Case Studies for Successful Innovation:

Tools for Evaluating Strategies and Technologies

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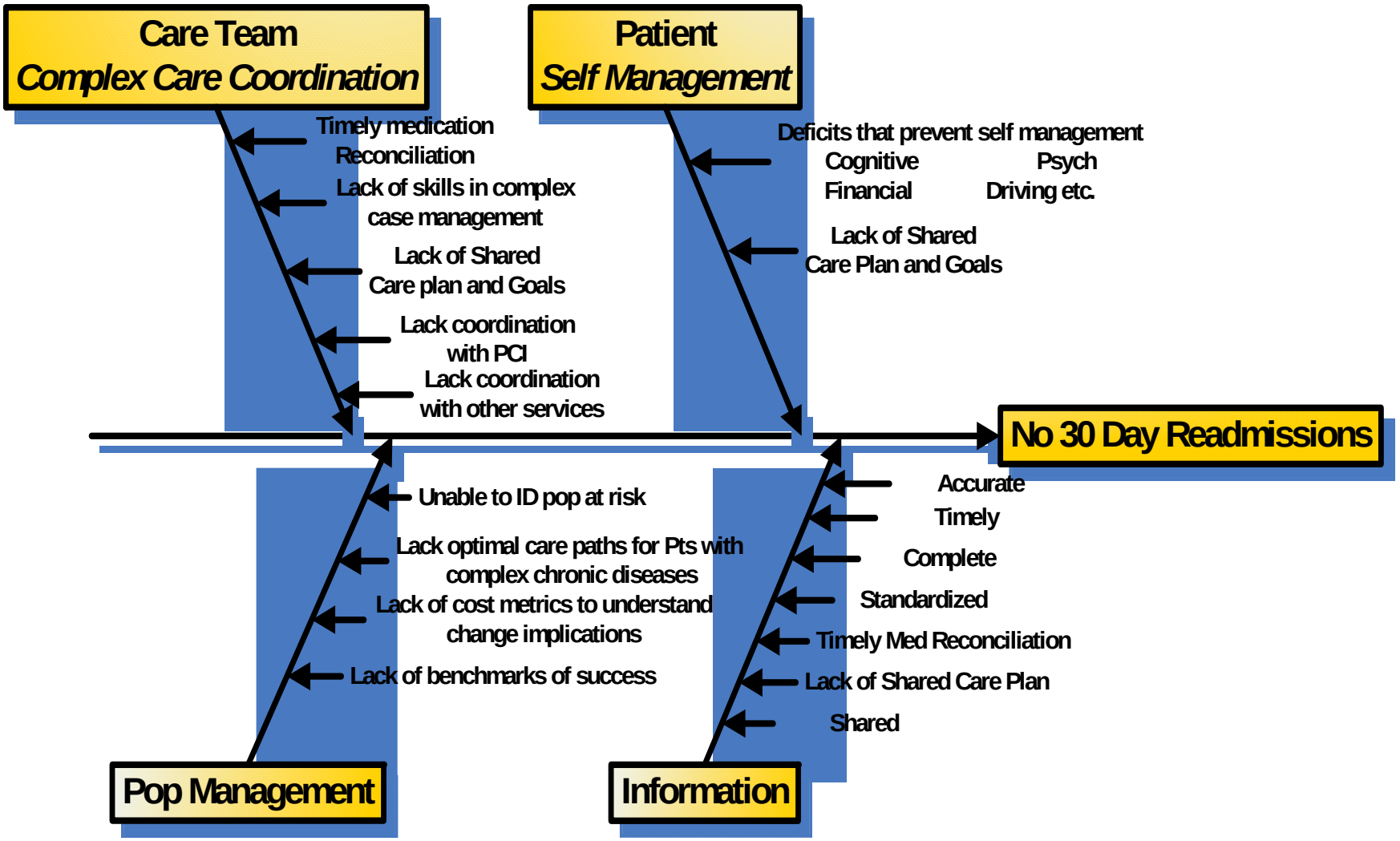
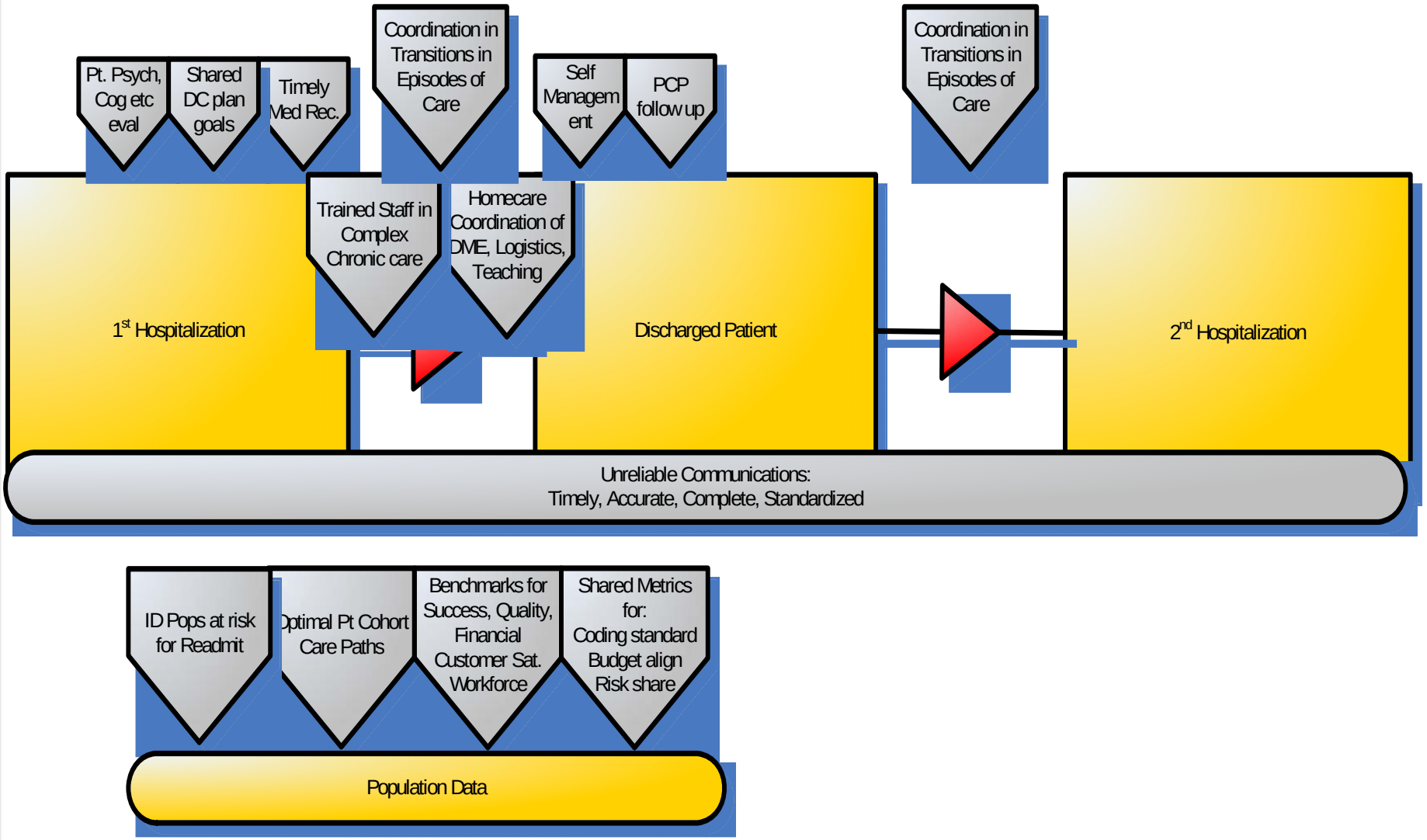
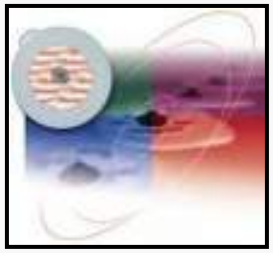
Issues surrounding readmissions



Issues surrounding readmissions by process steps



A Wealth of Technologies



Smart Sensors

Wireless Networks

Home Meds Management

Shared Care Plan

Home Monitoring

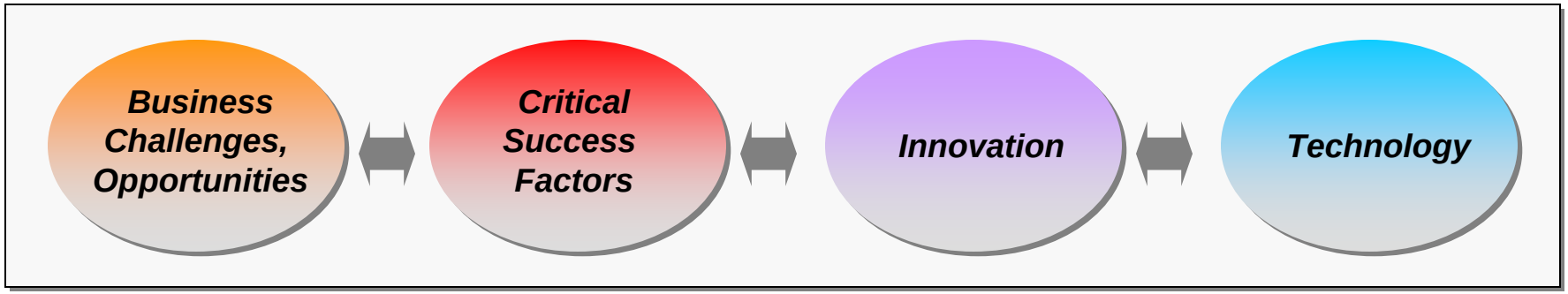
Video-Based Education

Telemedicine

Which technologies will have the biggest impact on 30 day readmissions?

How do high-impact technologies get disseminated quickly, efficiently and effectively?

Connecting Technology & Innovation to Healthcare Challenges



Innovations are strategic, technology is tactical

Which innovations and technologies will be truly helpful?

How can these be adopted to meet the business challenges & opportunities?

How will they affect quality and sustainability?

Which technologies are actionable now, near term, long-term?

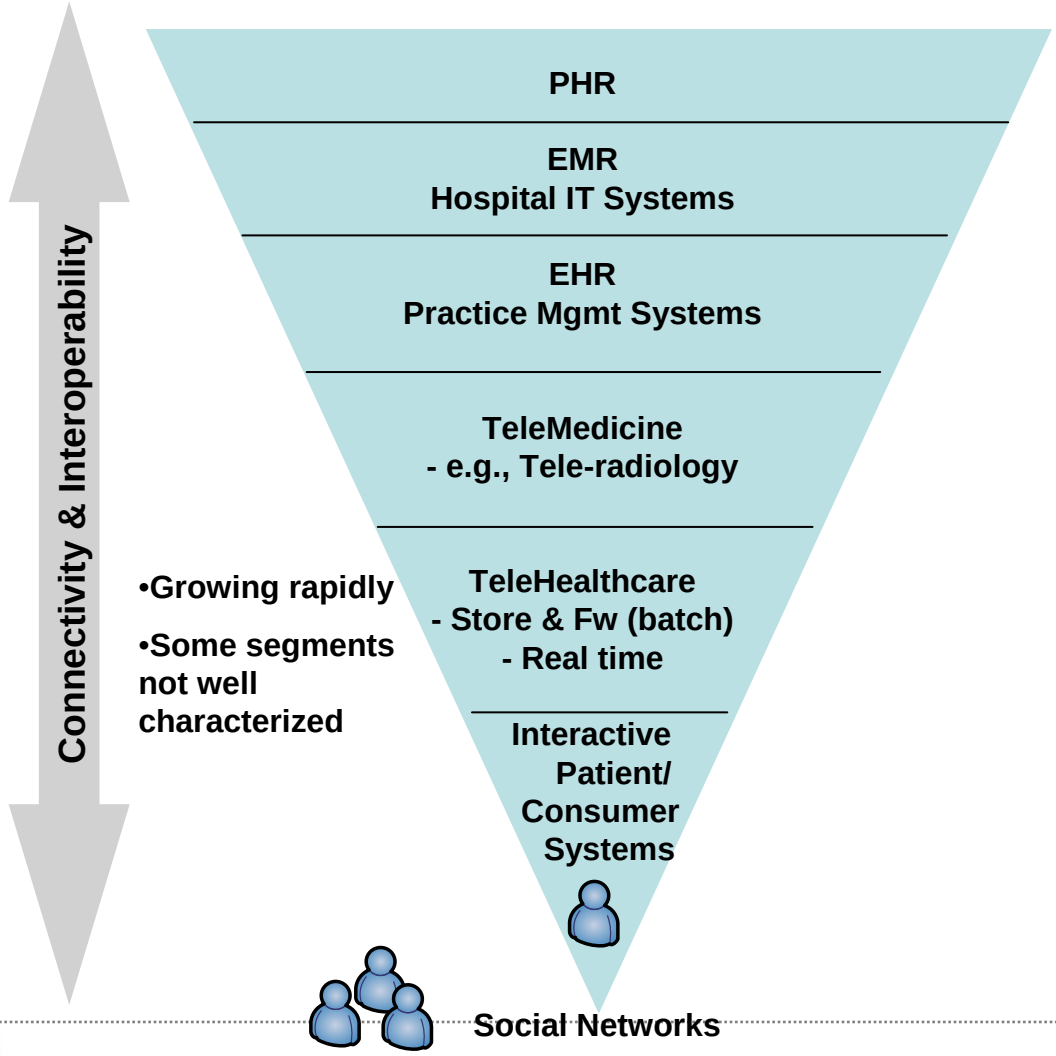
Remote Patient Management & Telehealth Technologies:
A Disruptive and Transformative Solution To A National Health Care Challenge

- The health care system is ill-equipped to manage the growing disease burden challenge
- New business models are emerging in response to policies designed to improve outcomes and reduce spending
- Remote patient management technologies are an opportunity to advance national health care goals
- Remote patient management technologies are a disruptive and transformative technology
- Adoption and diffusion paths reflect a balance between technology, policy and market interests

E Health market and Segments and Volume

Definition:

e-Health is Healthcare supported by Electronic Processes and Communication



U.S. Market 2007	Size [$M]	CAGR
EMR Technologies	**1,200**	**?**
Healthcare IT	**10,640**	**13%**
Hospital		
EHR	**1,500**	**?**
Practice Mgmt	**1,800**	**?**
e-Prescribing	**48**	
Home Telehealth & Remote Patient Monitoring	**600**	**50%**
	853	**36%**
Digital Home Health	**70**	**69%**
Remote Patient Monitoring	**209**	**?**
Connected Med. Service		
Wireless Health	**4,827**	**10%**
Wireless Devices	**2,700**	**29%**

The Telehealth Process

Patient <u>interacts</u> with telehealth device

<u>Data collected includes:</u>

- Vital signs (blood pressure, glucose meters, pulse oximeters, weight)
- Physical and emotional well-being assessment

Patient information is <u>collected & transmitted</u>

<u>Data transmitted over:</u>

- Video over low-bandwidth POTS
- Video over IP
- LAN/WAN
- Broadband

Caregiver or clinician <u>receives data & uses</u>

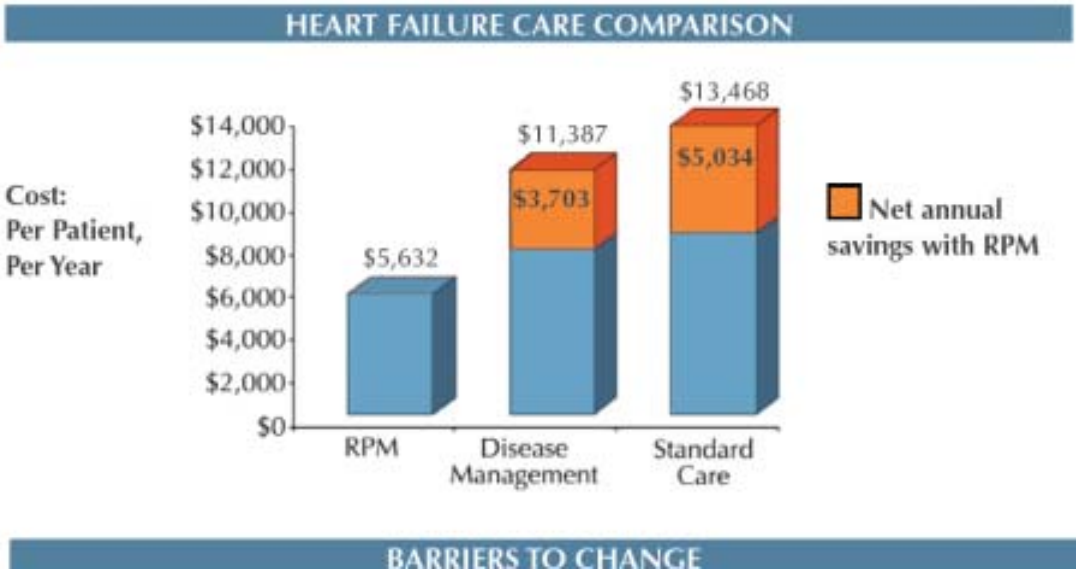
<u>Results include:</u>

- Enhanced communication between caregivers, providers, and patients leads to improvements in:
  - care coordination
  - caregiver support
- Reduce unnecessary visits
- Improve medication compliance

The Opportunity: RPM of patients with congestive heart failure

The New England Healthcare Institute's Research Update: *Remote Physiological Monitoring* reports the following cost savings for all Class III and Class IV heart failure patients, assuming that 80% of the 1.59 million patients in these two classes, or 1.27 million patients, will be hospitalized in a year, at an annual cost of $2,052 per patient for the monitoring technology ($2,802 with DM software):

- 60% reduction in hospital readmissions compared to standard care and a 50 percent reduction in hospital readmissions compared to disease management programs without remote monitoring.
- Based on the potential to prevent between 460,000 and 627,000 heart failure-related hospital readmissions each year, NEHI estimates an annual national cost savings of up to $6.4 billion dollars.



- The annual cost of a heart-failure related hospitalization per patient ranged from $5,632 for RPM patients to $11,387 for disease management without RPM patients to $13,468 for standard care patients.
- The net savings of RPM technology (i.e. savings after the costs associated with interventions) were $3,703 per patient per year for those with disease management programs and $5,034 for those with standard care.

Policy Change To Support Broad RPM Diffusion Will Drive Cost Savings

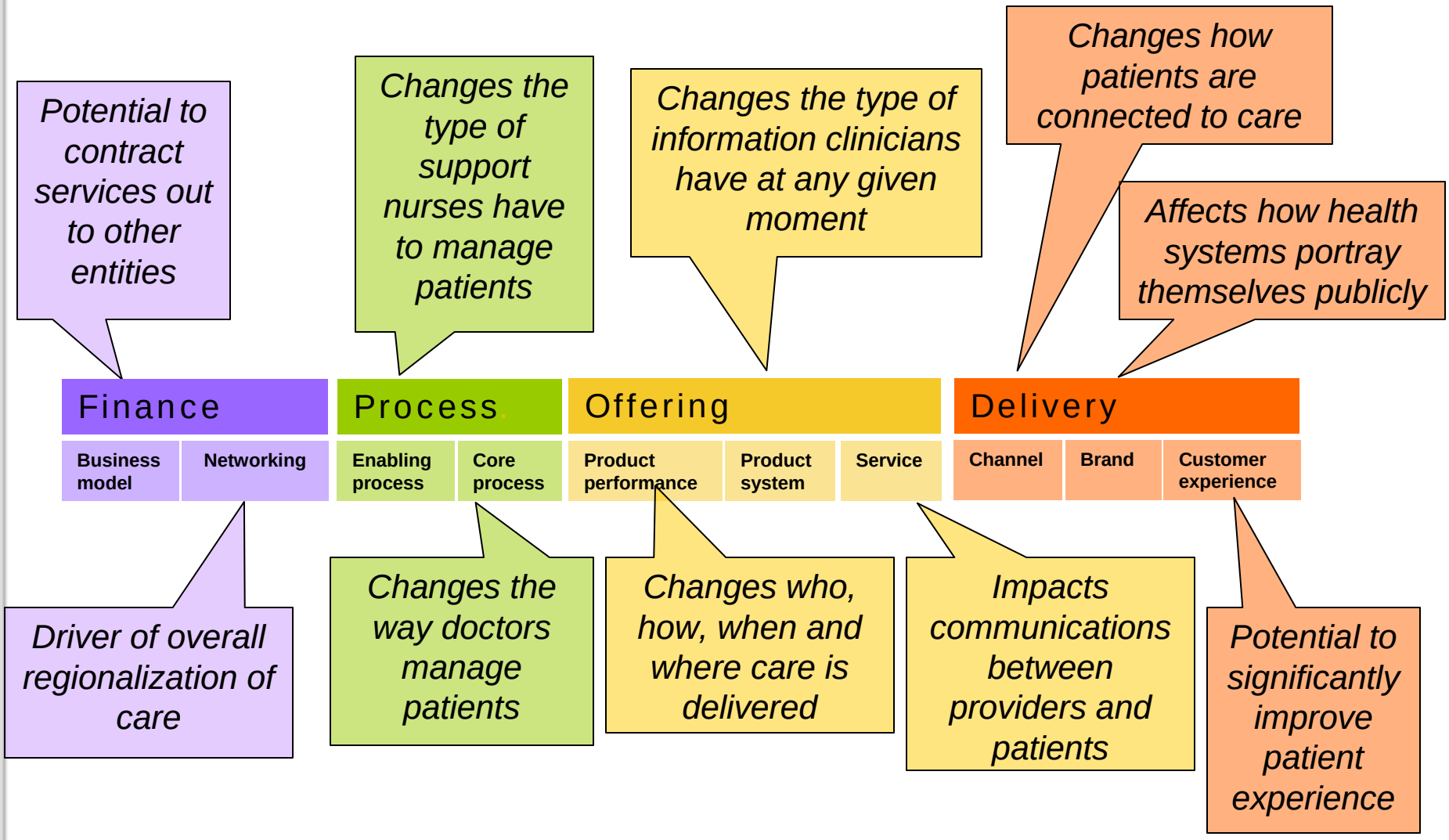
Analyzing data from the remote monitoring program at the VA, as well as other smaller programs, Better Health Care Together finds the US health care system could reduce costs by nearly $200 billion during the next 25 years if remote monitoring tools were utilized much more widely and supported by specific policy adjustments that include reimbursing health care organizations for remote care and encouraging continued investment in broadband infrastructure.

Estimated Savings and Gain from Policy Implementation, by Condition

	Net Present Value of Savings – Baseline Case	Net Present Value of Savings – Policy Case	Gain From Policy Change
CHF Patients	**$79.7 Billion**	**$102.5 Billion**	**$22.8 Billion**
Diabetes Patients	**$42.3 Billion**	**$54.4 Billion**	**$12.1 Billion**
COPD Patients	**$18.7 Billion**	**$24.1 Billion**	**$5.4 Billion**
Chronic Skin Ulcer Patients	**$12.5 Billion**	**$16.0 Billion**	**$3.5 Billion**
Total	**$153.2 Billion**	**$197 Billion**	**$43.8 Billion**

Source: *Vital Signs via Broadband: Remote Health Monitoring Transmits Savings, Enhances Lives*

Transformative and Disruptive Innovations in RPM Health Services



Ten Types of Telemedicine Innovation

1. Business model
how the enterprise makes money

2. Networking
enterprise's structure/ value chain

5. Product performance
basic features, performance and functionality

6. Product system
extended system that surrounds an offering

7. Service
how you service your customers

Finance		Process		Offering			Delivery		
Business model	Networking	Enabling process	Core process	Product performance	Product system	Service	Channel	Brand	Customer experience

3. Enabling process
assembled capabilities

4. Core processes
proprietary processes that add value

8. Channel
how you connect your offerings to your customers

9. Brand
how you express your offering's benefit to customers

10. Customer experience
how you create an overall experience for customers

Business Model Issues

Business models are evolving in a number of settings, starting with the VHA and integrated provider-based health plans, and moving to home care agencies, integrated delivery systems, health plans, an others.

- **The VHA** - RPM deployment has contributed to important financial and patient care goals as a result of decreases in hospital volume, fewer ED visits and long-term care bed days, as well as a shift in care to outpatient clinics and into the home, and resulted in further deployment of RPM.
- **Integrated provider-based health plans** - Like the VHA, integrated provider-based plans, such as Kaiser Permanente, Group Health of Puget Sound, and other group- and staff-model provider-based plans, may find that their financial and clinical integration provides fertile ground for the implementation of RPM.
- **Home care agencies** – Home care agencies are well positioned to extract value from RPM deployment but do not have a means of sharing in the much larger savings they generate when they reduce ED visits and hospitalizations. In 2008, 17 percent of agencies were reportedly using some type of telehealth system.
- **Integrated delivery systems** – Their traditional business model is poorly aligned with chronic care innovations and the RPM technologies that support them. It remains unclear how CMS requirements on 30-Day readmissions will impact models for the longer-term maintenance of patients with chronic diseases.
- **Health plans -** Special Needs Plans (SNPs) could migrate toward RPM deployment to capture the efficiencies of improved care management as both the number of SNPs for people with chronic conditions and the populations enrolled have grown rapidly over the past five years

Integrated System use of Telemedicine to reduce readmissions

Business Challenges, Opportunities	***Critical Success Factors***	***Innovation***	***Technology***
Veteran's Administration: • Aging veterans • Lifetime care commitment • Chronic disease burden increasing • Shrinking resources	Plans to increase use of RDM by 66% in 3 years Goal of up to 50% of chronic illness will be managed by RDM (Small group outcomes) ↓ 15%-70% ED visits ↓ 13%-68% admits ↓ 13%-71% LOS	Use telecommunications and remote disease monitoring (RDM) to manage chronic illness at home	Use remote disease home monitoring equipment to manage 30 chronic conditions

Source: http://www.liebertonline.com/doi/pdfplus/10.1089/tmj.2008.0021

HealthBuddy by HealthHero
Remote Chronic Disease
Management System

The Early Adopter Experience: Veterans Health Administration

VA has evaluated, piloted, reevaluated, and deployed RPM technologies in a continuing process of learning and improvement that stands in vivid contrast to patterns of adoption in the private sector. At this time, there is no program elsewhere in the US of the size and complexity of VA's national program to enable detailed comparison.

Home telehealth programs drive substantial benefits as alternatives to traditional care models

- Findings from comparative studies conducted on patients enrolled in the VA's Care Coordination/Home Telehealth program in 2006 and 2007 show:
  - 25% reduction in bed days of care
  - 20% reduction in numbers of admissions
  - 86% mean satisfaction score rating

Care Coordination/Home Telehealth: The Systematic Implementation of Health Informatics, Home Telehealth, and Disease Management to Support the Care of Veteran Patients with Chronic Conditions

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Department of Veterans Affairs, Office of Care Coordination Services, Washington, D.C.

Abstract

Between July 2003 and December 2007, the Veterans Health Administration (VHA) introduced a national home telehealth program, Care Coordination/Home Telehealth (CCHT). Its purpose was to coordinate the care of veteran patients with chronic conditions and avoid their unnecessary admission to long-term institutional care. Demographic changes in the veteran population necessitate VHA increase its noninstitutional care (NIC) services 100% above its 2007 level to provide care for 110,000 NIC patients by 2011. By 2011, CCHT will meet 50% of VHA's anticipated NIC provision. CCHT involves the systematic implementation of health informatics, home telehealth, and disease management technologies. It helps patients live independently at home. Between 2003 and 2007, the census figure (point prevalence) for VHA CCHT patients increased from 2,000 to 31,570 (1,500% growth). CCHT is now a routine NIC service provided by VHA to support veteran patients with chronic conditions as they age. CCHT patients are predominantly male (95%) and aged 65 years or older. Strict criteria determine patient eligibility for enrollment into the program and VHA internally assesses how well its CCHT programs meet standardized clinical, technology, and managerial requirements. VHA has trained 5,000 staff to provide CCHT. Routine analysis of data obtained for quality and performance purposes from a cohort of 17,025 CCHT patients shows the benefits of a 25% reduction in numbers of bed days of care, 19% reduction in numbers of hospital admissions, and mean satisfaction score rating of 86% after enrollment into the program. The cost of CCHT is $1,600 per patient per annum, substantially less than other NIC programs and nursing home care. VHA's experience is that an enterprise-wide home telehealth implementation is an appropriate and cost-effective way of managing chronic care patients in both urban and rural settings.

Key words: *home telehealth, chronic care, outcomes, patient satisfaction, veterans*

Introduction

The Veterans Health Administration (VHA) within the U.S. Department of Veterans Affairs is a large integrated healthcare system. VHA currently delivers healthcare services[1] that serve 5.6 million unique veteran patients annually. A total of 7.6 million veterans are enrolled to receive VHA care.[1] The number of veteran patients aged 85 years or more that VHA treats is set to triple by 2011 compared to 2000 (*Fig. 1*).

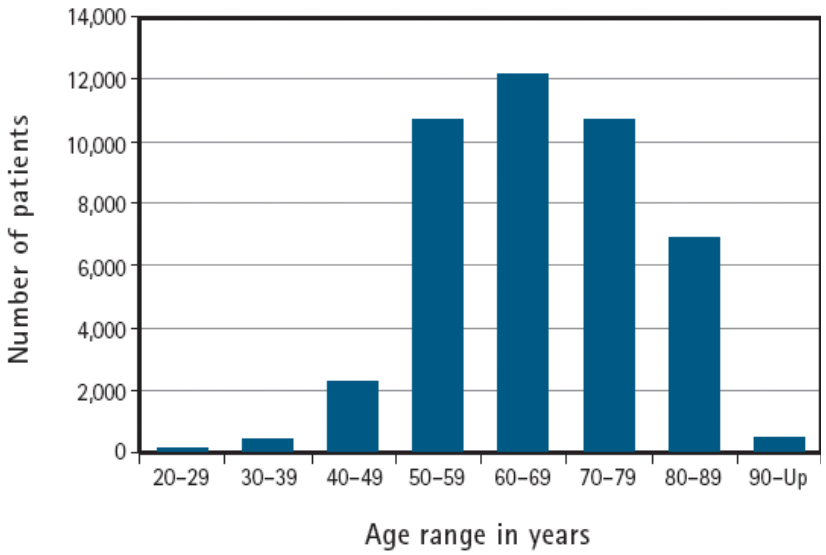
As the U.S. population ages, people are living longer,[3] staying healthier,[3–5] and choosing to live independently at home.[6,7] Responding to these same societal changes has heightened the emphasis Congress[8] and VHA place upon developing noninstitutional

DOI: 10.1089/tmj.2008.0021

The Early Adopter Experience: Veterans Health Administration (Contd.)

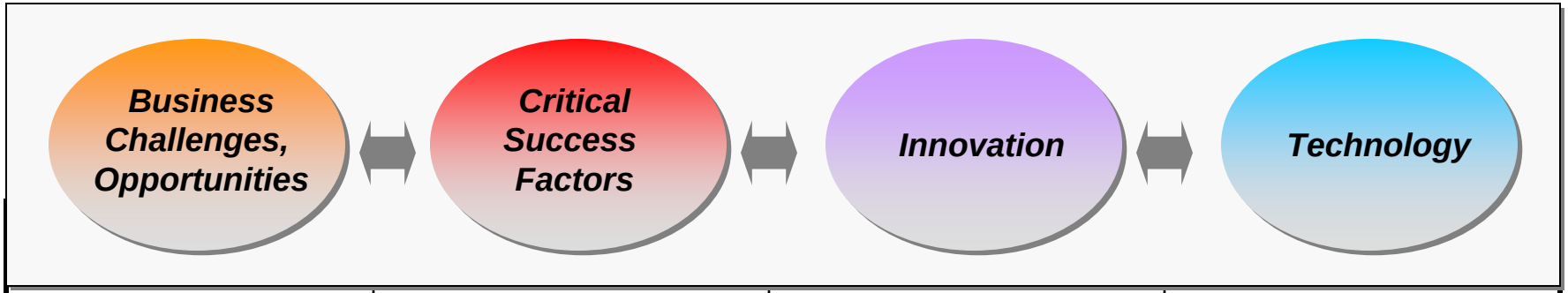
- The cost of the program is $1,600 per patient per annum. This compares with direct cost of VHA's home-based primary care services of $13,121 per patient per annum, and market nursing home care rates that average $77,745 per patient per annum.
- Since VHA implemented CCHT, a total of 43,430 patients have been enrolled in the program. CCHT patients increased from 2,000 to 31,570 from 2003 to 2007. VHA plans to increase its NIC services 100% above 2007 levels to provide care for 110,000 patients by 2011, or 50% of its projected NIC needs.
- VHA attributes the rapidity and robustness of its CCHT implementation to the "systems approach" taken to integrate the elements of the program. Wherever possible, CCHT incorporated existing business processes to reduce the program's overhead costs and increase efficiency.

Age Distribution of all CCHT Patients



Telemedicine's use in Home Care:

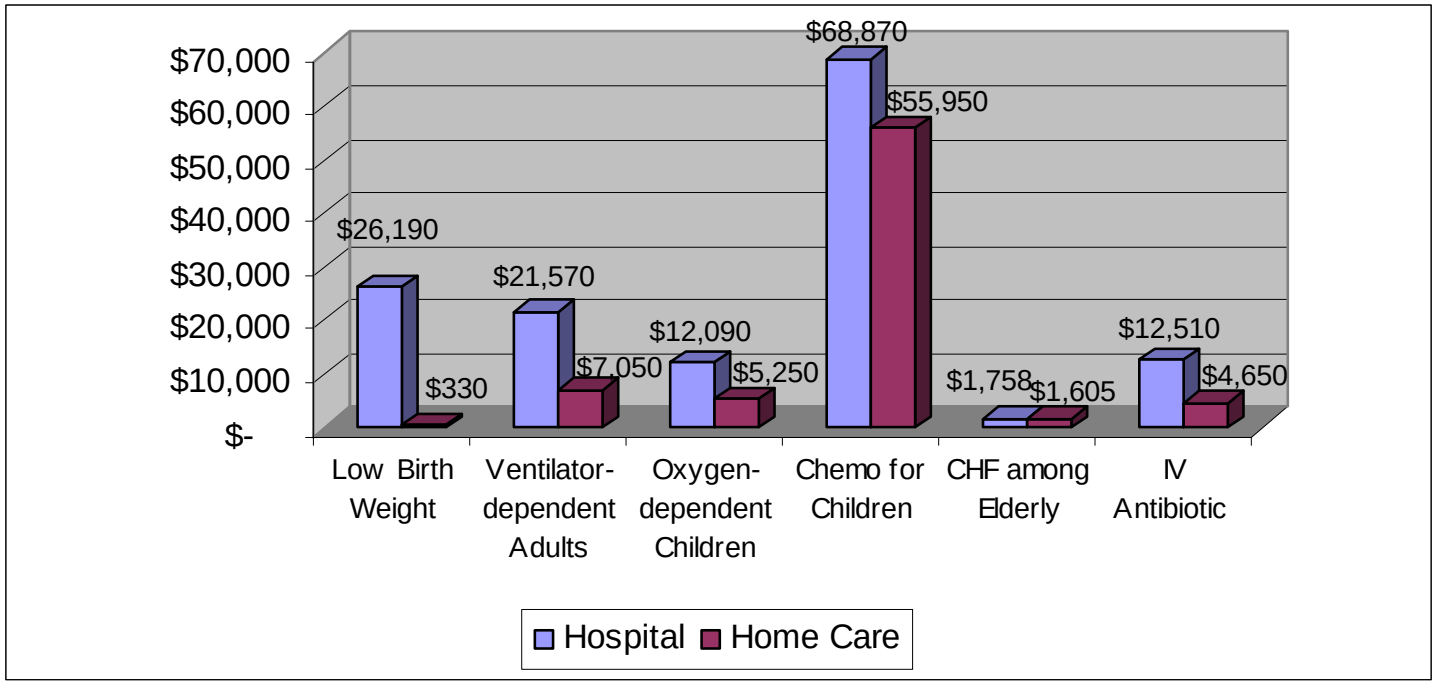
Centura Health at Home



Business Challenges, Opportunities	Critical Success Factors	Innovation	Technology
Home care visits are labor intensive (rural visits-travel, time, weather, cost) Decreasing reimbursement for homecare episodes	Reduction in number of in -person visits needed for appropriate care per episode Deliver care at lower cost per episode	Use of telecommunications and remote monitoring to substitute for in-person home visits	1. Two-way video 2. Remote sensor devices 3. TeleMed with Remote disease monitoring




Per Patient / Per Month Cost of Inpatient Care Compared to Home Care

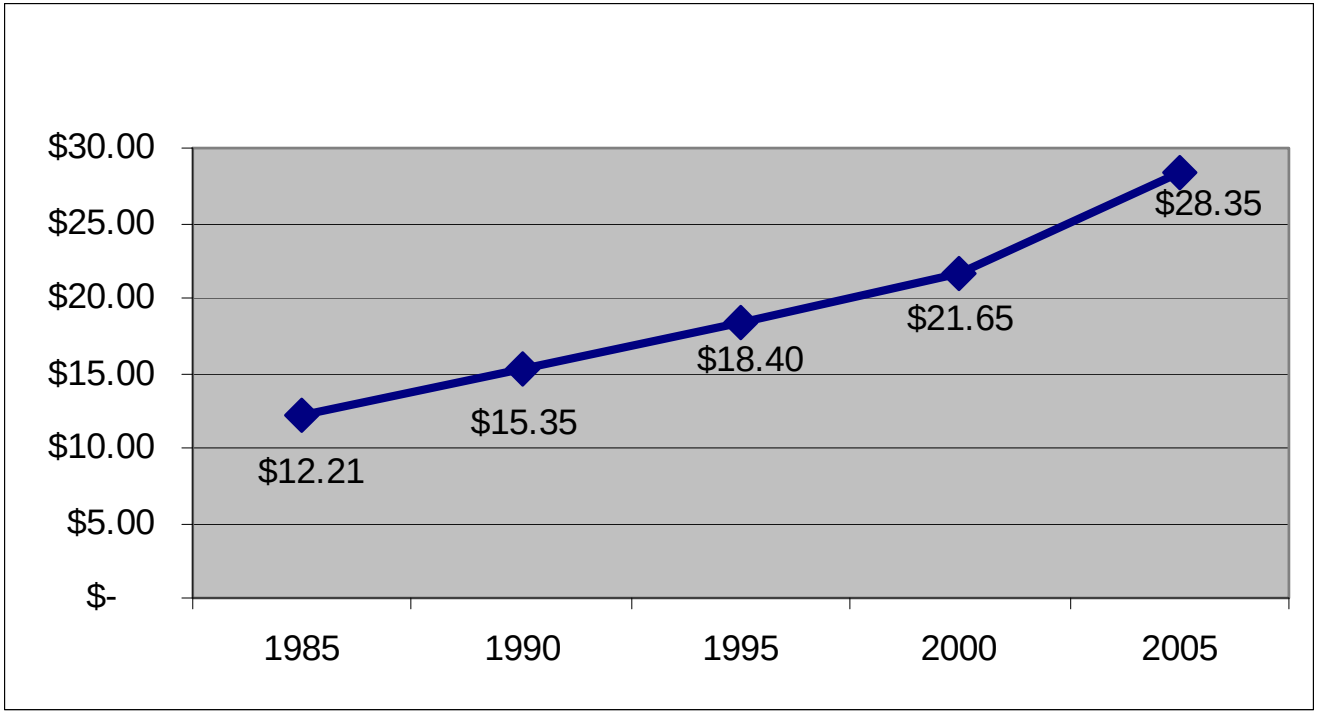


Source: National Association of Home Care, 2003 Statistics Report

Centura Health at Home

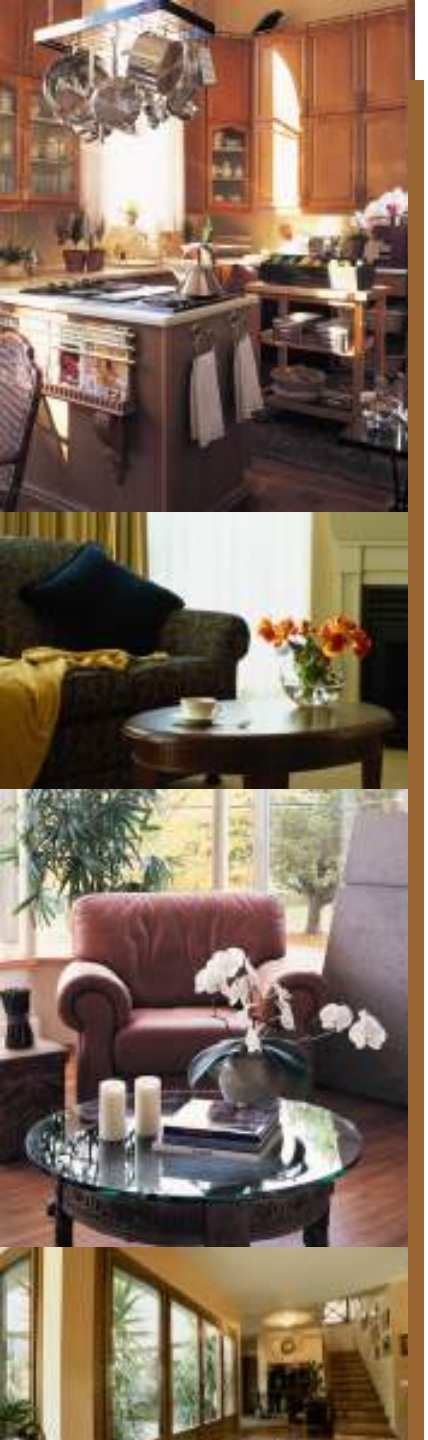



RN Hourly Rate Changes

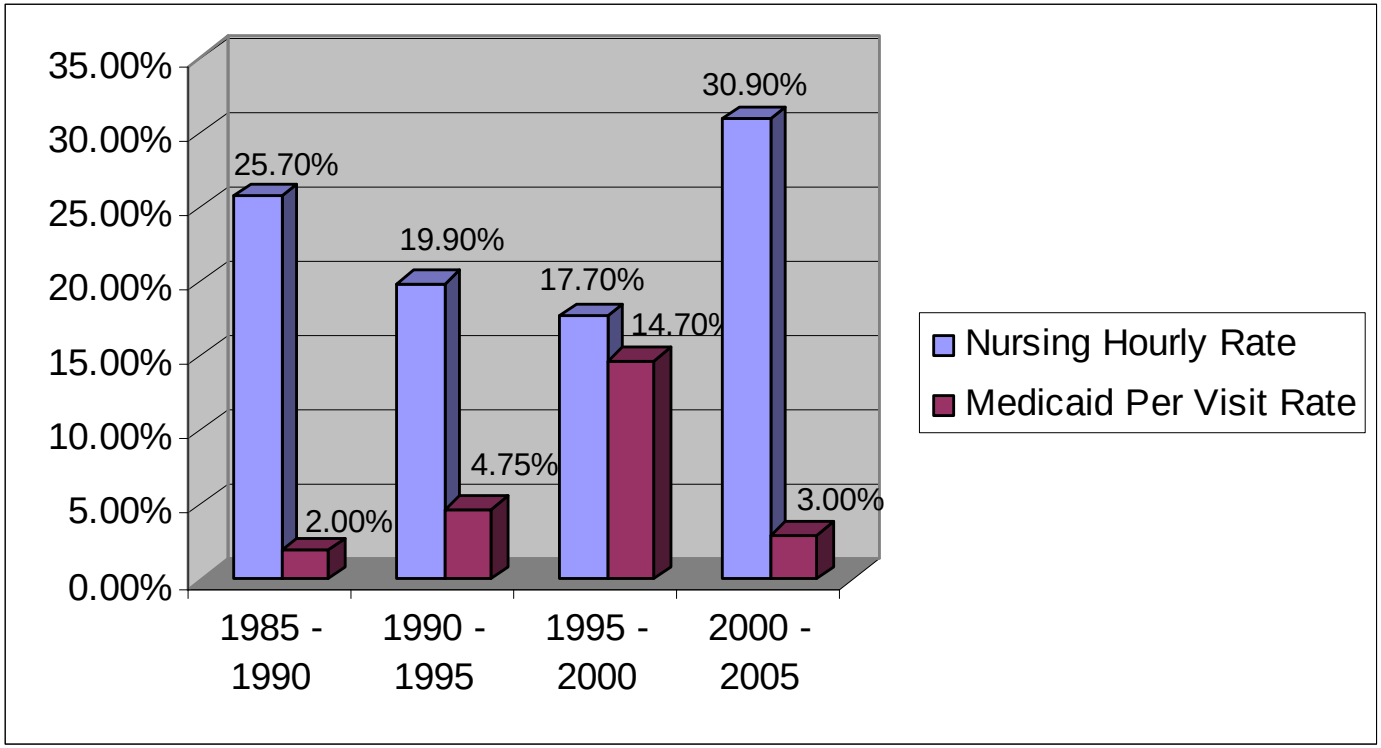


Source: Mountain States Employers Council Summer Health Care Compensation Surveys

Centura Health at Home



Comparison of 5-Year Rate Increases by Percentage



Source: Mountain States Employers Council Summer Health Care Compensation Surveys and Home Care Association of Colorado

Centura Health at Home



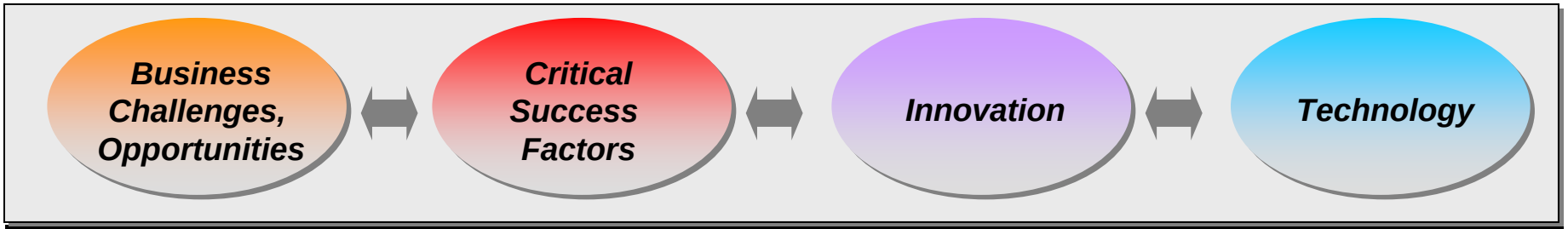

Patient Satisfaction

Compared to one year ago, how would you rate your health in general now?

	Much Better	Somewhat Better	About the Same	Somewhat Worse	Much Worse
Pre	1	1	3	7	3
Post	8	3	2	1	0

Centura Health at Home

Readmissions and a technology solution: Mercy Laredo

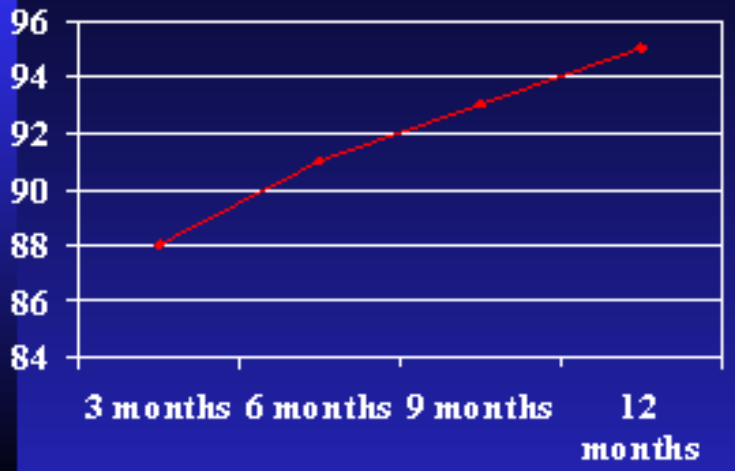


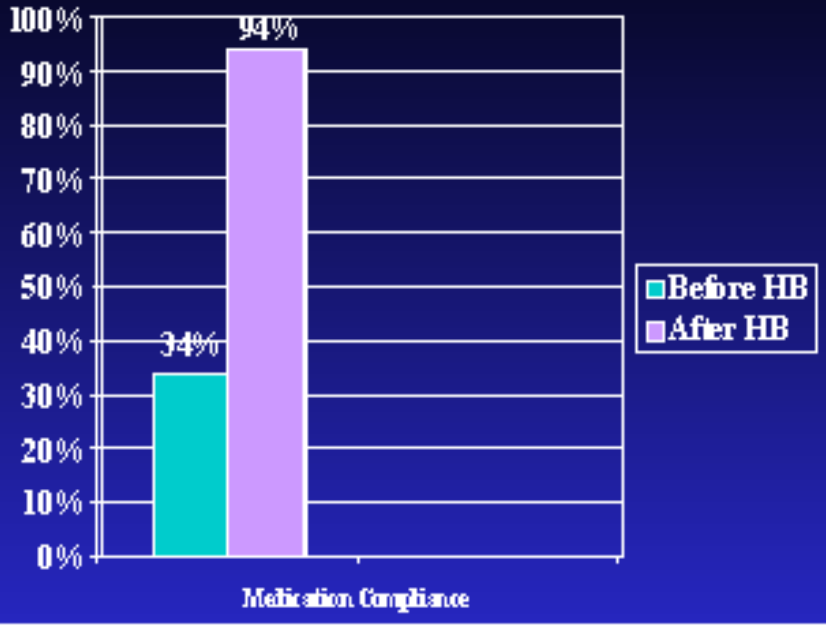
Challenge	Success Factor	Innovation	Technology
Lack of shared care plan and structures to advance self management: Clarity of Provider & Patient goals	• Patient medication compliance • Physician participation in goal setting • Patient satisfaction • Patient connecting to caregivers	Use of telecommunications and remote monitoring to create shared care plan and monitor individual	Remote disease monitoring
Help highest utilizers with no insurance coverage and little or no continuity of care to better manage self-care, prevent hospitalizations and ED visits	↑ Patient satisfaction ↑ Patients' perceived connection to care team ↑ Ability for patient to manage meds ↑ SF-12 scores ↓ 34% ED visits ↓ 32% Inpatient admissions ↓ 49% Outpatient visits ↓ $747 per patient/ year	Use telecommunications and remote disease monitoring to manage high resource intensive diabetic patients for better self care	Used Health Buddy home monitoring tool and HealthHero case management software

Goals of the Study

- Improve actual and perceived quality of life and health status for our indigent patients with chronic disease.
- Reduce hospital based utilization and/or more *appropriate* hospital based utilization
- Enhance the self-management skills of patients through education and monitoring.
- Enhance patient's satisfaction with healthcare system and providers.

Outcomes Summary





Utilization Measures	More Efficient Utilization			
	Standard Care	Telemed Program	Utilization Reduction	Z & p-values
Inpatient Admits PP/PY	1.99	1.18	41%	Z=1.64 P<.01
ER Visits PP/PY	0.93	1.05	-13%	Z=0.29 p>0.11
PDC Visits PP/PY	4.52	4.21	7%	Z=0.36 p>0.1
OP Visits PP/PY	1.33	1.75	-32%	Z=0.79 p>0.1

Financial Impact

By performing a comparative data analysis on the actual pre and post telemedicine population we estimate reduced per patient costs of approximately $6,500 for the 12 month study period. ($435,000 – 59,000 expenses = $376,000 net savings)

The savings is due primarily to the 41% reduction of in-patient admissions. AND the shortened LOS and resource consumption upon admission.

Medication Adherence and Compliance Overview

“Patients who have a clear understanding of their after-hospital care instructions, including how to take their medicines and when to make follow-up appointments, are 30 percent less likely to be readmitted or visit the emergency department than patients who lack this information,” according to a study by Dr. Jack that appeared in the February 3, 2009, Annals of Internal Medicine.

The Importance of Medication Adherence

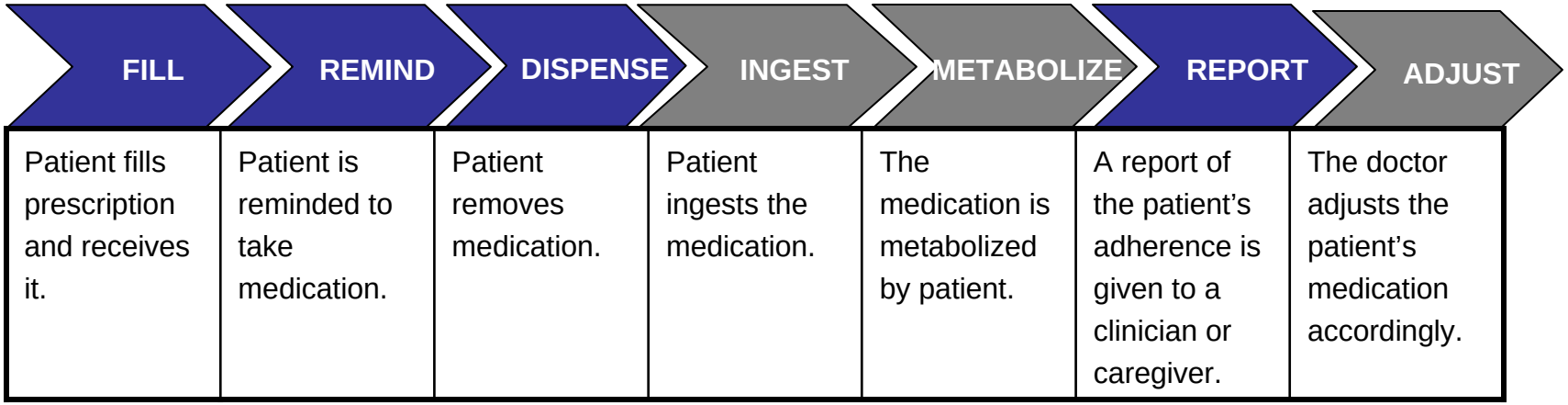
Patient safety is at risk.

- Deaths from medication mistakes at home increased from 1,132 deaths in 1983 to 12,426 in 2004. Adjusted for population growth, this is a sevenfold increase.
- 50% of the 1.8 billion prescription medications dispensed annually in the United States are not taken correctly by patients.
- Data from several research studies find that between 40% and 75% of older people do not take their medications at the right time or in the right amount.

There are significant financial implications.

- Medication non-adherence results in approximately $177 billion annually in direct and indirect costs to the U.S. economy.
- $47 billion each year is spent for drug-related hospitalizations.
- Not taking medications as prescribed has been associated with as many as 40% of admissions to nursing homes with an additional $2000 a year per patient in medical costs for visits to physician's offices.

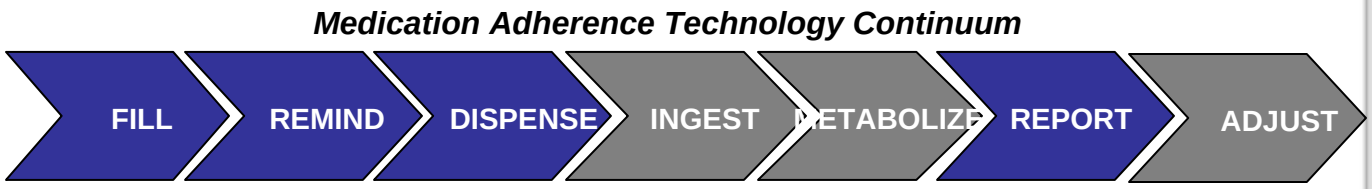
The Medication Adherence Technology Continuum



* Technologies in red are already available. Technologies in grey are in development.

Note: Technology continuum focused mainly on patient errors.

Within standalone technologies, three categorizations can be made based on the medication administration continuum



Category	Description	FILL	REMIND	DISPENSE	INGEST	METABOLIZE	REPORT	ADJUST
Single-Function Techs	•**Performs 1** function of the red (currently available)	X	X	X			X	
Multi-Function Techs	•**Performs 2 or more** functions of the red (currently available)	X	X	X			X	
Advanced Function Techs	•**Performs 1 or more** function(s) of the gray (currently in development) •Can possibly also perform red functions (but not required)	X	X	X	X	X	X	X

Note: Medication administration technologies focused mainly on patient errors.

Translating Expert Research and Partner Networks Into Results

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