AGENCY FOR HEALTHCARE RESEARCH AND QUALITY

AHRQ

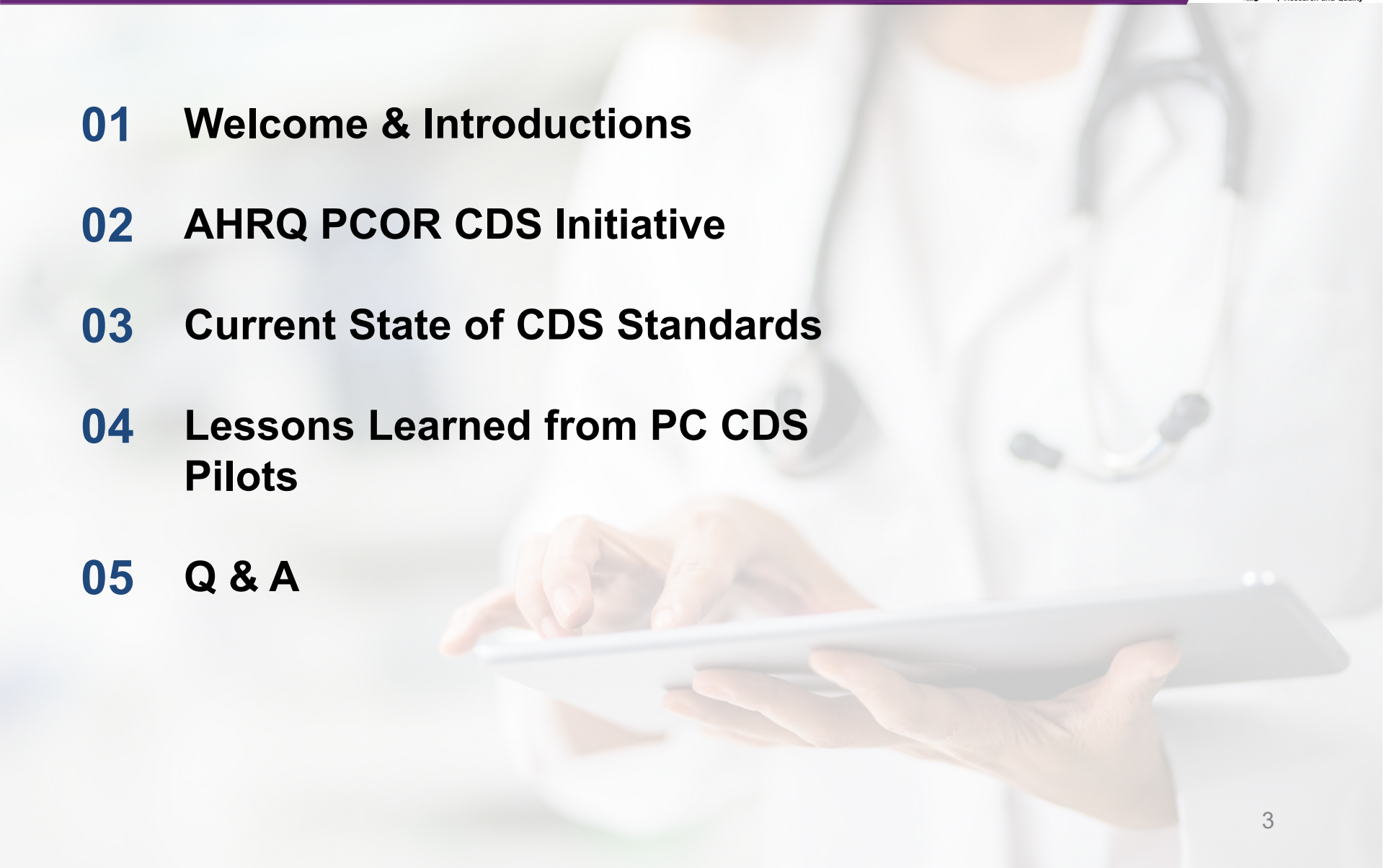
Lessons Learned from Real-World Applications of Patient-Centered Clinical Decision Support

Wednesday, June 1, 2022

Disclosure

We have no financial or non-financial interests or other relationships with ineligible companies.

Agenda



01 Welcome & Introductions

02 AHRQ PCOR CDS Initiative

03 Current State of CDS Standards

04 Lessons Learned from PC CDS Pilots

05 Q & A

WELCOME & INTRODUCTIONS

Dean Sittig, PhD, FACMI (UT Health Science Center)

Webinar Presenters

James Swiger, MBE

- Health Scientist Administrator, Agency for Healthcare Research and Quality (AHRQ)

Aziz Boxwala, MD, PhD, FACMI

- President, Elimu Informatics
- Adjunct Assistant Professor of Clinical Research and Leadership, George Washington University School of Medicine & Health Sciences

Nitu Kashyap, MD, FAMIA

- Associate Chief Medical Information Officer, Yale New Haven Health
- Assistant Clinical Professor, Internal Medicine, Yale School of Medicine

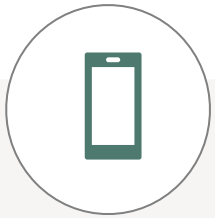
David Lobach, MD, PhD, MS, FACMI

- Vice President of Health Informatics Research, Elimu Informatics
- Associate Consulting Professor, Duke University School of Medicine

Learning Objectives

Understand the current state of standards for the collection and use of PGHD for CDS.

Learn how patient-centered CDS can be used to support healthcare delivery by efficiently monitoring patients remotely, collecting PGHD, and reducing clinician burden.



Learn the challenges encountered in the real-world integration of patient-centered CDS tools in an EHR system and gather actionable strategies to mitigate these challenges.

Patient-Centered Clinical Decision Support

Patient-centered clinical decision support: CDS that supports care for individual patients (or specific patient populations) using one or more of the following patient-centered factors:

Knowledge

Evidence-based research findings (CER and PCOR)

Data

Patient-generated health data, patient-reported outcomes and preferences, patient-specific data (i.e., labs, medications); and/or SDOH data that affect individual patient health

Delivery

Directly engages patients or caregivers (patient-facing) via apps or patient portals in different settings (e.g., at home, community, or doctor's office)

Use

Patient and/or caregiver involvement in understanding and applying the decision support provided

Source: Patient-Centered and Patient-facing Clinical Decision Support | Patient-Centered CDS Learning Network (pccds-ln.org)

Characteristics of PC CDS

Patient centric – patient preferences are taken into consideration

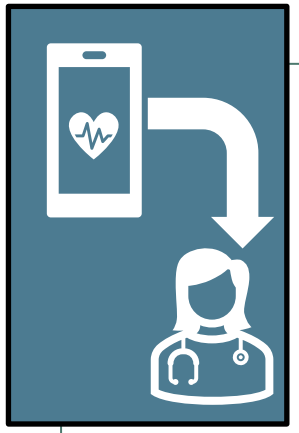
Patient facing – information or recommendations sent directly to patients

Personalized to patient's context and history – takes previous conditions, decisions, actions, preferences into consideration

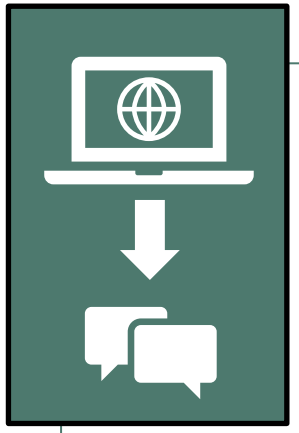
Accommodates patient workflow/lifestyle – information sent to patients where, when and how they want it

Between visit care – the vast majority of healthcare occurs outside of visits to the healthcare system

Examples of PC CDS



An app that gathers patient BP, transmits it to providers, and highlights abnormal values (as determined by patient's care plan) for provider and patient; Delivers care plan-recommended patient actions for abnormal values.



An EHR-integrated shared decision-making tool for Prostate Specific Antigen (PSA) screening used by a 50-year-old man and his physician.

AHRQ PCOR PC CDS INITIATIVE

James Swiger, MBE (AHRQ)

AHRQ PCOR CDS Initiative

- AHRQ's Mission:
  - To produce evidence to make health care safer, higher quality, more accessible, equitable, and affordable, and to work within HHS and with other partners to make sure that the evidence is understood and used.

- Division of Digital Healthcare Research's (DDHR) Mission:
  - DDHR's mission is to determine how the various components of the ever-evolving digital healthcare ecosystem can best come together to positively affect healthcare delivery and create value for patients and their families.

AHRQ Clinical Decision Support in Legislation

- 2016 initiative based on patient-centered outcomes research and ACA legislative requirements (Sec 6301)
  - (b) INCORPORATION OF RESEARCH FINDINGS.—The Office [AHRQ/OCKT], in consultation with relevant medical and clinical associations, shall assist users of health information technology focused on **clinical decision support** *to promote the timely incorporation of research findings* disseminated under subsection (a) into clinical practices and to promote the ease of use of such incorporation.
  - (c) FEEDBACK - The Office shall establish a *process to receive feedback* from physicians, health care providers, patients, and vendors of health information technology focused on clinical decision support, appropriate professional associations, and Federal and private health plans about the value of the information disseminated and the assistance provided under this section.

- Re-authorized in 2019 for 10 years

AHRQ's PCOR CDS Initiative (2016-present)

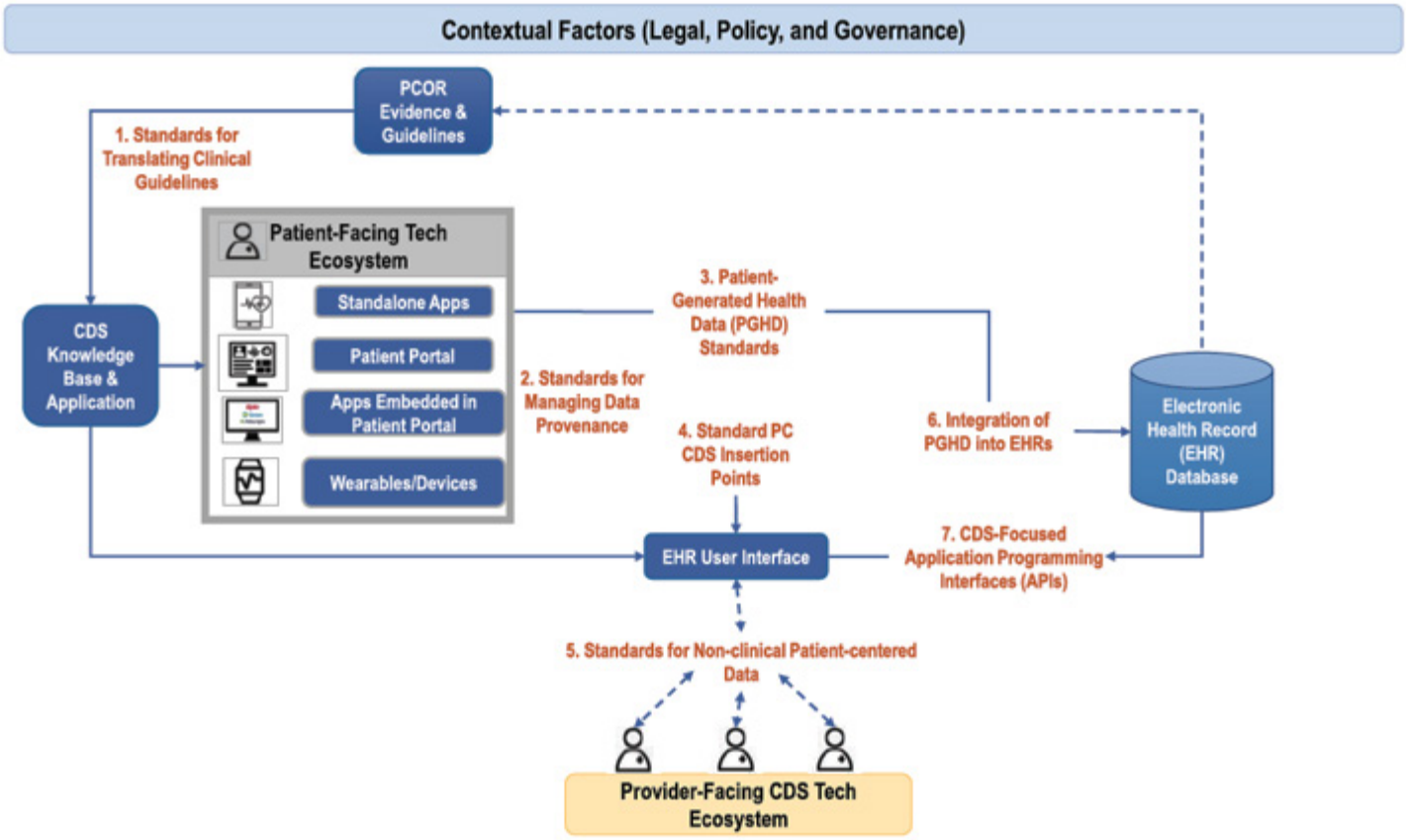
- AHRQ transformed that legislative mandate into an overarching initiative represented by the 4 pillars below with two basic goals: (1) to advance evidence into practice through CDS and (2) to make CDS more shareable, standards-based, and publicly-available.
- More information: cds.ahrq.gov

PC CDS STANDARDS

Aziz Boxwala, MD, PhD, FACMI (Elimu Informatics)

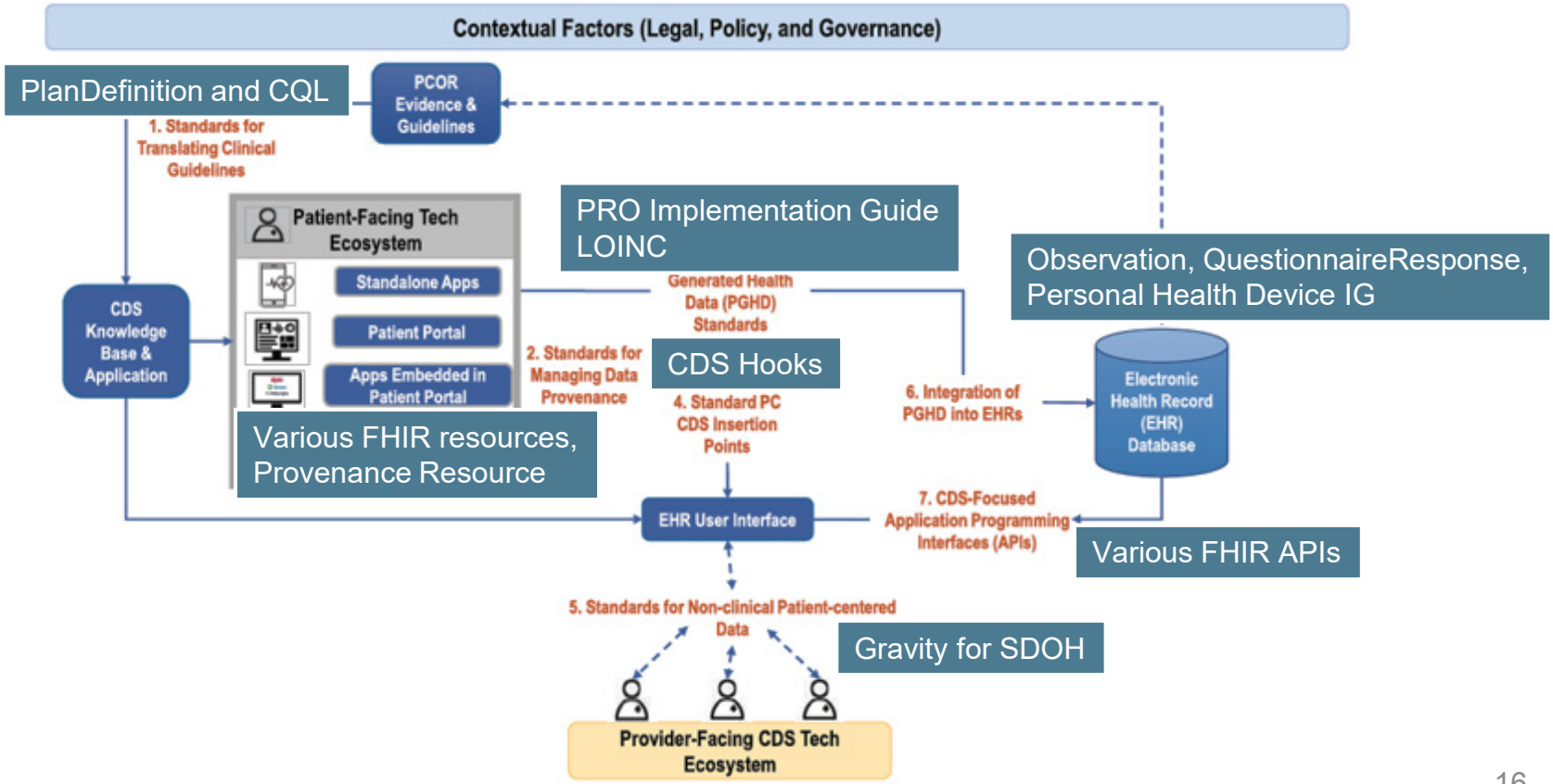
PC CDS Standards: The need for standards

Emerging standards aim to address the interoperability requirements of many aspects of the PC CDS delivery



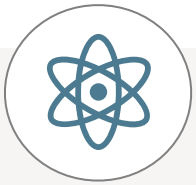
PC CDS Standards: Current HL7 FHIR® Initiatives

Many new FHIR resources and implementation guides for PC CDS



PC CDS Standards: Interoperability

Early days for PC CDS interoperability



Tremendous energy and effort to create new interoperability standards for PC CDS

Standards are still evolving and maturing

Terminology standards are further behind

Limited and variable supports in health IT systems and digital health apps

Limited implementation and adoption of these standards at healthcare organizations

PC CDS PILOT PROJECTS

#1: COVID Tracker for Outpatient Monitoring of SARS-CoV-2 Infected Patients

#2: Postpartum Monitoring and Management of Hypertensive Disorders of Pregnancy

Nitu Kashyap, MD, FAMIA (Yale New Haven Health)
David Lobach, MD, PhD, MS, FACMI (Elimu Informatics)

Overview

Pilot Project Goals

Pilot Project #1: SARS-CoV-2 Infected Patient Monitoring

- Rationale & existing system
- COVID monitoring in action
- Workflow opportunities
- Lessons learned from Pilot Project #1
- Impact of Pilot #1 experience on designing Pilot #2

Pilot Project #2: Postpartum Monitoring of HDP

- Rationale & existing system
- Workflow opportunities
- PP HDP monitoring in action
- Additional lessons learned through Pilot Project #2

Conclusions

Pilot Project Goals

Enhance the connection between patients and their providers by enabling clinicians to efficiently and remotely monitor a large population using tools integrated into their workflow.

Demonstrate features of PC CDS

Understand the needs and challenges of developing PC CDS that look toward future opportunities.

Pilot Project Timeline

Tasks	Oct-Dec 2020	Jan-Mar 2021	Apr-Jun 2021	July-Sep 2021	Oct– Dec 2021	Jan-Mar 2022	Apr-Jun 2022	Jul-Sep 2022
Planning Pilot 1								
IRB								
Build and test #1								
Pilot 1 launch			May 2021					
Planning Pilot 2								
Build and test #2								
Pilot 2 launch						Feb 2022		
Evaluate, closeout								

COVID-19 Tracker Rationale

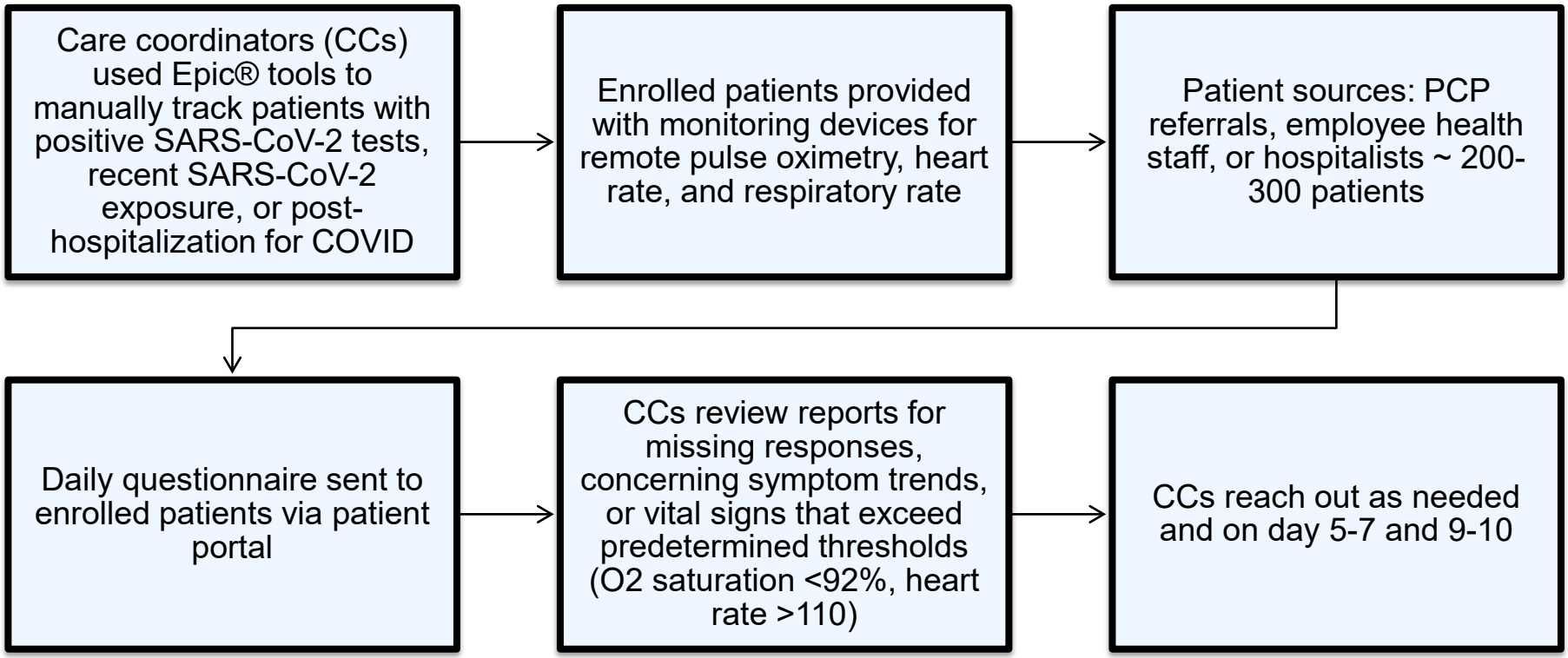
Address potential increased demands for healthcare services from COVID-19, and mitigate clinician burden

Overcome barriers for tracking infected or at-risk individuals

Limit unnecessary in-person contact with infected individuals

Facilitate connection and communication between patients and clinicians

Existing System

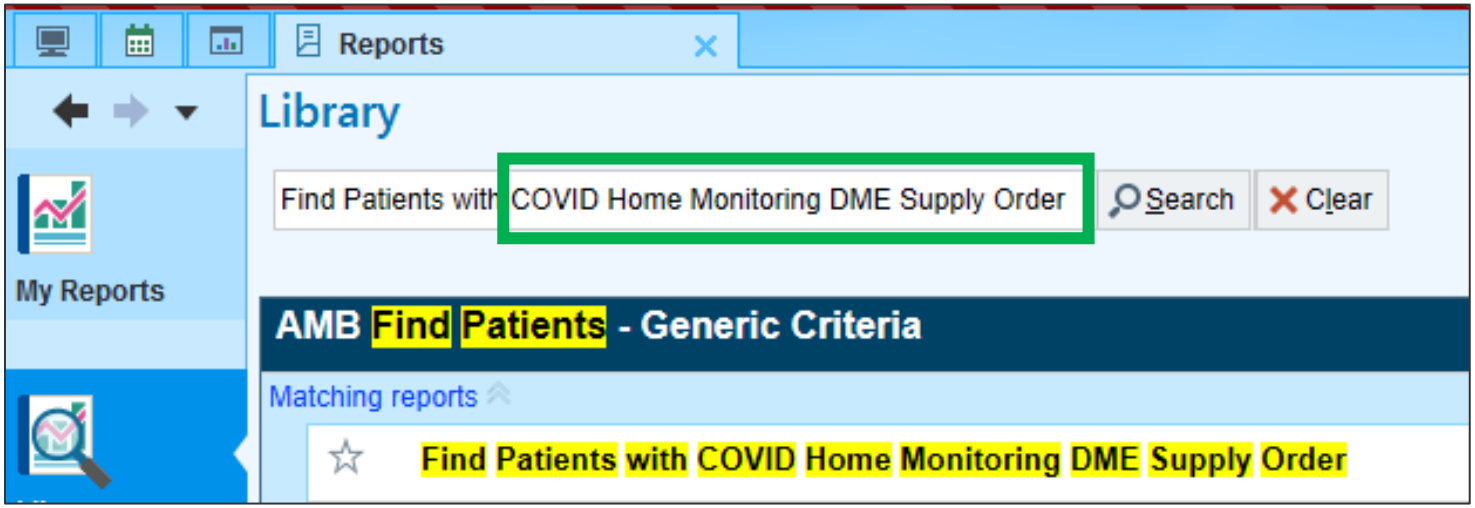


Workflow Opportunities

Themes	Existing Tools	Pilot Tracker
Daily patient reminders	Phone calls after 12 noon if no response received	Automated via Tracker app
Staffing limitation	Extended hours to call all patients needing follow up or missed values	Ability to triage abnormal findings and reduction in missed values
Trend view	Via native EHR tools	Via native EHR tools
Just in time patient feedback	None	Decision tree directed actions via app
Escalate based on symptoms	Phone call	Easy dial out to CC team
Managing stable patients	Effort outweighed benefit	Minimize effort with nudges and feedback built into app

COVID Tracker in Action

Identify, Enroll, and Outreach to Patients for COVID Remote Monitoring Text Messaging



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Create a Patient Outreach Encounter to Document Care Coordinator Discussion

Reports

Find Patients with COVID Home Monitoring DME Supply Order - NORC Testing [103784372] as of Fri 7/23/2021 10:06 AM

Filters | Options | Chart | Orders Only | Encount | Pt Outreach | Episodes of Care | Refill | Telephone | Letter | Research Studies | Generate Letters | HM Modifiers | Add to List | Place Orders | Send Communication | Send Patients Message

Refresh Sele

MRN	Patient	DOB	Age	Mobile #	PCP	Authorizing Provider	Order Date and Time	Last Disch	COVID-19 Risk of Complications	Episode Type
MR3724697	Zzzamb, Techdress Two	05/28/1971	50 y.o.	919-812-7594		Kashyap, Nitu, MD	07/23/2021 09:15:03 AM	12/16/17	2	Covid - TXT Home Monitoring
MR3724806	Zzzamb, Techdress Three	12/31/1982	38 y.o.	202-280-9294		Kashyap, Nitu, MD	07/23/2021 09:20:15 AM	9/11/16	0	Covid - Home Monitoring
MR3724822	Zzzamb, Techdress Five	02/10/2004	17 y.o.	773-401-7110		Kashyap, Nitu, MD	07/23/2021 09:24:09 AM	9/7/16	N/A	Covid - Home Monitoring
MR3725207	Zzzamb, Techdress Six	03/26/1956	65 y.o.	847-830-8677		Kashyap, Nitu, MD	07/23/2021 09:27:14 AM	7/28/20	5	Covid - Home Monitoring
MR3769585	Zzzambwest, Apple	10/25/1976	44 y.o.	203-752-8242		Kashyap, Nitu, MD	07/23/2021 09:29:45 AM	3/8/12	2	Covid - Home Monitoring
MR3769680	Zzzambwest, Coconut "Coci"	05/25/1959	62 y.o.	914-645-4379		Kashyap, Nitu, MD	07/23/2021 09:31:23 AM	4/30/20	3	Covid - Home Monitoring

Demographics | Pt Questionnaire responses | Risk of Complications | Nurse COVID Pat Outreach | Primary Care Snapshot | IP Admission Report

Recent Review Flowsheet Data

Patient Entered Remote Monitoring	5/12/2021
What is your temperature? (Range 90-106 only)	97.3
What is your Oxygen Saturation with your oxygen on at rest?	98
What flow of oxygen are you using (L/min)?	2
What was your heart rate? (Range 40-120)	98
How are you feeling today?	Better
Is it getting more difficult to breathe over the last 24 hours?	No
Are you having palpitations or dizziness?	No
Do you have questions or concerns that you would like to discus nurse?	No

Select an Episode to Open

+ Create New

New Episode

Name: Covid - TXT Home Monitoring

Type: Covid - TXT Home Monitorin

Noted:

Episode Type Name	Episode Type ID
Covid - TXT Home Monitoring	116

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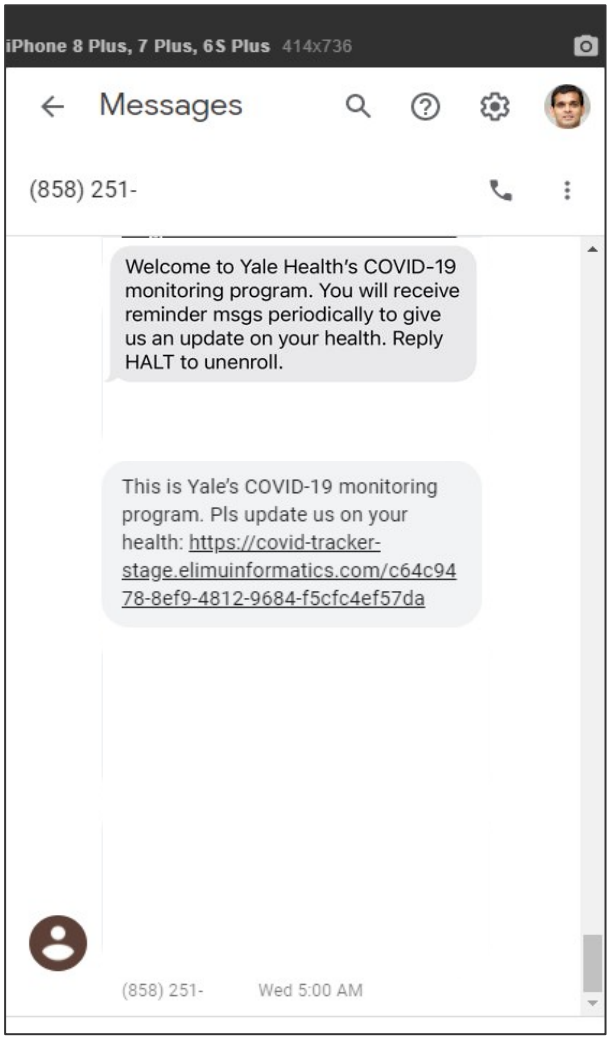
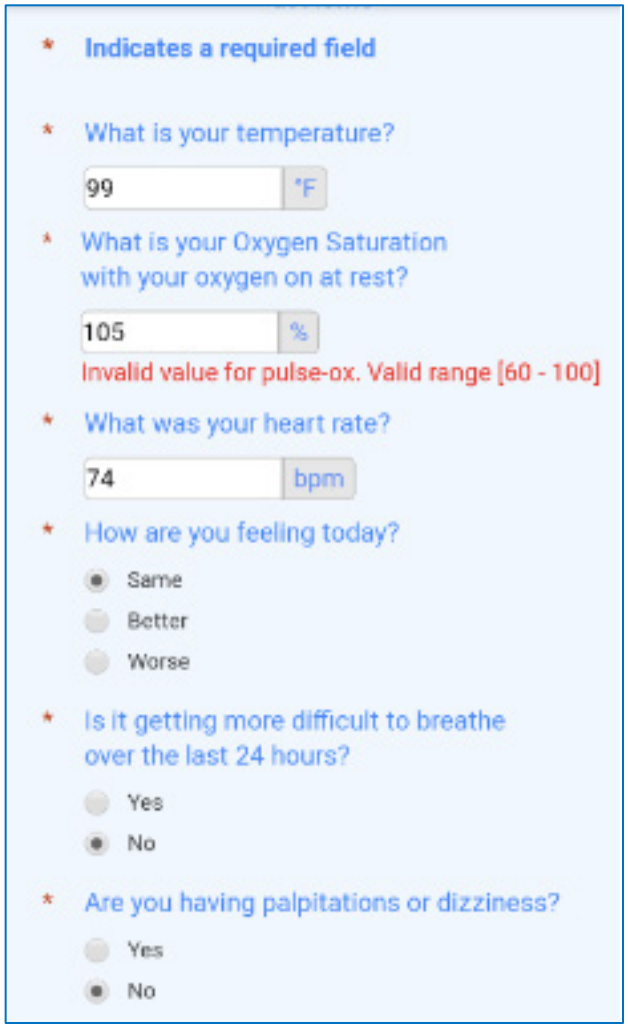
Patient View





Integration Challenges

Capability Needed	FHIR or Other Standard	Challenge with Standard	Our Solution
Identify patient for enrollment	Subscription resource or HL7 v2 message	Subscription not implemented by EHR HL7 v2 not implemented by our app	Used EHR's rule engine
Request app to enroll patient	None	No appropriate standard available	Used CDS hooks
Inform patients of their enrollment	Communication Request resource	Not implemented by EHR	Used text message
Authenticate patient using the app	SMART on FHIR	Requires patient to have portal account and remember login credentials	Sent patient short-lived links to web-based intake form
Update patient data from EHR to app	Patient, Practitioner, & Observation resources	Hospital firewall blocked access from the cloud-hosted app	Added exception to firewall
Update patient data from app to EHR	QuestionnaireResponse &Observation resources	QuestionnaireResponse not implemented by EHR Observation partially implemented	Used Observation with proprietary codes
Alert clinician	CommunicationRequest resource	Not implemented by EHR	Used rule-driven abnormal value highlighting in EHR flowsheet App instructed patient to call provider

Lessons Learned

- FHIR is still evolving: Lack of FHIR resources for “request to enroll” in an external service

- EHR implementation of several FHIR resources is lagging
  - Subscription resource to trigger the patient enrollment or other workflow activities
  - CommunicationRequest resource to send a message to the patient regarding enrollment or to send alert notifications to clinicians
  - QuestionnaireResponse resource to send PRO or other PGHD to the EHR from the app
  - Observation resource to send PGHD to the EHR has limitations

- Current cybersecurity environment and cloud-based apps can obstruct 3rd party apps
- Local champions are critical for success
- Local skills still critical for FHIR integrated apps

Impact of Experience from Pilot #1 on Pilot #2

We demonstrated that we could build a patient-engagement app that integrates with existing EHR-enabled workflows

- Integration was predominantly based on standards
- While we cannot do an ideal integration with standards, we can build a usable integration

Therefore, Pilot #2 uses a similar integration approach

- Clinicians largely use tools built within the EHR
- Patients use an app that is not tethered to the portal or EHR
- Shifted patient enrollment to a SMART on FHIR app (replacing the CDS Hooks approach)
- The new app has a more complex patient workflow -- Patients receive communication via text messages with links to the web app
- The new app has more complex decision tree based on patient responses

Monitoring Postpartum BP: Rationale

Need to monitor blood pressures and selected symptoms in women postpartum who had preexisting hypertension, pregnancy-induced hypertension, preeclampsia, or eclampsia

Early detection of changes enables early intervention and prevention of catastrophic illness

Half of patients no showed for post discharge BP check at 72 hours before clinical tracking program started

Pre-Intervention System

Bluetooth-enabled BP monitor provided at discharge

- Ask patients to check BP twice daily
- BP result automatically sent to EHR
- BP readings are sent to care team through an in-basket message weekly
- If BP >160/110, an immediate in basket message will be generated to care team
- Patients are instructed to call care team if sBP>160

Telehealth visit or phone call from pharmacy team at 72 hours post D/C and then every 1 to 2 weeks or prn

Follow up until 6 weeks postpartum

Workflow Opportunities

Themes	Existing Tools	HDP Tracker
Daily patient reminders	None	Automated via app
BP value review	Filed to chart or to inbasket in EHR	Added to monitoring report*
Trend view	Via native EHR tools	Integrated with in-office values, viewed in native EHR tools*
Just in time patient feedback	None	Decision tree directed actions via app
Escalate based on symptoms	Phone call	Easy dial out to CC team
Varying monitoring with duration	Individual patient instructions	Week 1, Week 2-6 schedules built differently

*part of pilot enhancements, not a feature of SMART on FHIR app

PP Monitoring of HDP in Action

Dashboard of Patients Enrolled in BP Monitoring

RSH Pop Pharmacy-Cardiology Collaborative Model - Active [926] as of Tue 2/14/2021 2:50 PM

Filters | Options | Chart | Orders Only | Encounter | Refill | Telephone | Hypertension Text App | Letter | Research Studies | Gener

My Reports

Library

RSH Pop Phar...

MRN	Patient	DOB	Age	Sex	PCP	PCP Department	Pharm
MR9033506	Zzzadtalex, Treasure	11/05/1984	37 y.o.	Female		No Department Specified	
MR9033513	Zzzadtdeb, Nancy	06/03/1990	31 y.o.	Female		No Department Specified	
MR9034141	Zzzamb, Anne	11/12/1963	58 y.o.	Female		NE IM NORTH HAVEN 4A DEVINE ST	
MR9034253	Zzzmary, Mac	12/01/1986	35 y.o.	Female		No PCP found	

Text Message Monitoring | Pharmacy-Cardiology | Delivery: Mom Chart | Y Pop PharmCards Patient Responses

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SMART on FHIR Patient Enrollment App

RSH Pop Pharmacy-Cardiology Collaborative Model - Active [926] as of Tue 12/14/2021 2:50 PM

Filters | Options | Chart | Orders Only | Encounter | Refill | Telephone | Hypertension Text App | Letter | Research Studies | Gener

My Reports

Library

RSH Pop Phar...

https://sapphire-stage.elimuinformatics.com/#!/appview/68c28acc-49f4-4997-8747-125980b348f8?sou - Internet Explorer

Edit View Tools

Sapphire

Enroll

Enrollee	Treasure Z	DOB	1984-11-05	Contact Information	
Preferred Name	TRICARE	Age	37	Mobile:	
Address	321 EASTERN ST	Gender	female	Home:	203-467-7999
		Birth Sex	female		

Enroll Patient in Postpartum Hypertension Text Messaging

phone: (home) 203-467-7999

Enter new mobile number USA(+1)

* Start messaging the patient on:

* Send messages at:

Note that Epic will not be updated if an alternative phone number is entered for this messaging program

Enroll Patient | Reset

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Patient User Experience

Your doctor would like to monitor your blood pressure. You will receive reminders to measure your blood pressure and to complete brief questionnaires. In order to stop receiving these messages, reply with STOP.

This message is a reminder to complete the questionnaire to share your symptoms with your doctor. https://pphtn-stage.elimuinformatics.com/c847ae75-2422-49cd-93d4-84fb149fbf43

Please check your blood pressure today. Thank you for providing this information to help us take better care of you.

We have not received your blood pressure measurement for today. Please check your blood pressure now so that we can continue to help you with blood pressure management.

Postpartum Hypertension

Yale New Haven Health

Since your last symptom report or communication with your OB care team...

Did you go to the emergency room?

- Yes
- No

Were you admitted to the hospital?

- Yes
- No

Do you have a new or lasting/prolonged headache?

- Yes
- No

Do you have new or constant pain in the upper right corner of your belly that is severe?

- Yes
- No

Do you have any known conditions that could explain this abdominal pain?

- Yes
- No

Submit

3:27 LTE

Thank you for completing the postpartum hypertension questionnaire. Your answers will be forwarded to the care team.

Recommendations

- Call the OB team member on call now at (203) 688-2800 and report your new or lasting/prolonged changes in your vision.
- Call the OB team member on call now at (203) 688-2800 and report your new or constant pain in the upper right corner of your belly that is severe
- Call the OB team member on call now at (203) 688-2800 and report your new or lasting/prolonged headache.

AA tn.elimuinformatics.com

Actionable Recommendations

- Call the OB team member on call now at (203) 688-2800
- Mark response as high priority on flowsheet (e.g., highlight with icon)

Patient Report/Dashboard for Clinicians

RSH Pop Pharmacy-Cardiology Collaborative Model - Active [926] as of Tue 12/14/2021 2:50 PM

Filters | Options | Chart | Orders Only | Encounter | Refill | Telephone | Hypertension Text App | Letter | Research Studies | Gener

My Reports

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MR9034253	Zzzmary, Mac	12/01/1986	35 y.o.	Female		No PCP found	

Text Message Monitoring | Pharmacy-Cardiology | Delivery: Mom Chart | Y Pop PharmCards Patient Responses

Patient Reported MyChart Blood Pressures

MyChart Blood Pressure Flowsheet	7/22/20	7
Encounter Blood Pressure	120/70	1
Pt Reported Systolic (MyChart)	-	-
Pt Reported Diastolic (MyChart)	-	-

Patient Reported Text Message Responses

Patient Entered Text Monitoring	1/26/2022	1/26/2022
Since your last symptom report or communication with your OB care team, did you go to the emergency room?	-	No
Were you admitted to the hospital?	-	Yes
Why were you admitted to the hospital?	-	Headaches
Do you have a new or lasting/prolonged headache?	-	Yes
Do you usually get headaches from a chronic condition, such as migraines?	-	No
Does this headache resolve with pain medication such as Tylenol or Advil/Motrin?	-	Yes
Do you have new or constant pain in the upper right corner of your belly that is severe?	-	No
Do you have new or lasting/prolonged changes in your vision?	-	Yes
What type of vision change are you experiencing?	-	Increased sensitivity to l
Are you taking blood pressure medication?	-	No
Do you have any symptoms that you would like to discuss with the OB care team?	-	No
Status of Enrollment	Enrolled	-

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Lessons Learned…

- Integration with existing workflow facilitates adoption
- Enrollment workflow needs improvement, especially the ability to track declines, reasons for decline.
- Alarm symptom escalation path is critical for patient and staff
- Require building time buffer zones during app design (link expiry time)
- Other symptoms are made available to clinicians ‘on-demand’ via reports in the EHR

… Lessons Learned

- Version control between all technologies involved remains a challenge – EHR test vs PRD, app test vs PRD, FHIR versions, etc.
- Need for text-based solution that does not need smartphones
- Other issues such as digital access, disparities, and digital literacy are beyond the scope of this project
- Need local IT expertise to integrate and test SMART on FHIR app in client environment – could limit portability
- Collaboration with EHR vendors is critical

Pilot Project Conclusions

- Successful development and deployment of a patient-engagement app that integrates with existing EHR-enabled workflows using new interoperability standards
- Still early days for the standards, their implementation, and the experience with their use for integrating patient engagement apps

Manuscript in Review:

Integrating a Patient Engagement App into an EHR-Enabled Workflow Using Interoperability Standards: It Is Not as Easy as It Looks

Q&A

Thank You