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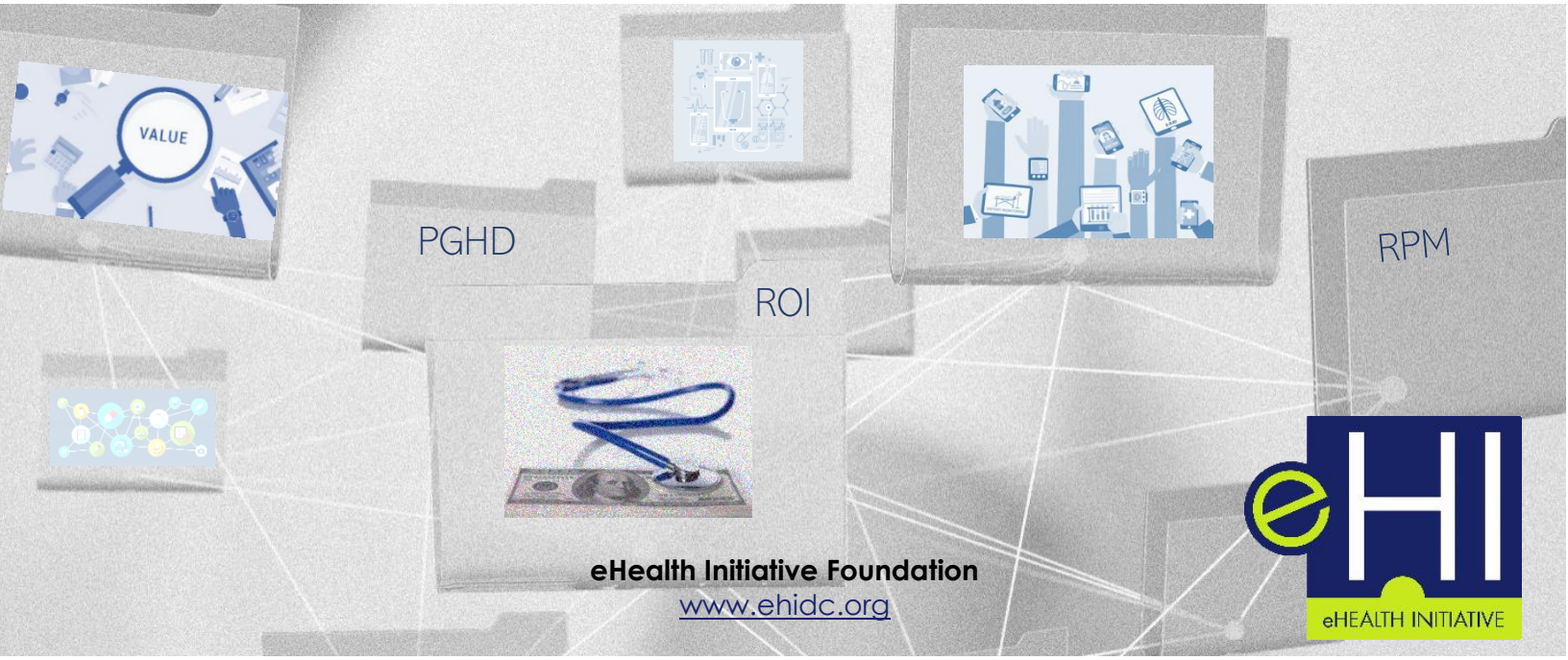
The Return on Investment of Patient-Generated Health Data & Remote Patient Monitoring



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INTRODUCTION

Healthcare stakeholders are seeking new strategies to improve access to care, address disease management, and spur treatment innovation as a growing number of patients require higher quality, more complex care at lower costs. At a time when the number of people with chronic conditions continues to rise at a staggering rate, providers must manage more patients with the same number of resources, or less, and deploy technology that improves efficiency and effectiveness.

The healthcare industry is deeply vested in identifying new ways to improve the overall health and satisfaction of patients. As a result, provider organizations are adopting remote patient monitoring (RPM) services – inclusive of data from home health devices – as a new standard of care.

Remote Patient Monitoring (RPM) and Patient-Generated Health Data (PGHD)

In contrast to traditional care that requires costly in-person visits and patients bringing their data into the clinic via spreadsheets, notebooks, or disparate apps, remote monitoring programs passively and continuously collect and transmit patient-generated health data (PGHD) from in-home medical devices to providers and care teams. PGHD, when compared to health data collected exclusively during in-person doctor's visits, more accurately and holistically reflects lifestyle choices, health history, symptoms, medication, treatment information, and biometric data such as heart rate, blood glucose, blood pressure, temperature, oxygen levels, and weight.

The use of PGHD presents an opportunity for providers to gain deeper insights in real-time about their patients, offering the ability for quicker response to health issues, and ultimately, better outcomes and lower costs. However, this data is oftentimes unreachable within the clinical workflow. For PGHD to reach its true potential, actionable information gleaned from the data must be presented via an interface that allows both patients and providers to easily share, view, and act upon the insights. There are tools currently available that identify data trends, elevate critical data points, and help aggregate, summarize, and visualize PGHD in meaningful ways. Investing resources in these tools makes PGHD useful at the point of care, while encouraging health professionals to embrace the available data and utilize these tools to further benefit their patients.

In addition to improving health outcomes, remote monitoring offers health systems financial and operational ROI in various capacities, enabling:

- Providers to improve operational efficiency by reducing manual or redundant tasks
- Providers and patients to build a trusting and loyal relationship based on accurate data
- Patients to engage in the planning, goal-setting, and self-management of their care
- The improvement of quality metrics and patient satisfaction scores
- A reduction in costs associated with readmission penalties, emergency department visits, and operations

MARKET DRIVERS CONTRIBUTING TO GROWTH OF RPM

As patient desires and needs change, new technology is developed, and industry trends evolve, the need for and use of remote monitoring is growing. A large motivator in this is the significant increase in the number of people with chronic conditions. More people are managing chronic diseases due to a growing aging population, the surge in obesity related to poor diets and sedentary lifestyles, and the negative impacts of alcohol and tobacco use. An estimated six in 10 American adults live with at least one chronic condition and 42% have more than one.[1] Chronic conditions account for most deaths in the U.S. and are responsible for more than 85% of the

nation's annual healthcare expenditures,[2] creating an urgent need for health systems to better manage these populations. Patients with chronic conditions face worse health outcomes, have higher hospital readmission rates, and generally incur higher healthcare expenses. This means that such patients will require more complex, comprehensive, and regular care in order to maintain or improve their health – at a cost to both patients and the healthcare system.

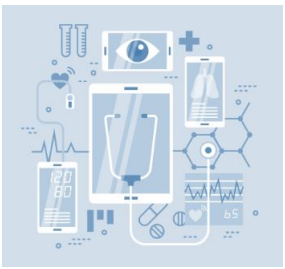
With this substantial increase in the number of chronic conditions, the aging population, and as a result, healthcare costs, the industry is faced with a conundrum: it must now manage more patients, who require more care, all with fewer resources. Provider shortages, low margins, and the move toward population health programs are challenging organizations to find innovative ways to leverage RPM technology. According to Spyglass Consulting Group, nearly two-thirds of hospitals and healthcare systems have adopted remote monitoring and analytics into their care processes, including programs at Partners HealthCare and Kaiser Permanente.[3] These programs are demonstrating the success of early, full-scale remote monitoring programs and are laying the groundwork for new standards of care that can change the way providers interact with and care for their patients.

In 2016, seven million people were using remote monitoring and connected medical devices as part of their care routines. In just five years, that number is expected to increase steeply, extending to 50.2 million RPM participants.[4] Berg Insight's most recent report on mHealth and home monitoring estimates that RPM revenues will grow from $7.5 billion in 2016 to more than $32.4 billion by 2021.

As all indicators suggest that remote monitoring will develop into a new standard of care in the near future, providers are likely considering the most effective way to deploy such programs to improve the patient experience and outcomes while cutting costs. Supporting this shift, the growing role of consumers in healthcare, in conjunction with more readily available and affordable patient monitoring devices, has increased digital access to care and enabled health systems to more easily collect and manage PGHD. As wireless networks race to roll out fifth-generation (5G) broadband service, which promises faster speeds and more bandwidth for data usage, the connectivity necessary to support remote monitoring programs will continue to improve. By the end of the decade, 5G is expected to support 50 billion devices and 212 billion sensors worldwide.[5]

Innovative technologies, the consumerization of healthcare, and a rising need for more complex care services are all driving a major shift in the industry, one in which technology can enable providers to deliver quality care to a higher volume of patients, while cutting costs. Remote monitoring is a solution to meet these needs.

CLINICAL ROI



Regularly collected, remotely-generated PGHD is now enabling providers to identify trends and outliers and creates opportunities for more effective data analysis and monitoring. This, in turn, offers the potential for earlier, data-driven diagnosis, interventions, and treatments. Tracking PGHD helps clinicians to offer more informed condition management and to minimize disease complications by identifying and treating high-risk patients sooner. Insights gathered from this data can be leveraged in post-acute and chronic care settings to improve outcomes, patient engagement, and

care plan adherence in a way not possible with data strictly gathered during in-person visits.

Leveraging PGHD in Post-Acute & Chronic Care

For many patients, healthcare is episodic; they are treated for the issues that they discuss in in-person doctor's visits and their providers base treatments around the data collected at that time. Meaning, once they leave the hospital after receiving treatment for an acute health event, they are largely disconnected from their provider and the continuing care they may need. In contrast, RPM improves outcomes in post-acute care by helping patients and doctors manage short-term care after in-person treatment with remotely-collected data. Programs educate patients on their condition, recovery needs, and pain management while providing regular reminders, early interventions, post-discharge information, or medication adherence tracking. With the information garnered from PGHD, providers are able to evaluate the effectiveness of treatments and customize care plans between patient visits.

If a patient recently discharged from cardiac surgery gains two pounds overnight or five pounds over a week, he or she should quickly engage with a physician. A connected scale can alert when this trend occurs, or an activity tracker that signals less than 500 steps taken in a day, enables proactive communication between the clinician and patient. Routine monitoring allows for intervention and education as early and as often as needed to keep the patient engaged, healthy, and adherent to their treatment program. These interventions do not need to be executed solely by a physician; touchpoints and check-ins can be completed by a nurse or care manager, automated by technology, or a combination of both. Enabling a care team with technology to more effectively intervene and manage treatments extends beyond the applications of post-discharge and post-acute care.

By continuously tracking the routine and biometric measurements of people with chronic conditions, providers are empowered to intervene earlier in disease progression, which helps prevent complications that can result in unnecessary in-person or hospital visits.

CASE STUDY

PGHD Lowers HbA1c Levels and Reduces Subsequent Healthcare Costs

A study examined the effects of telehealth interventions on controlling diabetes and the potential cost-savings to the health system. Both the intervention and control groups were asked to continue their usual health routines. Participants in the intervention group received a tablet computer equipped with software for vital sign monitoring, videoconferencing, health questionnaires, educational videos, and information sheets. Participants also received a blood pressure monitor and glucometer that were Bluetooth-compatible and were asked to monitor blood glucose and blood pressure at least three times weekly. PGHD was sent to a central computer running monitoring software and was checked by care coordinators daily, who held monthly consultations to discuss monitoring results, progress toward goals, health education, and the development of self-management strategies. When compared with baseline, the HbA1c of patients in the intervention group decreased significantly at the six-month endpoint. The control group's HbA1c remained unchanged. Total healthcare costs in the intervention group were significantly lower compared with the cost of typical care.[6]

CASE STUDY

RPM Reduces Mortality

A 2015 study in the Journal of the American College of Cardiology showed an association between RPM and a reduction in mortality. Researchers examined the relationship between passive, wireless home monitoring and survival of patients with cardiac electronic implantable devices (CEIDs). They found that time in remote monitoring was highly correlated with survival. Even those spending some time in a remote monitoring program had significantly higher survival rates than patients who did not use RPM at all.[7]

Patient Engagement Improves with Use of PGHD

Remote monitoring programs empower patients to be more engaged and involved with their treatment plan, which often leads to better treatment adherence, and, as a result, outcomes. Through connected health devices that allow patients to track their own health and share that information, patients are enabled by having greater ownership over their data, accountability to their outcomes, and a stronger connection to their care provider. In these patient-centric programs, participants can better communicate their health status to providers through the passive collection and integration of biometric and lifestyle data. In a 2016 survey from WebMD and Medscape Education, over 60% of respondents reported feeling more engaged when PGHD was a part of clinical encounters.[8] The majority of respondents stated that they were more likely to measure, collect, and supply PGHD to their provider if they believed it would be used in their care or to develop a treatment plan.[9]

In an exclusive interview, Martha Fernandez, OB/GYN with The Group for Women, shared, "Incorporating this type of data would be great. I ask patients all the time how much they are exercising, what are their eating habits, et cetera and, sometimes they are honest, and sometimes they are not. By utilizing this data, it helps to make the patient more accountable. This way, when I see them for their next visit, I can see how well they've been adhering to their plans."[10] Reporting PGHD information to doctors improves accountability, fosters trust and loyalty, and opens an avenue for increased communication and shared decision-making. When a patient is more engaged in the design of their treatment plan, they are more likely to have the skills, ability, and willingness to manage their health and act on providers' recommendations. Ultimately, this results in improved care plan adherence and improved health outcomes, which is beneficial for all stakeholders involved.

FINANCIAL ROI

Financial benefits derived from RPM and PGHD take the form of cost savings from reduced hospital readmissions, in-person visits, nurse engagements, and emergency department visits. Hospitals can also avoid Affordable Care Act penalties for readmissions within 30 days of discharge by implementing programs that help clinicians intervene before a negative health event can occur.[11] Additional financial benefits include lower operational costs, such as a reduced number of bed days when admitted to the hospital and reduced overall resource utilization. Improving health outcomes with early intervention, chronic care management, and

increased patient engagement is a worthwhile endeavor financially when remote monitoring is scaled beyond disparate pilots and used to manage health outcomes more proactively. At a time when care continues to become more expensive and hospitals are routinely expected to cut costs while improving care, these financial savings can be critical.

CASE STUDY

PGHD Reduces Readmissions

Brockton Hospital in Massachusetts began using a remote care program to follow a monthly census of 25 to 30 Congestive Heart Failure (CHF) patients. These patients were problematic because of multiple 30-day readmissions and excessive use of emergency department resources.

With the national average for heart failure patient readmissions within 30 days of discharge at about 25%, it's an enormous cost to the health system. Brockton Hospital hoped that by reducing its 30-day readmission rates to the 15 to 20% range, the organization could avoid penalties and implement a reasonable cost structure for shared risk contracts with insurers. The reduction meant that no more than eight patients could be readmitted.

The outcomes vastly exceeded the goals. Readmissions were reduced to zero, with no patients enrolled in the study readmitted to the hospital. Zero readmissions represented a significant decrease in total medical expenses across the board, considering that the average cost of one readmission within 30 days of an initial hospitalization is $27,000 per patient. Brockton achieved a cost avoidance savings of $216,000.[12]

CASE STUDY

PGHD Reduces Hospitalizations, ER Visits & Average Number of Bed Days

Diabetes is a chronic condition that contributes to high rates of morbidity, mortality, and costs for the Veterans Health Administration (VHA). Researchers evaluated a VHA care coordination/home-telehealth (CC/HT) program for its effectiveness in reducing healthcare services that contribute to these costs. Enrollees were veterans with diabetes who had two or more hospitalizations or emergency room visits. A care coordinator used a telemonitor with two-way audio-video connectivity, a handheld in-home messaging device with disease management dialogues, and a videophone with two-way audio-video connectivity to monitor the symptoms of patients' diabetes. Multivariate analyses indicated statistically significant reductions after patients were enrolled in the study for one year. The proportion of patients who were hospitalized reduced by 50%, those going to the emergency room reduced by 11%, and the average number of bed days were reduced by an average of three days. More than 95% of enrollees reported that the technology was easy to use and made them feel secure. [13]

New Reimbursement Models Supporting PGHD & RPM

Many payers are exploring new reimbursement models to support and incentivize RPM programs. The Centers for Medicare & Medicaid Services (CMS) instituted changes to their reimbursement policies that encourage the use of digital health tools and are continuing to explore opportunities to encourage the use of digital health to make care more efficient. One such change is CMS' recent unbundling of CPT code 99091, which allows physicians to be separately reimbursed for RPM services under the 2018 Physician Fee Schedule Final Rule. As a result, the code no longer requires an in-person visit to reimburse physicians for their time spent on remote care. More specifically, the Medicare program pays for the collection and interpretation of physiologic data that

is digitally stored and/or transmitted by the patient and/or caregiver to the qualified health professional. The current code requires a minimum time of 20-minutes of review.[14]

In addition, CMS created two payment structures to support remote monitoring in the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA). The first track, known as the Quality Payment Program, consolidates current fee-for-service Medicare programs, such as Promoting Interoperability (formerly Meaningful Use), into a single program: Merit-based Incentive Payment System (MIPS).[15] The second track, for clinicians exempt from the first, is Advanced Alternative Payment Models. An alternative payment model (APM) rewards providers for delivering high-quality and cost-efficient care, while Advanced APMs are a subset of APMs that let practices earn more rewards in exchange for taking on a greater amount of risk related to patient outcomes.[16]

Advances to MIPS and APMs continue today to better facilitate the adoption of remote monitoring via incentives for its use. In 2018, CMS upgraded the Clinical Practice Improvement Activity (CPIA) category of the Merit-Based Incentive Payment System (MIPS) to offer credit to clinicians who use digital tools to collect PGHD in near real-time.[17] The new Improvement Activity, which is called "Engage patients and families to guide improvement in the system of care," rewards clinicians for using clinically-endorsed RPM technology to engage patients.[18] MIPS-eligible providers can also qualify for a 10% bonus score in the Advancing Care Information (ACI) performance category when PGHD is incorporated into Certified Electronic Health Record Technology (CEHRT) during the performance period.[19]

Advanced APMs are driving the shift to value-based care by creating more opportunities for provider organizations to benefit financially when using PGHD, especially as it relates to remote monitoring initiatives. Existing APMs present opportunities for providers to deploy connected technologies as an essential part of the strategy for controlling added risks. [20] For example, through the use of panel support tools, engagement tools, prevention management programs, and other similar tools, providers are better enabled to proactively manage chronic conditions and advance preventive care. APMs are intended to provide great cost incentives for technology-enabled activities that require greater risk, and if scaled successfully, provide the needed population support as well.

As the federal government offers new ways to continue to enable flexible and timely care for Medicare beneficiaries, telehealth will play a major role, especially for those living in rural areas or managing multiple chronic conditions. In 2018, the United States Senate passed the Creating High-Quality Results and Outcomes Necessary to Improve Chronic (CHRONIC) Care Act, a bill which greatly expands possible funding for Medicare Advantage plans, Accountable Care Organizations (ACOs), and telehealth services, such as RPM for dialysis and stroke patients.[21] Medicare providers may soon have more opportunities for RPM reimbursement when engaging in care services expanded by the CHRONIC Care Act.

> "As the industry moves to Alternative Payment Models, Accountable Care Organizations, etc., everybody is pretty clear in that you won't succeed [financially] unless you have an engaged patient at the table with you, keeping you informed. That's the only way you get ahead of the curve on the preventative side."
>
> *-Mark Savage, Director of Health Policy, Center for Digital Health Innovation, University of California, San Francisco*
> [Personal Interview]

OPERATIONAL ROI

Integrating PGHD into programs of care allows providers to improve health outcomes, lower costs, and take advantage of reimbursement opportunities. These programs also create space for operational efficiencies that:

- Relieve stress on overburdened clinicians
- Improve patient-to-physician ratios
- Ensure doctors spend more time with high-risk patients
- Derive valuable insights for population health
- Reduce potential liability for providers

Burnout continues to be a prevalent issue for physicians. Ernst and Young's 2018 survey on digital health revealed that almost 65% of physicians believe that "technology that captures consumer-generated data will reduce the burden on doctors and nurses specifically."[22] Remote monitoring allows patients with non-critical conditions to remain at home and manage their own care, reducing unnecessary in-person visits. It also affords providers and care teams more opportunities to 'work at the top of their license' and spend more time with high-risk patients. Remote monitoring technologies enhanced with Artificial Intelligence (AI) tools, such as those from advances in analytics and machine learning, can also automate non-essential tasks within providers' workflows by offloading manual tasks, such as data entry, with automated processes.

Providers can analyze aggregated PGHD collected through remote monitoring to derive actionable and valuable insights on patient populations. In addition, analytics algorithms take real-time data into account, rather than static information collected during episodic visits, which enables providers to better understand why a patient is experiencing a specific outcome. Collecting and monitoring PGHD between visits also creates more opportunities to detect potential health issues that could otherwise go undetected. Remote monitoring technologies generate documentation of events, signs, symptoms, and interventions, potentially reducing provider liability.

Moving Forward

The explosive availability and popularity of consumer health devices, as well as the increased willingness and ability of consumers to capture and share personal information, will significantly contribute to the continual growth of PGHD in clinical settings. The growing consumerization of healthcare is increasing the demand for the availability of programs which leverage the information many patients are already generating.

In addition, technologies that capture this data are rapidly advancing, creating new endpoints that can be made available to healthcare providers. Devices that measure information such as air quality, sun exposure, stress, and continuous biometrics provide new data sets healthcare can use in the mitigation of chronic conditions and post-acute complications. As the sophistication of devices increase, they afford new use cases to healthcare providers. Smart implantables, wearables, smart home assistants, Virtual Reality (VR) / Automated Reality (AR) devices, and digestibles offer the future of remote monitoring additional data, insight, and engagement opportunities. Additionally, using the patient's own mobile device is becoming a necessity for RPM programs, as almost 23 million people are expected to use Bring Your Own Device (BYOD) connectivity for remote monitoring by 2021.[23]

Health systems' use of PGHD and remote monitoring is a competitive advantage and differentiator, especially as the consumerization of healthcare continues. However, market trends and resulting growth in RPM revenue are a sign that more health systems are, and will be, looking to establish themselves as leaders in the market.

What may be a competitive differentiator today is positioned to be table stakes over the coming decade. It was a decade ago that less than half of providers had adopted an EHR; today, over 90% of providers have implemented and utilize an EHR in everyday care. Taking advantage of new reimbursement models and emerging technologies will continue to push innovation forward, offering providers new opportunities to improve outcomes, efficiencies, and costs in the management of chronic conditions.

Moving forward, the industry can promote the use of RPM and PGHD through:

- **Legislation:** Increase legislation, regulatory guidance, and sustainable reimbursements to encourage providers' utilization of RPM and PGHD in the care of patients

- **Research:** Conduct and publish research documenting the effectiveness of using RPM and PGHD to treat people with chronic conditions or those recently discharged from a clinical event

- **Education:** Educate providers on how to seamlessly incorporate PGHD collected through RPM into their workflow. Help patients understand how participating in RPM programs will improve communication with care teams and help them better manage their conditions

- **Advocacy:** Patients and providers should advocate for RPM devices and systems that make it affordable, reliable, accurate, and easy for patients and providers to collect, transmit, and use PGHD in the treatment of chronic conditions

With these actions and more, the future will continue to see rapid advancements in the strategies to clinically operationalize RPM and PGHD, offering providers new opportunities to deliver the level of comprehensive care that patients are seeking at costs that are sustainable for all stakeholders involved.

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