ADOPTtoolkit
Accelerating Diffusion of Proven Technologies

Center for Technology and Aging

Technology Review:

A Guide from the Medication Optimization Toolkit

Description

A guide for exploratory review of available patient-centered technologies to optimize medication use, including a description of targeted applications in medication reconciliation, adherence and monitoring, core technology functions, and use benefits.

Audience

For organizations that are in the early stages of designing a program to optimize medication use and want to do an exploratory review of appropriate technologies that can best meet their needs and priorities.

1 Medication Optimization Technology Applications

How are health care organizations utilizing technologies that support medication reconciliation, adherence and monitoring to improve health, improve care, and lower costs?

2 Medication Optimization Technology Functions

What core functions do medication optimization technologies perform in order to meet the needs and priorities of a health improvement program?

3 Medication Optimization Technology Benefits

What are the leading use benefits that medication optimization technologies may deliver to ensure targeted patient care outcomes?

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1 Medication Optimization Technology Applications

A number of technology-enabled interventions can mitigate sub-optimal medication use, optimize the efficiency of medication reconciliation, adherence, and monitoring processes, improve health, and reduce costs of care. Specific technologies include online medication lists, mobile health solutions, integrated remote patient monitoring systems, and personal health records are listed in Table 1. Medication reconciliation, adherence, and monitoring are further described below.

Medication Reconciliation: Involves the step of creating an accurate list of a patient's medications in accordance with his or her treatment plan. Technological solutions that can address challenges during the medication reconciliation process include personal health records and electronic medication lists and records.

Medication Adherence: Defined as patient behavior that does not conform to the prescribed regimen. A number of technologies that can aid the medication adherence process range from simple, stand-alone to considerably more complex technologies integrated into larger platforms. Standalone technologies include medication information devices, medication reminders, a medication dispenser, or a device that combines some or all of those functions. Newer standalone devices with enhanced speech and auditory features can assist visually or cognitively impaired patients with accessing recorded medication information.

Medication Monitoring: Refers to tracking the patient's response to his or her medication regimen, intervening by the clinician/case manager if necessary, and refilling and /or adjusting prescriptions. Example technologies that can enable the remote collection of biometric patient data, transmission of information between patients and providers, and remote monitoring and adjustment of a medication regimen by a health provider include point-of-care testing devices, mobile phones and other communications devices, integrated remote patient monitoring systems, and personal health records, and electronic health records.

Table 1. Summary and Examples of Technologies that Help Optimize Medication Use

Technology Type	Description	Care Enhancement
Remote Patient Monitoring Technologies	RPM appliances and platforms connect patients in their homes to health care providers. RPM systems have multiple components, including medication-related features, and help guide and activate patients in chronic disease management.	Adherence, Monitoring [Integrated RPM solution]
Smart Pillboxes	"Smart pillboxes" alert patients to take their medication, remind the patient on how to take it, and record the date and time when the pill is taken. The device may also ask the patient health-related questions. Caregivers and/or health providers may be alerted (through email, phone, or fax) if a medication is not taken or is taken incorrectly.	Adherence, Monitoring
Medication Analysis Algorithms	Algorithms analyze medication lists for potentially inappropriate medications (e.g., drug-drug interactions and duplications) and provide medication-monitoring recommendations. Algorithms are available as a standalone or they can be integrated into clinical, practice, or electronic medical record systems.	Reconciliation, Monitoring
Medication Lists	Medication lists help patients keep track of all of their medications and associated dosages. Medication list software can be embedded into a PHR or available as a standalone.	Reconciliation
Personal Health Record (PHR)	PHRs are records of health information that are maintained by an individual or his or her caregiver (typically online). PHRs may in some cases be extensions of provider-controlled electronic health records that are accessible to the patient. PHRs may include information on medications and prescriptions, hospitalizations, immunizations, chronic diseases, medical history, and lab results.	Reconciliation
Automated Medication Dispensing Machines	Fully automated medication dispenser and reminder systems help patients take their medications, vitamins, or over-the-counter drugs properly. Devices can dispense medications several times per day, typically include an alarm system, and often can alert a caregiver if the medications are not dispensed.	Adherence, Monitoring
Medication Reminders	Several medication reminder apps are available for wireless phones. They typically provide visual/audible prompts, track pill-taking, show how a pills looks, confirm that a dose was taken, and display potential side effects.	Adherence, Monitoring

2 Medication Optimization Technology Functions

Problems related to medication reconciliation, adherence, and monitoring are estimated to result in hundreds of billions of dollars in costs and thousands of deaths annually. Interventions in these three areas could significantly impact outcomes related to medication use.

Chart 1 presents the three medication optimization technology categories in relation to five steps in the medication-use process: assess, prescribe, dispense, administer, and monitor. For example, medication reconciliation problems mainly present in the assess and prescribe phases of the medication-use process, while medication adherence problems commonly occur in the dispense and administer phases.

Chart 1. The Medication-Use Process:
Process Step Goals and Example Technologies for Patients and Caregivers

Medication Reconciliation		Medication Adherence		Medication Monitoring
Assess	**Prescribe**	**Dispense**	**Administer**	**Monitor**
Goals • Patient history includes a complete and accurate medication list • Patient needs are accurately conveyed and understood	**Goals** • Medication orders are documented and shared with patients	**Goals** • Medication is made available • Medication picked up by patient • Patient and caregivers understand medication instructions	**Goals** • Individual dose dispensed • Individual dose taken by patient (on time, in the right dose, and for the right length of time)	**Goals** • Routine dosing and tracking of medication • Reports and trending information from medication log generated • Clinician adjusts medication as needed • Prescriptions refilled
Example Technologies • Medication List Software • Personal Health Records	**Example Technologies** • Medication List Software • Personal Health Records	**Example Technologies** • Teleconsultations • Online Patient Education • Cognitive Assessment Tools • Pharmacy Kiosks	**Example Technologies** • Medication Adherence Devices (integrated and standalone, simple and advanced function)	**Example Technologies** • Personal Biometric Testing Device • Wireless Communication Devices • Personal Health Records

3 Medication Optimization Technology Roles and Benefits

Many people have the potential to live long, active lives despite the presence of a chronic health condition. Sub-optimal medication use can increase the burden of illness and result in higher costs to families and society. In particular, inadequate medication reconciliation, adherence, and monitoring, are often implicated in unnecessary health care utilization in the form of emergency room visits, hospitalizations, and rehospitalizations.

A number of technology-enabled interventions can mitigate medication use problems, optimize process step efficiency, and improve health and independence, and have demonstrated the potential for decreasing health care utilization, promoting community-based care management, increasing communication between patients, clinicians, and caregivers, and improving the quality of care and patient satisfaction.

Please visit the ADOPT Toolkit website for more specific toolkit resources related to these technologies.