED visits, outpatient visits can be tailored to each institution. No special provision being made for 30-day readmissions, as it is not being collected by all grantees and impact of this varies.
- Most grantees will be able to collect utilization within their own system only, so may be underestimating the full impact of change in utilization
- Model currently assumes that each “program” lasts for 12 months or less, to make the model simpler to use
- Model assumes one program intervention for the eligible enrolled patient population

## ROI of RPM — The Importance



- **Health Care Providers need sustainable business models**
  - Not-for-Profits, too: “No margin, no mission”
  - Upcoming penalties for avoidable hospital readmissions
  - “Accountable care” growing
- **Health Care Payors under pressure to bend cost curve**
  - Left unchecked, health care will consume ½ of *all* US spending by 2082 (CBO report)
- **Grantmakers want programs to continue when funding stops**
  - What will sustain grantees when your funding ends?
  - Design grants to show ROI . . . Ensure widespread adoption and incite policy change



## Questions?

[www.techandaging.org](http://www.techandaging.org)

[www.connected-health.org](http://www.connected-health.org)



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