

Overview of Pharmacists' Role of mHealth in Medication Adherence

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**Pharmacy Health Information
Technology Collaborative**



Table of Contents

1. PURPOSE.....	3
2. OVERVIEW	3
3. DISCUSSION	8
3.1. MEDICATION ADHERENCE WORKFLOW USE CASE.....	8
3.2. THE PHARMACIST CONDUCTS AN MTM CMR RELATIONSHIP WITH THE USE CASE PATIENT	12
4. CONCLUSION.....	13
5. REFERENCES.....	14
6. APPENDIX.....	16
7. ACKNOWLEDGEMENTS.....	17



1. PURPOSE

The purpose of this document is to provide an overview of mobile health (mHealth) as it relates to the practice of pharmacy. This document will identify resources utilized in the enhancement of medication adherence and improvement of patient engagement. The document includes information about pharmacist's involvement in medication adherence within the pharmacist health IT system workflow. The mHealth information should be documented and integrated within systems used by other healthcare providers, patients, and caregivers. This document will demonstrate how pharmacists can use technology to influence patient engagement related to medication adherence.

The overview section of this paper is an environmental scan of several publications discussing mHealth. The guidance developed a use case example following the JCPP's Pharmacist Patient Care Process related to medication adherence and using mHealth. This document was developed over a period of twelve months and the authors recognize the Health IT portions related to mHealth are changing and emerging with new technology. There are a variety of applications by many publishers and for the purposes of this paper background information is limited to published studies regarding mHealth. Since technology evolves rapidly, the information provided in this document is changing due to the rapid development of mHealth technology. It is highly unlikely that published literature can keep up with emerging technology.

GOALS

- To identify mHealth resources to enhance medication adherence for pharmacists' health IT systems.
- To identify pharmacists' systems medication adherence workflow that documents and integrates with other healthcare providers, patients, and caregivers systems.
- To demonstrate how pharmacists can use technology (e.g., mobile health (mHealth) devices, teleHealth) to manage chronic diseases and influence patient engagement related to medication adherence.
- To make recommendations to the pharmacy industry as follows:
 - To provide resources to pharmacists regarding mobile and connected health.
 - For the pharmacy industry to develop training tools to assist pharmacists in adopting mHealth and connected health solutions for medication adherence.
 - The pharmacy professional associations should develop guidance to assist patients, caregivers and consumers in selecting appropriate medication adherence applications.

Appreciating fully the clinical utility of electronic health data, the pharmacy profession has positioned itself well ahead of the curve for standardized outcomes-related data collection and enhanced electronic data accessibility for delivering quality patient care services. The mission of the Pharmacy HIT Collaborative Work Group on Communication Standards is to further integrate pharmacists who provide patient care services into the national health information exchange framework.

2. OVERVIEW

BACKGROUND

Pharmacists are uniquely positioned to help connect the dots within healthcare. Pharmacists are



medication experts and have the ability to connect and exchange health insurance information, through real-time electronic prescribing and prescription processing. New technologies utilize mobile devices. Pharmacists are on the forefront and have the potential to play a key role in integrating mobile solutions to improve patient care.

“The pharmacist, after all, knows more about your drugs and prescriptions than anyone else. So a real-time mobile link with the local pharmacy could be the key to medication management and adherence — two drivers of healthcare costs and clinical outcomes that factor in today’s fractured healthcare landscape.”

Combining the pharmacist with mobile health (mHealth) solutions can help reduce healthcare costs and improve the patient experience, by allowing remote interaction with the pharmacist. This is similar to the utilization of other mobile solutions such as online banking, or product ordering online. Patient access to real time medication lists could provide a link to help both patient and pharmacist improve medication related outcomes.

Health plans and pharmacies are looking at mobile messaging as a means of helping members and consumers make the right choices. They can push medication reminders, get feedback on programs and offer health and wellness advice that can be targeted to specific consumers — the idea being that the more personal the message, the more likely it is to be understood and followed.²

DEFINITIONS: MHEALTH, TELEHEALTH, TELEMEDICINE, CONNECTED HEALTH

There are currently several reputable definitions of mHealth and Telehealth. In order to provide consistency throughout the document, here are examples:

FROM THE MHEALTH ALLIANCE

“mHealth stands for mobile-based or mobile-enhanced solutions that deliver health. The ubiquity of mobile devices in the developed or developing world presents the opportunity to improve health outcomes through the delivery of innovative medical and health services with information and communication technologies to the farthest reaches of the globe.”³

FROM HEALTHIT.GOV

“The Health Resources Services Administration defines telehealth as the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration. Technologies include video-conferencing, the Internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications.”

“Telehealth is different from telemedicine because it refers to a broader scope of remote health care services than telemedicine. While telemedicine refers specifically to remote clinical services, telehealth can refer to remote non-clinical services, such as provider training, administrative meetings, and continuing medical education, in addition to clinical services.”⁴

FROM THE AMERICAN TELEMEDICINE ASSOCIATION

“Formally defined, telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve a patient’s clinical health status. Telemedicine includes a growing variety of applications and services using two-way video, email, smart phones, wireless tools and other forms of telecommunications technology.”⁵

CONNECTED HEALTH

“Connected Health refers to electronic methods of health care delivery that allow users to deliver



and receive care outside of traditional health care settings. Examples include mobile medical applications (apps), medical device data systems, software, and wireless technology.”

“FDA’s role in connected health continues to evolve along with medical device technology. The FDA’s Center for Devices and Radiological Health (CDRH) plays an important role in enabling a connected health environment while assuring that patients stay safe and the new technologies work as intended. CDRH is currently focusing its efforts in several different areas:

- convergence of wireless technologies with medical devices (in partnership with the Federal Communications Commission (FCC))
- medical devices used in a home environment
- mobile medical apps
- medical device data systems
- software role in medical devices⁶

On August 6, 2013, the FDA issued a *Federal Register* notice [Modifications to the List of Recognized Standards, Recognition List Number: 032](#) that recognizes voluntary consensus standards to help support and strengthen the interoperability and cybersecurity of networked and connected medical devices.

MEDICARE STAR RATINGS AND MEDICATION ADHERENCE

Medication adherence is important to the pharmacy, the patient and the entire health care industry. As defined by Medicare⁷, Star ratings include an overall rating to score each health plan on the type of services it offers. Star ratings represent a way to measure and achieve patient outcomes intended with medication use. For Medicare Prescription Drug Plans, there are four main categories:

MEDICARE PRESCRIPTION DRUG PLAN CATEGORIES

- Drug plan customer service: Includes how well the plan handles member appeals.
- Member complaints and changes in the drug plan’s performance: includes how often Medicare found problems with the plan and how often members had problems with the plan: includes how much the plan’s performance has improved (if at all) over time.
- Member experience with plan’s drug services: includes ratings of member satisfaction with the plan.
- Drug safety and accuracy of drug pricing: includes how accurate the plan’s pricing information is and how often members with certain medical conditions are prescribed drugs in a way that is safer and clinically recommended for their condition.

For Medicare C, these categories are slightly different than the Star measures for medication adherence for Part D Prescription Drug Plans (PDPs):

PART C DOMAINS

- Staying healthy – prevention
- Managing Chronic Conditions
- Member experience
- Member complaints and changes in performance

Within these broad categories, there are specific areas that pharmacists can have a high impact on because of their access and ability to provide patient care. While we recognize that pharmacists can



affect multiple measures, the focus is going to be on the Star rating measures that are impacted by patient's adhering to their medications:

MED ADHERENCE MEASURES

- Part D medication adherence for oral diabetes medications (taking oral diabetes medication as directed)
- Part D medication adherence for hypertension (taking blood pressure medication as directed)
- Part D medication adherence for cholesterol (taking statins as directed)

This is a result of the United States health care system that is moving toward outcomes and rewarding quality over quantity. In a recent article in the *Journal of the American Pharmacists Association*, it was stated:

The Medicare star rating system is part of CMS's efforts to define, measure, and reward quality health care. Approximately one-half of the star rating performance measures can be influenced directly by community pharmacists working in conjunction with payers that must meet the quality measures. In fact, pharmacists can make the strongest contributions to the performance measures that are weighted most heavily for medication use, adherence, and chronic disease outcomes⁸:

Specific to medication adherence, the Pharmacy Quality Alliance (PQA) recommended that the metric *Proportion of Days Covered (PDC)* be used as the measure of adherence. This metric defines high adherence as >80% of days covered. Each performance measure indicates the percentage of patients in a plan with high adherence to the medications of interest. Medication adherence is especially important for Star ratings because it contributes to the three triple- weighted Part D measures mentioned earlier: diabetes care — blood sugar controlled, diabetes care; cholesterol controlled; and controlling blood pressure.

PATIENT ENGAGEMENT

In order for pharmacists to affect quality on a large scale, pharmacists must leverage their access to patients to engage and impact patient outcomes. mHealth and Health Information Technology (HIT) are currently underutilized by pharmacists but can greatly influence patient engagement.

There are various definitions of patient engagement with a good behavioral framework provided by The Center for Advancing Health (CAH).^{9,10}

Actions individuals must take to obtain the greatest benefit from the healthcare services available to them. This definition focuses on behaviors of people themselves rather than actions of professionals or institutional policies. The Center for Medicare and Medicaid Services (CMS) embraces patient and family engagement¹¹ as a crucial concept for improving health outcomes and quality. Patient engagement is also an integral part of the HITECH Act for establishing Meaningful Use (MU) Stage 1¹³ and Stage 2¹⁴ incentives. These incentives are building blocks for providers to constructively engage patients to:

- Support behavior change
- Enhance care transitions
- Improve patients' health outcomes

CAH's definition of patient engagement raises the question, "How can pharmacists use technology to influence patient behavior such as medication adherence?" The following provide a possible answer to the question and ways in which pharmacists can use technology to influence patient



behavior.

TEXTING (SMS) TO FACILITATE BEHAVIOR CHANGE AND IMPROVE HEALTH

A critically-timed reminder delivered by SMS (text message), such as encouragement to sustain smoking-cessation behaviors (i.e., be cognizant of when deteriorating air quality impacts asthma) or improve medication adherence, can be leveraged with a mobile device. SMS-based interventions are not limited to medication adherence; they can impact preventive health and non-pharmacologic-based behavior change as well. Certain types of SMS-mediated behavioral interventions are likely more suited to pharmacist involvement, based on the setting or patient population. A recent study on the use of individualized messages to increase the use of sunscreen, for example, highlights the utilization of a technology that may be particularly attractive to pharmacists practicing in a community or ambulatory care setting. Improving health outcomes in patients offers many benefits, including financial reward and enhanced brand image.

The content of each SMS should be tailored to the specific target population to help elicit the desired outcome; this should include preferences for length, specificity, and privacy based on patient characteristics.¹⁵

IMPROVING MEDICATION ADHERENCE VIA SMS

One of the initial areas for SMS interventions in medication adherence has been conditions where a high level of adherence is paramount to treatment success (e.g., antiretrovirals for human immunodeficiency virus [HIV] treatment). In sub-Saharan Africa, HIV-infected patients received SMS medication reminders in an effort to address the numerous barriers to antiretroviral adherence.¹⁶ A Cochrane meta-analysis of these interventional studies found that participants receiving weekly reminders were associated with a lower risk of non-adherence at 48–52 weeks (relative risk, 0.78; 95% confidence interval [CI], 0.68–0.89).

Furthermore, Quinn et al.¹⁷ published the first study using an SMS-based intervention in a domestic chronic disease population. The study evaluated the effect of mobile text messaging and patient-provider Web portals on glycosylated hemoglobin (HbA_{1c}) levels in patients with type 2 diabetes mellitus. The intervention group received automated, real-time educational and behavioral messaging in response to individually analyzed blood glucose values, diabetes medications, and lifestyle behaviors communicated by mobile phone. The investigators reported a mean decline in HbA_{1c} of 1.9% (95% CI, 1.5–2.3%) in the maximal treatment group and 0.7% (95% CI, 0.3–1.1%) in the usual care group, representing a significant mean reduction of 1.2% (95% CI, 0.6–1.8%; $p < 0.001$) in the treatment group over 12 months.

Similarly, pharmacist-conducted studies in the United States have been launched to assess the impact of SMS interventions on clinical outcomes and medication adherence in patients including those with HIV infection¹⁸ and type 2 diabetes mellitus.¹⁹ SMS interventions to improve medication adherence in other settings have also been studied in populations ranging from pediatric liver transplant recipients²⁰ to adults with asthma.²¹

THE PENNSYLVANIA PROJECT: PHARMACIST INTERVENTION IMPROVED MEDICATION ADHERENCE AND REDUCED HEALTH CARE COSTS

The Pennsylvania Project, a large-scale community pharmacy demonstration study, evaluated the impact of a pharmacy-based intervention on adherence to five chronic medication classes. The pharmacist-provided intervention group significantly improved adherence for all medication classes, from 4.8 percent for oral diabetes medications to 3.1 percent for beta-blockers. Additionally, there was a significant reduction in per patient annual health care spending for patients taking statins (\$241) and oral diabetes medications (\$341).²²

MHEALTH WITHIN MEDICATION THERAPY MANAGEMENT (MTM)



Here is an example of a pharmacist using mHealth within an MTM scenario to measure true medication adherence.

One study of patients with uncontrolled blood pressure found that pharmacist case management and home blood pressure telemonitoring resulted in increased blood pressure control during the 12-month study as well as at six months follow-up. Self-reported adherence to hypertension medications increased in the intervention group between baseline and six months.²³

CONSUMER USE OF MOBILE HEALTH FOR CARDIOVASCULAR DISEASE PREVENTION

This article discusses how mHealth tools can improve healthcare delivery when partnered with healthcare providers. Heart disease and stroke are among the leading causes of death, disability, and high healthcare costs. Unhealthy behaviors related to cardiovascular disease (CVD) contribute to negative outcomes and include smoking, sedentary lifestyle, and unhealthy eating habits.

The American Health Association (AHA) added cardiovascular health as a focus area and targeted four health behaviors in their 2020 Strategic Impact Goals. The goals include reduction in weight and smoking, promoting physical activity, and healthful eating.

The studies reviewed in this work targeted these four health behaviors, as well as cardiovascular indicators, including blood glucose, lipids, blood pressure, and body mass index (BMI) as primary indicators in clinical trials, which also utilized mHealth interventions. There were a total of 69 studies evaluated that occurred between 2004-2014 and investigated the utilization of mobile health to reduce cardiovascular disease risk behaviors, weight loss, enhancing physical activity, smoking cessation, blood glucose management, hypertension management, and lipid management.

Evaluation of the studies reveal, in general, positive outcomes associated with the use of mobile health interventions to enhance weight loss, increase physical activity, decrease smoking, and decrease hemoglobin HbA1c. The evaluation thoughtfully points out that studies in certain areas of mobile health are still in the infancy stage and more work is necessary. This statement paper also outlines concerns about the design and evaluation of studies involving mobile technologies. It discusses the paucity of published empirical evaluation of the multitude of mobile products that exist and offers suggestions and recommendations for future research for consideration.²⁴

In summary, there are several articles related to mHealth and numerous notable examples of mHealth applications for medication adherence. Additionally, there are resources available for pharmacists to research the ratings of these applications.

3. DISCUSSION

Section 3.1 is meant to demonstrate a use case example following the Joint Commission of Pharmacy Practitioners' (JCPP) Pharmacist Patient Care Process related to medication adherence and using mHealth. Section 3.2 is a detailed Comprehensive Medication Review (CMR) document outlining the use case identified in section 3.1.

3.1. MEDICATION ADHERENCE WORKFLOW USE CASE

SW is a 67-year-old African-American male who is clinically obese and has recently been diagnosed with type 2 diabetes nine months ago. He stopped by the outpatient community pharmacy to discuss how to use his blood glucose meter because his recently "broke". SW stated that he is not averse to new technologies. Once he was diagnosed, he started documenting his health values on an online platform but has not been as diligent recently. After looking at his profile in the pharmacy,



the pharmacist notices he has not picked up his medication for diabetes in about six weeks. After a discussion with his pharmacist, SW stated he gets so busy with travelling to see his grandchildren that he often forgets when to refill his medication. He has a smart phone.

Collect

- Medication history from the pharmacy and the patient
- Adherence
- Review of symptoms
- Social history (exercise, diet, smoking, alcohol consumption)
- Lab data (A1C, Blood Glucose)
- Vital signs
- Immunization history (for diabetic)
- Physical assessment (foot pain, open sores, obesity)
- Lifestyle habits, preferences beliefs, functioning socioeconomic factors
- Insurance coverage

Assess

- Based on collection prior to visit and patient interview, the patient is non-adherent and is willing to use new technology with his smartphone.
- Based on laboratory data with a high A1C, determines patient's diabetes is uncontrolled.
- Not currently monitoring blood glucose readings because glucose meter (broken, unknown device).
- Patient is obese and does not currently exercise; diet has room for improvement.
- Patient not on optimal statin for atherosclerotic cardio vascular disease (ASCVD) prevention and current statin has drug interaction.
- Patient using diphenhydramine for sleep which is not recommended for patients older than 65.
- Needs immunizations, pneumococcal, influenza and shingles vaccines.

Plan

- Goals of therapy: Diabetes adherence > 80%, A1C at goal of < 7, optimal ASCVD risk therapy, exercise five days per week for 15 minutes, weight loss of 5 lbs. in two months.
- Provide and instruct on glucose meter covered by prescription plan that links with phone application (app).
- Use technology/mobile device mHealth to report blood sugar.
- SMS texting for adherence.
- Educate patient with each visit and follow active engagement; could also have education assessment on mHealth, including if patient understands and has the connectivity availability.



- Plan for a complete medication review.
- Contact prescriber for statin to switch to atorvastatin.

Implement

- Educate patient on importance of adherence; educate on SMS texting reminders.
- Demonstrate and assure knowledge of blood glucose meter.
- Evaluate the option to download a mobile application for blood sugar monitoring and instruct patient how to use and transmit information to pharmacy.
- Wearable technology for weight loss.
- Recommend technology to help manage exercise and diet.
- Provide needed immunizations.

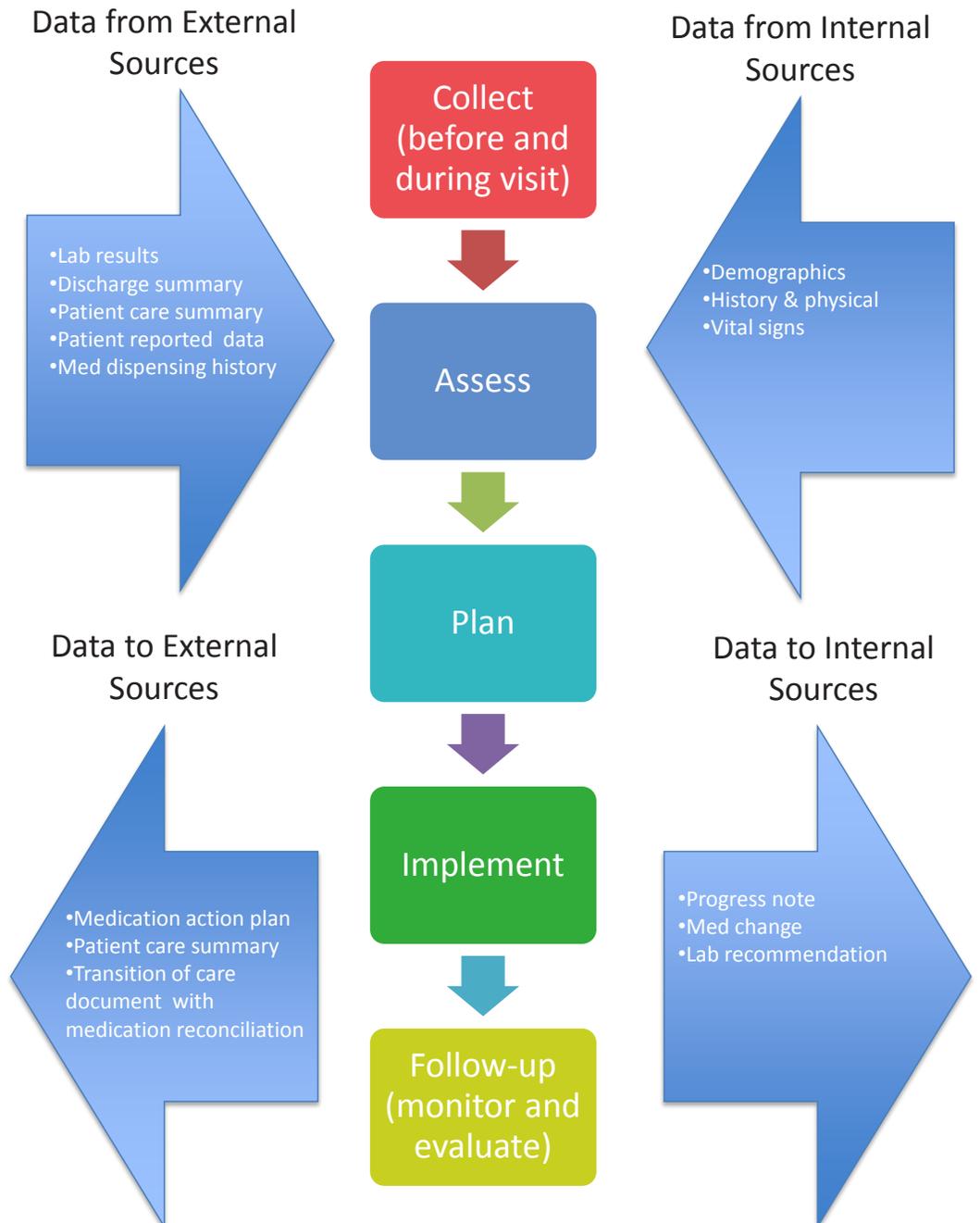
Follow-up: Monitor and Evaluate

- Follow-up in one month for comprehensive medication management (CMM) and further evaluation of sleep therapy, vitamin D therapy, and eye drop administration technique in particular; establish goals of therapy for other conditions.
- Follow up on blood glucose readings weekly via text.
- Measure adherence next visit.
- Measure A1C in two months.
- Non-adherent alerts possibly using patient's children.
- Repeat collect/assess.
- Monitor and evaluate communications from mHealth apps/wearable technology.
- Communicate with provider.



Pharmacists' Clinical Documentation Data Flow

Ambulatory Clinic Setting



25



3.2. THE PHARMACIST CONDUCTS AN MTM CMR RELATIONSHIP WITH THE USE CASE PATIENT

Medication List

- Sitagliptin/Metformin tablets 50/1000 mg twice a day- DM Type 2- last filled six weeks ago (quantity 60)
- Amlodipine/Benazepril 10/40 mg every day- hypertension- last filled three weeks ago (quantity 30)
- Simvastatin 40mg at bedtime- dyslipidemia- last filled four weeks ago (quantity 30)
- Sertraline 50 mg at bedtime- for depression- last filled two weeks ago (quantity 30)
- Combigan (brimonidine tartrate/timolol maleate ophthalmic solution) one drop in each eye twice daily – last filled four weeks ago (quantity 10 ml)
- Vitamin D 50,000U one capsule once weekly- last filled two weeks ago (quantity four)
- Tylenol PM (acetaminophen and diphenhydramine) one at night as needed- insomnia-over-the-counter (OTC)
- Multivitamin one daily- OTC
- Glucose meter (broken, unknown device)

Problem List

- Diabetes Mellitus: type 2
- Depression
- Hypertension
- Dyslipidemia
- Insomnia
- Glaucoma

Allergies and Adverse Reactions

- No known allergies
- No adverse reactions

Drug Therapy Problems

- Diabetes: Non-Adherence – Patient is two weeks late picking up medication for diabetes, not exercising, not optimal diet and not checking blood glucose readings.



- Drug interaction not optimal. Statin based on evidence-based guidelines, patient should not be on a dose of simvastatin greater than 20mg or on a different statin while on amlodipine).
- Inappropriate drug therapy for 67-year-old (Tylenol PM) – anticholinergic: diphenhydramine.

Medication Action Plan

- Follow-up in one month for comprehensive medication management (CMM) and further evaluation of sleep therapy, vitamin D therapy, and eye drop administration technique in particular and establish goals of therapy for other conditions.
- Use SMS texting for adherence.
- Follow up on blood glucose readings weekly via text.
- Measure adherence next visit.
- Measure A1C in two months.
- Schedule visit for immunizations in two weeks.

Comprehensive Patient Plan

- Transmit blood glucose readings.
- Wearable technology for weight loss.
- Eye drop administration technique.
- Follow up appointments. Patient is eligible for pneumonia, influenza and shingles vaccines and CMM.

4. CONCLUSION

The purpose of this paper is to prepare pharmacists for mHealth related to medication adherence within the pharmacist health IT system workflow. The workflow should be documented and integrated within systems used by other health care providers, patients, and caregivers. This guidance document will demonstrate how pharmacists can use technology to influence patient engagement related to medication adherence.

This paper provides resources to pharmacists regarding connected health, including the use of mobile health technology (mHealth). As a result of this guidance workflow, it is suggested that the pharmaceutical industry develop training tools to assist pharmacists in the awareness and utilization of mHealth and connected health solutions for medication adherence. In addition, the pharmacy professional associations should develop guidance to assist patients, caregivers, and consumers in selecting appropriate medication adherence applications.

The overview section of this paper is an environmental scan of several publications discussing mHealth. The guidance developed a use case example following the JCPP's Pharmacist Patient Care Process related to medication adherence and using mHealth. In addition, a detailed CMR was included to outline the use case.

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a period of twelve months, and the authors recognize the health IT portions related to mHealth are changing and emerging with new technology. There are a variety of applications by many publishers, and for the purposes of this paper, background information is limited to published studies regarding mHealth. Because technology evolves rapidly, the information provided in this document is changing due to the rapid development of mHealth technology. It is highly unlikely that published literature can keep up with emerging technology.

A noted gap in mobile health is capturing a patient's data as the patient is using mobile applications or devices (e.g., weight management, high blood pressure). It is important to assure system vendors use standards that will help pharmacists capture information from mobile devices and integrate that information into an electronic health record that is usable for the pharmacist. It is vitally important that the collection of patient reported data from mobile applications is in a form that is usable for the pharmacist to make medication-related clinical recommendations and enhance medication adherence.

For some pharmacists, capturing the medication-related data reported by patients can affect accreditation of organizations that they participate in (e.g., American Diabetes Association, National Committee for Quality Assurance and others).

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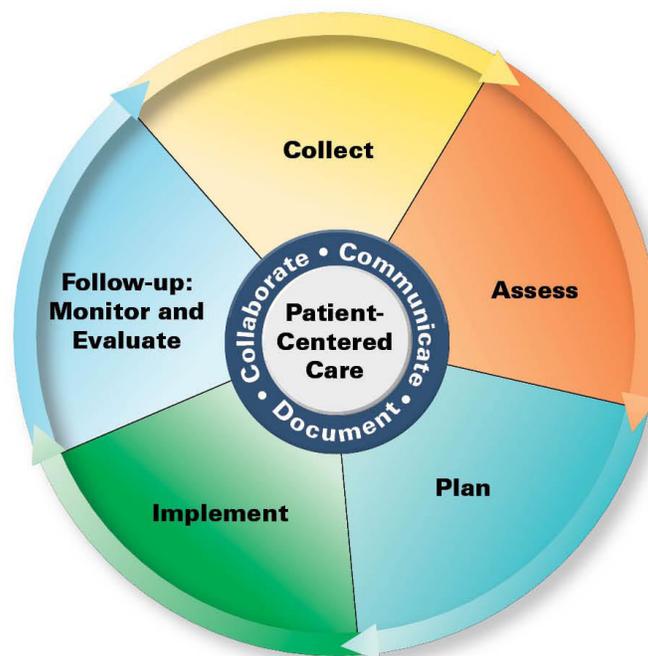
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Pharmacists' Patient Care Process



Pharmacists' Patient Care Process

Pharmacists use a patient-centered approach in collaboration with other providers on the health care team to optimize patient health and medication outcomes.

Using principles of evidence-based practice, pharmacists:

Collect

The pharmacist assures the collection of the necessary subjective and objective information about the patient in order to understand the relevant medical/medication history and clinical status of the patient.

Assess

The pharmacist assesses the information collected and analyzes the clinical effects of the patient's therapy in the context of the patient's overall health goals in order to identify and prioritize problems and achieve optimal care.

Plan

The pharmacist develops an individualized patient-centered care plan, in collaboration with other health care professionals and the patient or caregiver that is evidence-based and cost-effective.

Implement

The pharmacist implements the care plan in collaboration with other health care professionals and the patient or caregiver.

Follow-up: Monitor and Evaluate

The pharmacist monitors and evaluates the effectiveness of the care plan and modifies the plan in collaboration with other health care professionals and the patient or caregiver as needed.

6. APPENDIX

Diagram of a Standardized Pharmacist Patient-Centered Collaborative Care Process

The figure depicts a proposed standardized pharmacist patient-centered collaborative care process



6. ACKNOWLEDGEMENTS

The following representatives of the Pharmacy HIT Collaborative Work Group, which is devoted to Communication Standards, developed this document, "Guidance Document: The Use of Health IT in Documenting Medication Adherence within the Pharmacist Workflow":

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