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Toolkit Series

Remote Patient Monitoring

This toolkit and resource guide is written as an overview of remote patient monitoring (RPM) and its applicability in various settings and demographics around population health management. The COVID-19 pandemic in 2020 forced the healthcare industry to look closely at the technologies and platforms available as a viable way to provide timely and supportive care in the safest method possible. Overwhelmed hospital systems implemented RPM programs in order to closely monitor COVID-19 patients in their homes in an attempt to slow the flood of patients requiring hospital admission.

What is Remote Patient Monitoring and Telehealth?

Remote Patient Monitoring (RPM) is defined by The Center for Connected Health Policy (CCHP) as using "digital technologies to collect medical and other forms of health data from individuals in one location and electronically transmit that information securely to health care providers in a different location for assessment and recommendations." The most commonly collected medical health data for RPM are vital signs (blood pressure, pulse, blood oximetry levels, and weight).

CCHP has a broader definition than the traditional notion around telehealth or telemonitoring, as it includes "other forms of health data" which, for purposes of exploration in this toolkit, include RPM in various living settings for elderly individuals and people with chronic health conditions. The American Telemedicine Association (ATA) expands even further upon the definition of RPM to include the collection of data in the patient's home (rather than only in a hospital or medical clinic), which is then sent to be reviewed and interpreted by the patient's provider or another trained team member. ATA also defines what types of devices may be used to collect the data and terms these devices "personal health technologies." Their list includes wireless devices, wearable sensors, implanted health monitors, smartphones, and mobile apps. Other devices under this same umbrella include ambient motion sensors, fall detection devices, and other specialty sensors for monitoring speech, gait, and cognitive declines.

According to the American Academy of Family Physicians (AAFP), RPM is included under the definition and functionality of telehealth. Telehealth can include non-clinical services such as those categorized by CCHP as "other forms of health data". In the remainder of this toolkit, telehealth and RPM may be used interchangeably.

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History

The history of remote patient monitoring has its roots in telehealth, which has existed for the past 30 years and has evolved to encompass new modes of technology that enable patient-to-provider engagement.

Thirty years seems like a long period of time, but Teladoc reports that the first transmission of a radiological image over a phone line was completed in 1948! A lot of other important milestones were made along the way between then and when ATA was founded in 1993 to help promote the newly emerging field and providers of telehealth services. Telehealth began to shift and change with advancements of technology and with the growing acceptance and comfort with data gathering and engaging with patients in their own homes. It is at this intersection that we will begin to look at remote patient monitoring, its evolution, and the types of technologies used to enable this type of healthcare delivery.

Technologies Used

The landscape of the different technologies available to use for remote patient monitoring is quite expansive and ever-changing. The Center for Aging Services Technologies (CAST) has a primer toolkit that lays out the possibilities around technology and RPM. Additionally, CAST has developed and maintains a comprehensive Telehealth Selection Matrix that can be used as a decision-making tool for organizations pursuing remote patient monitoring programs. Though the spreadsheet contains less than two dozen technologies, it extensively examines factors that must be considered to determine if a particular technology will meet the objectives and regulatory needs of the organization. The following sections provide overviews of the most common types of RPM technologies and features.

Fall Detection

Since falls can be quite dangerous, fall detection is a function of many RPM devices. One type of well-known fall detection device is a Personal Emergency Response System (PERS, covered in more detail below). PERS pendants were initially developed to allow individuals to push a button on the pendant to call for help in the case of a fall or other emergency. However, seniors may feel uncomfortable wearing a pendant, as pendants can add to the stigma of the "frail elderly." Thus, many companies offer fall detection devices in the form of watches. Some options for this device include Lively, by GreatCall, as well as Freedom Guardian, Kanega Watch, and the Apple Watch. Most have GPS positioning and passive fall detection embedded. Like the traditional PERS devices, the watches may include monthly subscription fees in order to access the monitoring and emergency support services. One downside of the watch model is the limited battery life, requiring wearers to remove the watch at some point during the day to charge it.

Even more cutting edge is the use of devices like Amazon Alexa to summon help with voice commands. This function requires a subscription fee, but eliminates the concern of the user taking off their pendant at night or not charging the watch. A drawback is that Alexa is voice activated, so in the case of a debilitating fall where the person is not able to speak or is too far away from the Alexa unit, the function would not be effective.

Types of fall detection devices seem almost futuristic in nature when thinking about a device accurately detecting a fall. One company, Vayyar (Walabot), uses 4-D radar technology and signals to multiple fall detection devices in the home. It detects a fall through the tracking of movement down to the floor. It's embedded, two-way communication device contacts pre-identified caregivers that are programmed into the system for emergency response. The living environment must have Wi-Fi for the device to be connected, and it must be installed to exact specifications to avoid as many false-positive alerts as possible. The system is also not pet immune, which can also cause false positives.

Wearables

Wearables can take multiple forms and perform multiple functions. The earliest wearables were PERS pendants that could be worn either around the neck or on the wrist. Over time, the advancement of technology led to other devices being able to measure steps, periods of inactivity, sleep, falls, and a plethora of vital sign values. Again, a challenge around incorporating wearables with the elderly is the need for frequent charging. This barrier may limit the effectiveness if the wearer forgets to charge it or has a fall while the device is charging. An additional concern with devices that rely on Bluetooth connections is that they will be rendered ineffective if the wearer is out of range.

As these devices become more capable and complex, the volume and management of collected data presents as another unique concern. Medical providers do not have the bandwidth to receive, digest, and react to all of the information that is gathered by a wearable. This data can become dark data, meaning that it is gathered but not acted upon, thus limiting its value.

Personal Emergency Response Systems (PERS)

Developed in 1972, the original purpose of PERS pendants was to provide seniors with a reliable way to call for help in case of a fall or emergency. This concept of supporting healthy aging-in-place by providing a mechanism for a senior to call for help in the case of a fall or other health emergency has spurred an entire industry to move from landline phones to cellular-based connections. Many technologies now utilize global positioning and cellular tower triangulation to find and support a user in need, wherever they may be located, which can be extremely valuable for Individuals who still drive and live independently, as well as for individuals with cognitive or physical impairments who live independently.

In 2010, Philips announced the addition of its auto-alert feature to its *Lifeline* PERS pendant that uses accelerometers, barometric sensors, and highly tested algorithms to detect a fall at a 95% confidence level. This feature can summon help in the case of a debilitating fall in which the user is not able to push the pendant button for help. Since the introduction of Philips' auto-alert feature in their Lifeline pendant, many other companies have also added this feature to their PERS pendants.

The case could be made that the PERS technology was the original foundation of RPM. The popularity of PERS pendants and technology advancements has led to additional biometric wearable devices, ambient sensors, wide-band radar technology, and a transition from landline to Wi-Fi and cellular data transmission. All of these technologies have removed the limits of monitoring from within the four walls of the senior's home and encourage independence and safety within the full community setting.

Vital Sign Monitoring

Vital sign monitoring or biometric monitoring refers to taking specific vital sign readings and transmitting them to a call center or provider's office for review and response. The typical readings gathered are blood pressure, heart rate, blood oxygen levels, weight, and blood glucose readings (for diabetic patients). Many heart failure programs simply utilize a weight scale for monitoring and watch for significant changes in weight values that can indicate a client having additional fluid retention/overload or, with overuse of diuretics, becoming dehydrated. For patients returning home from a recent hospitalization, utilizing a thermometer to monitor for a fever, which is a sign of infection, can be a valuable tool for avoiding rehospitalization.

Whereas in-home vital sign monitoring equipment historically was large and bulky and required a landline connection, the evolution of technology has created devices that almost anyone can obtain and use easily at home. Today, in the era of BYOD (bring your own device), along with the ability to pick from a variety of peripheral devices that can be connected via Bluetooth to a smartphone or tablet for data gathering and transmission, a RPM platform is much easier to implement and use, but still requires the need to document (preferably within the patients' medical record) and manage the data in order to be truly functional.

The emergence of the Novel Coronavirus in 2019 introduced a new application of RPM to support COVID-19 patients. Given that fever and difficulty breathing are symptoms signifying worsening disease progression that

may require medical intervention, many medical providers and health insurance operators offered patients a thermometer and a pulse oximeter to use for self-monitoring these vital metrics. Patients were educated on the normal parameters for blood oxygen and body temperature so they know to alert their provider when they exceed these boundaries.

Ambient Sensors

Some of the earliest ambient sensor monitoring devices find their roots back to the year 2000. The Wellaware company was one of the first to create algorithms based upon the normalization of ambient sensor data firings from within a home environment. A suite of sensors was placed strategically around the home to capture the normal activity pattern of its occupants and create a snapshot of the individuals' daily activities. The company added sleep pads, door contact sensors, flush sensors, ambient humidity detecting sensors, and other sensors to complete the view of activity within a home. Wellaware determined both how many sensors were needed to get an understanding of the activity level of the person(s) being monitored and how to make the data digestible for caregivers to then act upon. Wellaware learned that monitoring an individual living alone was easier than trying to make sense of all the extra 'noise' an active household could create. In addition, they learned that outfitting an entire home also created an overabundance of data that made it more difficult to interpret, so they slimmed down their sensor packages to monitoring the primary living spaces: kitchen, living room, bathroom, and bedroom. Finally, they also added door contact sensors to make inferences about whether or not the monitored individual was still in the home. Many other companies have begun developing ambient and other types of sensors to capture behavioral activity in the home; these companies are listed in the technology table.

Ambient sensors provide a unique look into the behavioral activity of a client in their own home. The challenge remains in interpreting what a shift in activity levels means in relation to the client's overall health and wellbeing. One day of abnormal activity may be just an 'off' day, but a trend observed over several days or weeks can point to a health change. Such a change may require motivational interviewing skills in order to determine what (if any) underlying health condition(s) led to the behavioral change. Coupling vital sign and ambient sensor monitoring creates a unique opportunity for the collection of incredibly detailed health data. However, how it is shared with the client, their family, and healthcare providers is an art, not a science.

Medication Management

Medication mismanagement is a leading cause of seniors ending up in the ER. In fact, more than 25% of ER visits by seniors are related to adverse reactions to medications or complications from medical treatments. As people age, it is common to see the number of health conditions increase and the amount of medications prescribed to increase as well. Cognitive impairment may also impact seniors' abilities to manage their medication regimen.

Medication management may be as simple as a pill box or as complex as smart caps (which detect removal of the cap, thus inferring that the senior took their medication) or locked dispensing devices. It is worthwhile to note that there are literally thousands of medication management devices in existence. The first step to selecting an appropriate device is identifying what a senior needs assistance with when it comes to managing their medications—this can mean the difference between the senior being able to remain in an independent living situation and needing assisted living or long-term care. Without the use of tracers or video to confirm that the senior has taken the prescribed medication, current technologies can only determine whether the medication has been administered, not whether it has been ingested.

Applications in Various Settings

Population Health

Population health has become a catch phrase in the past few years, but is often misunderstood. It is not a single initiative aimed at one type of programming or intervention, but rather the interdisciplinary and collaborative efforts between non-traditional partners such as public health, industry, academia, healthcare providers, and local governments to achieve positive health outcomes. RPM programs can be leveraged to address six of the most common and costly health conditions as cited by the CDC. These include reducing tobacco usage, controlling high blood pressure, reducing antibiotic use, controlling asthma, preventing unintended pregnancy, and preventing type 2 diabetes. RPM programs can monitor individuals with high blood pressure, encourage physical activity, monitor weight, and provide wellness coaching that can help in the prevention, or reversal, of type 2 diabetes. RPM can also be helpful when managing a pregnancy, especially one at "high risk", by monitoring weight gain, blood pressure, and tracking exercise. With some RPM platforms utilizing tablet interfaces, educational materials specific to smoking cessation, exercise, diet, and many other topics can be distributed to the client being monitored. Video chats and telehealth visits are also possible, depending upon the vendor platform.

Chronic Care Management

Elderly adults are often the most common receivers of RPM due to their high rates of chronic conditions and comorbidities. However, RPM's ability to maintain, control, and improve the health outcomes for younger individuals also has significant long-term implications for our healthcare system.

In 2015, CMS began reimbursing for Chronic Care Management (CCM) under the Physician Fee Schedule (PFS). Starting in 2020, some changes occurred with the "incident to" services and general supervision language. For 2020, the PFS states: "The clinical staff are either employees or working under contract to the billing practitioner whom Medicare directly pays for CCM." This addition allows clinics providing and billing for CCM to contract with external entities to provide their RPM, therefore enhancing the actionable data clinics have at their disposal to help patients with managing their chronic health conditions.

Home

On any given day, one would be hard pressed to find a senior living in their own home stating: "today is the day that I want to purchase remote patient monitoring equipment so I am better able to age successfully in my home!" Rather, the opposite response usually follows when they hear of the potential to bring "monitoring" services into their home (for the purposes of this toolkit, "home" is defined as a senior's private residential space, not a senior living community). Remote patient monitoring is unfamiliar to many people outside the healthcare industries, and the word "monitoring" oftentimes evokes fear of surveillance and spying. For a generation that lived through concerns of "big brother", communism, and the Orwell classic "1984," welcoming hardware and software into their home is not at the forefront of most people's minds when it comes to staying healthy and independent. Indeed, the drive to obtain remote patient monitoring technology may be especially low among seniors who are noticing physical or cognitive declines in their own health, because there could be fear or anxiety that having this technology in their home could expose their condition to others and be the impetus to move them into an assisted living facility.

In 2019, 53% of seniors owned a smartphone.

There are a myriad of options—both wearable and non-wearable—that can support a senior living in their own home. PERS pendants are often the first piece of technology to come to mind (see overview provided above). At this time, none of the fall detection systems presently on the market have the ability to cover every corner of a senior's home like a PERS pendant can (if it is consistently worn). However, for those individuals that have localized concerns about falls and will not wear a PERS pendant, higher tech options that are installed in specific rooms—like Walabot by Vayyar—may be better options. The revelation of wearable devices like the Fitbit, Apple Watch,

Kanenga, Freedom Guardian, and other devices that are worn on the wrist or close to the body to track activity levels, biometric data (heart rate, respirations, blood pressure), and location detection have emerged as viable members of this market.

Vital sign monitoring can be a great support for seniors who are managing chronic health conditions. Data can either be maintained on a simple log or uploaded to a professional call center or physician's office setting, thereby offering their providers actionable data to adjust medications and understand the management of the health condition. Additionally, as noted previously, medication adherence and mismanagement are concerns for seniors living alone. Medication reminder solutions and dispensing devices are of great value for helping an elderly person live safely in their own home.

Best Buy Health has partnered with Great Call to provide several RPM options for at-home seniors under their Lively product line. They have a PERS pendant with cellular connectivity, fall detection, and GPS location ability. They also have Lively Home, which consists of ambient sensors, contact sensors, and a sleep pad. The data are sent to a central monitoring center where it is reviewed and triaged for follow up by trained care managers. Great Call has private pay options for individuals who want this type of RPM, but the majority of their business is in senior living communities where it is part of the monthly fees for living there.

Although there are many click-to-order solutions, it is important to remember that in order to create value for the senior being monitored and for family caregivers, the use of the technology needs to solve a problem and not create more work and stress for the family caregiver if they are the primary point of contact.

Senior Living

"Senior living" is a catch-all term for many levels of care designated for seniors. Others include "independent living" or "housing with services." The living settings may be an apartment, twin home, or duplex.

The use of RPM devices could benefit senior living residents by supporting them as they manage their disease and its potential progression, thereby delaying their eventual transition to higher levels of care. Senior living owners/operators may consider the financial benefits of reduced resident turnover. Applicable services can vary widely, from PERS pendants to community-based health and wellness options. Various types of RPM could be either embedded into the amenities and monthly fees of the property or available à la carte. With the latter option, similar to an elder living in their own home, persons living in a senior living setting would be responsible for purchasing RPM equipment and paying for any subsequent ongoing monitoring fees. While PERS pendants are typically included in senior living settings, other types of RPM that may also benefit seniors in this setting include additional fall detection services, ambient monitoring of daily living activities, vital sign monitoring, and medication administration/compliance monitoring.

Vital sign monitoring kiosks are an example of a cost-effective solution for senior living settings, as they allow many individuals to use one machine. It is important to plan appropriately for a multi-user device in order to be able to properly identify individual users, matching the data appropriately, sharing data with the individual, and properly cleaning the device between users.

The *Outcomes of Remote Monitoring section will provide more information around how senior living providers are utilizing RPM. The COVID-19 pandemic, which has increased social isolation and created fewer opportunities for staff persons to engage with the seniors living in their communities, has also brought to light the value of RPM for senior care that makes its use likely to continue after the pandemic.*

Subsidized Elderly Housing

Subsidized housing for the elderly is similar to senior living except that the residents of these apartments have low-incomes. These individuals would likely not be able to afford to privately pay for RPM services on their own and few owners/operators have a margin substantial enough to incorporate RPM into this living environment. Yet, the incorporation of RPM could better support the residents and potentially assist in identifying health status changes earlier, allowing for intervention by the provider, avoiding unnecessary ED and hospitalizations, and delaying transition to higher levels of care.

If the resident qualifies for their state's Medicaid program—and depending upon a state's coverage of RPM services—they may be able to receive some RPM if it is to serve a covered medical diagnosis. The Center for Connected Health Policy's State Telehealth Laws and Reimbursement Policies outlines RPM coverage by state. Currently, in their 2020 publication, 23 states allow Medicaid reimbursement for RPM, with a handful of others working towards it.

Assisted Living

Traditional assisted living (AL) care provides additional support to seniors who need assistance with their activities of daily living. This assistance can take several different approaches, depending upon the individuals' needs. Residents of assisted living facilities can derive the same benefit from RPM as residents of senior living and subsidized elderly housing centers, but challenges lie in how those costs are passed on to residents (whether services are offered à la carte or are embedded in the monthly fees) and in ensuring that collected data is monitored and reviewed.

Mild cognitive impairment is often a top reason that a senior is needing to move to an AL level of care. If permissible by state regulation, **a medication administration device** in the resident's apartment can support the resident in maintaining as much autonomy as possible. Another benefit of a medication administration device is that it can reduce time spent dispensing by staff and potential medication errors.

Assisted living facilities typically provide **PERS devices** in the apartment. These may take the form of a pull-cord that is hard-wired in the apartment or a pendant that is available either instead of, or in addition to the pull-cord. PERS with fall detection is of great value in the AL setting especially if they do not conduct wellness checks during the night for residents as the resident could experience a fall and lie injured for several hours before being checked on.

Additional technology in the AL setting may include the **ambient sensor system**. The more passive monitoring can be for the resident, the better the compliance and outcomes will likely be. This is especially true in AL memory care facilities. Residents in memory care present additional challenges in understanding unexplained weight loss, toileting habits, sleep patterns, and wandering. Ambient sensors may proactively identify behavioral pattern changes that may indicate physical or cognitive health issues. Behavioral sensor data can reveal increases in bathroom activity which can point to urinary tract infections, incontinence issues, or other G.I. issues the resident may not be able to identify or articulate. Sleep data (tracking the quantity, and potentially the quality, of sleep) is another indicator of health: increased average times in bed can point to illness, depression, or other issues, whereas decreased average sleep time or quality can indicate uncontrolled pain, anxiety, or depression, breathing issues, or increased levels of nighttime toileting. The data collected can also be helpful when conducting conversations with the resident and family caregivers around possible changes needed in their level of care.

A **multi-user vital sign kiosk** may be beneficial in the AL setting. Not all residents may be able to independently use the equipment accurately and safely, an issue that a kiosk could alleviate. This, in turn, however, may raise issues around time constraints for the staff (who need to take vitals for each resident) and disinfecting equipment between uses (which would not be an issue if each resident had their own equipment). These are discussion points that need to be weighed by leadership in determining which vital sign monitoring system makes sense to implement in their facility.

Patient-Centered Medical Home

The Patient-Centered Medical Home (PCMH) centers on five core components: comprehensive care, patient-centered care, coordinated care, accessible services, and quality/safety. Since the focus of PCMH care is to surround the patient with all available resources in order to achieve better outcomes, incorporating RPM services can be an important component in the overall plan of care. Janis Coffin, DO, FAAFP, FACMPE, PCMH CCE writes in Physician Practice that the pandemic has created a great opportunity to leverage RPM to improve productivity and promote cost savings in the PCMH as CMS has increased reimbursement for telemedicine and opened the door for more practices to entertain using RPM. Dr. Janis goes on to share that RPM use can reduce physician visits, phone calls to the office and a significant reduction in on-call urgent

calls by 51% due being proactive in managing patients with chronic health conditions instead of being only reactive to symptom management.

Skilled Nursing Rehab/Transitions

Remote patient monitoring is not typically associated with skilled nursing facilities due to the short length of stay, continuous staff presence (for monitoring), and the usual goal of discharging back to the resident's home at the end of the skilled episode. However, with the attention from Accountable Care Organizations (ACOs), Value-Based Healthcare, managed care contracts/agreements, and chronic disease management (CDM) programs, there is an increased emphasis on improved patient experience, better outcomes, and reducing the cost of healthcare overall. This has created a unique opportunity for healthcare providers to come together to better manage the entire episode of care for an individual within a set amount of reimbursement and shared risk. Making vital sign monitoring equipment available in the skilled nursing setting allows support staff to educate patients on its proper use before they are discharged. Vital sign monitoring in the skilled nursing facility may also lessen the number of days a person needs to remain in the facility, which could save costs. Once a patient is home, these tools may help to identify changes in health status earlier and could be the difference between a follow-up call to the provider or a readmission to the hospital.

Skilled Home Health Care

The opportunity for an over-arching contractual relationship exists between hospital, skilled nursing facility, and home health care agency. A skilled home health care agency that utilizes RPM should also be cooperatively engaged with the skilled nursing facility either through a contractual relationship or through a referral relationship. The resident would still need to choose that skilled home health agency to provide the RPM equipment and monitoring service.

Home health agencies have an opportunity to leverage vital signs RPM to inform the frequency of nursing visits during a skilled episode of care without risking reimbursement. Front-loading visits for a new skilled admission is a common practice among home health agencies and often they exceed the minimum visits identified in the Home Health Resource Groups (HHRGs). This can impact the agency's operating efficiency. Using vital signs RPM can allow home health agencies to receive data about the client on a daily basis and conduct phone triage to assess if there is an emerging concern that needs to be addressed by the provider.

Successful home health care agency RPM programs share something in common: they don't ask the client if they would like to have RPM as part of their care, but rather they inform the client that RPM is included as part of their care plan in order to improve the quality of their care.

To successfully implement RPM within skilled home healthcare settings, the review of the RPM vital signs data needs to be embedded with the daily workflow of the agency care team. Having the RN review vital sign readings of their clients before beginning the days' visits is not always feasible, as clients may not always take their readings early enough in the day for this to work. The RN case manager must be able to login to the data dashboard to review their patients' readings periodically throughout the day to look for anything that is out of parameter. There may be an opportunity to identify an office-based staff member who can review readings and alert respective RN case managers to address issues. Another option is to engage a third-party call center that specializes in RPM.

Finally, the home health agency should strategically look at their own operational costs and case review skilled visits against the HHRG rates to identify if there is opportunity to leverage RPM to improve outcomes for the agency and its clients. Examining rehospitalization rates for specific diagnostic groups can indicate whether RPM could be beneficial as a targeted effort for those groups. For instance, chronic heart failure and diabetes management are common diagnoses for which additional monitoring can help to identify an exacerbation early.

With the use of RPM to successfully reduce rehospitalization rates, the home health agency can advertise itself as a strong partner in better disease management to ACOs, managed care opportunities, and bundled payment care initiatives contracts.

Private Duty Healthcare & Home Care

Private duty home healthcare and home care agencies have an opportunity to look at all the RPM technologies as an additional benefit in their agencies, for many of the same reasons indicated for other organizations. Because their services are private pay, this becomes another option in their menu of services to create, enhance, and keep clients by differentiating themselves among other similar providers in their market area.

A best practice is to work with the client to take their readings before noon each day so that the care team can review and complete triage as needed.

Hospice & Palliative Care

Hospice and palliative care providers can leverage RPM services to support clients in achieving the best quality of life for as long as possible. Specifically, PERS and fall detection technology, as well as medication administration devices, may assist those clients who are still able to live independently. Some clients opting for palliative care may benefit from vital sign monitoring, as well, to assist in managing their disease symptoms.

Determining Outcomes of Remote Monitoring

Before beginning an RPM program, it is necessary for your organization to carefully consider the problem/s that RPM intends to address. Examples include:

- Reducing overall costs of patient care
- Increasing competitive market share
- Identifying opportunities lost due to a lack of data-driven best practices and outcomes (ACOs, Bundled-Payments, Value-Based relationships)

Bringing the discussion of RPM into strategic planning sessions can be the best place to start. Identifying, researching, testing, and implementing the RPM program can be part of a full 3-5 year strategic cycle. Human and financial capital will need to be considered, and, depending upon the financial situation of the organization, budgetary issues may also be a factor.

Key to the success of any new RPM program that has made its way past the boardroom doors is identifying a champion within the organization who is willing to take control of the project and create the sense of excitement and urgency among the rest of the team to bring it to fruition. This may be a person within the organization who has supported and championed other projects, or it may be a recruited individual with experience in this type of work. This person does not necessarily need to be a C-suite individual, and, in fact, it is often better if they are not. The champion needs to be a person who is intimately involved with the day-to-day operations and can identify how the various RPM data will be embedded into existing workflows.

Projects that are not properly cascaded from leadership can result in failure. Many employees have been part of some grand initiative begun at the executive level only to watch it have poor execution and eventually wither and die. This can often be resolved through proper communication from leadership to staff to better explain the “why” of the initiative and gain buy-in. Leadership may also fail to listen to their employees and understand if the root problem has been identified and solved by the chosen solution. Below are some key items to address as part of the RPM initiative. Each is important and failure in any one category can impact the success overall.

Buy-in (Lack of) • Client • Caregiver • Staff	**Acceptance** • Project • Budget • Level of effort	**Technology** • Lease versus buy • Initial and ongoing costs • Lifespan
Installations • Contracted or internally sourced	**Connectivity** • WIFI, cellular, ethernet • Required plan upgrades	**Data interpretation/EMR Integration** • Education of staff on how to use data to identify changes • Education of healthcare providers and customers about goals of RPM use
Staff Workflow Changes • Review of data in a timely manner	**Ongoing maintenance** • Contracted or internally sourced	**Measuring outcomes** • Costs incurred/saved • Health outcomes

In addition to everyone in the organization understanding the project's "why," the organization needs to have historical data to establish a performance baseline. This baseline allows organizations to set attainable measurements and goals for the initiative and ensure that such goals support the "why." The items below represent potential goal-setting areas that companies may identify during strategic planning as areas upon which they want to expand:

Increased Census • RPM as a distinguishing feature for sales & marketing • Increased marketability share ◊ Improved satisfaction surveys ◊ Testimonials • Reduction in Turnover	**Care Partnerships** • Opportunities to partner with other care organizations • Hospitals (ACOs) • Home Health / Home care • Insurance Companies • Senior Living Providers	**Delay in Transitions of Care** • Ability to maintain residents longer in lowest level of care • Lower costs of sales and marketing for filling empty units
Revenue • Ancillary services • Soft ROI • Hard ROI	**Improved Health Outcomes** • Hospitalization rates • Length of Stay (LOS) • ADL declines • Falls	

Reimbursement and Cost Considerations

The costs associated with a RPM program must be well researched and understood before launching an initiative, and must also be balanced against the value gained. Many of those success measures may actually be indirect or considered as a soft ROI (return on investment) that could emerge over time, and will be unique to the type of facility/organization. Examples include the increased scores on satisfaction surveys or increased length of stay for individuals already residing in a senior living community. Service providers that focus on in-home service delivery may see an opportunity to increase organizational marketability by having more services available to support individuals within the community.

Depending upon the service delivery model, RPM programs can offer à la carte services or embed services into the organization's overall function. Typically, if the RPM service is going to be delivered in an AL setting, they are included in the monthly rates. Medication administration devices, vital sign monitoring, and other types of monitoring requiring more hands-on staff engagement may be à la carte.

Skilled home healthcare agencies may build-in costs for vital sign monitoring in their suite of services, as it can be used to monitor for signs of rapid health decline which may indicate a need for immediate intervention to avoid rehospitalization. The use of vital sign monitoring can also help the skilled home health agency to effectively plan their visits over the episode of care. The agency may also want to incorporate RPM services (such as PERS, fall detection, medication administration/reminder devices, and wearables) both at the beginning and at the end of the skilled episode as a continued revenue stream and to improve customer satisfaction and health outcomes.

Communicating and Understanding Value *(aka Marketing Considerations)*

Marketing a RPM program is as unique as each service setting described throughout this toolkit. This is a quick summary of aspects to consider when developing your marketing and communications strategy for your RPM service.

Surveys of existing clients, family caregivers and staff persons to understand the overall perception or RPM is an important first step. When working with the elderly, organizations must consider those who are close to the senior or involved in their care, as the senior often relies upon their input and direction. Understanding the concerns that family caregivers have for their loved one can create unique service opportunities and talking points for marketing.

Marketing focusing on business-to-business partnership opportunities has a drastically different look and feel. What are the main points of concern for an ACO, VBP, CCM, or bundled-payment arrangement? Reducing readmission rate penalties and increasing patient satisfaction scores are critical for these arrangements, so it is imperative to understand how the addition of RPM can improve those outcomes. Planning your program will also include the tracking of necessary data points to prove progress and success around the defined outcomes.

Many studies have shown the efficacy of vital sign monitoring, PERS devices, and medication administration devices; these data will be valuable to share with potential partners. The other types of technologies discussed in this toolkit are newer and have fewer validated longitudinal studies.

Policy/Procedure Recommendations

There are a few areas that deserve a deeper look when deciding to create a RPM program. Addendum A contains four procedural templates focused on marketing, technology evaluation, best practices for evaluating key functionality, and infrastructure needs both within a facility and in an individual's home setting. The procedures are intended to spark deeper conversations among leaders about considerations for launching a RPM program, and are not intended to be all-encompassing guides about what is needed for ongoing operations. The vendor you select to partner with should be able to provide marketing templates, installation, troubleshooting, and maintenance aides for their products. Additionally, your vendor should be able to support customary and reasonable service level agreements.

gpTRAC
Great Plains Telehealth Resource & Assistance Center

Thank you to Sherrie Petersen, MBA for being willing to share her vast experience around the use and implementation remote patient monitoring and sensors programs and services, and for leading the development of this toolkit.

***Disclaimer**: The information and links contained in this toolkit are current as of publication. The evolution of data, especially in health and technology related topics, continues to be rapid.*

Addendum A — Sample Procedures

In the next few pages you will find examples of four important procedures which will be important to the successful delivery of RPM services. These are intended to provide a starting point for your use and should be editing to meet your organization's specific needs.

1. Program Leadership Procedure
2. Technology Evaluation Procedure
3. Physical Plant Evaluation Procedure
4. Client Home Environment Evaluation Procedure

Addendum A — Sample Procedures 1: Program Champion

Procedure: Establish Program Leadership

Purpose: To have a RPM champion to lead the work; to have an identified process of understanding what problem is being solved by utilizing RPM; to be prepared to work with sales and marketing to create materials specifically for RPM.

Objective: Identify a program champion

A. The champion within an organization will be charged to create a sense of excitement within the organization about utilizing RPM to:
   a. The champion will work with the multi-disciplinary team to
      i. Identify opportunities for improvement that can be impacted by using RPM.
      ii. Lead focus groups with residents and families to hear excitement and concerns about introducing RPM program to the community.
B. Become the liaison with residents and families for adoption and embracing of the solutions.
C. Work with discovery teams in evaluating the various technology solutions for use.
D. Work with vendors to understand data interpretation and integration into daily workflows
E. Through the efforts of the champion, over time the following outcomes can be seen:
   a. Improve the lives of residents within a community
      i. Increased length of stay within a level of care
      ii. Heightened level of engagement of residents with their own health and wellbeing
      iii. Identify emerging health status changes for earlier intervention with PCP
   b. Position the organization as a leader
      i. Leveraging technology to focus on residents that need attention now
      ii. Create strategic opportunities with Accountable Care Organizations (ACOs), Value Based Payment programs (VBP), Managed Care Organizations (MCOs).

Addendum A — Sample Procedures 2: Technology Evaluation

Procedure: Technology Evaluation

Purpose: To have a standardized process to evaluate proposed types of technology for use in current line of business.

Objective: Well-informed Decisions around RPM technology

Objectives are:

A. To provide an objective tool for comparing specific features of different subsets of RPM equipment.

B. To include a consistent matrix format that can be used to include new or emerging vendors for inclusion in the evaluation including the following categories:

1. Company name
2. Company website
3. Category of Technology
4. Types of data points collected
5. Lease versus own
6. Connectivity (WIFI vs. cellular) options and costs associated
7. Installation (self or professional)
8. Dashboards
9. Integration capabilities to EMR/EHR
10. Professional or consumer use cases

Definitions:

A. Remote Patient Monitoring

a. The use of digital technologies to collect medical and other forms of health data from individuals in one location and electronically transmit that information securely to health care providers in a different location for assessment and recommendations.

B. Telehealth

a. A generic term for remote delivery of healthcare by a range of options, including by landline, cellular phone, and the internet.

b. The data collection is typically in the patient's home setting.

C. Vital Sign Monitoring

a. The collection of and transmission of biometric readings for a patient in their home.

i. Blood Pressure

ii. Pulse oximetry

iii. Heart Rate

iv. Weight

v. Blood Glucose

vi. Spirometry

D. Ambient Sensor Devices
    a. Device that detect and respond to some type of input from the physical environment.
        i. Door activity
        ii. Kitchen activity (refrigerator open/close activity, cabinets, stove sensors)
        iii. Toilet flush sensors
        iv. Bathroom humidity sensors
        v. Motion detection sensors
        vi. Sleep pads
E. PERS (Personal Emergency Response) Device
        a. A pendant or pull cord type of device (hard-wired in a facility setting) used for an individual to be able to summon for assistance in case of a health emergency.
        b. A pendant may include a fall detection feature and alerts can be transmitted either by landline or cellular connectivity.
F. Fall Detection
    a. A type of device that is passive (no need to wear a pendant) and can identify potential falls using 4-D Radar Technology.
    b. Function is limited to location of sensor and specific coverage area
G. Medication Management
    a. Devices used for visual and/or auditory reminders to take medications
H. Wearable Devices
    a. Watch-like bands that can detect and transmit various data
        i. Heart rate/rhythms, pulse, 1-lead EKG, movement/activity levels, sleep
    a. Biosensors
        i. Self-adhesive patch affixed to the body to gather biometric data

Procedure: Physical Plant Evaluation

Purpose: To have a standardized process to evaluate the physical plant environment for RPM deployment. Ideally the discovery process around hardware and plant constraints should be completed before entering in to a contract with any technology vendor to understand if there are infrastructure constraints that must be addressed before proceeding ahead with a major innovation project.

Objective: Pre-Site Assessment: To have a general understanding of opportunities and constraints of installing RPM technology platforms in congregate housing setting

A. To understand the existing infrastructure of WIFI in buildings being considered for RPM installations as well as cellular strength issues if the technology uses embedded cellular cards.
B. Is there bandwidth available to support the various RPM technologies being considered?
C. Need to fully understand the technology/vendor specific minimum internet/bandwidth specifications to operate system(s).
D. If not, is there already a system upgrade plan identified?
E. Is there availability of designated networks to support the RPM technologies?
F. To understand challenges that must be evaluated completely before implementing a successful program in a community setting.
G. Are there known weak signal areas or dead zones within apartment dwellings? Can WIFI extenders be used to mitigate or will this impact the existing WIFI system?
H. Again, as referenced above, is there a system upgrade planned to remedy the known issues?

Pre-Installations:

A. A pre-site assessment data gathering should be done ahead of any personnel or equipment being sent to begin an installation deployment.
B. The pre-site assessment will be a multi-disciplinary team approach to include, but not be limited to, administration, director of client services, sales & marketing team, IT and relevant installation team, if being used, as outlined by the SoW.
C. The facility blueprints and WIFI schematics as well as a site tour will be done to:
    a. Identify any problem areas around
        i. Signal strength.
        ii. Placement of electrical outlets or need for additional ones to be installed.
        iii. Placement of hardware that is necessary within each apartment or within community spaces.
    b. If vital sign monitoring equipment is to be installed, assess best place to have equipment located.
        i. Is it for 1:1 use or a multi-user platform?
            1. If multi-user, where is best location?
            2. How will staff be trained to support residents in using it?
            3. What kinds of cleaning and maintenance procedures need to be in place?

4. If 1:1 use (in individual resident's apartment),
    a. Is there a designated location for it be placed in each living unit?

ii. Need to be located near electrical outlet if any components need steady current or frequent charging

iii. Floor composition for placement of a weight scale if to be used. Needs to be located on a hard floor surface.

D. Discussion will need to be held around whether equipment is assigned to a specific unit or an individual resident(s) for ambient sensors, PERS pendants and fall detection systems.

a. Need to be able to learn from the specific vendor if the data set can be transferred by resident of if it is attached to the hardware in the case of a resident moving from one living space to another.

i. This could impact data history and trending

ii. This could cause a period of "re-learning" of behavioral patterns for ambient sensor data.

E. Medication Management devices should be able to follow the resident if moves within the community occur as should wearable devices that are connected to the individual and not a unit.

Addendum A — Sample Procedures 4: Client Home Environment Evaluation

Procedure: Client Home Environment Evaluation

Purpose: To have a standardized process to evaluate the client home environment for RPM deployment.

Objective: To have a general understanding of opportunities and constraints of installing RPM technology platforms within the patient home environment

To understand the system requirements for various types of RPM technologies.

To inform client of requirements before arriving for installation.

To understand challenges that must be evaluated before implementing a program in an individual home setting.

Home Installations:

A. A pre-site assessment data gathering should be done ahead of any personnel or equipment being sent to an individual client's home.

B. The client and/or caregiver should be informed of the type of equipment to be installed and approximate time required to complete the installation process as well as:
   a. Inform of any specific access requirements needed during installation
      i. WIFI Router
      ii. Electrical outlets
   b. Inform of any mounting of equipment on walls, doorways, appliances, beds, toilets, and ask for any unique wall composition (wallpaper, paneling, textured surfaces)
   c. If vital sign monitoring equipment is to be installed, ask client/caregiver to think about best place to have equipment located
      i. Near electrical outlet if any components need steady current or frequent charging
      ii. Floor composition for placement of a weight scale if to be used. Needs to be located on a hard floor surface for accurate/consistent measures
      iii. A place near and table and chair so that the client can sit to take BP reading and devices can be kept in a centralized location.

C. The following items are key data points to assist in a smooth installation process. Additional specific information may be required by the technology vendor.
   a. Client
      i. Name
      ii. Address
      iii. Phone numbers/Cellular phone carrier (if technologies depend upon cellular transmission of data)
         1. Cellular coverage heat maps may not always depict accurate cellular strength and coverage
         2. Vendors chose different cellular carriers for embedded cellular cards and this can impact functionality of equipment
      iv. Email address
      v. Specific entrance instructions (gated community or specific door requests)
      vi. WIFI name and password (if technologies depend upon WIFI transmission of data)
         1. If client does not have WIFI, must know if the installation can continue based upon availability of an embedded cellular card in the technology.
      vii. Emergency contact information
         1. PCP
         2. Hospital Preference

3. Caregiver/next of kin
    a. DPOA status

b. Family/Caregiver
    i. Name
    ii. Address
    iii. Phone numbers
    iv. Email address
    v. Relationship to client

D. Vital Sign Monitoring
    a. If vital sign monitoring equipment is being installed in the client's home, the client and/or caregiver will need:
        i. To be educated on use of each peripheral device
            1. Either by the installer (if appropriate) or by
            2. Watching a video or reading of instructional materials
            3. Frequency and time of day recommended
            4. When to contact provided numbers for technical support

E. Ambient Sensor Devices
    a. If sensor devices are installed in the client's home, the client and/or caregiver will need:
        i. To be instructed on what kinds of data the sensors are gathering
        ii. When to contact provided numbers for technical support

F. PERS (Personal Emergency Response) Device
    a. If a PERS device is installed in the client's home, the client and/or caregiver will need:
        i. To be instructed on vendor specific functionality
        ii. Conduct test pushes to ensure device is operational while installer still in the home

G. Fall Detection
    a. If a fall detection system is set up in the client's home, the client and/or caregiver will need:
        i. To be instructed on the coverage area of the system
        ii. How the system will respond to a detected fall
        iii. How to cancel a false alarm
        iv. Who to contact for technology concerns or questions.

H. Medication Management
    a. If a medication management device is installed in the client's home, either the client, caregiver or appropriately licensed individual will need
        i. Connectivity of the device to WIFI or cellular connectivity will need to be established according to the vendor's instructions.
        ii. To set up the medications in the device.
        iii. Dispensing / alerting times will need to be set up according to the times the PCP has recommended.
        iv. Who to contact for technology concerns or questions.

I. Wearable Devices
    a. If a wearable device is installed for the client,
        i. The type of device and compatibility of it to a specific technology platform (android or ios) needs to be determined
        ii. The client will need to have set up and access to user name and password for either google play store or apple store if the device is to be paired to their cellular phone.

Resource Library

National Organizations:

LeadingAge / CAST — A number of excellent resources are available here

Telehealth & RPM Long-Term and Post Acute Care: Primer & Provider Selection Gride

CAST Telehealth & RPM Selection Tool

Technology Selection Tools

CAST Telehealth Case Studies

CAST Home Care Home Health Case Studies

Telehealth Matrix

Telehealth Guide (Account Needed)

Center for Technology and Aging

RPM Program

American Telemedicine Association

Definition of Telehealth

Centers for Medicare and Medicaid Services

Chronic Care Management

AARP

New Home Monitoring Devices CES 2020

American Academy of Family Physicians (AAFP)

Telehealth Kit

National Institutes of Health

Aging in Place

Avel eCare

Avel eCare

Avera eCARE history

Telehealth Resource Centers:

National Consortium of Telehealth Resource Centers

* Remote Patient Monitoring Webinar Series - MATRC and TTAC

CCHP Remote Patient Monitoring Research Catalog

CCHP Store and Forward definition

Center for Connected Health Policy

All 50 States laws and reimbursement

Remote Communication Technology Codes

Resources of Interest: (and mentioned throughout the toolkit)

Business Insider https://www.businessinsider.com/remote-patient-monitoring-industry-explained
Ambient Home Health Monitoring https://blog.essence-grp.com/ambient-home-health-monitoring-sensors/
Xfinity https://www.xfinity.com/hub/smart-home/senior-monitoring-elderly-parents
Ziegler http://eziegler.com/files/Ziegler_SeniorLivingTechnologyWhitepaper_FNL.pdf
Seniors Matter https://www.seniorsmatter.com/monitoring-the-elderly-at-home/2491888
A Place for Mom https://www.aplaceformom.com/caregiver-resources/articles/senior-monitoring-sensors
AMR (American Medical Response) http://www.amrwny.net/
Senior Solutions Gather Data to Support Health
CMS Agrees to Cover Breakthrough Medical Devices
Philips: Philips Lifeline; Vital Sign Monitoring; Lifeline with Auto-Alert; Medication Dispenser
Independa https://independa.com/
Fitbit https://www.fitbit.com/global/us/about-us
Passive Fall Detection Tech https://www.techradar.com/best/best-fall-detection-sensors
History of Telehealth https://intouchhealth.com/a-brief-history-of-telehealth/
Winterlight https://winterlightlabs.com/clinical-research
Lively: Devices, including Lively Home and Lively Mobile (spec sheet recommends daily charging)
Apple Watch https://www.apple.com/apple-watch-series-6/
Wearables / Smartwatches https://www.wearables.com/collections/smartwatches
Companion 24/7 https://learn.getcompanion247.com/top10/?utm_source=top10&SubID=des_U4nx8k2qEZ
Companion Medical Alert for Alexa https://www.amazon.com/Companion-Medical-Alert-Amazon-Alexa/dp/B07CWCXRJB
Statista https://www.statista.com/statistics/489255/percentage-of-us-smartphone-owners-by-age-group
Definition of Dark Data https://www.gartner.com/en/information-technology/glossary/dark-data
Freedom Guardian Device
Kanega Watch
Essence https://www.essencesmartcare.com/
Stanley Health Care https://www.stanleyhealthcare.com/
Wellaware https://www.fierceelectronics.com/components/wellaware-systems-launches-wellness-monitoring-solution
Walabot/Vayyar https://walabot.com/walabot-home
eCare21 https://ecare21.com/
CloudDX https://clouddx.com/#/
Honeywell (vital sign monitoring) https://lifecaresolutions.resideo.com/
mobileHelp https://www.mobilehelp.com/
Sensara https://www.sensara.care/
Amazon Alexa Health
Indie Health (vital sign monitoring) https://indie-health.com/
Healthsense / Great Call https://healthcare.greatcall.com/
Forma Safe Home - uses multiple data inputs (fall detection, stove lock/safety, video door bell, additional feature sets coming)
Medminder https://www.medminder.com/
Hero Health
Med-E-Lert https://www.medelert.com/
Pillsy https://www.pillsy.com/
Adhere Tech https://www.adheretech.com/
Pill Pack https://www.pillpack.com/
Article: The Most Common Reasons Seniors Visit the ER
Definition of home, Miriam Webster: https://www.merriam-webster.com/dictionary/home
Definition of Telehealth (thefreedictionary.com)
Value Based Care
Accountable Care Organizations (ACOs) https://www.aha.org/accountable-care-organizations-acos
Bundled Payments Care Initiative https://innovation.cms.gov/innovation-models/bundled-payments
Triple Aim https://healthcareitskills.com/triple-aim/
CMS: Home Health Resource Groups (HHRG)
CDC Definition of Population Health https://www.cdc.gov/pophealthtraining/whatis.html
Soft and Hard ROI https://www.classy.org/blog/soft-roi-hard-roi-why-assess-both/
The Evangelical Good Samaritan Society, Living Well at Home: The Atlantic and The Globe and Mail
“Incident-to” Billing https://www.physicianspractice.com/view/basics-incident-billing