Remote Patient Monitoring

This tool describes remote patient monitoring devices, distinguishes between remote patient monitoring and telehealth, and offers recommendations on how to implement remote patient monitoring effectively within a community-based care coordination (CCC) program.

Time needed: 2-4 hours

Suggested other tools: Technology Tools and Optimization for CCC; Patient Engagement; Promoting Patient Self-Management; Patient Health Diary; Personal Health Record

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Table of Contents

How to Use

1. **Review** the current state of remote patient monitoring technology and its relationship to electronic health records (EHR), health information exchange (HIE), personal health records, other health information technology (HIT), and telehealth.

2. **Appreciate** the benefits and challenges in using remote patient monitoring technology with patients in a CCC program.

3. **Consider** evaluating various apps for remote patient monitoring to "field test" their use in the home and in the CCC program.

4. **Plan to adopt** remote patient monitoring for targeted patients, recognizing the needed to address technology implementation, workflow changes, necessary documentation, and planning for transitioning the patient to self-management.

Remote Patient Monitoring Technology vs. Telehealth

Although remote patient monitoring and telehealth are sometimes considered to be synonymous – and both have many similar benefits – an important distinction must be made between the two.

- **Telehealth** is an interactive session in which a health care professional provides direct clinical services where the patient is not present in a health care facility. Patients may or may not be known to the provider. They may be in their place of residence, or be in need of emergency care in a location that is not immediately accessible to health care professionals, such as on a remote farm, cruise ship, military theater, or prison. E-visits (conducted primarily through e-mail) are similar to telehealth, but provide limited clinical services for patients who already have an established relationship with a provider. In both, but especially telehealth, there are issues of professional licensure, payment/reimbursement, patient authorization for treatment, and other issues that must be addressed in providing clinical services.

- **Remote patient monitoring** refers to technology used to continually assess a person's health status. Clinical services is not specifically included in remote patient monitoring, although it certainly may lead to provision of such services, either in a traditional health care setting or via telehealth. Remote patient monitoring technology may include physiological monitoring (e.g., blood pressure, glucose, weight, and temperature), medication administration reminders or monitoring, diet and exercise tracking, falls monitoring, tools to help patients cope with anxiety or depression, etc. Remote patient monitoring may be used in conjunction with telehealth, by home health nurses, or in disease management programs. When patients use physiological monitoring and other health care monitoring/tracking devices for themselves, this technology may then be referred to as self-monitoring technology. Both remote patient monitoring and self-monitoring may use mobile medical devices, and both are useful in CCC programs.

Architecture of Remote Patient Monitoring Technology

Remote patient monitoring technology requires several components:

- ☐ **Input device**. This may be a sensor clipped onto a patient's clothing, physically attached to a patient by one or more leads, embedded in a watch, shoe, clothing, mattress, etc., or placed in a home (such as a motion sensor). Other forms of input devices include smart phones, computers, or landline telephones. These are either used for patients to enter data themselves, or as local data storage devices into which there is a wireless communications feed from the input device.

- ☐ **Local data storage** is used to capture and retain the data locally. This data may be held by the patient or submitted to a central data repository.

- ☐ **Telecommunications** is needed to transmit the data from the input device/local data storage device to a central data repository. Telecommunications may include a variety of home hub devices that capture short-range signals (e.g., Bluetooth) and move them over a cellular network to the central data repository. They may also be less sophisticated forms: Patients may be required to use an intermediary local data storage device (e.g., a USB drive) and literally carry the data to the provider or insert it into their own personal computer to store the data or use the computer and WiFi, cable or other means to send the data through the Internet.

☐ **Central data repository** may include a provider's EHR, a patient PHR, a HIE organization, or (less commonly) other HIT such as a registry, e-prescribing system, laboratory information system, and others – depending on the nature of the data being monitored.

☐ **Diagnostic application software** helps the patient, CC, provider, or other person interpret the data captured through the device. This may be a smart phone app that compares data to normal values and provides an alert to contact the provider or take other action. Smart phone apps may provide some graphing functionality so the patient can see positive change or observe concerns, upload data to a PHR, and may recommend links to educational information on the web.

More challenging is to integrate the data coming from remote patient monitoring devices into an EHR. Most often, providers (or payers in their disease management programs) have nurses review the data coming in and then cut-and-paste relevant portions to an EHR (or disease management program). This is time-consuming and error prone. Unfortunately, at this time there is not a lot of integration capability built into the underlying EHR software and so incorporating patient data into an EHR requires special programming.

Benefits and Challenges of Remote Patient Monitoring/Self-Monitoring

As the U.S. population ages, persons are generally better educated, more comfortable with the use of technology, and most want to live in their homes for as long as possible. Yet greater numbers of these persons have chronic conditions that consume in increasing percentage of health care expenditures. Health care monitoring devices (whether remote patient monitoring or self-monitoring) are becoming popular and there are ever-growing types of devices. In late 2012, the Institute of Medicine (IOM) published a summary on *The Role of Telehealth in an Evolving Health Care Environment* (available at: http://www.iom.edu/Reports/2012/The-Role-of-Telehealth-in-an-Evolving-Health-Care-Environment.aspx) which identified a number of benefits and challenges to telehealth and remote patient monitoring devices,

Benefits

☐ **Specific improvements in the management** of hypertension, congestive heart failure, and diabetes. An article entitled *Partners Integrates Home Monitoring Data With EHR* published in *Information Week* (available at: http://www.informationweek.com/health care/electronic-health-records/partners-integrates-home-monitoring-data-with-ehr/d/d-id/1110559) described findings from Partners Health care in Boston where there was a 50% reduction in readmissions of CHF patients, 1.5 percentage point drop in the HbA1c of patients with diabetes, and significant drops in systolic and diastolic blood pressure after six months.

☐ **Better adherence to medication.** Although those intent on non-compliance can defeat the technology, those who are merely forgetful can be helped immensely by special watches with alarms, pillbox timers, smart pill containers, or automated pill dispensers. Some of these only serve to remind the patient; others keep pills locked until a timer releases an alert and unlocks the container; and still others transmit a signal to a home health nurse or other base station that the pill has been removed from the container. There

are systems in an early stage of development that can monitor swallowing of a pill, although there are ethical concerns about such technology.

☐ **Support for "management by exception"** so that home health services concentrate on individuals shown to need the most help on any given day, thus increasing the number of patients that can be managed per nurse. (See: *Strategies for Incorporating Telehealth-based Care Coordination and Management Solutions into Programs to Integrate Care for Dual Eligibles* (2012), Center for Technology and Aging, available at: http://www.techandaging.org/Dual_Eligibles_Issue_Brief.pdf)

☐ **Reductions in hospitalizations, readmissions, lengths of stay and costs.**

For research on substantial hospitalization-related cost savings from home telehealth, see: Chen, H. et al. (2011) *Telehealth and Hospitalizations for Medicare Home Health care Patients*, American Journal of Managed Care, available at: http://www.ajmc.com/publications/issue/2011/2011-6-vol17-n6/AJMC_11jun_ChenKalish_e224to30.

For specific findings from the Home Care Association of New York State, see*: Home Telehealth: Enhancing Care, Saving Costs*, available at: http://www.hca-nys.org/TelehealthBriefingDoc.pdf

Challenges

☐ **Patient preference and acceptability** with respect to the kinds of devices people want to use and how much intrusion they are willing to accept in their lives. A study not yet published[1] has found that when asking patients to use remote patient monitoring as part of a research study (in this case the study on usage of such technology) they were more inclined to use the technology, perhaps drawing upon human factors that fulfill higher needs.

☐ **Attrition** with the use of the technologies after care coordination or home health services end. To address this issue studies suggest putting such monitoring devices in the home for the first half of a patient's care coordination period, using this time to contact the person frequently, reiterating directions, and coaching the patient, then removing the devices in the second half of the period, returning to in-person visits but monitoring for and reinforcing the use of self-care routines. See: *Guide to Long Term Care Planning* from the National Care Planning Council available at http://www.longtermcarelink.net/eldercare/home_telehealth.htm.

☐ **Using off-the-shelf devices**, such as mobile/smart phone apps, gaming systems, social media, etc. to connect to providers, as noted above. This includes whether the devices are compliant with health care interoperability standards, such as Health Level Seven [HL7] Data Communications Protocol.

☐ **Management of data** flowing from all the devices and presenting the information to providers in a meaningful and actionable way. (See discussion concerning diagnostic application software.)

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[1] Personal conversation: Margret Amatayakul and Larry Pawola, PharmD on research being conducted at the University of Illinois at Chicago, Biomedical and Health Information Sciences Department, July 25, 2014.

☐ **Need for more training** in the health professions on patient monitoring devices, more **reporting** of adverse events, and **regulation** of patient monitoring devices. The Food and Drug Administration has recently issued clarity on regulation of such devices. (See *Overview of Device Regulation* at: http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/overview/

☐ **Broadband connectivity** remains a challenge in rural and underserved population areas, although as the scenario below suggests, not every remote patient monitoring device requires instantaneous feed of data. The latest report from the Federal Communications Commission was published in 2013 reporting on 2012 availability, *FCC Releases New Data on Internet Access Services, is* available at*:* http://www.fcc.gov/document/fcc-releases-new-data-internet-access-services-7. Note that this report was severely criticized by some as being inaccurate or misleading.

Remote Patient Monitoring in Home Health

A patient with congestive heart failure can step onto an automated scale connected to the household POTS (plain old telephone system) and have weight submitted directly to the home health agency. Tele-nurses wear an alerting device and receive indications of the name and phone number of the home care patient who has gained one-to-two pounds within a 24-hour period to be contacted immediately by phone. With connectivity to the patient's EHR, the nurse is able to order a diuretic for the patient if necessary.

Implementing Remote Patient Monitoring

Just as with any information technology, when planning to adopt remote patient monitoring in a CCC program it is important to follow a process that includes: a readiness assessment of both the CCC program as well as a readiness assessment for each patient to whom remote patient monitoring is offered or recommended; optimal selection of equipment; proper implementation; attention to workflow changes; assurance of necessary documentation; and planning for transitioning the patient to self-management.

Readiness of CCC Program for Remote Patient Monitoring

An evaluation should be done to determine if the CCC program is ready to support remote patient monitoring, or whether it will only recommend self-monitoring devices. The assessment might include:

☐ **Understanding available technology**
  o Remote patient monitoring devices are rapidly evolving. The Center for Technology and Aging published a paper in July 2009 entitled *Technologies to Help Older Adults Maintain Independence: Advancing Technology Adoption* (available at: http://www.techandaging.org/briefingpaper.pdf)
  o Becoming familiar with what is available in general, and then specifically understanding the technology may require due diligence on the part of the CC, IT staff, and community resource persons who may carry out the monitoring on behalf of the CCC program.

- ☐ **Availability of staff** who will monitor the data coming into the program and will take appropriate action. These are generally registered nurses who may have undertaken a certification program (which may be required in certain states), but at a minimum demonstrate:
  - o Ability to be approachable via the phone (e.g., courteous, use of clear and understandable language, non-judgmental, not minimizing patient complaints)
  - o Good listening skills (e.g., discovering details in patient conversation, interrupting patient only if necessary)
  - o Effective interviewing techniques (e.g., asking open-ended questions, active listening, motivating)
  - o Ability to detect emotional cues via the phone (e.g., crying, dyspnea, silence)
  - o Critical thinking and problem solving skills
  - o Ability to collaborate with the patient/caregiver in care planning
  - o Appropriate and medically acceptable interventions, including consideration of extraneous factors/barriers to implementation of a care plan
  - o Ability to evaluate a care plan and its implementation, including obtaining understanding, re-education as needed, and revision of the plan as needed

- ☐ **Availability of supporting technology.** At a minimum, a central repository and telecommunications must be in place, and ideally, diagnostic application software and integration with local EHRs or HIE. (See *Technology Tools and Optimization for CCC*.)

- ☐ **Call system** that appropriately handles patient/caregiver calls (see Workflow Changes below).

- ☐ **Policy and procedure development** and compliance practices**.** The CCC program should have a culture of using written procedures to guide work, and to ensure compliance with policies for clinical interventions, reimbursement if applicable, service productivity, and quality of service.

Readiness of Patient for Remote Patient Monitoring

For each patient there should be a physical and cognitive assessment of capabilities for using remote patient monitoring (or self-monitoring if that is the preferred choice for the CCC program to recommend). For example:

- ☐ Does the patient have the *cognitive skills* to remember or perform certain tasks without onsite coaching? Are there any language or health literacy barriers that would preclude success?

- ☐ Does the patient have *physical limitations*, such as hearing and vision needed to use the device and/or engage with the CC or follow-up nurse? Does the patient have sufficient degree of mobility to move to and use devices if necessary? Is there a caregiver that is always present to perform these services if necessary?

- ☐ Is the *home environment* conducive to implementing certain devices? Some devices are small and easily carried in a pocket, or simply remain attached to the person. However, distances between the input device and local storage device may be a limiting factor—

especially for devices using Bluetooth for data transmission between the input device and the local storage device.

Selection of Equipment

In selecting or recommending the right devices, consider the following:

☐ **Cost of acquisition**
- o If the patient must acquire the device,
  - ▪ Does the patient purchase or lease the device?
  - ▪ Is there reimbursement to the patient for the cost of the device?
- o If the CCC program acquires the device,
  - ▪ Is there a minimum number of units to acquire?
  - ▪ Will there be a leasing or purchasing program; how will this be conducted?
  - ▪ How will devices be returned, or are devices so personal they cannot be returned?

☐ **Vendor-related considerations**
- o Technology support service offered
- o Equipment obsolescence
- o Cloud based storage

☐ **Product-related considerations**
- o HL7 compliant
- o Size/weight for portability
- o Backup battery and/or operational batteries
- o Video quality, if applicable
- o Sound quality, if applicable
- o Clinical peripherals
  - ▪ FDA approved
  - ▪ Vendor flexibility
- o Security controls meet HIPAA requirements

☐ **CCC program ease of implementation**
- o Integration with EHR
- o Connectivity to HIE services used
- o Special equipment set up
- o Digital picture download if applicable

☐ **Ease of implementation in a home**
- o "Plug and play" devices that fit standard telephones, smart phones, and/or computers
- o Need for routers, modems (internal/external), hubs, and other peripheral devices
- o Number of peripheral devices (e.g., automated scale and other clinical monitoring devices as well as computer-related peripherals such as a mouse, smart phone) that can function at one time (i.e., how many serial ports required)
- o Digital picture upload, if applicable

- ☐ **CCC program ease of use**
    - o Ability to transmit, retrieve, and store data
    - o Ability to generate clinical, productivity, and usage (e.g., telephone charges) reports
    - o Call routing capability
    - o Programmability for unique patient needs
    - o Education content

- ☐ **Ease of use in a home**
    - o Easy to understand icons
    - o Accommodation for patients with limited English proficiency, low health literacy, vision or hearing issues
    - o Equipment reliability
    - o Sanitation and safety factors

Implementation

In addition to the normal installation process, system configuration, testing, training and go-live, consideration should be given as to how devices will be installed in the patient's home and how the patient/caregiver is trained on use. There should be no need for special technology training, but "tele-proofing" should be performed (once an assessment is done to support that the patient and home are suitable for remote patient monitoring) to ensure safety, such as:

- ☐ Appropriate placement of devices so that cabling distances are minimized

- ☐ Duct-taping cables to the floor if there are cables required

- ☐ Using colored tape on rearranged furniture

- ☐ Training the patient/caregiver

- ☐ Leaving easy-to-read instructions

- ☐ Clearly marking or programming device with phone number of the CCC program

- ☐ Ability to swap clinical peripheral devices as needed

- ☐ Check on telecommunication costs, especially for those who need to transmit data and communicate with the CCC program frequently

Workflow Changes

The following workflow changes should be considered:

- ☐ The equipment should support the ability for data flowing into the CCC program to be routed automatically to the correct computing devices, patient records, and even fields within an EHR. Staff should not have to spend their time filing electronic data.

- ☐ Incoming call routing, wait time management, voicemail messaging, triage, and disposition should be evaluated (for example, there are significant differences when using an automated telephone menu in comparison to a live receptionist).

- ☐ Telephone considerations and physical placement of staff in the CCC program should consider the nature of the patients and conversations. CCs may have to speak very loudly

to their patients, which is not conducive in an environment without sound-proofing in cubicles. Spending considerable time on the phone requires comfortable headsets and the need for a certain amount of exercise. Will Bluetooth headsets to smart phones be a suitable solution, or will this be more disruptive to others and potentially a privacy issue?

☐ Depending on the size of the population served, staff assignment to patients should consider that remote patient monitoring may be a 24x7 operation. If the CCC program is not 24x7 accessible, there must be a clear path for incoming calls/alerts to ultimately be responded to by a nurse. Consideration needs to be given as to whether a recorded message directs the caller to another resource or whether there is an answering service. There must be specific policies for after-hours response time. There must be remote access to data being received, if not also to the patient's full EHR. There may need to be additional resources to direct patients/caregivers to other providers and/or community resources.

☐ Workflow relating to when it is appropriate for a nurse to conduct an in-person visit and how access is provided to data and resources during the visit versus accessibility while at the agency.

☐ Documentation may also vary with use of a desktop device with telephone connection and field-ready devices. This includes not only access to data but the ability to fully document a patient encounter on a timely basis. In an office with potentially one call after the other, policy should support the ability to complete documentation prior to taking another call. It may be necessary to use white boards for quick note taking that can easily be erased for the next call.

Transitioning the Patient to and from Telehealth Services

As previously noted, CCC program services may be available only for a specified period of time for a particular patient. Not only must consideration be made as to how to introduce a patient to remote patient monitoring but how to remove dependency on the monitoring. Patient assessment should include not only the ability but willingness to accept CCC services as well as the potential for the CCC services to be fully self-managed. Care planning should be carefully thought through so the patient/caregiver knows how to problem solve on their own and who to contact for what type of service, when necessary.

For support using the toolkit

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