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A Tool to Identify and Engage Patients on Risky Opioid Regimens

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Abstract

Background Concerns around opioid safety for patients living with chronic pain have led to a growing number of collaborative and multimodal pain care initiatives. A major challenge in these efforts has been identifying and engaging patients on high-risk opioid regimens in a timely manner.

Objectives In this clinical informatics case report, we describe the development and implementation of a web-based tool to support providers as they implement an integrated pain support clinical initiative at primary care clinics across three health care systems.

Methods The tool identifies patients on risky opioid medication regimens and generates autopopulated patient outreach letters. It contains three core functions that: (1) identify patients prescribed high-dose opioids or coprescribed opioids and benzodiazepines, (2) generate automated letters for patients with an upcoming primary care appointment, and (3) allow clinic staff to write back to a database to track outreach and referrals. Qualitative stakeholder feedback was gathered through interviews and user testing to assess perceived usefulness and ease of use of the tool.

Results Over a 24-month period, the tool identified 1,125 patients prescribed risky medication regimens and generated 1,315 total letters as some patients became reeligible. Stakeholder feedback revealed that the tool was useful to quickly find patients on risky medication regimens and efficient in generating prepopulated letters that could be mailed in large batches. Additional feedback led to iterative refinements and improved system capabilities that varied across clinics.

Conclusion Deploying clinical informatics tools that prioritize, engage, and track high-risk patient populations supports reduction of risky medication regimens. Such tools can reduce workload burden on busy primary care staff, particularly during implementation studies, and enhance patient-centered care through the use of direct-to-consumer outreach.

Keywords
- opioid analgesics
- chronic pain
- veterans
- medical informatics

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Background and Significance

Over the past two decades, opioids have been linked to nearly 650,000 overdose fatalities in the United States,[1] with a record high number of predicted deaths in 2022.[2] Opioids have been one of the most common treatments for chronic noncancer pain. However, long-term opioid therapy, higher opioid doses, and concurrent opioid–benzodiazepine prescribing all increase risk for addiction and overdose.[3–5] To reduce opioid-related harms, in 2016 the Centers for Disease Control and Prevention (CDC) revised recommendations for patients living with chronic pain on opioid therapy.[6] These guidelines caution against prescribing opioids greater than 90 mg morphine equivalent daily doses (MEDD) or prescribing concurrent opioid and benzodiazepine medications. The updated 2022 CDC guideline eliminated mention of a specific threshold but still emphasized caution regarding high-dose therapy.[7] Use of nonpharmacological therapies (NPTs), such as cognitive behavioral therapy or physical therapy, are also encouraged.[6,7] A growing body of evidence suggests that NPTs plus gradual dosage reduction for high-risk opioid regimens have been associated with improved pain control and functioning.[8–14]

As the largest integrated health system in the United States, the Department of Veterans Affairs (VA) has pursued several innovative strategies to address risky opioid prescribing regimens.[15,16] Veterans have been disproportionately impacted by the opioid epidemic, as approximately 50% experience chronic pain[17] compared with 20% of U.S. adults.[18] Notably, the VA's Opioid Safety Initiative, begun in 2013, has demonstrated reduced use of opioids and improved safe prescribing through data-driven education, pain management, risk mitigation, and addiction treatment strategies.[19] As part of this initiative, a dashboard tool was developed to provide prescriber- and patient-level data on risky opioid and concomitant opioid–benzodiazepine regimens.[15] Over a 2-year period, use of the dashboard was associated with a 16% reduction in patients on high-risk regimens.[15] Additionally, the Stratification Tool for Opioid Risk Mitigation (STORM) tool estimates risk of overdose and suicide and provides tailored, evidence-based mitigation strategies.[20] STORM has demonstrated value in identifying high-risk patients and was associated with decreased all-cause mortality.[21]

However, a key challenge has been engaging patients and facilitating shared decision-making on pain management options with care teams, which was also emphasized in the updated 2022 CDC guideline.[7] Direct-to-patient outreach ahead of upcoming appointments has shown promise in engaging patients in discussions around medication safety and reducing risky regimens.[22] Given the time constraints faced by medical teams, innovative tools are needed to reduce the burden on clinicians while facilitating patient empowerment in safe and effective chronic pain management. Examining user acceptance and usefulness during the design and implementation of these tools is critical to reduce clinician burden and enhance usability, a major hurdle of health information technology adoption.[23]

Objectives

In this clinical informatics case report, we describe the development and implementation of a web-based case-finding tool to identify and outreach to patients on risky opioid regimens who might benefit from timely engagement in a patient-centered assessment of risks and benefits of their current opioid regimen. We examined user acceptance of the tool to inform optimizations for future implementations.

Methods

Primary Care-Integrated Pain Support Initiative

A primary care-integrated pain support (PIPS) initiative was developed to mitigate risk from certain risky opioid regimens and promote engagement in NPTs among patients with chronic pain.[24,25] This pharmacist-led approach was based on a collaborative care model to improve coordination of pain care between primary care physicians, pharmacists, and clinical staff.[15] PIPS was targeted towards patients who: (1) were receiving opioid prescriptions of $\geq$90 mg MEDDs or combination opioid–benzodiazepine prescriptions[6] and (2) had an upcoming routine primary care appointment within 2 to 3 weeks. Prior to the appointment, clinic staff mailed eligible patients a letter that described safety concerns with high-risk opioid prescriptions and promoted awareness of NPTs (see ►Fig. 1 for the full letter). Patients were encouraged to bring the letter to the appointment, which is in line with a prior approach to facilitate patient–provider conversations on risky medication regimens.[22] During the appointment, providers could review medication safety and refer patients to the PIPS intervention. If referred, a pharmacist met with the patient to discuss NPT options and a dose reduction plan if mutually agreed upon. As part of this multifaceted initiative, we designed and developed a case-finding tool to facilitate automated identification and outreach to patients. This study followed guidance for writing clinical informatics case reports.[26]

Design and Development of Case-Finding Tool

Pain subject matter experts (W.B., A.M.M.) identified three core functions for the tool: (1) identification of patients prescribed high-risk medication regimens with an upcoming primary care appointment, (2) generation of letters to mail to eligible patients, and (3) maintaining a record of patients who had been contacted. These components were iteratively built and discussed among team members for the initial version of the tool. Data elements were also examined to aid in query development and dashboard display (►Table 1). As the tool was intended to support implementation of the PIPS initiative across three primary care clinics, it did not integrate with the electronic health record (EHR), which would require substantial financial and computing resources to build and test across sites.

We developed an extract, transform, and load process using the VA's Corporate Data Warehouse (CDW) to extract eligible patients and relevant data elements daily. These data were used to populate the dashboard, which used Microsoft SQL Server Reporting Services web-based framework

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[Patient First Name] [Patient Last Name]
[Street Address]
[City], [State Abbrev] [Zip]

Dear [Patient First Name] [Patient Last Name],

You've probably heard about recent concerns related to the safety of opioid pain medications. We are writing to let you know about a new service available at the [Healthcare System] to help patients with chronic pain reduce medication use and get involved in non-medication treatments, and in so doing, live healthier and more active lives.

You are eligible for the new program, which is called **Primary Care-integrated Pain Support ("PIPS").** As part of the program, a PIPS pharmacist will review your medications with you and suggest changes to make your treatment safer. They will also review non-medication pain treatments available to you that may make your pain treatment more effective. We've seen PIPS work for other patients and would like to discuss it with you at your next primary care appointment.

Please bring this letter to that appointment as a reminder to you and your provider to discuss this opportunity.

Sincerely,

[Healthcare System] Pain Board

Fig. 1 Patient outreach letter template.
Note: All figures do not contain any identifiable patient information (it is imaginary).

(►**Fig. 2**). The dashboard was hosted on a VA internal website that clinic staff accessed with a user name and password. Site-specific letter templates could be autopopulated with patient information, including name and address, and sent to a printer. The dashboard included write back functionality where clinic staff could input if the letter was mailed. ►**Fig. 3** illustrates a sample patient-level view of the dashboard.

Implementation

The case-finding tool was implemented in primary care clinics across three VA health care systems: two in the South and one in the West. It was deployed between March 1, 2017 and March 1, 2019 in one Southern and one Western site and during May 1, 2018 to May 1, 2020 in one Southern site. Initial training was provided to end users (i.e., pharmacist, pharmacy technician, research assistant) on accessing the dashboard, filtering patients, and printing letters. Users accessed the patient list at least once every 2 weeks to review patients with upcoming appointments. The developers provided ongoing support throughout the implementation period for each site. ►**Fig. 4** describes the patient identification, engagement, and tracking process.

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Table 1 Data elements used in case-finding tool

Domain	Element	Description
Patient	ID	Unique patient identifier
	Name	First and last name
	Address	Most recent address
	Phone number	Most recent phone number
Diagnosis	Diagnosis code	ICD-9 and ICD-10 codes for chronic pain
	Date	Date of diagnosis
Medication	ID	Unique medication identifier
	Name	Medication name
	Class	Medication class (i.e., opioids, benzodiazepines)
	Dosage	Medication dosage
	Start date	Medication start date
	End date	Medication end date
	Days supply	Number of days supply
	Status	Medication status (i.e., active, suspended with medication end date less than current date, expired with medication end date later than current date)
	Morphine equivalent daily dose	Calculation based on morphine-based medications prescribed over one year period
Appointment	ID	Unique appointment identifier
	Type	Stopcodes for primary care/medicine or general internal medicine
	Date	Upcoming appointment within <3 wk of current date
	Medical facility	Health care system facility code
	Clinic	Name of clinic
Provider	ID	Unique provider identifier
	Name	Name of provider
	Type	Primary care provider
Letter tracking	Mailed flag	Yes/no flag to indicate letter mailing (inputted by clinic staff)
	Date mailed	Date letter was mailed (inputted by clinic staff)
Consult Tracking	Consult flag	Yes/no flag to indicate consult with pharmacist (inputted by clinic staff)
	Date of consult	Date of initial consult (inputted by clinic staff)

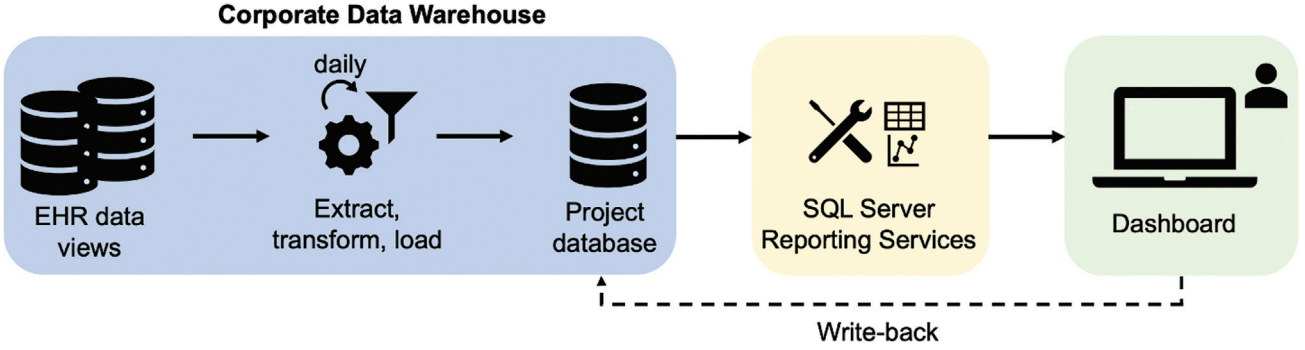

Fig. 2 System architecture. EHR, electronic health record.

Evaluation

Qualitative feedback from users (pharmacist, pharmacy technician, research assistant) was gathered through interviews and user testing to examine perceived ease of use, usefulness, and refinements for the tool. This process was guided by the Technology Acceptance Model, which has been applied to numerous studies to explain acceptance and adoption of health information technologies.[27] Perceived

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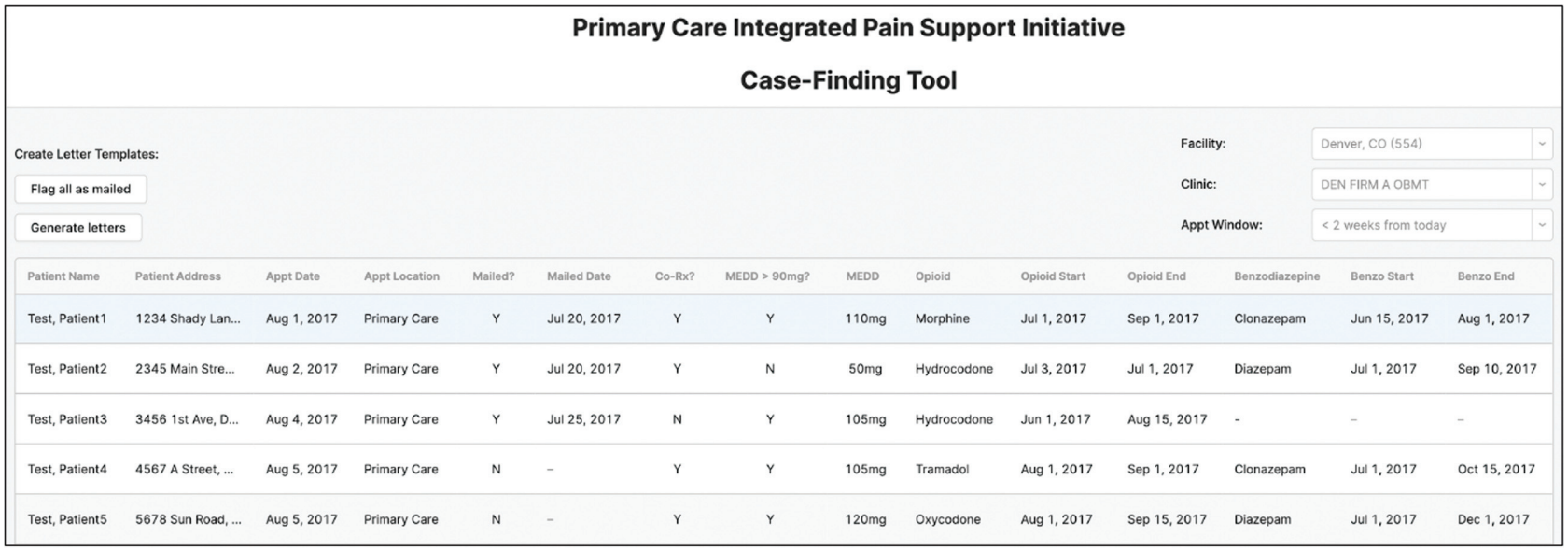

Primary Care Integrated Pain Support Initiative

Case-Finding Tool

Create Letter Templates:

Flag all as mailed

Generate letters

Facility: Denver, CO (554)

Clinic: DEN FIRM A OBMT

Appt Window: < 2 weeks from today

Patient Name	Patient Address	Appt Date	Appt Location	Mailed?	Mailed Date	Co-Rx?	MEDD > 90mg?	MEDD	Opioid	Opioid Start	Opioid End	Benzodiazepine	Benzo Start	Benzo End
Test, Patient1	1234 Shady Lan...	Aug 1, 2017	Primary Care	Y	Jul 20, 2017	Y	Y	110mg	Morphine	Jul 1, 2017	Sep 1, 2017	Clonazepam	Jun 15, 2017	Aug 1, 2017
Test, Patient2	2345 Main Stre...	Aug 2, 2017	Primary Care	Y	Jul 20, 2017	Y	N	50mg	Hydrocodone	Jul 3, 2017	Jul 1, 2017	Diazepam	Jul 1, 2017	Sep 10, 2017
Test, Patient3	3456 1st Ave, D...	Aug 4, 2017	Primary Care	Y	Jul 25, 2017	N	Y	105mg	Hydrocodone	Jun 1, 2017	Aug 15, 2017	-	–	–
Test, Patient4	4567 A Street, ...	Aug 5, 2017	Primary Care	N	–	Y	Y	105mg	Tramadol	Aug 1, 2017	Sep 1, 2017	Clonazepam	Jul 1, 2017	Oct 15, 2017
Test, Patient5	5678 Sun Road, ...	Aug 5, 2017	Primary Care	N	–	Y	Y	120mg	Oxycodone	Aug 1, 2017	Sep 15, 2017	Diazepam	Jul 1, 2017	Dec 1, 2017

Fig. 3 Sample patient-level dashboard view.

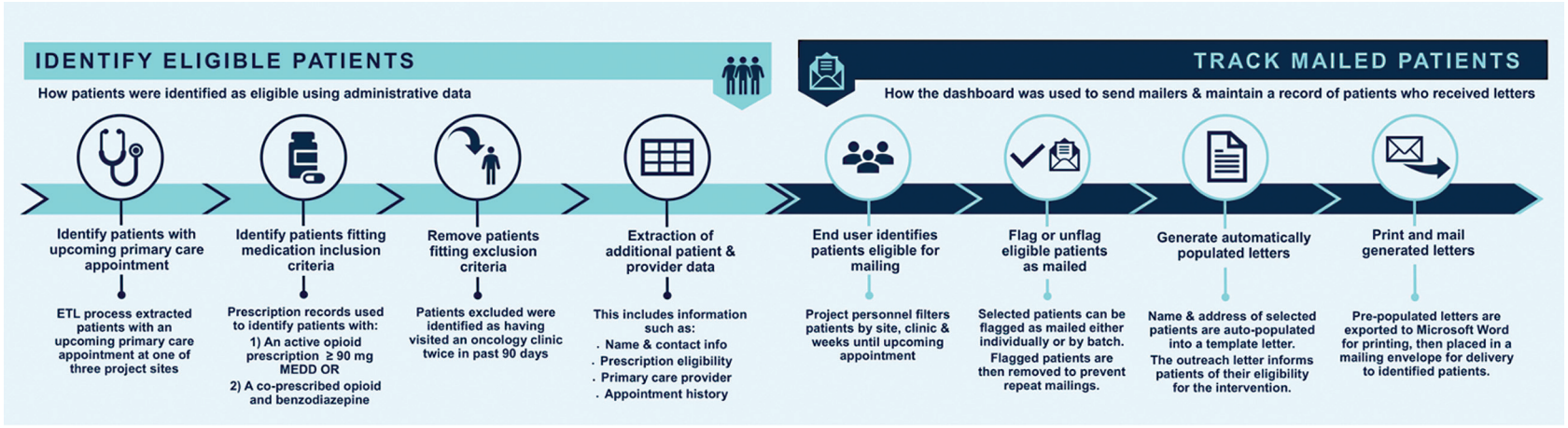

Fig. 4 Patient identification, outreach, and tracking process. MEDD, morphine equivalent daily doses.

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ease of use relates to the degree to which the person believes it is easy (mental and physical effort) to use the system, whereas perceived useful is the extent to which the person thinks that their performance will be increased by using the system.[27] One interviewer elicited feedback from users during the implementation period, and notes were corroborated to identify input related to perceived ease of use and usefulness. Data from the CDW were used to provide context on the demographic and clinical characteristics of patients who were mailed the letter.

Results

Over a 24-month period, the case-finding tool identified and mailed 1,315 letters among 1,125 patients (►Table 2). Letters were mailed multiple times as patients became reeligible for the PIPS intervention with medication changes. Half of the patients were 45 to 64 years, and the majority were male (89%) or White non-Hispanic (78%). Approximately 42% met the 90 mg MEDD opioid criteria, 58% met the benzodiazepine coprescription criteria, and 5% met both criteria. Approximately 59% of patients were from southern health care sites and 41% from the western health care site.

Based on the qualitative stakeholder feedback, the dashboard was easy to use and helpful to identify patients without conducting time-consuming patient chart reviews (►Table 3). Sorting and filtering functionalities made it easy for clinical staff to identify patients with the riskiest opioid regimens and those who had not yet been sent a letter. It also required minimal routine maintenance and troubleshooting to maintain functionality. The dashboard was able to serve a further purpose as an audit and feedback tool, which is an implementation strategy that summarizes clinical performance data for monitoring, evaluating, and modifying provider behavior.[28] For instance, PIPS project staff were able to, in real time, compare referrals to the intervention with patients identified as eligible and discuss discrepancies between these patient groups with pharmacists and clinicians during monthly site meetings. Although this was an unexpected application of the dashboard, it allowed project personnel to monitor all avenues of patient engagement, such as provider referral to the intervention.

Table 2 Characteristics of letter recipients ($n = 1{,}125$)

	n (%)
Age	
18–44	96 (9%)
45–64	567 (50%)
65+	462 (41%)
Gender	
Women	128 (11%)
Men	997 (89%)
Race and ethnicity	
Black, non-Hispanic	120 (11%)
White, non-Hispanic	883 (78%)
Hispanic	45 (4%)
Other	77 (7%)
Medication[a]	
Opioid ≥ 90 mg MEDD	473 (42%)
Coprescribed opioid and benzodiazepine	656 (58%)
Both criteria above	60 (5%)
Site	
First Southern Healthcare System	491 (44%)
Last Southern Healthcare System	170 (15%)
Western Healthcare System	464 (41%)

Abbreviation: MEDD, morphine equivalent daily doses.
[a]Medication categories are not mutually exclusive (i.e., 60 individuals received opioid prescriptions of ≥90 mg MEDDs or combination opioid–benzodiazepine prescriptions)

Table 3 Stakeholder feedback on case-finding tool

Domain	Feedback
Perceived ease of use	
Sorting and filtering	• Easy to sort patients by daily MEDDs to identify those with highest dosages • Ability to filter patients that had already been mailed letters to quickly identify letters needed
Technical assistance	• Minimal training needed to instruct end users how to access dashboard and use the features (~1 h per clinic) • Limited technical support and trouble-shooting needed over the implementation period (~5 h per clinic)
Perceived usefulness	
Patient identification	• Little time required to identify high-risk patients for outreach
Audit and feedback	• Project staff able to examine which patients were being referred to pharmacists
Letter generation	• Little effort required to generate letters from prepopulated template • Minimal staffing hours needed to print and mail letters (<10 min/wk)
Patient engagement	• Difficult to track which patient received a letter and brought it to appointment

Abbreviation: MEDD, morphine equivalent daily doses.

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Stakeholder feedback varied across sites and was iteratively incorporated into the dashboard. For example, the dashboard's initial version did not contain data elements for the date and time of upcoming primary care appointments. Clinicians emphasized the importance of this information to facilitate timely sending of the letter. Also, generation of a separate view for patients who had been sent a letter was requested to improve patient tracking. This tailoring-focused coding and testing took an added average of 50 hours. Additional data elements and system functionalities were iterated on to enrich the dashboard capabilities and user experience.

Discussion

Main Findings

As health care systems continue to focus attention toward patient-centered, precision medicine,[29] leveraging system-wide data can assist in prioritizing high-risk patients to receive evidence-based practices and collaborative care interventions. To our knowledge, this paper is the first attempt to describe the application of a case-finding tool to prioritize, engage with, and track a high-risk patient population. It is crucial to ensure that patients who would most benefit from patient-centered reassessment of risky opioid therapy are promptly provided with these options. Although the dashboard was only one tool within an overall implementation facilitation strategy,[24] it was useful to provide real-time patient eligibility and enrollment numbers to maintain effective prioritization of high-risk patients. Without a dashboard, it would be unrealistic to accomplish the identification and engagement tasks without a large project or clinical staff dedicated to manual patient record review.[30,31] This work highlights the value of iterative design and development that can incorporate changing user needs that vary across clinic staff and sites.[32,33]

We identified several areas for future system enhancements based on the stakeholder feedback and implementation experience. It was difficult for clinic staff to determine if a letter was received prior to the patient's appointment, which prevented measurement of the extent to which this outreach effort reached patients. Future improvements should incorporate additional tracking workflows and functionality, such as asking patients during the visit if they received the letter and incorporating electronic outreach modalities with read receipts. In addition, dashboard enhancements could incorporate visual affordances such as color-coding, icons, and other visual displays to highlight changes in medications or eligibility status. Prior studies have found that visualization techniques can improve usability and enhance decision-making.[34–37] Furthermore, inclusion of additional patient-centered factors, such as preferences, goals, or other patient-generated health data, may be valuable to involve patients in shared decision-making.[38] The VA Lighthouse Application Programming Interfaces (APIs) contain tools to build interoperable digital solutions that can help patients and their clinicians manage their health.[39] Supporting the widely used Fast Healthcare Interoperability Resources (FHIR) data standard,[40] the Lighthouse APIs could make it possible to enhance existing clinician-facing tools through incorporation of patient-contributed data, integration with the EHR, and use of "hooks" to alert clinic staff to changes. Notably, as the VA transitions to the Oracle Cerner EHR, use of standards-based FHIR APIs is critical to support clinical tools that can work across different EHRs. Future work could leverage interoperable dashboards to expand identification and outreach efforts to all patients on risky opioid regimens.

Limitations

This study had a few limitations to acknowledge. First, we lacked detailed information on the patients who received the letter or scheduled an appointment upon letter receipt, as this was not tracked consistently across the three sites. Enhancing workflow tracking and functionalities in future versions of the tool will be valuable to understand the reach and effectiveness of the intervention. Second, we focused on identification of patients who were prescribed opioids greater than 90 MEDD, which is concordant with the 2016 CDC recommendations for patients living with chronic pain on opioid therapy.[6] However, there are a number of additional clinical and social factors that may contribute to risky opioid regimens that should be considered to optimize the tool and patient outreach efforts. Third, at the time of this study, we lacked data from Prescription Drug Monitoring Programs (PDMP), which are state-level databases that allow health providers to track controlled substance prescriptions. There is still not a nationally standardized PDMP, as they are regulated by each state with varying requirements for incorporating PDMP data into EHRs. Obtaining PDMP data for the three sites in different states at the time of tool development would have been prohibitively resource intensive and cause delays in implementation. Therefore, MEDDs were calculated from VA-prescribed medications only, and it could be possible that some patients did not receive a letter if their medications were prescribed from another health care system. Future iterations of our tool and MEDD calculations should incorporate PDMP data, as the CDC recommends use of these data to assess cumulative opioid dosages and medication combinations.[7] Fourth, reporting of changes in coprescribing of opioids and benzodiazepines or changes in MEDD were outside of the scope of this paper given the larger implementation trial examining the impact of implementation strategies on uptake of the intervention. These findings will be reported in a separate analysis. Fifth, we assessed acceptance of the tool through qualitative feedback and did not measure other aspects of usability that have also been shown to influence acceptance and use (e.g., efficiency, effectiveness).[41] Lastly, this tool was implemented across VA primary care clinics, and the feedback may not generalize to other clinics or health systems that may be considering implementing similar tools.

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Conclusion

Developing and implementing case-finding clinical informatics tools can facilitate patient identification and direct-to-patient outreach. The tool was valuable to prioritize high-risk patients prescribed risky opioid medication regimens across three health care systems. Stakeholders found the tool easy to use, valuable to identify patients and prepopulate their letters, and it required minimal maintenance and troubleshooting over the 24-month implementation period. This work emphasizes the value of iterative user-centered design that can adapt to user needs and be tailored for each clinic. Incorporating additional tracking features and workflows, visual displays, and patient-level measures may be valuable to reduce workload burden and enhance patient-centered care.

Clinical Relevance Statement

Optimizing the tools and information used to deliver care is essential to enhancing patient-centered care and reducing the time burden for busy clinical staff. Our findings have implications for health systems considering clinical informatics interventions that prioritize, engage, and track high-risk patient populations.

Multiple-Choice Questions

1. How was acceptance of the case-finding tool measured?
   a. Usability evaluation
   b. Card sorting
   c. Survey
   d. User testing sessions and interviews

   Correct Answer: The correct answer is option d. User testing and interviews were conducted among end users to examine acceptance, specifically perceived ease of use and usefulness, as guided by the Technology Acceptance Model.

2. What was an unexpected application of the case-finding tool?
   a. Engaging families and caregivers
   b. Serving as an audit and feedback tool
   c. Promoting health information exchange
   d. Reducing appointment no-shows

   Correct Answer: The correct answer is option b. Audit and feedback tools are a type of implementation strategy that summarize clinical performance data for monitoring and evaluating provider behavior. In this study, the tool allowed project personnel to monitor all avenues of patient engagement, such as provider referral to the intervention.

Protection of Human and Animal Subjects

This study was considered quality improvement by the Stanford University Institutional Review Board.

Conflict of Interest

None declared.

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