Remote Patient Monitoring: How Device Manufacturers Can Increase Value & Improve Margins
Let our experts lead the way

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INTRODUCTION

This document describes the changing market conditions faced by manufacturers and distributors of remote patient monitoring devices. We will review the trends and the opportunities that technology and services offer in today’s market.

**Trend:** Technology is rapidly replacing traditional methods for patient care. Administrators and insurance providers want to serve more patients with fewer resources. Wirelessly connected devices for monitoring persistent ailments are replacing frequent office visits.

**Trend:** It is now well understood that pacemakers and other devices are facing declining revenues because they have become commodity products. More, Medicare and Medicaid reimbursements have been cut for these devices. What are healthcare device manufacturers doing to combat this trend? We will discuss how software and new features, like patient portals and smartphone apps, are improving value and profitability.

**Trend:** Devices that use patient smartphones to either relay data from a monitoring service portal or care provider are gaining traction, but are dependent on smartphone penetration rates, particularly among older populations. That said, they lessen the cost burden for device manufacturers and healthcare organizations.

**Trend:** More device manufacturers are attempting to implement smartphone SIM cards for monitoring patient vital stats. For example, such a solution could eliminate bulky sensors or wearable patches for blood oxygen measurements. This technology holds great promise, but most manufacturers still do not enable users to easily change SIM cards (see new Google phone currently in testing).

**Trend:** Applications for monitoring patient health REQUIRE wireless networks that offer both reliability (even in remote locations and over great distances) and advanced security to protect patient’s health and private information. Until recently, this combination has been elusive from a single solution and provider.

In this white paper, we will expand on these discussions for the industry as a whole and consider options for improving the cost and performance of common remote patient monitoring devices. For each device, we will provide the size of the market and the clinical conditions for the application. Then we look at how healthcare device manufacturers can take advantage of technology to improve margins, patient engagement, and revenue. Finally, we review options for wireless connectivity, including the pros and cons of each technology.

GROWING PRESSURE ON HEALTHCARE MARGINS

In an article from the July 2014 edition of *Medical Economics* titled “Remote patient monitoring: How mobile devices will curb chronic conditions,” John Morrissey wrote: “It’s only a matter of time before the exam-room-centered focus of patient care gives way to management of assigned populations to maintain or improve health.”
Morrissey concludes that best way to manage these populations of patients and to care for more patients at the same time, is to develop and deploy new technology. “This emerging business and clinical need has stimulated the growth of a class of technology that connects patients’ current medical status to physicians and other caregivers in hospitals and primary care practices.”

Patients are in favor of this approach as they want hands-on assistance from their care providers. 33% of patients want their doctors to have access to patient monitoring systems and 40% of older patients want alerts sent to their doctor for health emergencies. (Medical Economics)

David Scher, Cardiologist and mobile tech consultant, told the magazine “Remote monitoring is extremely important and probably in the forefront of mobile technologies now.”

REMOTE MONITORING DEVICES

Remote monitoring devices represent the ripest opportunity for technology to replace human interactions. This section will review the most in-demand remote patient monitoring (RPM) devices and how device manufacturers are using new features, apps and portals to add value for doctors and patients.

CARDIAC RHYTHM MANAGEMENT

Cardiac Rhythm Management (CRM), as the name suggests, monitors and regulates heartbeat. It regulates a heartbeat by sending an electrical charge into the heart. These devices can also take emergency action by turning into a defibrillator.

The CRM monitors fall into these categories:

- **Pacemakers** — treats bradycardia, which is a slow or irregular heartbeat.
- **Implantable Cardioverter-Defibrillators (ICD)** — provides defibrillation in the case of a heart attack.
- **Cardiac Resynchronization Therapy (DRT)** — for patients who have experienced heart failure.

Remote management of such devices reduces the need for patient office visits down to the typical two to four times per year for routine device maintenance. The devices monitor their health and signal when there is an electrical or other problem like an imminent lead failure. Wireless solutions have proven more popular with patients because they are no longer tethered to their home-based relay station.

Device manufacturers have begun to add new features and services to their monitoring service and their devices. For example, by adding a patient portal that lets the patient review data and summary information, the number of calls to doctors and medical hotlines can be reduced significantly. Smartphones also provide a new avenue for the device manufacturer to engage with the patient by pushing health summaries to the patient’s cell phone.

“This emerging business and clinical need has stimulated the growth of a class of technology that connects patients’ current medical status to physicians and other caregivers in hospitals and primary care practices.”

— John Morrissey, Medical Economics, July 2014
**CARDIAC RHYTHM MANAGEMENT MARKET**
Berg Insight says that 1.3 million pacemakers were implanted worldwide in 2013. Of those, 73% were new. The same year 450,000 ICDs were implanted. But the growing number of devices is not improving revenue in the United States because of falling prices (emerging markets represent a better financial opportunity currently).

**BLOOD PRESSURE MONITORING**
There are two types of blood pressure monitors:

- **Stethoscope** — this is the familiar device that inflates and deflates to take systolic and diastolic readings. The need to strap that device onto the arm and sit quietly is awkward for the patient.

- **Oscillometric** — most remote blood pressure monitors are of this type. They work by calculating the blood flow. But they require regular calibration, meaning frequent trips back to the doctor’s office.

These established devices also have mature wireless technology and the data they provide is therefore reliable for adjusting the dosage of medication. As these devices continue their evolution, it is expected that they will provide more value by including long-term data (which isn’t possible with irregular readings taken during office visits). More, these devices are far more reliable than patients for the regular capture of the data.

**THE BLOOD PRESSURE MONITORING MARKET**
Remote blood pressure monitoring is most heavily deployed in the United States and Japan. In 2011, revenue was $557 worldwide for these devices alone. This is a far smaller market than glucose monitoring and CRM, but sizeable enough to draw manufacturers. According to Berg Insight, this market will enjoy steady growth as the popularity of wireless blood pressure monitoring grows among people who adopt wellness programs and fitness training.

**BLOOD OXYGEN MONITORING**
Blood oxygen monitoring is for patients with:

- Congestive heart failure (CHF)
- Chronic obstructive pulmonary disease (COPD)
- Asthma

The monitor is attached to a finger where it shines a light through a translucent part of the body. The monitor then measures the absorption of wavelengths of red and ultraviolet light, which indicate the presence of hemoglobins that carry oxygen.
BLOOD OXYGEN MONITORING MARKET
The global market for remote blood oxygen monitoring devices was $1.18 billion last year, the largest segment of which is critical care. The home market is smaller but growing, as patients engaged in sports and wellness programs want to monitor more vital signs.

GLUCOSE MONITORING
Diabetes is obviously a condition that requires lifelong monitoring for most patients. There are two types of devices:

- Blood glucose meters (BGM)
- Continuous glucose monitoring (CGM) with an insulin pump

These devices are not yet completely unattended. They either require that the patient put a drop of blood in the meter for each test or (for the continuous monitors with an insertable sensor) replace the sensor weekly at a cost of $70. The CGM transmitter and receiver cost $1,200 and $600 respectively.

When the manufacturer adds software to these devices and wirelessly connects them to the clinic, these integrated systems are called Sensor Augmented Pump Therapy or Artificial Pancreas Device Systems. These systems are changing the lives of diabetics, requiring many fewer office visits and interactions with healthcare professionals.

GLUCOSE MONITORING MARKET
Berg Insight says the market for all health monitoring devices together was $22.5 billion in 2013 with glucose monitoring accounting for the bulk of that at 40%. Global glucose monitoring revenue is in decline due to commoditization and Medicare, and Medicaid have cut reimbursement rates. Most of the revenues come from test strips sold by the monitor manufacturers.

DEVICE COMMUNICATION TECHNIQUES AND TECHNOLOGY
How do these remote devices actually transfer data and what must you know to make an informed decision? There are different communication options depending on the need for interactivity with healthcare professionals, frequency and volume of data to be reported, and the behavior of the patient.

- Bluetooth — short-range radio signal that can transmit data to a smartphone. Virtually every smartphone is equipped with Bluetooth transmitters. Smartphones, which operate from cellular connectivity have extensive networks. However, the transmission range for Bluetooth applications is no more than 98 feet.

- Wireless — wireless router with internet connects the device with monitoring systems and healthcare professionals. For this technology to work, the patient must have a working, high-speed Internet connection and router. Wireless transmissions are vulnerable to outages of the router (caused by network signal or power interruptions).

“Remote monitoring is extremely important and probably in the forefront of mobile technologies now.”

— David Scher, cardiologist and mobile tech consultant
• **Landline** — in this case the base station in the patient’s house use POTS (plain old telephone system) to transmit data. These devices must typically be installed in the home at an additional expense to the healthcare organization. More, fewer and fewer homes have an installed landline. In fact, the use of landlines is expected to drop 50% in the United States in the next few years.

• **SMS Text Message** — text messages between healthcare professionals and patient smartphones. These messages can be sent and received via cellular phones and/or connected devices. This method is inexpensive, but only small amounts of data can be transmitted at a time.

• **Cellular** — cellular networks connected to cellular-enabled devices offers superior mobility and ease of use. While prices for cellular equipment have been dropping rapidly in recent years, it remains a more expensive option than other delivery mediums.

• **USB Cable** — monitoring device enabled with USB cable must be connected to a personal computer to transmit information over the internet. This option is the most common method in current use, but the level of complexity is high and often prohibitive for older patients.

SOFTWARE AND APPLICATIONS IMPROVE PATIENT OUTCOMES & MARGINS

• Adding new software features to the device

• Providing a cell phone app with which to interact with the device or patient portal

• Patient portal

NEW SOFTWARE FEATURES FOR CONNECTED DEVICES
For remote patient monitoring solutions that connect devices to personal computers, the opportunities for improving software features are extensive. Among those most effective for improving margins and patient outcomes are:

• **Assessments**: programs with automated and persistent assessment tools give healthcare professionals regular insight into patients’ health and state of mind beyond the data. This tool has proven particularly valuable in identifying new treatment options and provides missed observations caused by fewer live, in-office interactions.

• **Tracking and Analytics**: patients in need of persistent care of diabetes, heart disease, and blood pressure are more likely to play an active role in their health plan with access to long-term data that logs their progress. It is crucial that the user interface is very simple for this feature.
Interactive Tools: software that enables real-time access to healthcare professionals via video, VOIP or chat has proven popular among healthcare administrators and patients alike. Time-to-resolution and office visits are sharply reduced.

SMARTPHONE APPS

Smartphones and their apps provide a platform to increase the interaction with patients and provide many advantages:

- **Simple Connectivity:** smartphones equipped with Bluetooth can automatically connect with remote patient monitoring devices. Non-tech savvy patients need only open the apps while in a range of 30 feet (for most types of Bluetooth applications) of their remote monitoring device to trigger the exchange of information.

- **Cost Effective for Healthcare Provider and Patient:** smartphone apps receive and send information to monitoring services over cellular and wireless connections automatically and as part of patients’ existing wireless plan. Apps for the remote patient monitoring devices are also distributed through ubiquitous marketplaces like Google Play and iTunes.

- **Broad Cellular Coverage:** Cellular networks now cover more than 90% of the worldwide population. The only limitation for remote patient monitoring is the same faced by the smartphones themselves – when the patient is in very remote locations, connectivity cannot be guaranteed.

- **Smartphone Sensors:** more and more smartphones come equipped now with all kinds of sensors. For example, cell phones can measure humidity, gravity, acceleration and pitch. And of now we are beginning to see sensors for heartbeat, blood pressure and body temperature. Google’s new modular phone (currently in test markets), lets users swap out SIMs for different purposes. This should make it possible to build monitors into the phone that could measure more vital signs using light, sound, temperature and other techniques.

PATIENT PORTALS OPTIMIZE OPERATIONS & REDUCE LIVE PATIENT INTERACTIONS

Centralized, web-based patient portals have been available for nearly a decade now, however due to improvements in security/encryption and improvements in user interfaces, they are now capable of much more detailed and interactive patient support.

- **Single Point of Access:** patients that can access their medical files, billing information, prescription refills, appointment scheduling, test results, live interactive tools like video, VOIP and chat, and resource materials in one location will record fewer contacts with healthcare professionals.

- **Security:** security for technology-based healthcare solutions has improved dramatically in recent years. In particular, improvements with mobile security, network access control solutions, virus software, and additions like cryptographically signed health certificates now provide effective compliance with HIPAA.

CONCLUSION

The health care monitoring industry is undergoing rapid change. The pressure to serve more patients with fewer resources presents opportunities for software application providers and healthcare device manufacturers to take advantage of technology to improve margins, patient engagement, and revenue. Wirelessly connected devices for monitoring persistent ailments such as cardiac rhythm management, glucose and blood pressure monitoring are replacing the need for frequent and costly office visits.

In the healthcare industry, there will continue to be a great need for applications for monitoring patient health over wireless networks that offer both reliability (even in remote locations and over great distances) and advanced security to protect patient’s health and private information. Until recently, this combination has been elusive from a single solution and provider. Today, it is not only a possibility but a reality.
ABOUT AERIS

Aeris Communications, Inc. (Aeris) is a pioneer and leader in the machine-to-machine (M2M) market, an integral part of the Internet of Things, (IoT). We are both a technology provider and a cellular network operator delivering comprehensive M2M/IoT services to leading brands around the world. In other words, we put the “Internet” in the Internet of Things.

The IoT and M2M industry brings together people, process, data and machines to make networked connections more relevant and valuable than ever before. Aeris is at the forefront of this industry, which is expected to grow to $19 trillion over the next 10 years, driven by the 50+ billion devices that will be connected. We connect M2M / IoT businesses around the world with nearly four million devices, which record more than eight billion events per day and ranks in the top ten M2M operators globally.

Among our customers are the most demanding users of M2M / IoT global services today, including Hyundai, Acura, Rand McNally, Leica, and Sprint. Our global headquarters is in Silicon Valley (Santa Clara, California). Our European headquarters is near London, UK. For more information about Aeris, go to http://www.aeris.com or write to us at info@aeris.net.

To learn more, contact us at info@aeris.net or 1-888-GO-AERIS in North America or +44 118 925 3202 in Europe.

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