

Mobile Applications and Other Patient-Centered Technologies for Use by Pharmacists to Advance Team-based Care

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Disclosures

Dr. Nathaniel Rickles has no actual or potential conflict of interest associated with this presentation.

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Learning Objectives

- 1) Identify different areas of patient care that mobile applications and other technologies might have an impact on clinical care.
- 2) List the ideal patient, provider, and site characteristics that can help decide which technologies are most likely adopted.
- 3) Describe examples of apps used by pharmacists in patient care environments.
- 4) Discuss the evidence supporting the use of different apps and technologies to support pharmacist care of patients.

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Use of Mobile Applications & Other Portable Technologies

Learning Objective 1: Identify different areas of patient care that mobile applications and other technologies might have an impact on clinical care.

- Drug Information- Clinician, patient, caregiver
- Clinical monitoring- Clinician, patient, and caregiver
- Patient Behavior Change
- Clinician Behavior Change
- Data management
- Patient social support/networking and other resources
- Professional Meeting & CE management
- Others?

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Reference

- Medical journals
- **New England Journal of Medicine, The Lancet and BMJ**
- Literature search portals
- **PubMed/MEDLINE**
- Drug reference guides
- **Lexicomp and UpToDate**
- Other Examples: **Epocrates, Skyscape Rx™, RxDrugs/Omnio, Micromedex, FDA Drugs and DrugDoses.net**

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Information and Time Management / Communication

- Writing notes
- Recording audio
- Taking photographs
- Organizing information
- Accessing cloud drives
- Scheduling appointments
- Examples: **Dropbox, Google Drive**
- Health Record Maintenance
- Examples: **Epic, PatientKeeper**
- Voice/Video calling
- Texting/E-mailing
- Social networking

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Patient Use of Information Technologies: Opportunities



amazon alexa MedicineNet

Google Scholar MedlinePlus[®]
Trusted Health Information for You

WebMD[®] healthline

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Patient Use of Information Technologies: Challenges

JOURNAL OF MEDICAL INTERNET RESEARCH Bickmore et al

Original Paper

Patient and Consumer Safety Using Conversational Assistants for Medical Information: Observational Study

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Pause & Ponder

At your table and/or with the person next to you, please exchange with one another (5-10 min):

- (1) Who uses mobile apps and other portable technologies regularly for personal use?
- (2) What types of technologies do you use for personal use and why?
- (3) Who uses mobile apps and other portable technologies regularly for work?
- (4) What types of technologies do you use for work and why?
- If you said no to 1 and 3, please indicate reasons for resistance and explore what would help you use them for the personal or work purposes.



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Assessment of Learning Objective 1

Epocrates and Skyscape Rx[™] are examples of:

- A. Patient disease state monitoring mobile applications
- B. Clinician disease state monitoring mobile applications
- C. Clinician drug information tools
- D. Patient drug information tools
- E. None of the above as I wasn't paying attention

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Patient Characteristics Affecting Technology Adoption

Learning Objective 2: List the ideal patient, provider, and site characteristics that can help decide which technologies are most likely adopted.

- Attitude toward adoption: perceived vulnerability/severity, other beliefs
- Smartphone ownership
- Patient-friendly interface
- Wi-fi availability
- Cost
- Physical dexterity
- Age
- Languages
- Literacy Level
- Convenience/Disruptive
- Support of Use

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Clinician Characteristics Affecting Technology Adoption

- Clinician attitude toward technology
- Peer network and use of tools
- Organizational culture and expectations
- App reliability, accuracy and privacy
- Wi-fi availability
- Age
- Cost
- Physical dexterity
- Convenience/Disruptive
- Others?

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Practice Site Characteristics Affecting Technology Adoption

- Internet connection
- HIPAA and HITECH compliance
- Protocols and policies on technology use
- Financial resources
- Integration with Electronic Medical Record
- Others?

Assessment of Learning Objective 2

- The following factors affecting the adoption of mobile applications are similar for patients and clinicians EXCEPT:
 - A. Age
 - B. WiFi Availability
 - C. Cost
 - D. Literacy level
 - E. Attitudes toward adoption

Pharmacist Use of Mobile Technologies:

Learning Objective 3: Describe examples of apps used by pharmacists in patient care environments.

- Many apps available
- Need to try them out before recommendation (great student project) and confirm accuracy and if any costs
- Check to see if app is available for iPhone and/or Android before making recommendation

Highly Rated Medication Apps

Table 1. Top five highest-rated free medication apps

Mobile application	Pertinent features	Rating (1-5)
Eprescribes	<ul style="list-style-type: none"> Reviews drug prescribing and safety information for brand, generic, and OTC drugs Checks for drug-drug interactions Reviews health care insurance formularies for drug coverage information Includes calculations such as body mass index Identifies medications by imprint or physical characteristics 	Android (4.3) Rating not for iOS
Pharmacy Pill ID & Drug Info	<ul style="list-style-type: none"> Identifies a tablet or capsule by color, shape, and imprint Provides details such as the medication's complete profile 	Android (4.1) iOS (4.5)
Monthly Prescribing Reference	<ul style="list-style-type: none"> Contains drug information and drug interaction checker Includes go-to-date, concise prescription and OTC message Provides daily drug lists and alerts Offers personalized bookmarks list for frequently accessed content Offers more than 100 clinical tools, including calculators 	Android (4.2) iOS (3.9)
Pharmacy Lab Values	<ul style="list-style-type: none"> Provides more than 150 lab values Does not require Internet to function properly Divides labs into categories 	Android (4.1) App not for iOS
Pharmacist's Letter	<ul style="list-style-type: none"> Gives concise recommendations for patient care Includes subscription option for CE in-the-Letter 	Android (4.3) iOS (3.8)
Pocket Pharmacist	<ul style="list-style-type: none"> Contains complete drug profile Checks drug interactions, precautions, and adverse effects between two or more drugs Provides online resources for medications 	iOS (4.5) not for Android
SHOTS Immunizations	<ul style="list-style-type: none"> Provides CDC vaccine schedule and brochures Includes graphics, images, and commentary for vaccines by Society of Teachers of Family Medicine Contains important go-to-date information for each vaccine, including brand, high-risk indications, adverse reactions, contraindications, catch-up administration, epidemiology, brand names, and address 	Android (4.8) rating for iOS

Examples of Apps Used by Pharmacists – Diabetes

Fooducate	My Net Diary Calorie Counter PRO	MySugr	BG Monitor Diabetes
Search foods to see calorie and sugar content	Calorie counter with ability to track A1C, blood pressure, glucose levels and carb counts	Syncs with glucose monitors and allows sharing with providers	Log for blood glucose, insulin and carb intake, automatically calculating insulin

Examples of Apps Used by Pharmacists – Diabetes

Health2Sync	BeatO	Diabetes Connect	Diabetes:M
Diabetes log with sharing and communication features	Connects to BeatO glucometer and identifies trends	Tracks weight, blood glucose, meals, insulin and medications	Features include test time reminder, nutrition log, fitness app sync, glucose trends

Examples of Apps Used by Pharmacists – Diabetes

Beat Diabetes	Diabetic Diet	Sugar Sense Diabetes App	OneTouch Reveal
			
Beginner-friendly app for newly diagnosed	Resources for healthy eating and weight loss	Easy to use tracker for blood glucose, weight, insulin, carbs and exercise	Syncs with OneTouch Verio Flex meters to identify trends

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Examples of Apps Used by Pharmacists – Heart Disease

Instant Heart Rate	PulsePoint Respond	Blood Pressure Monitor	Smart Blood Pressure
			
Heart rate monitor backed by researchers and cardiologists	Connects patient with CPR-trained individuals during a cardiac emergency	Tracks vital signs and medications to identify trends	Log of blood pressure, heart rate and weight

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Examples of Apps Used by Pharmacists – Heart Disease

iBP Blood Pressure	Cardio	CardioVisual
		
Stores blood pressure and blood glucose taking into account stress levels	Fitness app that reads heart rate using finger sensors and the cameras	Health information resources for various heart conditions

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Examples of Apps Used by Pharmacists – Adherence

AsthmaCare	Asthmahero	EpApp
		
Medication reminders and asthma treatment plan	Medication reminders and adherence graphics	Medication reminders for epilepsy, seizure diary and seizure statistics

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Assessment of Learning Objective 3

- Which of the following is an example of a diabetes mobile application that tracks blood sugar, diet, weight, exercise, and medication use?
 - Sugar Sense
 - Diabetes Connect
 - Pulse Point Respond
 - EpApp
 - One Touch Reveal

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Examples of App Use in Rickles et al. Pharmacy Project

Learning Objective 4: Discuss the evidence supporting the use of different apps and technologies to support pharmacist care of patients.

Walgreens

- Pilot/feasibility study
- Intervention - Community Pharmacy Exercise and Health Promotion Program
- 3-month randomized, controlled, multisite prospective study
- Study Aims
 - To measure the impact of CPEHPP among older adults on educational, behavioral, and self-efficacy outcomes.
 - To evaluate the feasibility and acceptability of CPEHPP among older adults.

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Examples of App Use in Rickles et al. Pharmacy Project

Study Design

All participants will have in person meeting with pharmacist
 Received activity tracker
 Discuss importance of exercise, exercise monitoring, setting goals, medication adherence
 Calendar to log steps every day; End of every month upload activity tracker data
 CPEHPP participants
 30 minute in-person visit
 Discuss exercise goals, barriers, motivators to exercise, exercise preferences & medication adherence
 Weekly phone calls for 1st month, biweekly 2nd and 3rd

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Examples of App Use in Rickles et al. Pharmacy Project

Walgreens Premium Activity Tracker

- Striiv 24/7 activity tracker
- Touch-screen
- Distance tracker
- Calorie tracker
- Counts active minutes
- Water resistant
- Smartphone App
- Sleep tracking
- Call and text message alerts



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Rickles et al. Pharmacy Project: Eligibility Criteria

Requirements for Inclusion

- 65-85 years of age
- Lack frequent exercise
- Take Medication(s) for: Hypertension, Diabetes, Cholesterol
- Fills prescription at Walgreens
- Physically capable of activity (Heart conditions)
- Mobility
- Read and understand English
- No significant memory loss

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Rickles et al. Pharmacy Project: Recruitment

Recruitment Approaches

- Flyer-based recruitment
- Profile-based recruitment : Pharmacist uses adherence call outreach and Medication Therapy Management lists
- Telephone contact with patient to confirm eligibility
- Enter information into Excel data sheet
 - Name, Address, Phone, Email, Medications, Race/Ethnicity, Weight
- Package sent in mail
 - Cover Letter, two copies of consent form, PAR-Q, baseline survey, pedometer

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Rickles et al. Pharmacy Project: Results

- Patients whose health limited them from completing activities had a lower activity level at baseline (<0.001)
- Patients with higher levels of activity had more positive attitudes toward exercise and health at baseline (0.049)
- Patients with a higher perception of their ability to exercise had more positive attitudes about exercise and health at baseline (0.012)
- Those with higher educational backgrounds rated their health status lower at baseline (0.008) and final (0.005)
 Patients with higher activity levels had higher perceptions of their ability to exercise at baseline (0.006) and at the end of the program (0.019)

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Rickles et al. Pharmacy Project: Health Status (SF-36, Mental Health)

- Changes in mean scores were not statistically significant
- Using median scores, patients reported feeling more full of pep and having more energy

How much of the time during the past 4 weeks:	Mean (SD) Baseline Median (n=26)	Mean (SD) Final Median (n=17)
did you feel full of pep?	3.15 (1.617) 3.00	3.41 (1.417) 4.00
have you been a very nervous person?	2.31 (1.490) 2.00	2.18(1.015) 2.00
have you felt down in the dumps that nothing could cheer you up?	1.88 (1.275) 1.00	2.35 (1.539) 2.00
did you have a lot of energy?	3.31 (1.436) 3.00	3.53 (1.231) 4.00
have you felt downhearted and blue?	2.69 (1.379) 2.00	2.35 (1.498) 2.00
did you feel worn out?	2.92 (1.324) 3.00	2.76 (1.200) 3.00
have you been a happy person?	4.08 (1.412) 5.00	4.06 (1.088) 4.00
did you feel tired?	3.31 (1.320) 3.00	3.29 (1.105) 3.00

1= None of the time, 2= a little of the time, 3= some of the time, 4= a good bit of the time, 5= most of the time, 6= all of the time

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Rickles et al. Pharmacy Project: Step Data

- Trends for control and intervention group: an increase in steps after each month of the program
- In each month, the intervention group took more steps
- Changes are not statistically significant

Step Data	Mean (SD) Intervention (n=9)	Mean (SD) Control (n=9)	Mean (SD) Total (n=18)
Month 1 Steps	3867.21 (2230.532)	3262.26 (2755.088)	3564.73 (2451.567)
Month 2 Steps	4991.44 (4072.086)	4240.28 (5164.105)	4615.86 (4527.939)
Month 3 Steps	4144.11 (2374.698)	2214.03 (1836.456)	3372.08 (2320.516)

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Rickles et al. Pharmacy Project: Program Satisfaction

- Overall participants had positive opinions about the program
- Several participants at various sites continue to track steps after program completion (~8-9 patients)
- Patients feel accountable and give them goals

How strongly do you agree or disagree that:	Mean (SD) the #
The pharmacists were helpful in helping you identify specific activity goals that you had	3.2500 (1.87072)
The pharmacist provided ongoing encouragement and feedback about your participation in exercise	3.0000 (1.78885)
You found the activity tracker device simple and useful	3.9444 (1.66176)
Meeting the pharmacist face-to-face to discuss exercise and health promotion was helpful	3.0625 (1.91377)
The monthly phone calls helped in motivating you to engage in more exercise	3.0000 (1.77281)
Reviewing the results of the activity tracker with the pharmacist enabled you to see the progress you made towards greater exercise	3.3889 (1.75361)
As a result of this program, you can now see better benefits of exercise and how it can improve your health	3.6111 (1.85151)
As a result of this program, you feel more confident being able to take medication more consistently	3.5294 (1.87475)

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Examples of Apps Used by Pharmacists – Lark



Monitoring parameters for:

- Hypertension
- Diabetes
- Diabetes Prevention
- Wellness
- Behavioral Health

Latest Study Shows Lark for Hypertension Drives Significant Reduction in Blood Pressure, Risk of Stroke after Just 6 Months

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ProHealth Physicians Lark Trial

- Lark trial started in April 2019.
- Use of Lark Smartphone App that provides daily guidance to make positive choices that influence health such as food, activity, sleep, and medication use. App connects with the device to provide personalized insights.
- Patients receive a device suited for their health- a Bluetooth scale, blood pressure cuff or glucose meter.
- Geek squad® support is available to help patients set up and use the device.
- Virtual Care Center- a care coach with diabetes expertise provides telephone-based education and motivation support and provides access to a pharmacist, physician, and other specialists as needed.
- Summary of data from device, care coach sessions and other supports are provided at the time of the patients office visits with prescribers.

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Literature Supporting Evidence for Apps: Clinician Perspectives

- Quicker and less error prone clinical decision-making
- Patient ownership and motivation
- More thorough documentation
- Increased productivity
- Improved outcomes
- Further research is needed to validate the benefits of these technologies in order to better implement their use in pharmacy practice.
- Safety, reliability and accuracy

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Pause & Ponder: Your Perspectives

- Among those near you, please explore your own and others thoughts regarding the following:

What features would you most want from an app or technology and Why?

When would you think of using the app or technology and why?

How would you integrate the app or technologies into your workflow or practice?

What are the facilitators and barriers to integrating these devices/tools into your pharmacy practice?



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Literature Supporting Evidence for Apps: Patient Perspectives

- Conducted systematic review of the literature using multiple databases including Scopus, Cochrane Library, ProQuest, and Medline. Review examined manuscripts published from 2000 to 2017.
- 7 studies confirmed that the mobile app increased treatment adherence. In 5 of these, there were significant changes in adherence from baseline to the end of the trial. Patients reported adherence improvements of 7-40%.
- Users also reported the apps were easy to use and useful for managing their medication. Individuals reported high satisfaction with the apps with average scores of 8.1 out of 10.

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Literature Supporting Evidence for Apps: Patient Perspectives

- Researchers have found several features appreciated most by patients include:
 - App performance
 - Simple interfaces preferred
 - Practicality
 - Use of helpful reminders and notifications
 - Monitoring health information
 - Versatility of the medication information input and display
 - Usefulness in supporting healthcare visits
 - Flexible management of alarms that warn about taking Medication and education about the type, use of, and precautions about the medication they use

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Literature Supporting Evidence for Apps: Other Perspectives

- Researchers identified several concerns when reviewing 420 free apps: 250 apps utilized a single method of adherence support (reminder, behavioral, educational), 149 apps used two methods, and 22 apps utilized all three methods.
- Most apps were developed without a health care professional's involvement in app development and lack an evidence base of effectiveness.
- Future research should involve robust clinical trials comparing the effectiveness of different apps across a diverse group of conditions.

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Developing Apps Using Virtual Agents- NEU/UConn Collaboration



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Assessment of Learning Objective 4

- Based on the literature evidence presented, which of the following is a CORRECT statement about mobile applications and related technologies:
 - Patients report satisfaction with most of the existing apps.
 - Clinicians and patients are reporting better treatment outcomes.
 - There is need for more trials showing effectiveness of apps.
 - Ease of use is an important feature for patient use of mobile apps.
 - All of the above are CORRECT.

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Questions?



Please contact Nate Rickles with any questions or interests in research collaboration on any of the topics presented especially related to use of technologies to improve the patient experience and maximizing medication adherence.

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