New Frontiers in Home Telemonitoring

It's Already Here. Where Are You?

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KEYWORDS

Telemedicine, home-care, remote monitoring, quality improvement, cost reduction, nurse retention, physician referrals, IT adoption, telemonitoring.

ABSTRACT

Home-monitoring technology is a somewhat rare example of highly effective healthcare information technology that patients "get." Clinical and IT professionals throughout the United States and Europe demonstrate that patients quickly understand and grow to value telemonitoring as a tool to take charge of their own health. Healthcare providers involved with home telemonitoring programs report significant direct and indirect benefits for all stakeholders, as well as a number of lessons learned when working with patients, clinical and medical staff, healthcare administrators and board members and third-party payors. Despite decades of successes, health telemonitoring technologies are still relatively untapped. However, new technologies are reaching the marketplace. Demographic and regulatory shifts are pushing stakeholders toward a new frontier in telemonitoring. Based on their own experiences and an extensive literature review, the authors conclude: the new frontier of home telemedicine is here. Where are you?

Coming of age prior to World War II, many of the "greatest generation" balked at using the first ATMs at the local bank. Today, many baby boomers (those born between 1946 and 1964), still do not own an ipod. Gen X- and Y-ers, who have just entered the workforce, do not seem overly excited about the benefits of the electronic medical record, if indeed they know what it is. Yet patients from each of these generations have come to embrace home telemonitoring.

Variously called telemedicine, telehealth, tele-home care, telecare, etc., home telemonitoring is a supplement to traditional home-care, whereby a patient or caregiver provides daily updated medical data from home using a modem, cable or satellite-based equipment. Nurses at a central location review customized reports of vital signs such as blood pressure, weight and body temperature, and respond as necessary.

Home-care professionals, physicians and IT administrators all report an impressive body of research, practical experiences and anecdotal success stories that support a number of superior quality and cost benefits possible with home telemonitoring compared to traditional home-care. These telemonitoring advocates also share frustration that the potential cost and quality benefits are not being realized. As the administrator of a 10-year-old home telemedicine program said, "This is no longer an experiment. It's a recognized cost-cutter that has saved the state of Texas over $1 billion in healthcare costs."[1]

This article discusses patient care and quality results compared to traditional home healthcare; the varied challenges and successes of adoption of these technologies among various stakeholders; and costs and return-on-investment for patients, providers and

third-party payors. Based on case studies and an extensive literature review, it is clear that the new frontier of home telemedicine is here.

HIGH QUALITY, LOW COST

At BayCare Home Health in Dunedin, Fla., home telemonitors lead about 40 patients each day through customized activities, such as standing on a scale or putting on a blood pressure cuff all in their own living rooms. The monitor asks five to 10 key questions including, "Do you need to talk to a doctor or nurse today?" Nurses review all records daily, but any number of "out of parameter" readings, as well any negative answers will automatically alert a nurse to respond immediately. Most home telemonitoring systems include a small home device linked to a central location. Some home monitors also incorporate video so clinicians can view a patient and make evaluations.

Compelling results lead BayCare and its medical staff to rely on these devices for patients with a number of medical conditions. Consistent with results at other hospitals and with academic research, they see daily proof that home telemedicine leads to a higher quality of care as well as cost savings for providers and patients alike.

Daily routine, interactive relationship of staff and patient and education combine to improve patient compliance dramatically over traditional home health care. Home telemonitoring has even been found to be better than telephone-only nurse support to help patients maintain proper treatment and detect risk factors, according to a randomized study in Europe.[2] "It's a great educational tool," said Janet Wilbur, Home Health Administrator with BayCare. "Patients see repeatedly how their own vital signs, medication compliance and nurse feedback help keep them out of the hospital."

Hospital investments in healthcare IT will continue at a record pace through 2008, with over half of the hospital executives reporting to spend over $10 million in health IT in 2008, following a year of comparable spending.

Overall, hospitalizations of BayCare's home health patients using home telemedicine have dropped over three percent per year. When these patients are hospitalized, they spend fewer days in the hospital. (See Fig. 1.) BayCare's acute care (risk-adjusted) re-hospitalization rate showed an improvement of 3.6 percent in a one-year period ending September 2007. Patient compliance with oral medications over the same period also increased 3.1 percent (risk-adjusted), a significant improvement that can be lifesaving, Ms. Wilbur said.

For example, one of BayCare's home-care patients, who is blind, suffered from out-of-control blood pressure until she signed on to home telemonitoring. "Now, because of this program, mainly because the monitor asks her specifically if she has taken her medications, her blood pressure is in control for the first time in years," Ms. Wilbur said.

A number of large studies in Colorado, Florida, Georgia, Maine, Pennsylvania and South Carolina also demonstrate that both re-admission rates and length of stay after re-admission are significantly shorter for patients using home telemedicine.

With eight years of telehealth experience, Virginia-based Sentara Home Care Services reports a significant decrease in hospital admissions among its home telemedicine patients. Similarly, in a large longitudinal study reported by the Pennsylvania Homecare Association, 10.1 percent of congestive heart failure (CHF) patients in traditional home-care were hospitalized, compared to 6.2 percent of those using telemonitoring technologies.[3] Among this same population, 4.5 percent of telemonitoring patients vs. 8.8 percent of traditional home-care patients required emergency room visits. In a Pennsylvania State University study, diabetes patients enjoyed similar benefits from home telemonitoring.[4]

As for cost savings, the Penn State study also showed estimated hospitalization costs of $232,872 for the control group that had no telemonitoring compared to $87,327 for the group that did. In another study, Kaiser Permanente reports that among 200 patients with various chronic conditions, total costs per patient for those using home telemedicine was $1,948, versus total costs of $2,674 in the control group.[5] These costs included outpatient physician and emergency department (ED) visits plus laboratory, pharmacy and hospitalization expenses.

"That's not 'funny money,'" as one BayCare administrator put it. "Those are real dollars saved."

PATIENTS ALSO VALUE OTHER SAVINGS

Patients save money not only in direct healthcare expenses, they also enjoy less frequent travel to appointments, fewer childcare expenses, less time from work and less time waiting for appointments.[6] Problems in any one of these areas could prevent a patient from maintaining regular home-care or in-office appointments. In Maine, a largely rural state with one of the largest telehealth systems in the country, patients report saving an average of 165 miles of travel per year.[7]

Also highly relevant, home telemedicine regularly achieves these benefits with no negative effect on quality indicators, as discussed above, or on patient satisfaction. In the Maine study, patients ranked the top three benefits of telemedicine as convenience in terms of travel, involvement of all clinicians (presumably through electronic sharing of information), and ease of family involvement.

Though telemedicine is always a complement to traditional home-care, this technology is more appropriate for some populations than for others. Because self-management and behavior modification are keys to maintaining health in patients with degenerative or chronic conditions such as diabetes, CHF and COPD, patients with these conditions can be good candidates for home telemedicine. At least one research review, however, concludes that benefits for patients with pulmonary and cardiac conditions are "more consistent" than benefits for those with diabetes and hypertension.[8] Other good candidates are post-surgery and

cardiology patients or those with burns. These groups usually use the technology for a shorter period of time. Some of the highest physician referrals for home telemonitoring at BayCare come from cardiology and cardiovascular specialists for their post-surgery patients, though other physicians also order home telemedicine for patients with a variety of conditions.

WIDER REACH, FEWER RESOURCES

Arguably, the greatest benefit that home telemedicine can offer patients is its sheer geographical reach. Patients who live in rural areas, who do not or cannot travel or are economically disadvantaged, can all receive quality care through home telemonitoring. The state of Maine, for example, relies on telemedicine to reach rural patients who cannot otherwise access care due to their "geographic isolation, paucity of local specialty medical services, prolonged periods of hazardous winter driving conditions and poor road infrastructure."[9] For military veterans in situations like these, the U.S. Department of Veterans' Affairs (VA) reports that telemonitoring has offered encouraging results. In 2006, for congestive heart failure (CHF) patients alone, the VA found that telemedicine technologies enabled them to reduce total inpatient hospital days by 77 percent, to 122 from 630 the previous year. With such positive results, the VA planned last year to increase by 50 percent the 26,000 veterans receiving in-home telemedicine support for chronic diseases, including depression.[10]

Hospitals and home-care agencies also report that telemedicine technologies enable them to sustain quality care with a higher patient to nurse ratio. This in itself accounts for some of the cost savings for patient and provider and is increasingly important in an era of substantial nursing shortages. BayCare Home Care saw its average nurse manager's caseload rise by five to 10 patients during their initial launch of telemedicine.

In the second year of the Pennsylvania Homecare Association's three-year survey, home health agencies with telemedicine programs had an average patient-to-nurse ratio of 15:1 compared to an 11:1 ratio for those without such programs.[11]

In year three of the federally funded study, researchers reported "strong evidence... that nursing productivity is increased with the advent of telehealth.[12] An agency in the southeast United States. reports that its case managers more than doubled the number of patients each handled,[13] though patient acuity for the patient population is unclear.

ADOPTION OF TELEMONITORING TECHNOLOGY VARIES

Despite the proven cost and quality benefits, administrators investing in healthcare IT understand that the adoption of the technology—by the patient, by physicians and by other clinicians—is crucial to any return on investment. Of all the members of the healthcare team, patients as a whole might be seen as the toughest group in which to generate buy-in. Asking patients, especially those who might be unfamiliar with such technology to use it daily in their homes is one challenge. In addition, "computers" and "monitors" do not naturally conjure up the sense of "caring" and "personal attention" that patients expect.

The reality of home telemonitoring, however, is that "caring" and attention" are exactly what patients experience.

PATIENTS: 'DON'T TAKE MY MONITOR AWAY!'

Home care staff in Florida and Virginia report that patients not only accept but also embrace home telemonitoring.

"There's a misconception that elderly patients believe this technology to be intrusive," said Ms. Wilbur. "Quite the contrary: Most of our elderly patients find the monitor invaluable. It allows them to participate in their own care."

"We actually see the patient through a monitor," said Sheila Schubert, Regional Director with Sentara Home Care Services in Virginia, which enrolls about 100 telemonitoring patients at any one time. "Patients like that."

Patients discharged after heart surgery welcome home telemonitoring as well. "They might have been closely monitored in the ICU, and then are eventually discharged home," said Alexandra Feliciano, RN, with Cardiac & Vascular Surgical Associates in Clearwater, Fla., which works with BayCare. "Patients like the monitoring because they feel safer."

They are indeed safer, she confirmed, because both she and the home-care nurse call them when vital signs are abnormal. Sometimes the patient is not even aware that his condition has changed, so the phone calls come as a comforting surprise. In addition, for patients alarmed about a symptom on a weekend or after hours, they too can call the central monitoring station for information about whether they should seek treatment immediately, the next day or not at all.

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Clinicians at BayCare report that patients overwhelmingly accept this technology. "It is a rare patient who doesn't want this device," Ms. Wilbur said. "Patients are actually more likely to be upset to lose it when they improve. Some have even asked if they can pay for it out of pocket."

RESEARCH SUPPORTS FRONTLINE EXPERIENCE

The theory behind home telemonitoring is very simple and very fundamental, according to physicians at BayCare: give patients the information they need to control their own health, and they will. Connect them with clinicians who can help, and they will embrace that help. That is the theory, and in addition to the anecdotal evidence discussed above, hard data from national and international sources proves it to be true.

In in-depth interviews with patients with the University of Tennessee Medical School, researchers found that 98 percent were

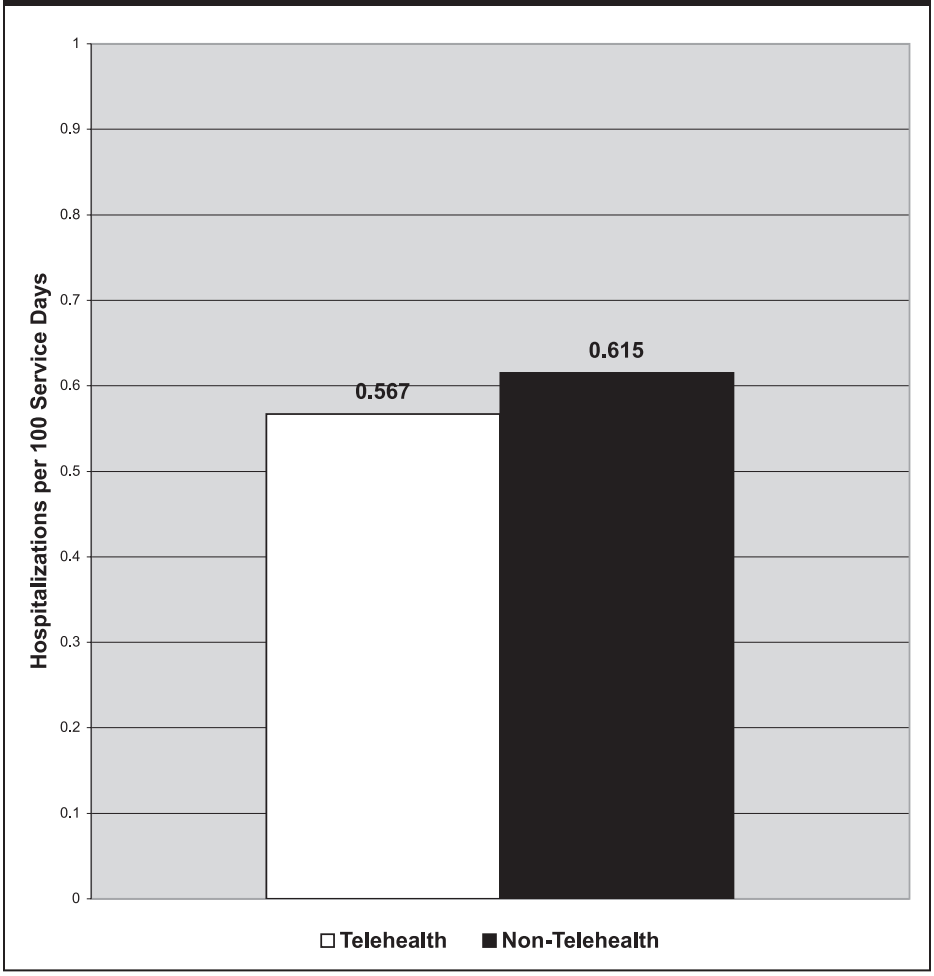
satisfied with home telemonitoring, and 100 percent said that the equipment was easy to use.[14] In another report,[15] 96 percent of patients say that telemonitoring "visits" were as good in quality as regular office visits. Over half said they were even better. Even some of the frailest of patients, such as older adults with CHF,[16] use and benefit from the technology.

Patients from diverse backgrounds wholeheartedly accept it, as well. In a Canadian review of 65 empirical studies, patients "regardless of their nationality, socioeconomic status or age"[17] remain compliant when participating in home telemonitoring programs. These researchers go on to conclude that home telemonitoring "empowers patients, influences their attitudes and behaviors and potentially improves their medical conditions."[18]

With the reduction in hospitalizations, lengths of stay and ED visits discussed earlier, plus the positive reception that patients have offered home telemonitoring, it is of little surprise that patients are willing to pay many of the expenses out of pocket.[19]

To date, that is how most providers in the United States are compensated, if they are compensated directly at all.

Fig. 1: Hospital stays per 100 service days BayCare Home Care: All patients (January-December 2007).



EXTRA WORK, NO EXTRA PAY?

Clinician and physician adoption of home telemonitoring varies initially, but their acceptance is among the top drivers of a program's success. As reported by numerous telemonitoring administrators, both groups ultimately embrace the technology for the potential it offers to improve quality and access to care.

Physicians in general are initially reluctant or uninterested at best, report several healthcare facilities across the United States, and their hesitation is understandable. Presently in most states, providers are not reimbursed for the time spent reviewing patients' telemonitoring reports. Even when hospital nurses oversee initial monitoring and report only the readings outside the normal range, physicians demonstrate some reluctance. The valid question, at least at first, is, "Why do I have to deal with this new data that I didn't order, review it remotely, and for free?"

The answers are not necessarily difficult to find, and organizations that actively educate physicians about home telemonitoring technology enjoy positive adoption rates. As physicians become more familiar with the technology, they appreciate the strong correlation between home telemonitoring and patient outcomes discussed previously. At BayCare Dunedin, home-care administrators report that as soon as one of their 40 monitors comes in from one patient, it is already earmarked for another. "Physicians here see the need for and benefit of the telemedicine program," Ms. Wilbur said. "A small group of about 10 started with us in 2005, and we now have over 120 physicians consistently using our home telemonitoring system, and it is a standing order for some practices."

Staff with the Clearwater, Fla., cardiovascular practice referenced previously in this article, report that about 50 percent of their patients use home telemonitoring after discharge from the hospital. Abnormal readings trigger calls to the patient from both telemonitoring staff and from doctor's office staff, who advise the patient to come in for an appointment or to go directly to the ED, when necessary. "It's entirely behind the scenes for me," said John C. Ofenloch, MD, cardiothoracic surgeon. "I'm here if they need me. Otherwise, there's no need for interruptions during office visits or during an operation."

Island Health Care, a home-care provider serving South Carolina and Georgia, experienced similar results. Their success with

the technology included a more than 60 percent increase in the number of physicians enrolling patients in their program.[20]

Perhaps trumping all the benefits, from the perspective of many physicians, is the potential for this technology to speed patient throughput from hospital to home, so that all resources, including the physician's time, can be re-deployed for the most pressing patients. As physicians gain confidence that patients do receive appropriate monitoring at home just as easily—and certainly more cheaply—than in the hospital, they can discharge certain hospitalized patients sooner. In a Pennsylvania State University study of 171 diabetic patients, about 64 percent of those using home telemonitoring were discharged to home during the course of the study, compared to about 40 percent of those receiving traditional home-care.[21]

Related, home monitoring technology can bring patients back into the doctor's office for a compensated visit before an issue grows severe enough to require an ED visit. For example, if a home telemonitored patient with CHF gains five pounds in a day or two (a symptom of dangerous fluid build-up), the physician is alerted and can see the patient that day for preventive care, versus waiting for the usual six-week follow-up appointment. At BayCare, CHF patients using home telemonitoring are hospitalized 0.67 times per 100 home-care service days, compared to 1.03 times for non-telemonitored patients. (See Fig. 2). As for high users of medical care (those patients who answer "yes" to every programmed question), home telemonitoring can potentially divert them from the ED or doctor's office simply because a skilled nurse answers their calls.

EMPOWERING NURSES

For nursing professionals who entered healthcare to provide skilled hands-on care and comfort to their patients, the adoption of home telemonitoring is perhaps more personal. Like physicians, those directly involved in home telemonitoring sometimes perceive that the tasks related to set-up and data collection are no more than add-ons to what they already do. They also see home-care technology as a step removed from their patients' bedside, or at least from their patients' living rooms. For these reasons, good training and education can smooth the transition and lead to successful clinician adoption of these technologies.

An important component of this education involves time. One longitudinal study of 36 home-care agencies illuminates a number of specific roadblocks and solutions related to nurses' adoption of home telemonitoring. According to the third-year report of the Pennsylvania Homecare Association's telemedicine study, researchers report an "adjustment period" for nurses new to home telemedicine,[22] with a clear learning curve that leveled off during years two and three. Suggested reasons for the learning curve include nurses' aversion to and unfamiliarity with the computer-related technical installation and maintenance of the equipment in patient homes. Nursing staff turnover was highest among nurses during the initial implementation of a program, at 28 percent, and lowest in the groups that had used the technology longest, at 12 percent. The PHA's recommendations include assigning these installation and maintenance roles to technical staff. BayCare enlists technologically adept nurses to lead the roll-out of its telemonitoring programs.

In one survey of healthcare professionals in Maine, taken after their involvement with home telemonitoring, an overwhelming number of site coordinators and providers said they were "highly satisfied" with the program after spending some time with it.[23] All totaled, 95 percent to 100 percent report being "highly" or "moderately" satisfied. Another study shows that not only do nurses become more positive about the technology over time, agencies that do not use telehealth had a higher turnover rate among RNs (20 percent) than those who do (14 percent).[24]

PHA's landmark study points to benefits enjoyed by home telemedicine nurses, including daily interaction with patients; an increased role in patients' day-to-day care; patient feedback; and their own increased productivity.[25]

The theory behind home telemonitoring is simple and fundamental: give patients the information they need to control their own health, and they will.

Sheila Schubert, with Sentara in Virginia, said that their nurses also appreciate the addition of a video monitor that allows the telemedicine nurse actually to see his or her patients. They also are rewarded by the fact that they can monitor the sickest patients daily and provide quicker intervention than with traditional home-care. "Telemonitoring gives me, as a nurse, a way to track important vital signs, and to act on them," said cardiovascular nurse Feliciano.

TECHNOLOGY: USER-FRIENDLY, BUT NOT INTEROPERABLE

The variety of options available for home telemonitoring equipment appears to meet most patients' and caregivers' needs, given the fact that both groups rank "ease of use" high in several studies, as discussed above. Overall, home telemonitoring devices are ready to go, off the shelf.

Communication with the central monitoring station is one issue dependant on a number of external factors, from geography to a community's technology infrastructure. According to literature for Honeywell, their HomMed monitor offers two communication options, either phone line or two-way pager; both text and voice prompts to assist patients through the monitoring procedures; and an interface that requires a limited number of button presses. Phone lines might be more appropriate for mountainous regions. Some manufacturers offer satellite communication, which might be more functional for some rural areas.

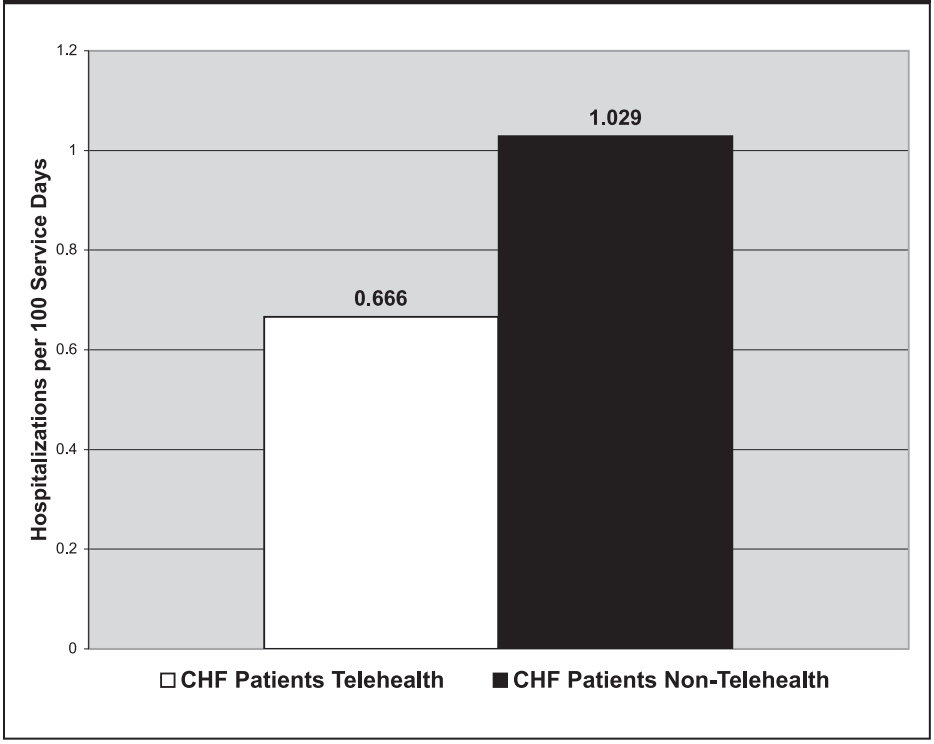
Minor technical issues do arise, of course, in the form of lighting problems, audio delay, image artifacts, etc. Though such problems occurred in one-third of the cases in the Maine study, these glitches interfered with the telemonitoring consultations only four percent of the time.[26] Some patients with BayCare, which uses the Honeywell product, commented that they would prefer the feel of a "real button" vs. touch-screen buttons, so the company is working to accommodate that option. This willing-

ness to adapt hardware and even software to encourage patients to be more compliant and ensure that clinicians will support it bode well for the industry as a whole.

Just last year, the American Telemedicine Association introduced technology guidelines for these products.[27] Covering both clinical and functional needs, the guidelines call for such features as two-way, interactive video as necessary, plus specific optional tools such as a telephonic stethoscope, electronic glucose meter and digital thermometer, for example. These guidelines do not yet address issues with interoperability, however, or the value of creating devices that can be interchanged among different telemonitoring software systems.

To date, though the medical device industry is converging around opportunities to standardize equipment interfaces and transmittal methods, none is yet of "plug and play" variety that has led to the widespread adoption of many consumer products. Until the industry reaches that point, those familiar with home telemedicine note that hospitals and physicians will not have access to the "best of breed" devices for their patients, but instead only to the "ones that best fit." To that point, hospital executives surveyed by the Gantry Group report that they highly favor new healthcare IT products that will integrate with their existing clinical IT solutions, ranking integration easily at the top of the list with 54 percent of the votes, even above vendor reputation (31 percent) and price (31 percent).[28]

Fig. 2: Hospitalization for patients using home telemonitoring vs. non-telemonitored patients.



ROLE OF THE C-SUITE

Hospital investments in healthcare IT will continue at a record pace through 2008, with over half of the hospital executives surveyed by the Gantry Group reporting plans to spend over $10 million in health IT in 2008, following a year of comparable spending.[29]

Home telemedicine programs are not necessarily the most expensive healthcare IT program a hospital or system is undertaking at any one time. However, considering the size of any IT investment, the long-term commitment required and the impact it has on staffing and on patients, refocusing administrative attention on a regular basis can improve results and keep up the momentum for growth and quality improvements. Hospital systems like BayCare in Florida and Sentara in Virginia report that keeping all the stakeholders informed, from the front line nurse to physicians to board members, is important to the sustainability of a home telemedicine project, especially during the initial year of rollout of the program.

"The biggest resistance for this project came from me," said BayCare's Denny Crockett, Senior Vice President for Ambulatory Services (including home-care). Though he believed in home telemonitoring, he championed the program for BayCare's multi-site home-care division only after becoming convinced of the return-on-investment (ROI) potential. "In Florida, reimbursement is not a factor, because there is very little," he said. "For us the ROI is measured in decreasing the number of home visits we make" while maintaining quality.

BayCare launched their program first in its largest home-care office and with about 50 monitors. With positive ROI numbers in hand, they added a second office with a similar number of monitors the following year, and a third in January 2008. BayCare relies on both standard and customized reports to substantiate trends and to track key indicators for their home telemonitoring program. "We continue to evaluate the program, but if results continue as they have, we'll eventually have home telemonitoring in all 12 of our home-care offices."

In addition to changes in on-site home visits, the most common ways for hospital administrators to evaluate home telemedicine are: clinical quality, low cost, adoption as routine medical care and sustainability.[30] With this in mind, regular administrative reports on ROI, patient satisfaction, quality and outcomes, ED visits and length of stay, and staffing issues discussed here can help inform executive leadership of progress made by and potential growth of home telemonitoring.

CONCLUSIONS

The healthcare and IT industries face both challenges and potential rewards when introducing home telemonitoring to a greater number of patients throughout the U.S. As is true for other subsections of the industry, of great relevance here are:

- Demographics, particularly the baby-boom generation now entering retirement in large numbers;
- Nursing shortages;
- New and emerging technologies, including expansion of broadband capabilities and more attractive price points for equipment and systems; and
- The dual focus on burdensome health care costs from both local and national levels.

The compensation landscape is evolving, though gradually. Payers are exhibiting an emerging comprehension of the value that home telemedicine brings to their operations and to patient care. The federal government is slowly coming to appreciate and compensate for the use of this technology, in part due to its own VA studies. Some large, private insurers are rewarding the costs savings too. At least five states require some sort of insurer compensation for home telemedicine.[31] Given the proper push from regulators in both quality and cost areas, the industry is poised for dramatic changes in compensation over the next two to five years.

Today, a limited number of equipment manufacturers have staked ground in this market. Because of high cost barriers to entry, large hospital systems are more likely than smaller home-care organizations to invest in the technology. With the effects of consumerism on healthcare, the transition to increasing personal participation in one's own care, the evolution of increasing technologies in our daily lives, and increasing clarity around funding and compensation, more players will move into the market.

The American Telemedicine Association estimates that only about 1,000 providers in the US offer any type of daily home telemedicine services to their patients, though the US is home to over 5,700 hospitals and over 20,000 home-care agencies. The technology is proven, adoption is proven, quality improvements and cost savings are proven. The opportunity is obviously here, and it is growing.

Over the next three to five years, continued regulatory changes will steer the technology to become both interoperable and compensable. More patients will be able to welcome into their homes any telemonitoring device their local providers offer. Need and desire for interoperability will open opportunities for manufacturers, and best of breed devices will replace "whatever fits" devices.

At that point, patients will reap the true benefits of home health telemonitoring IT, including improved recovery, better disease management and reduction in the need for visits to the hospital, doctors' offices and emergency departments. This, in turn, will not only save money but will improve quality of care as well as quality of life.

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Congratulations to the following individuals who have recently achieved the Certified Professional in Healthcare Information and Management Systems (CPHIMS) credential from February 16 through April 30, 2008. The CPHIMS program is dedicated to enhancing and promoting the healthcare information and management systems profession by providing the premier credential in the industry. The CPHIMS program accomplishes this mission by establishing standards for professional practice; creating a fair, valid, and reliable examination process by which professionals can demonstrate their knowledge and skill; granting certification to those who meet the program's standards; and communicating the value of the credential to consumers and other key constituencies.

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