

*A LeadingAge CAST Report*

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TELEHEALTH AND REMOTE PATIENT  
MONITORING (RPM)

*Provider Case Studies 2014*

# TELEHEALTH AND REMOTE PATIENT MONITORING (RPM): *Provider Case Studies 2014*



A program of LeadingAge

2519 Connecticut Ave., NW  
Washington, DC 20008-1520  
Phone 202-508-9438  
Fax 202-783-2255  
Website: [LeadingAge.org/CAST](http://LeadingAge.org/CAST)

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## **LeadingAge Center for Aging Services Technologies:**

The LeadingAge Center for Aging Services Technologies (CAST) is focused on accelerating the development, evaluation and adoption of emerging technologies that will transform the aging experience. As an international coalition of more than 400 technology companies, aging-services organizations, businesses, research universities and government representatives, CAST works under the auspices of LeadingAge, an association of 6,000 not-for-profit organizations dedicated to expanding the world of possibilities for aging.

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# TABLE OF CONTENTS

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<b>1</b>	<b>Introduction</b> .....	1
	1.1 Case Study Guidelines.....	1
<b>2</b>	<b>Lessons Learned and Advice Drawn from the Case Studies</b> .....	3
<b>3</b>	<b>Reducing Readmissions and Enhancing Medication Reconciliation in Long-Term Care through Telehealth Coupled with Coaching</b> .....	7
	3.1 Provider: Franciscan Visiting Nurses Service (VNS).....	7
	3.2 Vendor: Honeywell HomMed.....	7
<b>4</b>	<b>The Value Proposition for Real-Time Analytics in Telemonitoring Systems</b> .....	11
	4.1 Provider: iTelehealth Inc.....	11
	4.2 Vendor: SilverSphere.....	11
<b>5</b>	<b>The Value of Real-Time Monitoring for a PACE in Congregate Setting</b> .....	16
	5.1 Provider: Lutheran SeniorLife.....	16
	5.2 Vendor: AFrame Digital.....	16

# 1 INTRODUCTION

The LeadingAge Center for Aging Services Technologies (CAST) is pleased to provide the following three case studies on the impacts and benefits of telehealth and remote patient monitoring (RPM). We hope they will demonstrate for providers the benefits of using telehealth and RPM products.

The case studies are designed to help long-term and post-acute care (LTPAC) providers understand the benefits that telehealth and RPM products can offer to their care settings.

This set of case studies is a companion to the 2014 CAST whitepaper entitled [Telehealth and Remote Patient Monitoring for Long-Term and Post-Acute Care](#). The portfolio includes a [Telehealth and RPM Selection Matrix](#) that compares 26 telehealth and RPM products from 21 vendors with respect to embodiments, different LTPAC settings, functionalities and features. Telehealth and RPM vendors that chose to participate in the self-review were offered an opportunity to nominate a provider to write a case study on its use of the vendor's telehealth and RPM product.

## 1.1 Case Study Guidelines

CAST provided guidance as well as a template for the case studies to help case study contributors. The template included the following required sections:

- Case Study Category (case studies may cover more than one category)
  - **Impacts and Benefits of Telehealth and Remote Patient Monitoring (RPM), including analytic tools, EHR integration, interoperability and health information exchange, in:**
    - Health Outcomes (Blood Pressure, Blood Glucose, etc.)
    - Staff Efficiencies
    - Quality of Life/Satisfaction with Care
    - Hospitalization and Hospital Readmissions
    - Cost of Care and Return on investment (ROI) to:
      - Providers;
      - Payers; or
      - Consumers.
- Organization Name
- Organization Type (Housing with Services, Home Health/Home Care, Hospice, Attending LTPAC Physician, Adult Day Care/Senior Centers, Assisted Living Facilities, Acute Rehab Facilities, Long-term Acute Care Hospitals, Long-term Care Rehab Facilities, Skilled Nursing Facilities, Intermediate Care Facilities, Intellectual Disabilities/Mental Retardation/Developmental Disabilities (ID/MR/DD) Facilities, Continuing Care Retirement Communities (CCRC), Program of All-Inclusive Care for the Elderly (PACE))
- Other Partners (Payer/Health Plan, Physicians' Offices, Emergency Department, Hospital, Accountable Care Organizations (ACO), Pharmacies, Others)
- Organization Description

- Project Description
- Telehealth and RPM System Type (Store-and-Forward: Interactive Voice Response System (IVR), Store-and-Forward: Biometric RPM, Other Store-and-Forward Systems: Other than IVR & Biometrics (e.g. Imaging, Consultation Notes, etc.), Real-Time Biometric RPM, Real-Time Interactive Two-Way Video Conferencing with Clinician)
- Telehealth and RPM System Embodiment (Single-User/Patient Home Base Unit, Single-User/Patient Mobile/Wearable Unit, Staff-Operated Multi-User Mobile Unit, Multi-User Unit/Kiosk)
- Business Model (Medicare Reimbursement, Medicaid Waiver Coverage, Private Health Insurance Coverage, Private Pay, Standard of Care, ACA-Related Opportunity (ACO, Hospital Readmission Reduction Program, Bundling of Payment, etc.))
- Implementation Approach
- Outcomes (Health Outcomes (Blood Pressure, Blood Glucose, etc.), Staff Efficiencies, Quality of Life/Satisfaction with Care, Hospitalization and Hospital Readmissions, Cost of Care and Return on investment (ROI) to Providers, Payers or the Consumer, etc.)
- Challenges and Pitfalls to Avoid
- Lessons Learned
- Advice to Share with Others

members and other LTPAC providers will benefit from these case studies and learn from other providers who have already selected, implemented, and used telehealth and RPM products.

CAST received three completed case studies from nominated providers. We believe that LeadingAge

## 2 LESSONS LEARNED AND ADVICE DRAWN FROM THE CASE STUDIES

Readers can learn many lessons from the following case studies. Each participating provider took a slightly different approach to choosing and utilizing a telehealth or RPM system, and shared the factors that led to their success. Below is a summary of lessons learned and advice from these as well as previous CAST telehealth case studies ([See the 2013 Telehealth Case Studies Report for more information](#)):

### Communications

- Communications between telehealth nurses and coaches on the one hand, and physician on the other, is extremely important to the success of a telehealth program.
- Providing telehealth nurses and coaches access to the physician's EHR ensures that all parties are working off of the same information and have access to the same data and each other's notes. This also reduces the burden of documentation in two disparate systems and double entries.
- Communicate technical issues with the vendor as soon as you or end-users encounter them to increase chances of program success.

### Vendor Choice

- Choose a telehealth system that is simple, reliable, easy to use, easy to maintain and affordable to providers and patients to warrant buy-in and sustained use. Ensure the telehealth solution can easily integrate into the patient's daily activities.

- Partner with vendors who are responsive and are willing to work with you to resolve arising technical issues quickly and effectively.
- If you choose a smaller vendor, you can mitigate risk by rolling the technology one site at a time to learn from the experience and address encountered issues, before expanding roll-out to other sites.

### Leadership and Buy-In

- Engage leaders; their engagement is key to the success of a telehealth and RPM program. It takes leadership to change behavior – and persistence to change culture.
- Engage staff; their engagement, buy-in and support are critical to a program's success.
- Change is hard, especially when it comes to implementing a new technology that changes the way services are delivered, particularly for clinicians who have to deliver critical health care services. Patience and support from leadership are critical to overcoming these challenges.

### Enrollment

- Understand the patient population as well as internal competencies, and plan the program based on the organization's unique needs and goals.
- Establish selection/inclusion criteria around specific conditions in which telehealth has shown efficacy.

- Focus on high-risk, high-cost patient populations, at least initially.
- Ensure all patients who qualify for telehealth are assigned at the time of intake, rather than later in the care episode.
- Ask a trusted clinician to provide an introduction to telehealth. Patient telehealth program enrollment is most effective when introduced by a trusted clinician.
- Streamline the hospital and skilled nursing discharge planning process to incorporate enrollment into a telehealth program.
- Create “scripts” that clinical and non-clinical staff can use to recruit participants to reduce patient confusion and ensure consistent messaging.
- Offer real-time education to patients during a teachable moment. This increases self-management.
- Make sure the patient’s primary care physician is educated about the program, so they can reinforce its value when the patient visits them in the office.

### **Process Redesign and Improvement**

### **Education and Training**

- Work with the telehealth partner to develop a communication strategy regarding the benefits of the telehealth program for internal stakeholders and referral sources.
- Provide traditional clinical call center nurses with additional disease management education. Effective nurse communication training is vital to patient enrollment and engagement.
- Ensure that case managers and field staff understand the value of telehealth, including what is in it for them: reducing readmissions for their patients and better clinical care.
- Empower the patient with the knowledge of his or her own health readings. Patients want to be informed, active participants in their care program.
- Telehealth clearly impacts the efficacy of health care delivery at every point in the care continuum, providing the opportunity to reduce readmissions and improve the quality of patient care coordination. In nursing facilities, telehealth can transform the way nurses do their work and enable continuous improvement in quality and outcomes while containing costs. Consider how telehealth will change care processes and workflows, and redesign processes to take advantage of telehealth data in driving efficiencies and ongoing process improvements.
- When selecting a telehealth solution, take the integration of telehealth data into the electronic health record (EHR), which is not straightforward, into account. Partner with a vendor who not only implements interoperability standards, but is willing to work with others, like the EHR vendor.
- Work with the telehealth partner to establish a clinical program design that will have maximum clinical and financial impact.
- Make sure you have a process in place and measures to evaluate your programs success.

- Telehealth technology is an enabling tool, not an end unto itself; focus on patient services versus telehealth equipment. Improving wound care or chronic disease management is a quality initiative, not an information technology initiative.
- Telemonitoring alone does not improve outcomes unless it is accompanied by an effective and active care management programs, including interdisciplinary services aimed at eliminating root causes of problems to alleviate them and reduce risk factors. Such services may include transportation, home visits, home care or home delivery of medications, for example.
- Multi-pronged approach may be necessary for some non-adherent patients who ignore telehealth nurse's advice to seek medical attention; such approaches may entail proactive outreach to the physician or family member.
- The connection between the clinical staff and the patient is critical to the success of the telehealth program. Integrate visits to the home into the clinical program to reinforce the importance of using the telehealth equipment to the patient.
- Share clinical outcome data with all applicable practitioners across the full care continuum. Analyze the data, along with the financial data, to validate system cost savings, and report regularly to the physician group and senior leadership.
- Establish physician pro re nata (PRN), as needed, orders for telehealth patients to maximize efficiency of monitoring.
- If managing the telehealth inventory, make sure to apply an organized approach to inventory management including signing the equipment in and out. Make sure the telehealth system allows inventory to easily move between patients. Ask telehealth partners for a process to effectively manage the equipment.

#### **Financial Data Matter**

- Understand your return on investment (ROI), collect and analyze the data that will demonstrate ROI.
- Develop business partner relationships.
- Partnership/collaboration with the organization's chief financial officer is important to collect and analyze financial data.

#### **Planning and Looking Ahead**

- Plan to expand the program to a larger number of patients. Take into account the possibility of linking projects into partnerships with payers, hospitals, Patient-Centered Medical Homes and accountable care organizations (ACO).
- As health care organizations work to form integrated delivery networks or become ACOs in order to leverage a more streamlined health care model, the system-wide embrace of telehealth solutions as a communication bridge for the patient discharge process, can (quite literally) be the missing link.

The case studies presented here represent great examples of using telehealth and RPM products. Each



case study demonstrates how using telehealth and RPM has impacted each organization, and in turn the care they provide. Building upon the experience of these organizations can help other providers write their own success stories and case studies.

### 3 REDUCING READMISSIONS AND ENHANCING MEDICATION RECONCILIATION IN LONG-TERM CARE THROUGH TELEHEALTH COUPLED WITH COACHING



#### 3.1 Provider: Franciscan Visiting Nurses Service (VNS)

**Contributors:** Michael Puskarich, VP, Finance, Franciscan VNS



#### 3.2 Vendor: Honeywell HomMed

##### Impacts and Benefits of Telehealth and Remote Patient Monitoring (RPM) in:

- Health Outcomes (Blood Pressure, Blood Glucose, etc.)
- Quality of Life/Satisfaction with Care
- Hospitalization and Hospital Readmissions
- Cost of Care and Return on investment (ROI) to:
  - Providers

##### Organization Type

Home Health/Home Care

##### Organization Description

Visiting Nurse Service at St. Francis opened its doors in 1913 to meet the needs of the community. In that first year, VNS assisted over 5,000 patients. VNS has now grown to serve 30 counties in central Indiana. VNS has also expanded the services offered to better meet the needs of the community. VNS is a full-service home health care organization, providing nursing, physical therapists, speech and occupational therapists, home care aides, social workers and dietitians all providing care under your doctor's guidance.

##### Project Description

For hospitals and other care providers, including ACOs, the transition from fee-for-service (FFS) to value-based purchasing (VBP) has the potential to be bumpy, especially from a financial standpoint, because overall revenue has the likelihood of decreasing while hospitals work toward growing value-based reimbursement dollars. The key to succeeding through the transition time period, and beyond, is to continue to implement solutions that have the potential to cut costs while also identifying new sources of revenue, as was the case with Franciscan VNS.

##### Telehealth and RPM System Type

Store and Forward: Biometric Remote Patient Monitoring (RPM)

##### Telehealth and RPM System Embodiment

Single-User/Patient Home Base Unit and Single-User/Patient Mobile Unit.

## Business Model

Affordable Care Act (ACA)-Related Opportunity, namely ACO.

With VBP requirements now in place, policy makers on Capitol Hill have recognized the potential of telehealth to streamline care across the continuum, and are working to make it more accessible for healthcare providers as part of the VBP transition process. The Telehealth Promotion Act (H.R. 6719) is poised to increase federal support and payments for telehealth services nationwide, while also proposing a series of improvements to existing Medicare and Medicaid programs to augment the role and impact of telemedicine.

Franciscan VNS was able to assist the ACOs it works with in the shift to VBP by looking at the pivotal inflection point where telehealth can make a positive financial gain by looking at the challenging areas, which are 1) optimizing new revenue streams and 2) tracking quality measures. These two areas, if managed correctly, can increase the possibility that these organizations can achieve shared cost savings.

Franciscan VNS was able to optimize new revenue streams through the new Coaching Program it implemented more than 18 months ago, and has addressed the other two challenges through the use of its telehealth program as well.

## Achieving Shared Savings Bonuses through Cost-effective Care

VBP contracts are in their infancy and most are structured according to a shared savings model that generally incentivizes providers to reduce spending for a defined patient population by offering them a percentage of any net savings they realize.

For example, today Medicare continues to reimburse health systems on a FFS basis, and at the end of the year, shared savings bonuses are calculated. Each provider is benchmarked against the rate of increase for the overall FFS population. If a hospital reduced cost (i.e. compared to the average FFS population) they qualify for a bonus, which is a percentage of the overall savings.

Telehealth solutions like the one used by Franciscan VNS are the perfect companion to hospitals and ACOs in this new world order because they have the same overarching goal: making healthcare delivery more efficient and cost-effective, while simultaneously increasing quality of patient care. This is accomplished through the reduction of avoidable readmissions by improving patient care transition through regular biometric monitoring with a remote device after a patient's hospital discharge. Furthermore, any change in a patient's health can be assessed by trained medical staff and addressed immediately.

## Tracking a Wide Variety of Quality Measures

The value-based incentives and penalties also rely on quality measures to demonstrate healthcare providers are meeting quality standards and benefitting patients, in conjunction with cutting costs from the system. The financial incentives are intended to get physicians to work together and proactively intervene to keep patients healthy, rather than wait to treat them after their health has deteriorated, which traditional FFS payment methods encourage.

The 33 different ACO quality measures Medicare is currently tracking examine how well doctors coordinate with each other, whether patients receive appropriate preventive services, whether they suffer unnecessary harm and how patients experience their treatments.

While many hospitals and ACOs are grappling with the tools to track the new quality measures, there are technology solutions already on the market to help them. Many telehealth solutions feature back-end software support which allows healthcare providers to tie hard data points to the quality of care for each patient. Franciscan VNS uses Honeywell's LifeStream Management Suite to provide the analytical tools to track patient outcomes and patient case load for each care provider, as well as hospital admissions – and readmissions – based on patient diagnosis.

### Implementation Approach

Franciscan VNS successfully provided a reduction in overall hospital readmission rates through traditional telehealth services (it boasts readmission rates that typically hover well below 10 percent – well below the national average that is close to 20 percent).

By using its expertise with remote patient monitoring (RPM), it was also able to identify and implement a new program that created a new revenue stream for the Alliance: the Patient Health Coaching Program.

The Coaching Program, a joint effort between Franciscan VNS and a physician-based ACO, aims to impact the long-term health of patients with chronic conditions, who traditionally do not qualify for home health services but are typically the most expensive to care for in the hospital.

The Coaching Program was designed to provide the right level of education to patients to empower them to take the management of their healthcare into their own hands and improve their overall health prognosis long-term. This is accomplished through four areas of emphasis:

- Creating a Personal Health Record (PHR) to improve communication across the care continuum;
- Identifying Red Flags to provide early intervention points and notification for the patient and telehealth nurses;
- Implementation of a Medication Reconciliation and Self-Management process involving the patient, the patient's Program coach and his or her physician, to ensure full patient understanding of prescribed medications; and
- Preparing patients to be actively involved in their care during any follow-up visits that may occur.

The physicians, telehealth and home health nurses involved in the Program use Honeywell's Genesis DM and Genesis Touch RPM devices to monitor the health status of their enrolled patients, and track the progress of health throughout the duration of the patient's participation in the Program using Honeywell's analytic software.

### Outcomes

Results from Franciscan VNS indicate that Coaching Program had high rates of success from cost-savings and quality of care standpoints:

- An average readmission rate of five percent;
- Medication reconciliation rates in the high 40 percent range; and
- A 95 percent patient retention rate in the Program since its inception due to a high rate of patient satisfaction.

Patients have also reported life changes based on the results they observed every day through their RPM devices. For example, diabetes and CHF patients have increased their level of exercise and decreased their daily caloric intake to keep weight down and heart-healthy activities up, underscoring the long-term objective of the program.

### Challenges and Pitfalls to Avoid

Two of the biggest challenges Franciscan VNS had to address within the first six months of Coaching Program implementation involved aspects related to communication:

- The first embodied “selling” involvement in the Program to prospective patients;
- The second required creating a system to foster communication between coaches and the patient physicians.

For prospective patients, the ability to be part of the coaching program free of charge seemed too good to be true and they were skeptical of its validity, and as a result, Franciscan VNS Program staff had to design a way to reassure them that despite the lack of cost associated with the Program, it was indeed a hospital system-certified program.

The initial process between patient coaches and patient physician offices involved the coaches placing a call to the physician offices and then relying on the physician’s staff to make updates to the patient’s record – a process that very quickly became cumbersome to all parties.

### Lessons Learned

To address the challenges that arose, Franciscan VNS utilized the same team approach they used

in the creation of the program: they worked with the ACO physicians to create better process flows around the issues.

For patients, they worked in tandem with physicians to create “scripts” that both the physicians and coaches could use to talk to prospective Program patients. The scripts ensured all parties were on the same page, and that the patient was receiving the same information from multiple care parties – ensuring there was consistency around presentation and underlining the validity of the Program.

To address communication issues between the Program coaches and physicians’ offices, they worked together to provide enhanced access to existing physician IT systems, which allowed the coaches to enter patient information directly into the patient record. This saved the physician’s staff time and allowed coaches to have access to a more robust view of patient health – allowing them to better prepare patients for physician interaction.

### Advice to Share with Others

Data is needed to: 1) truly understand the population you serve, 2) assess the organization’s competencies, and 3) analyze the level of program success.

To address that necessity, 70 percent of the patients enrolled in the Franciscan VNS Patient Health Coaching Program are monitored via RPM daily, and their health results are compared against not only the general population of patients in the Franciscan Alliance system, but against patients using traditional telehealth monitoring following hospital discharge. Data is tracked month by month for comparative purposes, as well as year by year.

## 4 THE VALUE PROPOSITION FOR REAL-TIME ANALYTICS IN TELEMONITORING SYSTEMS



### 4.1 Provider: iTelehealth Inc.

**Contributor:** Loretta Schlachta-Fairchild, PhD, FACHE, Lt Col (Army Ret.)



### 4.2 Vendor: SilverSphere

**Impacts and Benefits of Telehealth and Remote Patient Monitoring (RPM) in:**

- Health Outcomes
- Staff Efficiencies
- Quality of Life/Satisfaction with Care

#### Organization Type

Home Health/Home Care

#### Other Partners

Florida State University, Cognitive Psychology Program  
Providence Hospital, Washington, D.C.

#### Organization Description

iTelehealth is an advisory firm that helps health care providers implement telehealth, mhealth and bioinformatics programs. Its CEO, Dr. Loretta Schlachta-Fairchild, PhD, FACHE, Lt Col (Army ret.), is a registered nurse with more than 25 years' experience in telehealth, telemedicine and telenursing. Before founding iTelehealth, she was COO of Strategic Monitored Services, an early adopter of home telehealth technology in disease management. Dr. Schlachta-Fairchild developed the International Competencies for Telenursing for the International Council of Nurses, after surveying more than 700 telenurses from 30 countries. She also served as Principal Investigator for the 2000 U.S. Telenursing Role Study, a web-based study of nurses' roles in telemedicine in the U.S. Before retiring from the U.S. Army, Dr. Schlachta-Fairchild served as Clinical Director of Telemedicine for the U.S. Department of Defense Telemedicine Testbed and as Principal Investigator and Project Director for the U.S. Army's Electronic Housecall program.

#### Project Description

This case study shares some observations that suggest how real-time data analytics may improve remote patient care and support more scalable telemonitoring operations. The observations are a part of an ongoing research study sponsored by the National Institutes of Health's (NIH) National Institute on Aging, which involves adults ages 65 and older using SilverSphere's Bios – in-home health, a telemonitoring solution powered by AFrame Digital. Working directly with the subjects (patients) and

the technology, and having worked with many types of remote monitoring technologies, the nursing staff have been able to fully compare this telemonitoring system with other remote patient monitoring solutions. Furthermore, they had the opportunity to observe the role of real-time data analytics and activity trending in telemonitoring platforms.

### **Telehealth and RPM System Types**

Store and Forward: Biometric Remote Patient Monitoring

Real-Time Biometric Remote Patient Monitoring

### **Telehealth and RPM System Embodiment**

Single-User/Patient Home Base Unit

Single-User/Patient Mobile/Wearable Unit

### **Business Model**

The NIH study follows a protocol that resembles the direct patient monitoring portion of chronic disease or post-acute remote monitoring programs. The same protocol would be appropriate for value-based payment arrangements and population health management. In an operational implementation, the protocol would also include interdisciplinary services from a care management team to address significant alerts and remove health barriers identified while monitoring an individual.

### **Implementation Approach**

For a six-month period, older adults regardless of gender were asked to measure their weight, blood pressure and heart rate at least once a day using digital wireless measurement devices in their home. A total of 60 participants were included in the study, of whom 40 had congestive heart failure and

20 were monitored while the remaining 20 served as a control group. Finally, we had a group of 20 individuals without congestive heart failure who were monitored to provide negative control. Key inclusion criteria included minimum ages of 65 years and 50 years, based the absence or presence of heart failure, respectively. Individuals not living independently in their own home or retirement community were excluded from the study. Alerts were generated when predetermined thresholds for each parameter were exceeded. Unlike other systems, participants were also asked to wear a wireless wristwatch 24/7 activity tracker continuously, press a button on the activity tracker whenever they take a key agreed-upon medication, and answer a rotating daily survey using a mobile application on a tablet device. All of these data, including activity data gathered inside the home, along with skin temperature, ambient temperature, and location within the home, were automatically sent in real-time to the cloud-based telemonitoring system. In addition, skin temperature and activity data gathered via the wristwatch tracker outside the home were stored and automatically forwarded to the cloud-based telemonitoring system when the participant returns home.

Nurses remotely received and securely viewed telemonitoring data, and initiated appropriate action based on data and presenting symptoms using medically approved standing orders and within nursing's scope of practice. An action might be initiated in response to a mobile alert, following a nurse's weekly review of patient remote monitoring data, or after a phone call or once-a-month home visit with a study participant. The telenurse also personalized education and care based on individual need and the medical diagnoses of the treating physician.

In this study, the telenurse did not contact the treating physician. Instead, all communications were made directly with the study participants or members of their family or household, to engage them more actively in their own health and help them interact with the health system appropriately, such as by scheduling office visits and recognizing signs when they should call their physician or seek urgent or emergency care.

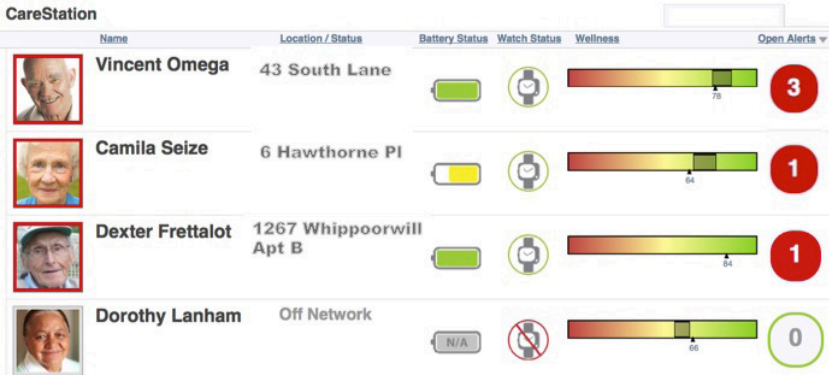
**Outcomes**

**Staff Efficiencies:** The most compelling observation with regard to using this telemonitoring system is the way it used real-time analytics to bring staff clinically actionable data. Instead of having staff constantly review incoming patient data, compare those to prior data, and try to spot worrisome trends or values – as a clinician would ordinarily do; the system does it automatically, and in real-time as the data come in. When staff get an alert by “exception”, they know which data they need to evaluate a patient’s condition and hopefully make a difference in health outcomes. This saves staff a considerable amount of time.

Another time-saver is the way staff manage alerts using a smartphone. Staff choose to receive alerts as emails or text messages so they can maintain sit-

uational awareness without being tethered to their computer. They don’t necessarily need to act on every alert immediately, but they can call the patient right away if needed. When a staff member speaks with a study participant, they might ask, “Can you think of any reasons why your blood pressure just spiked?” Sometimes, if a patient forgets to take a medication, they ask him (or her) to take his medication and then check the vitals again in an hour. If staff don’t get an alert, they can be assured the patient has taken the medication to manage his (or her) blood pressure. And if staff want to be certain, they can use their smartphone to look up the timestamp for the most recent measurements taken.

About once a week, staff log into CareStation, a secure, HIPAA-compliant web-based portal accessed through Silversphere’s Stratos management console to review patient data. Graphically rendered Wellness Indicators in CareStation give staff an immediate, understandable grasp of how well each patient is doing based on his or her own baseline trends and customizable target values. As shown in a screenshot depicting hypothetical participant’s data below, a shaded region on the graded red-yellow-green indicator bar represents a person’s individualized baseline range. The arrow and numeric value tell the clinician how well the person is currently doing relative to his or her baseline.





In CareStation, the patient panel is automatically ordered by greatest number of open alerts, but staff can also sort patients based on current wellness values that fall most below individual wellness baselines. These tools help staff prioritize patients that are in most need of attention. If staff want to drill down further, they click on a patient to see his or her home page, and from there can click on different tabs to look at composite trends for different dimensions of wellness – for example, Activity, Physical Measurements, Stability, or Self-Assessments – then click another tab to review charts, tables and trend lines.

**Health Outcomes:** Before identifying positive clinical outcomes from a telemonitoring program, it is helpful to validate whether a particular telemonitoring system will actually be used by its targeted population groups. At the 2014 American Telemedicine Association (ATA) Annual Meeting, our research team reported that the wristwatch-based activity tracker used in the study was worn 76% of the time by a sample of ‘healthy’ older adults ages 65 and older during the six month period they were being monitored, including nighttime. Additionally, we reported that subjects in this sample checked their weight, blood pressure, and heart rate once a day about 85% of the time. These findings suggest that telemonitoring systems will be used by older adult populations. Quality of Life and Satisfaction with Care were not specifically measured, but some study participants wanted to share their data with their treating physicians. Others reported being motivated by their Wellness Indicator values to change behaviors; for example, by increasing their activity and/or improving their diet. These Wellness Indicators are displayed on the tablet application used when answering their daily surveys.

We can conclude from this study that data-driven decision support tools can illuminate clinically actionable acute problems and contribute to the delivery of more effective care. The addition of real-time data analytics and targeted exception alerting—in a telemonitoring system that at-risk patient populations will use, and which will enable telenurses to support a larger patient population—enables more proactive and timely interventions by an interdisciplinary care team to ultimately improve patient outcomes and decrease health costs.

### **Challenges and Pitfalls to Avoid, Lessons Learned and Advice to Share with Others**

Initially, we encountered difficulty with the telemonitoring system’s cellular gateways because of frequent software updates pushed by the carrier, which required the gateway to be power-cycled by the patient/participant. This issue was alleviated by swapping out the cellular gateway devices for different ones. Some participants reported that it was difficult to make their selections to survey questions on the patient application, so feedback was provided to AFrame Digital to increase the blank space around each multiple choice answers to a question. But these were fairly isolated challenges.

The far greater challenges arise out of what telemonitoring does well. When a telemonitoring system works well, it helps identify barriers to care and risk factors, such as transportation issues, low activity, low medication adherence, and dietary habits. To avoid confounding factors, this particular study was designed without additional care management or interdisciplinary services, which are designed to help overcome these barriers and help patients reduce risk factors. Consequently, our efforts to reduce risk factors were limited to nursing advice, education and support. In a clinical setting,

a telemonitoring program should be accompanied by care management and interdisciplinary services.

To illustrate the point, we relate a story of one of the study participants who suffered a minor stroke about four months after entering the study program. The telemonitoring system worked as designed: she was compliant about using the monitoring equipment, evidenced by a steady stream of trended data and alertable exceptions throughout the period leading up to her stroke. Based on these health data, which staff knew about because of the effectiveness of the telemonitoring system, they repeatedly asked her to contact her doctor or seek further medical care, but she ignored these recommendations. Staff also provided education and support on multiple occasions to help her increase her physical activity, follow her medication regimen, and reduce salt intake, but these efforts were unavailing. After her stroke, she said:

“I should have gone to the doctor when you told me over and over that my [blood] pressure was too high, but I thought I would be okay because it always runs high...I should have listened to you and gone to the doctor, and maybe this [stroke] wouldn't have happened.”

Telemonitoring alone cannot overcome:

1. **Noncompliance/Nonadherence.** This individual ignored repeated nursing advice to call her doctor or seek further medical care. Her responses included: “Yes, I'll call my doctor”, “Yes, I'll tell the doctor at my next scheduled appointment” or “[my blood pressure] is fine. I've had high blood pressure before and it always goes down when I take my medication.” She also ignored repeated reminders to reduce salt intake. A multi-

pronged approach is sometimes needed to help patients accept the severity of their condition, and adhere to clinical recommendations.

2. **Transportation Barriers.** One of the study participants uses a wheelchair. Her limited mobility made transportation to a doctor's office difficult. Having transportation readily available might have facilitated going to the doctor and receiving preventive clinical care.

While interdisciplinary services can help overcome barriers, it's important to consider that this patient's participation in the study may have actually saved her from having a more severe stroke. Staff visited the patient twice after she returned home from rehabilitation following her stroke. Except for very mild weakness in one of her arms, she still had the same functional abilities as before. It is possible that she took her medications more often than she would have if she had not been telemonitored. Maybe she avoided a deadly stroke because of staff phone calls calling attention to her high blood pressure, their instructions to take her medication and/or because she was looking at her blood pressure readings every day. Even the additional mindfulness of actively participating in her own health on a daily basis might have influenced why she only had a mild stroke. Her participation in this study may help her become more compliant with clinical recommendations to avoid more strokes in the future. For this particular case, we can only speculate.

## 5 THE VALUE OF REAL-TIME MONITORING FOR A PACE IN CONGREGATE SETTING



### 5.1 Provider: Lutheran SeniorLife

**Contributor:** George M. Brett, MD, Medical Director



### 5.2 Vendor: AFrame Digital

**Impacts and Benefits of Telehealth and Remote Patient Monitoring (RPM) in:**

- Health Outcomes
- Staff Efficiencies
- Quality of Life/Satisfaction with Care

#### Organization Type

Housing with Services, Home Health/Home Care, Adult Day Care/Senior Centers, Program for All-Inclusive Care (PACE)

#### Other Partners

Unified Alerts

#### Organization Description

Lutheran Senior Life (LSL) is a faith-based social services organization that serves more than 2,000 seniors annually in western Pennsylvania, a region with one of the nation's highest concentrations of elderly adults. Some of these services are provided through a model of care known as a Program for All-Inclusive Care for the Elderly ("PACE", although in Pennsylvania, PACE is formally known as Living Independently for the Elderly, or "LIFE").

#### Project Description

LSL devised a senior housing program to reduce placements of its LIFE participants in skilled nursing facilities (SNFs) and enable safe transitions of skilled nursing residents to independent apartments. LSL relies on remote monitoring technologies to enable 24/7 on-site coverage and real time situational awareness and decision support for remote members of the LIFE care team.

#### Telehealth and RPM System Types

Real-Time Remote Patient Monitoring

Telehealth and RPM System Embodiment:  
Multi-User/Patient Mobile/Wearable Unit

#### Business Model

Under a PACE model, a sponsoring organization like LSL accepts Medicaid capitated payments and risk-adjusted capitated Medicare Part A, B and D payments in exchange for providing all-inclusive care to frail elderly participants. That care includes delivery of institutional or community-based long-

term care services, such as those presented in this case study.

### Implementation Approach

Whenever feasible, LSL helps its LIFE participants live independently in their own homes, with family members or with foster families drawn from the Lutheran community. When, due to burnout or a change in health status, for example, the primary caregiver can no longer provide on-site care and supervision to a LIFE participant, Pennsylvania law requires LIFE participants to be placed in a skilled nursing facility, or SNF. By state law, they cannot be transitioned to assisted living facilities. SNF placements are undesirable for a number of reasons. Examples include the following:

- Many LIFE participants may only need a level of supervision and support provided by assisted living rather than the higher level of care provided by a SNF.
- Transfers to a SNF are traumatic for the individuals. They lose a significant degree of independence by moving to the more restrictive clinical setting. They also lose a significant portion of their disability benefits or other income, since Pennsylvania (like many states) requires Medicaid beneficiaries to contribute most of their income to the cost of long term care in a SNF.

In 2011, LSL implemented a care model that now helps about 40 LIFE participants live independently in the community even though they no longer live with a family caregiver. To implement this model, LSL has refurbished clusters of federally-subsidized apartments, which includes placing an easy-to-in-

stall wireless network throughout all the apartments and common areas. Residents wear a lightweight and discreet wristwatch monitor, which interacts with the wireless network to provide continuous, real-time remote activity, sleep and fall monitoring, and early response to requests for help or other situations that pose a risk to their safety. The local wireless network connects over the internet to AFrame Digital's cloud-based telemonitoring platform, which generates targeted mobile alerts and provides real-time data to on-site and remote members of our care team.

As LIFE participants, the residents receive the same services available to all LIFE participants, including transportation on most days of the week to LSL's senior day center. In addition, they receive:

- One on-site certified nursing assistant (CNA), 24 hours a day, 7 days a week, who divides his or her time helping different residents with meals, laundry, dressing, housekeeping and other activities of daily living.
- A combination of meals-on-wheels and/or nutritious meals delivered by family members.
- Two visits per day by home health nurses to administer medication.

On-site 24/7 coverage by a CNA is an important component of our aging-in-place model. The CNA on-duty is our first-responder to "priority" alerts generated by the telemonitoring system. If a resident falls or presses the Help Requested button on the watch monitor, the on-duty CNA receives an alert on a mobile device.

We gather vitals data from these residents during their almost-daily visits to the senior day center,

which obviates the need for remote monitoring of vitals in this care model. However, an advantage of AFrame Digital's FDA-cleared system is that we can add remote monitoring of weight, blood glucose, blood pressure and blood oxygenation if our aging-in-place model changes or needs arise.

### Outcomes

**Health Outcomes:** The telemonitoring component of our program is not just about responding to immediate risks to our LIFE participants' safety. AFrame Digital actually provides a dual benefit in that the data gathered from the wearable device for fall detection is also used to make inferences about a person's overall wellness based on his/her activity.

While continuous monitoring and activity tracking may sound intrusive, LSL's residents accept wearing the wristwatch monitor because the system is unobtrusive, they understand the benefits, and are grateful to live independently in their own home.

An example of how LSL's residents benefit directly from the system – besides being able to live independently – is with the built-in fall detection system. One of new the residents fell as she was getting out of bed on the first day in her new apartment. She was wearing her new wristwatch monitor, but didn't remember to push the Help Requested button. Nevertheless, the monitoring system automatically generated an "Impact Detected" alert. A nurse who was on-site at the time, received the alert and quickly came to help. Fortunately, this resident was uninjured from her fall. By contrast, a person without the monitoring system may fall and have difficulty getting up for a number of reasons, which can lead to increased morbidity due to the prolonged downtime, including complications like rhabdomyolysis, renal failure, and even death.

Sometimes, an "impact detected" alert occurs in the absence of a true fall; even so, we have found that these alerts, or a new pattern of impact alerts, can have great clinical value. When these alerts occur, it prompts us to consider whether there might be a different problem going on. For example, does a new medication need to be changed, or its dosage adjusted? Impact alerts have also helped us determine that a resident needs a new assistive device. We furthermore ask these residents questions to help us evaluate for signs of a deteriorating health condition.

Consequently, we don't treat these alerts as "false positives" because they actually help us make more proactive clinical or functional assessments. If our care team decides the system is generating impact alerts without clinical value for a particular individual, we can adjust the individually-customizable settings to reduce the system's sensitivity to impact-related events, just for that individual.

While adherence to wearing the wristwatch monitor is quite good, AFrame Digital helps us maintain high adherence by automatically checking in real-time whether residents are wearing the wrist monitors, or whether it's time for a monitor's built-in battery to be recharged. These are simple features, but they help us reduce the care burden for our team.

Our residents have multiple chronic conditions and varying degrees of cognitive impairments. These pose risks to their safety if they wander away from any of our senior apartment complexes. For residents at greater risk for wandering away, we might personalize settings that send mobile alerts to the on-site CNA (e.g. via text message) when one of these residents approaches a specified "hot zone". A hot zone is a pre-set radius around a wall router

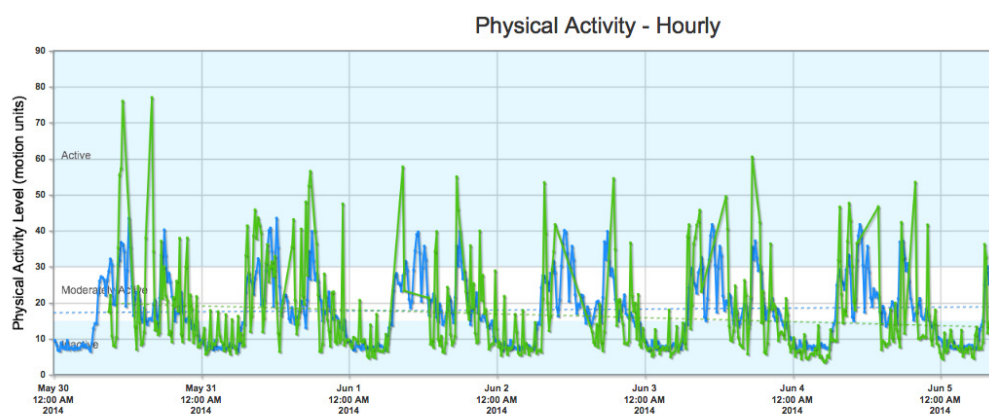
that is plugged into an A/C outlet near exit points from the building. When specified residents step into that radius, the system automatically generates a targeted mobile alert that notifies the CNA about the resident's location. Receiving this alert in real-time helps a CNA remain especially vigilant till the danger of wandering away has passed. If a resident manages to leave the premises, the CNA automatically receives another real-time mobile alert that a resident has just gone "off network," which allows the CNA to immediately assist the resident back into the apartment building.

Activity trending is an emerging parameter of wellness, and our interdisciplinary care team finds AFrame Digital's activity data to be valuable in different ways. Using real-time data analytics, the system sifts through incoming activity data, compares those to an individual's baseline activity patterns, and looks for trends that may be concerning, simi-

lar to what a clinician might do. This allows our team to receive an alert to notify us, for example, that a person's recent activity level is above or below his or her baseline.

As with impact alerts, activity alerts influence the questions our clinicians might ask when they see monitored LIFE residents in the clinic for an office visit or evaluation, but without adding a tedious and time-consuming task to our workflow. Clinicians don't have to be tracking the data regularly or even receive the alerts; but they have access to graphs presenting the information when they log into the system's web-accessible portal.

For example, when staff receive an alert that a resident's physical activity is below the resident's baseline, they might log into CareStation and view a report like the graph shown below. This graph of physical activity over the course of a week displays



In this example, staff might notice a pattern of disrupted sleep cycles and overall decline in activity relative to the individual's baseline trend (see May 31 through June 2). These objective data can guide staff to ask questions they might not have thought to ask the individual, such as whether the individual needed to go to the bathroom at night more frequently than usual. Disrupted sleep and frequent urination may or may not indicate an emerging condition or fall risk, which makes these data clinically relevant. While bed sensors or toilet flush sensors could also be used, using the wearable device provides a simplified means of obtaining objective data.

the individual's baseline circadian rhythm (in blue), and an individual's actual activity pattern for the week preceding the alert (in green). The graph also depicts the baseline and actual trends with dashed blue and green lines, respectively.

#### **Cost of Care and Return on Investment to**

**Providers:** Without the AFrame Digital remote monitoring solution, it would not be financially sustainable to implement this aging-in-place model. We would have to reduce ratios of residents to on-site staff and increase the number of site visits by nurse supervisors. Alternatively, the targeted LIFE participants would have to remain in skilled nursing facilities, which already cost twice as much as our monthly Medicaid payment per participant. Since implementing the model, we've been able to decrease the percentage of LIFE participants living in skilled nursing from 20% to 12%, resulting in monthly savings of about \$4,000 for each person successfully transferred from skilled nursing. Because of the success we've experienced with this model, social services provided by LSL that previously were at risk of being reduced in order to meet budget shortfalls are no longer at risk because of losses sustained in our LIFE program.

#### **Challenges, Pitfalls to Avoid and Lessons Learned**

We were one of AFrame Digital's first customers, and provided feedback on early versions of its wristwatch monitor. The AFrame team was highly responsive, even going so far as to redesign its watch in response to our feedback; for example, by changing the material used in the wristband and improving its moisture seal.

Often, healthcare providers are risk-averse when it comes to selecting products from smaller companies over incumbent vendors. However, it is important for an organization not to be so risk-averse that it misses opportunities to leverage innovative technologies that could really improve the care we provide. LSL managed its selection risk by conducting a comprehensive product survey, setting up back-to-back in-person product demonstrations and applying objective selection criteria to the down-selected vendors.

We also managed the risk of selecting a small company by rolling out the AFrame solution one senior living complex at a time. Before installing it in the next complex, we evaluated product performance and our own care management practices to see what could be better. This has been a very useful process for training as well.

#### **Advice to Share with Others**

Be patient: Implementing any new technology is hard, especially for practitioners challenged to deliver healthcare services in a new way. Support of LSL's leadership has been instrumental in the success we've experienced in the program.