

Research and Applications

Assessing the use of a clinical decision support tool for pain management in primary care

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ABSTRACT

Objective: Given time constraints, poorly organized information, and complex patients, primary care providers (PCPs) can benefit from clinical decision support (CDS) tools that aggregate and synthesize problem-specific patient information. First, this article describes the design and functionality of a CDS tool for chronic noncancer pain in primary care. Second, we report on the retrospective analysis of real-world usage of the tool in the context of a pragmatic trial.

Materials and methods: The tool known as OneSheet was developed using user-centered principles and built in the Epic electronic health record (EHR) of 2 health systems. For each relevant patient, OneSheet presents pertinent information in a single EHR view to assist PCPs in completing guideline-recommended opioid risk mitigation tasks, review previous and current patient treatments, view patient-reported pain, physical function, and pain-related goals.

Results: Overall, 69 PCPs accessed OneSheet 2411 times (since November 2020). PCP use of OneSheet varied significantly by provider and was highly skewed (site 1: median accesses per provider: 17 [interquartile range (IQR) 9–32]; site 2: median: 8 [IQR 5–16]). Seven “power users” accounted for 70% of the overall access instances across both sites. OneSheet has been accessed an average of 20 times weekly between the 2 sites.

Discussion: Modest OneSheet use was observed relative to the number of eligible patients seen with chronic pain.

Conclusions: Organizations implementing CDS tools are likely to see considerable provider-level variation in usage, suggesting that CDS tools may vary in their utility across PCPs, even for the same condition, because of differences in provider and care team workflows.

Key words: primary care, clinical decision support tool, chronic pain

Lay Summary

Primary care providers can benefit from clinical decision support (CDS) tools that aggregate and synthesize problem-specific patient information. We describe the design and functionality of a CDS tool for chronic noncancer pain in primary care—OneSheet. For each relevant patient, OneSheet presents pertinent information in a single electronic health record view to assist primary care providers in completing guideline-recommended opioid risk mitigation tasks, review previous and current patient treatments, view patient-reported pain, physical function, and pain-related goals. We also report on the retrospective analysis of real-world usage of the tool in the context of a pragmatic trial. Overall, 69 providers accessed OneSheet 2411 times (since November 2020). Seven “power users” accounted for 70% of the overall access instances across both sites. We observed modest OneSheet use relative to the number of eligible patients seen with chronic pain. Organizations implementing CDS tools are likely to see considerable provider-level variation in usage, suggesting that CDS tools may vary in their utility across providers, even for the same condition, because of differences in provider and care team workflows.

INTRODUCTION

Electronic health records (EHRs) are ubiquitous¹ yet, current challenges with EHR design and functionality often inhibit clinicians’ ability to easily use patient information, as relevant clinical data is often missing, fragmented, or conflicting.^{2,3} Thus, experts have called for EHR designs that allow clinicians to synthesize and organize patient information more easily.⁴ Improving EHR interfaces is particularly relevant for primary care providers (PCPs) because their clinical workflow includes a broader range of needs and activities. PCPs also work under considerable time constraints and regularly make decisions for patients with multiple, long-standing, and complex chronic conditions. As such, PCPs can benefit from EHR-based clinical decision support (CDS) tools that better aggregate and/or synthesize patient information to support both common and challenging clinical scenarios.^{5–10}

Most PCPs care for many patients with chronic noncancer pain, including many conditions (eg, osteoarthritis, fibromyalgia, and low back pain) that have biopsychosocial etiologies and symptoms.¹¹ Opioid-related risks, such as misuse, overdose, and substance use disorder, complicate PCP’s decision-making when managing chronic pain.^{12,13} Per the Centers for Disease Control and Prevention (CDC) clinical guidelines, patients prescribed long-term opioid therapy should be carefully monitored, and opioids appropriately tapered when relative risks outweigh benefits.^{14,15} While not a first-line treatment, long-term opioid therapy may be appropriate for some patients with chronic pain.¹⁴ PCPs who use nonopioid therapies are advised to identify and select from myriad treatment options based on a patient’s personal history, outcomes, goals, and relative risks and benefits of different treatments.¹⁶ Given these complexities, it is unsurprising that PCPs report that EHRs often fail to meet their information needs when caring for chronic noncancer pain.^{8,10} Thus, chronic noncancer pain is a prime candidate for CDS that better aggregates and synthesizes relevant clinical information for PCPs.

Prior studies have developed or conducted small-scale evaluations of chronic pain-related CDS.^{6,17–26} Yet, several of these CDS tools focus on a narrow set of outcomes, such as opioid misuse or overdose risk,¹⁸ whether an opioid is prescribed,^{18,20} or whether urine toxicology is conducted.^{19,21} While likely valuable for reducing opioid-related risks, tools focused on these narrow outcomes are unlikely to aid PCPs in weighing opioid-related risks against patients’ health outcomes (eg, pain and physical function), patients’ goals, and the risks and relative benefits of nonopioid treatment

options. In contrast, other existing CDS tools are designed to aggregate and synthesize a broader set of pain-related patient information and clinical knowledge.^{17,22,23} Such systems have the potential to more fully meet PCP’s information needs and help them choose the most appropriate pain treatments. However, research on such systems has only described these systems or conducted short-term evaluations.^{9,22–26} Therefore, it remains unclear how these more comprehensive CDS tools for chronic noncancer pain are used in routine primary care practice.

This article aims to describe not only the design but also the functionality and real-world usage of a CDS tool for chronic noncancer pain in primary care known as the Chronic Pain OneSheet (ie, OneSheet). Since November 2020, OneSheet has been live in the Epic EHR of 25 primary care clinic locations across 2 academic health centers. These centers participate in a randomized pragmatic clinical trial that aims to determine whether having access to OneSheet in the EHR affects PCPs’ pain-related ordering, prescribing, goal setting, risk monitoring, and outcome measuring behavior in visits with patients with chronic conditions noncancer pain. The trial was approved by the Indiana University Institutional Review Board and registered with [clinicaltrials.gov: NCT04295135](https://clinicaltrials.gov/ct2/show/study/NCT04295135). The current study describes the design of the OneSheet within the Epic EHR, specifies the various tasks PCPs can undertake within the tool (ie, “functionalities”) and reports on 16 months of OneSheet usage in clinical practice by PCPs. These PCPs volunteered to participate in the pragmatic trial and were randomized to receive OneSheet access in Epic. The findings of our study aid in understanding how CDS tools can be designed to support common, complex, and multifaceted condition management in primary care. We pair this with real-world usage rates from our trial period to illustrate what uptake of these tools looks like in practice. We expect our findings to inform the design, implementation, and evaluation of EHR-based CDS for complex or ambiguous clinical decision-making tasks like chronic pain care.

METHODS

Description of OneSheet design and functionality

OneSheet was designed based on user-centered studies (89 cognitive interviews and visit observations) involving 20 PCP study participants, informatics researchers, clinical IT builders, health services researchers, and pain specialist physicians.^{8,10} By aggregating and synthesizing relevant information in a single EHR view, OneSheet

allows PCPs to quickly access the information they need to complete guideline-recommended opioid risk mitigation tasks,¹⁴ such as ordering and reviewing urine toxicology results, reviewing Prescription Drug Monitoring Program (PDMP) reports, ordering naloxone, verifying an opioid treatment agreement, and reviewing current medications for opioid dose and concurrent opioid-benzodiazepine prescribing. More generally, OneSheet allows PCPs to collect and review each patient’s visits, previous and current treatments, potential other treatments, patient-reported pain and physical function, and pain-related goals more efficiently. Collectively, this information is designed to help PCPs choose treatments (opioids or nonopioids) that appropriately balance risks and benefits in patient-reported outcomes and goals.

OneSheet was first implemented at Eskenazi Health in Indianapolis, IN, and later at Wake Forest Baptist Health (Atrium Health Wake Forest Baptist) in Winston-Salem, NC. OneSheet was built in the Epic EHR using an individual patient dashboard-like tool called a *Navigator* (see Figure 1). OneSheet is organized into 2 columns,

with navigational links at the top of each column to allow users to easily jump to pertinent sections. The left column contains the following areas:

- *Pain-related diagnoses:* The pain-related diagnoses section captures any visit diagnoses the patient has historically reported that could be relevant to their current treatment with opioids or chronic pain. If the patient has any of the codes from a list of relevant international classification of diseases (ICD)-10 diagnosis codes in their diagnosis list, they will display in this box along with the encounter date. The list of ICD-10 codes is derived from previous study work with clinical experts in treating chronic pain.²⁷
- *Opioid (agonist or antagonist) Rx or benzodiazepine Rx:* This section displays a patient’s current opioid, naloxone, and benzodiazepine medications. This section makes it easy to identify if coprescription is occurring and can facilitate efficient conversation about a patient’s current pain medications, should they need to be reconciled.

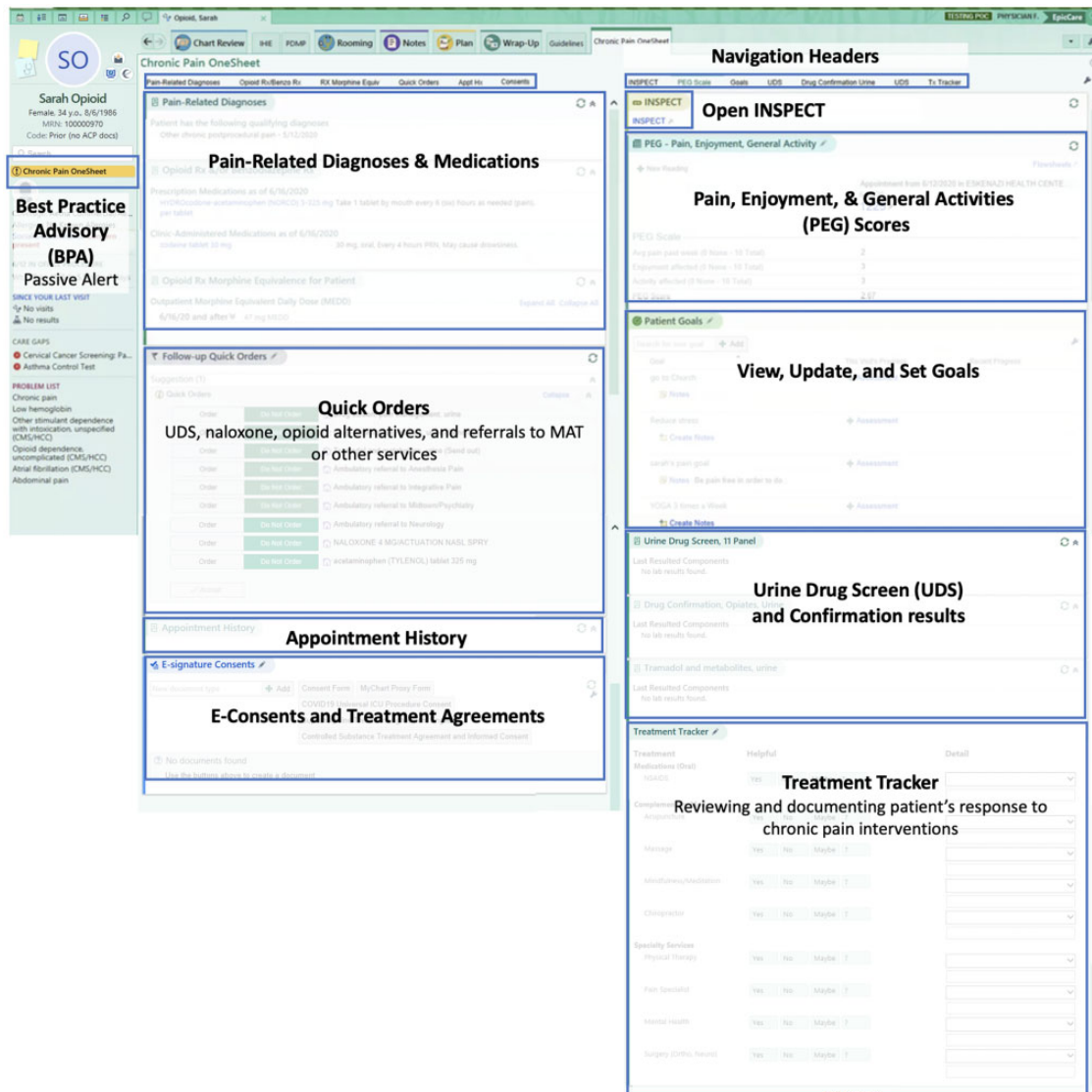


Figure 1. Screenshot of OneSheet, annotated. © 2022 Epic Systems Corporation.

- *Opioid prescription morphine equivalent daily dose*: This section displays the morphine equivalent daily dosage information for any current opioid medications.
- *Quick orders*: The brief orders section gives providers easy access to standard orders for patients with chronic pain, such as urine drug screening (UDS), referrals to alternate pain treatment modalities, and naloxone prescriptions. Providers can toggle the order/do not order buttons for the orders the patient needs and click an accept button to send them to the cart quickly.
- *Appointment history*: OneSheet summarizes the dates, providers, and primary reasons for recent visits. Clicking on a visit date will bring up an abbreviated summary of clinical actions that occurred at that visit. This section includes visits missed by the patient, as providers requested visibility into no-show rates.
- *E-consents*: This section displays existing electronic consent documents, such as controlled substance agreements or opioid treatment agreements, with the date of signing. Providers can add new agreements by choosing from the buttons at the top of the section.

The right column contains:

- *PDMP link*: A direct link to the state PDMP site that opens within the EHR via single-sign-on.
- *Pain, enjoyment, and general activity (PEG) scale*: The PEG scale is a brief, 3-item, guideline-recommended instrument to help providers and patients consistently track pain interference with daily activities and facilitate discussions about pain outcomes that are important to patients. The 3 items measure overall pain level, pain interference with life enjoyment, and interference with general activity, all on a 0–10 scale.²⁸ The OneSheet section displays each item's 3 most recent records and the overall PEG score and makes it easy to record new measurements via the “add measurement” button at the top of the section.
- *Patient goals*: This section contains previously documented patient goals. Clicking on a goal title allows the provider to see documented progress updates, assess progress since the last visit, and record any progress made on the goal. Providers can also add new goals, with an editable pain and function goal template at the top of a drop-down menu.
- *Urinary drug screening and drug confirmation results*: The most recent results from the most common UDS and confirmation lab orders are presented in an abbreviated flowsheet. Table columns include Date/Time, Drug Name, Value, Reference Range, and Lab Status.
- *Treatment tracker*: The treatment tracker provides a comprehensive list of chronic pain interventions and allows providers to track helpful treatments and document patient reactions. Information entered here persists across visits for future reference and ongoing treatment tailoring. The treatment tracker emphasizes nonopioid pain management options and can serve as a reminder list for providers while discussing other treatment options with patients.

In the EHR, PCPs can access OneSheet in multiple ways, including by navigating to the OneSheet Navigator Activity or clicking on a passive alert (Best Practice Advisory [BPA]), which appears on the chart of patients who meet chronic conditions noncancer pain diagnosis or medication criteria. PCPs can also paste a summary of OneSheet information in their progress notes using a documentation shortcut (*SmartTools*).

OneSheet training and technical assistance

OneSheet users received a 6-min initial training video to illustrate the essential functions of the tool. The training focused on the OneSheet functions that the clinical members of the study team have found most useful including the PDMP link, PEG instrument, UDS review, and patient goals section. Following training, PCPs were asked to begin using OneSheet during encounters with patients with noncancer chronic pain. Training for the complete set of OneSheet functions and sections was done via supplemental tip-sheets shared by email. These biweekly emails continued for approximately the first 4 months of the study. These emails served 3 functions: (1) remind PCPs to use OneSheet, (2) share tips about critical features, and (3) provide an opportunity for PCPs to share feedback and ask questions. Once all topics were covered, a reminder of covering a single OneSheet function and an associated tip sheet was sent monthly via email or EHR message (*Epic InBasket*).

The study team monitored individual PCP usage of OneSheet weekly. If a given PCP was not using OneSheet, the study team reached out to offer one-on-one training to discuss how to fit OneSheet into the individual's workflow. The study team also spoke with the most dedicated OneSheet users to thank them, determine how OneSheet fit into their workflow, and to ask for testimonials for sharing with other users.

Participant characteristics

We recruited 137 of 218 eligible PCPs practicing at 25 primary care clinic locations associated with 2 academic health centers. Participating PCPs were randomly assigned to a treatment group (69, 50.4%) with access to OneSheet or a control group (68, 49.6%). Most treatment group PCPs were medical or osteopathic physicians (68%), female (70%), white (77%), and not of Hispanic or Latino ethnicity (78%) (see [Table 1](#)). On average, participant PCPs had 10 years of experience practicing medicine. The clinical credentials and gender of PCPs in the control group and PCPs who did not enroll in the study were similar to those who enrolled and were assigned to the treatment group.

Table 1. Provider characteristics

Characteristic	Count	Percentage
Clinical training credentials		
MD/DO	47	68
PA	14	20
ARPN	8	12
Sex		
Female	48	70
Male	21	30
Ethnicity		
Hispanic or Latino	4	6
Not Hispanic or Latino	54	78
Prefer not to answer	11	16
Race		
American Indian/Alaska Native	0	0
Asian	8	12
Native Hawaiian or Other Pacific Islander	0	0
Black or African American	4	6
White	53	77
Prefer not to answer	5	7
Experience	Mean	SD
Years actively practicing medicine	10	9.9

OneSheet use

In the first 16 months of the study, the 69 OneSheet users accessed the tool 2411 times. We observed significant variability in use among PCP participants. Two PCPs accessed OneSheet once, and 38 PCPs used it 10 or more times. The distribution of PCP usage of OneSheet was highly skewed (site 1: median accesses per provider: 17 [IQR 9–32]; site 2: median: 8 [IQR 5–16]), with 7 “power users” accounting for 70% of the overall access instances across both sites. OneSheet was accessed an average of 20 times per week between the 2 sites. Individual variability in use among PCPs was greater than the variation in use between the 2 sites (see Figure 2).

PCPs were able to access OneSheet through the BPA or by adding OneSheet to their list of favorites. Usage rate was calculated by dividing the total number of unique patients with eligible chronic pain that each PCP in the intervention group treated during a given month by the number of patients for whom the PCP accessed the OneSheet. This measure captures the extent to which PCPs used the OneSheet when it was presumably applicable to the patient. Site 1 had greater OneSheet usage (average rate: 4.3%) than site 2 (average rate: 1.1%). Usage over time at site 1 had remained consistent, with a slight slowdown around March 2021 when 1 frequent user retired (see Figure 3). The usage rate at site 2 was initially much lower but began to parallel the usage at site 1 beginning in April 2021 after the OneSheet navigator was added as a default favorites tab for all intervention PCPs. A default favorites tab meant that OneSheet appeared upon chart open for all patients regardless of chronic pain status or reason for the visit. Only 16 providers failed to use OneSheet in the final 5 months of the trial suggesting they abandoned using the tool after having some experience with it.

DISCUSSION

This article aimed to describe the design, functionality, and real-world usage of OneSheet, a CDS tool for chronic noncancer pain in primary care. We found modest use of OneSheet by PCPs at both sites. Despite being designed based upon an extensive user-centered process that focused on PCP’s perceived information needs and preferences for decision support, we observed modest use relative to the number of patients seen who have chronic pain. Our observed usage rates may be interpreted in several ways.

On 1 hand, aggregate usage for more than 1300 unique patients and consistent usage over our 16-month trial period suggests that some PCPs found OneSheet helpful in their daily practice. On the other hand, use for less than 10% of patients identified as having eligible chronic pain suggests that OneSheet may be useful for only a subset of these patients or a subset of their visits. It is also possible that additional functionality or more proscriptive workflow integration could increase usage rates. Additionally, low OneSheet use could be a function of the volume or frequency of chronic pain patients presenting to the general PCP. Specifically, if chronic pain patients are rare, the PCP could easily fall out of practice using the tool, forget about it altogether, or not use it enough to build efficient use habits, thus reducing future use.

We also observed variability in OneSheet use across individual PCPs. For instance, very few ($n = 16$) providers stopped using it at 1 of the sites. This suggests that many PCPs found OneSheet useful over time, but only for a small subset of patients with chronic pain visits. Variability in use could be attributable to several factors. First, the OneSheet may have varying salience to providers who see different patient mixes. All study providers treated at least some chronic pain patients, but those with more frequent visits with

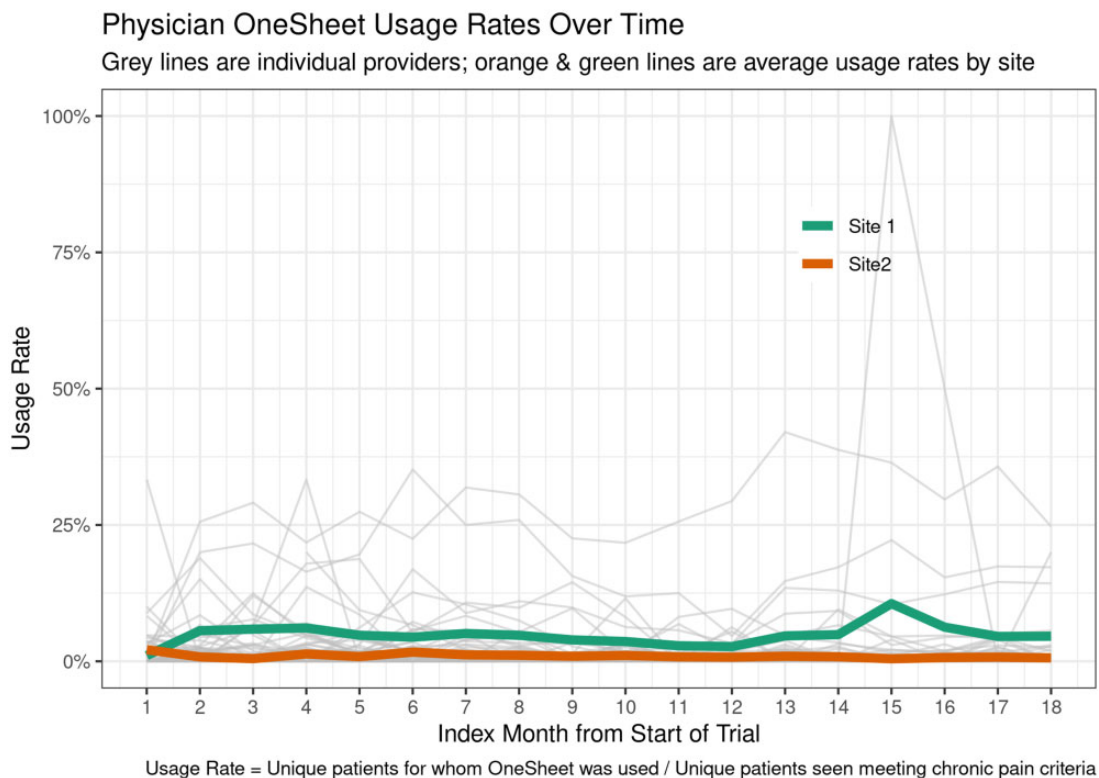


Figure 2. OneSheet usage rates over time by the provider (grey lines) and trial site (colored lines—site 1 is green, site 2 is orange).

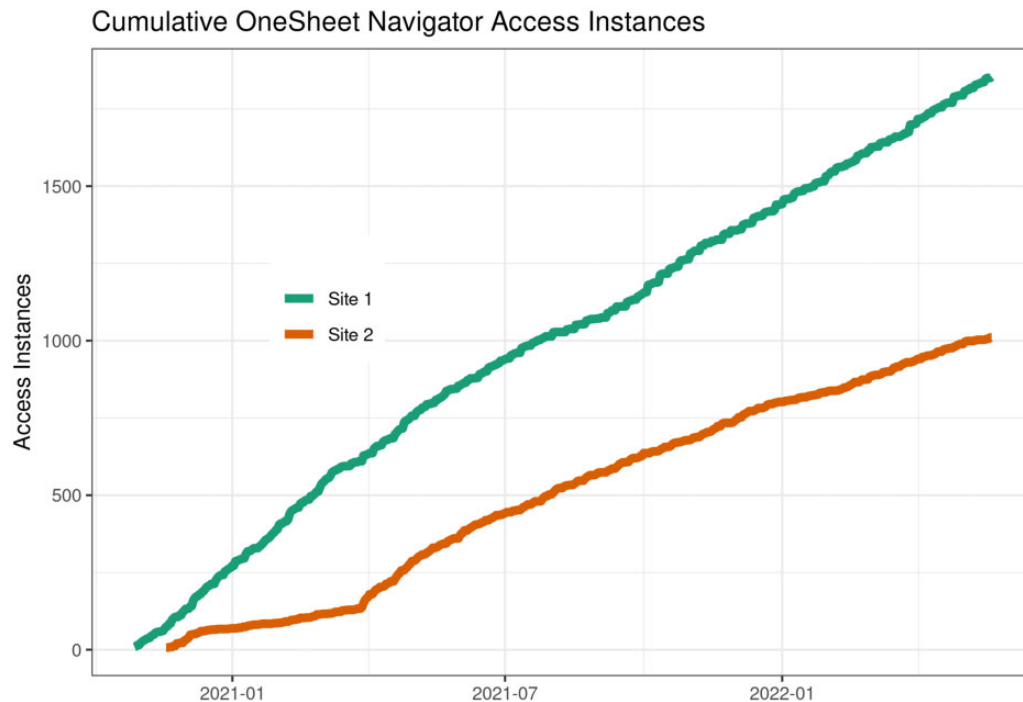


Figure 3. Cumulative OneSheet usage by site (site 1 is green, site 2 is orange).

chronic pain patients may be more regularly reminded of the utility of the OneSheet, which in turn could drive more significant usage. Second, information needs for chronic pain treatment may vary within patient over the course of treatment, and the current OneSheet design may prove more beneficial for certain treatment stages. Finally, the information and tools contained on the OneSheet may be more aligned with certain providers' information preferences for chronic pain treatment and their pain care workflows.²⁹ For example, if a provider prefers the OneSheet workflow for accessing the PDMP that may result in greater usage. Additional qualitative research is required to explore how to improve the user-centered design approach by aligning individual PCP needs with the design of CDSs. A "precision CDS" approach that matches PCPs with decision support tools that fit best with their extant practice patterns and individual preferences may lead to higher usage of CDS tools.³⁰ Finally, more research is needed to define a normatively "appropriate" use rate for OneSheet and its correlation with meaningful improvements in key patient outcomes.

Moreover, providers experience ever-increasing demands on their attention from EHRs. Changing entrenched provider behavior in the EHR has proven to be particularly challenging,³¹ even in the wake of significant federal policy changes aiming to decrease the burden.³² Our findings suggest the need for continued research to contextualize usage rates and explore barriers and facilitators to OneSheet use and the sociotechnical forces that inhibit provider behavior change, even among trial participants who, as volunteers in the study, are presumably more open to change than the average provider. Future research can focus on the 5 Rights of CDS,³³ to ensure that OneSheet implementation is tailored to the right patient, visit, and point in primary care workflows.³⁴ Relatedly, future work is needed to understand clinician perceptions of the broad chronic noncancer pain passive alert used to suggest OneSheet usage, such as whether it promoted alert fatigue,^{35,36} and how it may be refined.

Strengths

The OneSheet brings a unique tool to PCPs to support decision-making and decrease barriers to informed decision-making when treating patients with chronic pain. Per the CDC and other clinical guidelines,³⁷ prescribing decisions should be informed by different data elements ranging from prior prescriptions, dosing, refill frequency, multiple laboratory values, and patient-reported outcomes. By removing the need to search multiple screens and sections in the EHR for all of these varied data, the OneSheet allows PCPs to streamline data curation for decision-making when treating a complex patient with chronic pain. Additionally, many of these aforementioned data elements have a time or longitudinal component. By aggregating data such as PEG scores, the OneSheet positions data to support prescribing behavior responsive to patients' evolving chronic pain conditions. Additionally, our study was able to automatically record OneSheet usage in log files. This provided an objective measure of usage that did not rely on PCPs' self-report of activity. Self-reported technology usage is not always an accurate representation of actual end-user behavior.³⁸

Limitations

Our pragmatic trial faced real-world challenges during the implementation stage with the rapid shifts in PCP practices driven by the COVID-19 pandemic. A change in both prescribing practices (eg, changes in opioid prescribing refills) and clinical workflows makes it challenging to separate the impact of the OneSheet trial from concurrent changes that occurred during the pandemic. Additionally, while we would typically plan for more in-person support during the implementation of this type of trial, many clinics were unable to accommodate nonessential personal due to pandemic-related restrictions. This may have affected some elements of PCP recruitment and retention. Our trial was limited to 2 academic medical centers across their clinics located in Indiana and North Carolina; thus, caution

must be exercised prior to generalizing to other practice environments. Finally, given that we are still currently acquiring EHR data we were unable to assess the OneSheet's impact on clinical outcomes like opioid prescribing, UDS screening, etc. Nevertheless, we are confident that reporting usage rates of a new decision-support tool are vital in assessing the overall adoption of new EHR interventions.

CONCLUSION

Organizations implementing CDS tools are likely to see high provider variation in usage, suggesting that in addition to information needs, individual provider workflows is essential to consider when designing and implementing CDS. Our results are the first to go beyond describing a chronic pain and opioid prescribing CDS tool to report usage rates in the context of a pragmatic trial.

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AUTHOR CONTRIBUTIONS

NCA, OM, LS, RG, JV, and CAH conceptualized and drafted the manuscript. NCA, JH, AS, and ET gathered and analyzed the data. BWB, NM, SFE, RWH, RG, JV, and MCBA were major contributors to writing and editing the manuscript. The manuscript has been read and approved by all the authors. Each author believes that the manuscript represents honest work.

CONFLICT OF INTEREST STATEMENT

CAH discloses past research grant funding for studies of information technology to support pain care to his institution from Security Risk Solutions, Inc. and the Agency for Healthcare Research and Quality. CAH also discloses personal fees from Indiana Health Information Exchange, personal fees from New York eHealth Collaborative, personal fees from RTI International, outside the submitted work. OM discloses past and current research grant funding for studies of information technology to support pain care to her institution from Security Risk Solutions, Inc. and the Agency for Healthcare Research and Quality. MCBA and RWH are supported by National Institutes of Health funding through the NIH K08 EB022631, U24 NS115708, R24 DA055306, and R33 DA046085. RWG discloses unrelated research grant funding to his institution from Pfizer, NIH, PCORI, and AHRQ. JRV is a founder and equity holder in Uppstroms Inc., a health technology company. The other authors have no conflicts to report.

DATA AVAILABILITY

The datasets generated and analyzed for the current study are available from the corresponding author on reasonable request.

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