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Remote patient monitoring: How mobile devices will curb chronic conditions

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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. That's not to say physicians won't be actively treating sick patients every day, but new payment models, with financial incentives and disincentives for physicians, call on healthcare providers to better manage patient populations as a way to prevent health problems and improve outcomes.

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. It's a collection of vital-sign takers, activity trackers and other devices to step on or strap on, then transmit the readings to a collection point in a computer or secured site in the Internet "cloud." At its best, such technologies can pick up weight gain, elevated hypertension or other concerns before they become serious threats to health or life.

"Remote monitoring is extremely important and probably in the forefront of mobile technologies now," explains David Lee Scher, MD, FACC, a Harrisburg, Pennsylvania cardiologist and mobile-tech consultant, "because of its potential importance in decreasing hospital readmission rates, which are a big headline because they are responsible for penalties that the Centers for Medicare and Medicaid Services (CMS) is now imposing on hospitals that have readmissions within 30 days for certain diagnoses."

Whether the goal is preventing readmissions or maintaining medical stability among the chronically ill, "what remote monitoring does is it keeps the patient more in touch with the physician over a period of time outside of the acute-care setting, such that you don't have to wait for disasters to happen" to bring the deteriorating condition to a provider's attention, Scher says.

And patients want access to these remote monitoring technologies to improve their health. A 2012 eHealth patient survey by the public relations agency Ruder Finn found that 33% of patients want their physicians to have access to remote monitoring technologies. Older patients want these technologies even more: 40% of older patients want access to technology that can alert physicians and other caregivers if they are having a health emergency.

For now, establishing—and being paid for—a remote monitoring program remains a challenge, especially for small and solo independent practices. Physicians are already dealing with, and being overwhelmed by, a bevy of technology systems that they are required to understand and invest in, from electronic health records (EHR) systems and patient portals to telemedicine platforms and social media.

Instituting remote monitoring, experts say, will require a change in how a medical practice conducts its business, and may require joining a clinically integrated network of providers in order to scale the monitoring process appropriately. Physicians will have to develop new ways of interacting with patients, and institute new processes and responsibilities for staff members to take on this flood of data and make it practical and useful for improving patient care and reducing costs.

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>
> — DAVID SCHER, MD, FACC, CARDIOLOGIST AND MOBILE TECH CONSULTANT, HARRISBURG, PENNSYLVANIA

Next: Remote patient monitoring in 5 steps

How remote patient monitoring works

A 5-STEP PROCESS

PHASE 1: COLLECT

- **Activation:** Patient, caregiver, clinician or third-party activates or initiates device for passive data collection
- **Obtaining data:** Activated device passively or actively collects information, which is recorded and stored for viewing and/or delivery
- **Packaging data:** Data is packaged in the appropriate format for transmission

PHASE 2: TRANSMIT

- **Delivery:** Data transmitted via Internet, telephone, text message or other electronic method
- **Receipt:** Appropriate provider, caregiver or third-party receives patient data from device
- **Indicators programmed:** Indicators of thresholds and normal results programmed into algorithm or noted if reviewed by a clinician.

PHASE 3: EVALUATE

- **Data review:** Indicators are used to screen data for areas of concern, either by using an algorithm to compile results or a clinician to tabulate the information.
- **Alert preparation:** Device, intermediary software or healthcare worker prepares the alert for transmission to care team via phone, text, pager or e-mail. In acute events,

an alert is sent according to structured hierarchy of the patient's health team.

PHASE 4: NOTIFY

- **Alert sent:** Alert is sent to patient and designated responders, including family, caregiver and emergency technicians who can provide assistance to the patient.

PHASE 5: INTERVENE

- **Treat and adjust:** Clinicians, emergency responders, family and the device intervenes in patient activity to provide assistance and adjust treatment.
- **Education:** Clinicians teach patient, caregiver and family about the incident, and how to avoid or handle it in the future.

Source: Center for Technology and Aging, 2010

Next: What are the upfront costs?

Upfront costs

But the cost-saving approach first requires an investment. The benefits, in the form of reduced personnel expenses for bigger monitoring loads, and preventing costly crises under a fixed-revenue business model—dictate investments in equipment, data transfer, and response to incoming data, all of which can add up.

For example, five health systems participating in a project to discern return on investment had median first-year expenses of about $1,000 to $2,000 per enrolled patient for technology and personnel, according to a report issued earlier this year by the Center for Technology and Aging, in Oakland, California.

And the big hit isn't usually the cost of devices and applications. These are plummeting in price and getting easier to use as entrepreneurial competition over the possibilities of remote monitoring in the reform era create "lots of software vendors with viable products on the market that are just waiting for the traction to start," says John Norenberg, vice president of information systems, physician services, at Advocate Health Care in Downers Grove, Illinois.

They could wait a while longer. "This technology sounds cool and wonderful, particularly to somebody who's not actually trying to take care of people," says Paul Luetmer, MD, FACC, a cardiologist in a practice owned by Aspirus System in Wausau, Wisconsin "The idea that you can measure something and transmit that somewhere seems like, 'Well, that's the solution.' And that's the really easy part."

To make a difference, transmitted data must get to a medical provider in a form that leads to a decision. "That decision then has to result in a transmission of information somehow back to the patient. Then the patient has to take that information and actually change what they do," Luetmer says.

The financial, operational and practical implications of pulling that off are legion. Chief among them:

- Getting paid. Physicians must be compensated for or somehow recoup their costs for hosting these monitored blood-pressure cuffs, weight scales, body sensors and other devices in patient homes, and to field and make sense of the data they produce.
- Staffing needs. Someone must be in charge of going through the incoming data in a timely way and be able to either respond directly to, or hand off to the appropriate medical professional, a recognized indication that a patient needs immediate intervention.
- Filtering important data. The quantity of data these monitors potentially produce on patients can't be allowed to overwhelm physician workflow and information handling, but pertinent data have to find their way into the office mainstream, usually via the electronic health record.
- Legal uncertainty. Questions of medical/legal liability can arise from the availability of data that detect precursors to serious health threats--and the prospect that no one will see the threat and act expeditiously.

Next: Who are the customers?

Logical customers

Viewed through those challenges, the application of emerging technologies in primary care is daunting; informed observers generally believe doctors won't be put on the spot to adopt monitoring until many changes occur.

"When you're talking about the small practices, it doesn't fit yet," says Fran Turisco, a healthcare consultant with Aspen Advisors. "It's only when the incentives turn around where you get paid bonuses when you keep the quality metrics high, yet the cost low—and the patient's satisfied."

Concern over monitoring and data-collecting burdens likely is unwarranted, says Scher. "The pushback is that, 'I have to now hire people devoted to monitoring these technologies,' and that isn't necessarily true. Most remote patient monitoring companies have call centers."

In fact, he says, "They set up the whole infrastructure. The only thing they haven't set up is how somebody's going to get paid for [using] it."
The logical customers for preventive measures such as monitoring technology are hospitals and health systems, including developing accountable care organizations that are involved with or building an infrastructure for population-based health management.

At Catholic Health Initiatives (CHI), an Englewood, Colorado-based network of regional healthcare delivery "ministries" in 17 states, remote monitoring "fits very well with our overall strategy," says Xavier Sevilla, MD, MBA, vice president for clinical quality improvement. When patients are at home, "they are still our patients, and we are still responsible for providing care and delivering health to them, even when they are not interacting with us face to face."

CHI will get little or no payment under the fee-for-service system; but when providers are motivated to look after patients to keep them healthy, says Sevilla, reimbursement for the care that produces the desired results will follow, starting with large organizations and coming eventually to small practices that are nudged into joining the shift to preventive care.

"The way a small physician practice in a rural area would benefit from this is through a payment model that would really look at the whole population, very similar to what's going on with accountable care organizations," he says. Instead of getting reimbursed for direct costs incurred in remote patient monitoring and other uses of emerging technology, practices would share in cost savings the monitoring and other measures helped generate, splitting them with a payer or health system under contractual terms.

Preventing readmissions for CMS-penalized diagnoses is the first wave of motivation. "It's the hospital that's willing to pay; they're the ones to set up the equipment and to monitor and have the integrated solutions, because they're the ones that are going to be penalized," Turisco says.

But doctors get the handoff after discharge, and "if their patients are continually getting readmitted because they're not getting treatment, and [physicians] are not chasing the patient once they're discharged and making sure that they're staying on their regimen and taking their medication or coming in for their visits, then they get penalized. There are financial implications."

Next: How to handle the data

Handling the data

Physicians are beginning to weigh the preventive and catch-early aspects of patient care in the population management era, which may require diversifying the practice workforce to include midlevel practitioners, nurse coordinators and health coaches working as teams.

But as traditionally constituted, most primary care offices "don't have the workflows that would permit them to take on something as big as this," says Sevilla regarding remote monitoring.

CHI is adding registered nurses to its practices as health coaches to take on clinical tasks now performed by doctors, especially for "highly complex patients, those patients that need very careful monitoring, that need continued communication," he says.

Workflow redesign is reflecting the addition of coaches, and remote monitoring will be a later step after the team-oriented design is working. Rather than something separate, monitoring would play off the redesigned practice, introducing information from outside feeds when it becomes useful or necessary, and directed to the person most appropriate to receive it.

Handling data upon arrival is a significant issue. "You can have all the data in the world, and if it's not digestible and filtered, it's going to be the biggest turnoff ever," says Scher. Physicians fear "a deluge of useless monsoons of data." That's where analytical strengths of computer systems have to be tapped, but the pickings are slim, he says. "The two weakest links in patient monitoring are analytics, which drive actionable trending data, and the fact that these have to interact with electronic records."

It's a matter of knowing at a glance whether data signify concerns, and then getting the alert in front of clinicians as they do their other work.

"If you have this data going to a third place, it's a waste of time, it's a total dead end," says Scher. "It has to go into the electronic health record." And only a fraction of monitored data is worthy of immediate attention, which the system must lift out of the constant stream: "Analytics must translate the data into information that is telling the physician, 'This must be done, otherwise a big problem is going to occur with that patient.' In plain English."

The approach that CHI is looking into involves systems armed with software to sort data into an overall picture—on one screen—comprising patients that have been tagged with alerts, so practices " don't have to put someone in front of a screen waiting for something to happen," says Sevilla.

Where doctors come in

The way the procedure is developing, doctors are being held responsible for medically appropriate tasks when monitoring begins, and when it yields actionable information, but not the voluminous middle—the intake of unrelenting data, responses to minor concerns, and contact with patients if routine issues arise.

Primary responsibility for that "middle management" usually is given either to a dedicated group within a health care network or a third-party vendor selling both setup and operational services. Physicians control the parameters of the monitoring: the values of metrics for a particular patient that, if exceeded, warrant contact with the patient's physician office.

"I don't see a lot of times where physicians are involved in the actual tactical or implementation of the monitoring or the day-to-day support of the devices," says Kent Dicks, chief executive officer of Alere Connect in Scottsdale, Arizona. "I see physicians involved in the parameters up front, the instructions up front, and making changes if it's outside their instructions."

"The physician can set alerts, in any kind of therapy, and anytime a patient gets outside of boundaries—maybe they've gained X amount of weight in a short period of time and they're retaining fluid—the

physician or the physician's assistant can intervene," says Dicks. Doctors get involved in customizing the monitoring by patient or perhaps by type of condition, he adds. "The physician isn't monitoring them. They're in the loop of care, to make adjustments to the care if the patient's having an issue."

The setup for Honeywell HomMed, a remote patient monitoring business based in Brookfield, Wisconsin, consists of a tablet with applications that patients interact with, and "biometric devices that acquire the weight, the blood and other things like glucose, temperature," says Paul Elko, product manager. A clinician, usually a registered nurse, "monitors the serial changes in those biometrics with our back-end software."

Sometimes the monitoring professional calls the patient or talks via a two-way video hookup on the patient's tablet device, to ask about symptoms, without involving the patient's regular physician. If warranted, for example, in the case of rapid weight gain, "they'll refer that patient to the primary care physician, who may do something as simple as instruct the patient to take an extra Lasix pill for the next two days," Elko says.

Next: One part of a bigger plan

Part of bigger plan

It's unreasonable to expect solo or small practices to get involved in the actual operation of such a data-sifting system, Sevilla says.

Small groups would have to be part of something bigger, such as a clinically integrated network focused on population management. For the independent doctors affiliated with CHI as part of an integrated network in each market, options extend to either embedding a CHI-employed staffer or centralizing services and assigning managers to practices.

In the Advocate network, smaller practices also are among a large corps of independents, says Norenberg. "At some point you need scale to do this, and that's a very provocative statement for smaller practices."

Physicians who remain independent can't be isolated, says Lonny Reisman, MD, executive vice president and chief medical officer of Aetna. Practices still will be accountable for managing a share of populations, including "being concerned about patients once they've left their office, and being accountable either for their behaviors or physiologic changes that might be germane to their well-being." Reisman says it comes down to an imperative "to support practitioners by enabling them to conduct the sorts of review, and provide the level of scrutiny and support for their patients, that we're all going to demand as a society."

Seeing the potential for decreased use of high-cost resources, health insurers have been preparing not only for holding providers to risk-based arrangements but also handing over tools, including remote monitoring, for them to succeed in bearing risk for quality improvement and cost control.

During the past decade, Aetna has acquired companies in anticipation of emphases on data exchange, tracking and analysis: ActiveHealth Management, a firm Reisman co-founded, that aggregates clinical data on patients from claims and labs to compare with evidence-based standards; then Medicity, a health information exchange vendor, which among its functions could add data from EHRs for the analyses needed; and iTriage, which communicates symptoms or concerns of patients.

The next step, says Reisman, is to introduce remotely captured biomarkers to provide "the sort of information [that] gives you a host of opportunities to optimize the treatment of the patient."

The business objective for Aetna is to make this set of technologies available to physicians in exchange for collaborating in a variety of value-based contracts where "you as the physician now get compensated based on either clinical outcomes or your ability to manage costs," he says.

In addition to the tools, a service component can be used to embed a nurse from Aetna to help facilitate data usage in practices that don't have the staff, or the expertise within the staff, to react to alerts and analysis.

Already, the health insurer is working with nearly 130 medical groups, from health systems to small practices, collaborating on clinical performance improvement with the aid of embedded case managers and a steady stream of data for immediate action and for analysis of performance, says Randall Krakauer, M.D., Aetna's national medical director.

Next: The return on your investment

Return is there

The investments pay off, says David Lindeman, PhD, director of the Center for Technology and Aging at the University of California Center for Information Technology Research in the Interest of Society, in discussing the agency's study of varied approaches to netting a return at five systems:

- Centura Health at Home in Colorado;
- Dignity Health in California, Arizona and Nevada;
- HealthCare Partners, an ACO in Southern California;
- Sharp HealthCare, San Diego; and
- the Veterans Affairs network in Central California.

Return per-patient ranged from $1,760 at Centura against costs of $493, to $9,882 at Dignity Health against costs of $7,148. Gains were chiefly from reduced use of hospital and emergency services.

The study shows that "in different environments, different systems using different remote monitoring devices, you do see...improvements for the bottom line over time. That's very clear," says Lindeman. Better clinical performance is implied. "As a proxy for improved healthcare, when you look at people's track record of admissions, you're showing that you've reduced the problems and are managing more of those chronic conditions," he says.

The results add to "a strong evidence base for the effectiveness of remote patient monitoring," Lindeman says. And that's primarily in a fee-for-service world. "You'll see the benefits growing as you have state Medicaid programs moving entire populations into a managed-care environment; as community health clinics, and the physicians and clinicians who work there, have more individuals being rapidly enrolled" through health insurance marketplaces.

Averting health crises should be a return by itself, says Sevilla.

"I think every doctor would agree that a patient going to the emergency room three times a week or being admitted on a weekly basis is not receiving the best quality of care."
If doctors see preventing such ordeals as the ultimate goal, "it will be easier to accept something like this even if it's new, even if it involves change in how we do things. But ultimately the beneficiary of all this is the patient."