



Understanding the Information Needs of Pharmacy Staff Using CancelRx: A Qualitative Study of the Use of Prescription E-cancellation

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ABSTRACT

Background: Although electronic prescription cancellation such as via CancelRx can facilitate critical communication between prescribers and pharmacy staff about discontinued medications, there is little work that explores whether CancelRx meets the needs of pharmacy staff users.

Objective: This study leverages qualitative interviews with pharmacy staff to address the following question: *When medication changes are made by a prescriber using CancelRx, what information is needed by pharmacy staff to make correct and effective decisions in their roles in medication management?*

Methods: We conducted an inductive thematic analysis of interviews with 11 pharmacy staff members (pharmacists and pharmacy technicians) across three outpatient community pharmacy sites within an academic health care system.

Results: Three information needs themes were consistently identified by both pharmacists and pharmacy technicians: prescriber intent when initiating the CancelRx, clinical rationale for the medication change, and intended medication regimen. Notably, both pharmacists and pharmacy technicians often reported seeking multiple information needs not fully addressed by CancelRx in the electronic health record (EHR) to achieve the shared goals of correct dispensing of medications and supporting patient self-management.

Conclusions: Our qualitative analysis reveals that outpatient community pharmacy staff in an academic health care system often seek additional information from the (EHR) following medication changes communicated by CancelRx to meet their information needs. Ideally, the prescriber would provide sufficient information through CancelRx to automatically identify all discontinued prescriptions. These limitations highlight the need for design features that support routine communication of needed information at the time of a medication change, such as structured data elements.

1. Introduction

The prevalence of medication-related errors across inpatient and outpatient care settings in the United States represents an ongoing patient safety concern.^{1–3} It has been estimated that over 2 million adverse drug events (ADEs) occur among Medicare beneficiaries alone each year,⁴ yet a majority of ADEs are considered preventable.⁵ In particular,

the discontinuation or cancellation of medications can result in serious ADEs.⁶ One study found that over 30% of prescriptions intended to be discontinued yet later dispensed to patients could be categorized as posing a high risk of ADEs.^{7,8} Medications may be discontinued by prescribers for a variety of reasons, such as the necessity for a different medication or therapy based on progression of a patient's condition or conditions, an allergic reaction, or the natural completion of a therapy

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such as is often the case for antibiotics given for infections.⁹ Pharmacists and pharmacy staff play a key role in ensuring medication safety through patient counseling and identification of prescribing issues.¹⁰ However, a lack of clear communication between clinics and pharmacies can lead to medications being erroneously dispensed to patients, thus increasing the risk of ADEs.^{11,12}

Although medication cancellations or discontinuations are frequently documented in electronic health records (EHRs), the extent to which such information is consistently and clearly shared with pharmacies varies considerably.¹³ Pharmacies linked to clinics or health systems – or outpatient community pharmacies – may share an electronic record system (EHR) and receive discontinuation information electronically. However, chain or commercial pharmacies often do not have access to health system EHRs, which has implications for the extent of information sharing between clinicians and pharmacy staff within these settings.

CancelRx is part of the National Council for Prescription Drug Programs' (NCPDP) SCRIPT standard which, when implemented, enables prescribers to submit medication cancellations that are then shared electronically with pharmacy software via a one-to-one match to a prescription. Although the use of e-prescribing is nearly universal,^{14,15} e-cancellation through the use of CancelRx is relatively less well-utilized.¹⁶ As of 2022, approximately 89.9% of pharmacies and 80.3% of prescribers have systems enabled for use of the CancelRx prescription e-cancellation.¹⁷ Multiple studies highlight e-prescribing's ability to enhance communication between clinical and pharmacy staff, with improvements in patient safety largely due to reductions in illegible prescriptions that frequently characterize paper-based scripts.^{16,18} A smaller but growing body of research suggests that e-cancellation is also critically important for patient safety, especially for reducing the number of duplicate or discontinued medications filled in error.^{12,16} A recent study evaluating the efficacy of CancelRx in a large academic health system demonstrates that it facilitates clear and rapid communication regarding medication changes, with the proportion of successful medication discontinuations increasing from 34% to 93% after CancelRx implementation.⁹

Ultimately, a pharmacy staff member's ability to engage in accurate dispensing relies on information communicated from the prescriber's office to the pharmacy. However, we have a relatively limited understanding of the extent to which CancelRx specifically meets the information needs of pharmacy staff to facilitate the appropriate cancellation of medications and thus helps reduce medication-related errors and improve patient safety.¹⁹ This study addresses such a gap by exploring whether CancelRx addresses the information needs of pharmacy staff users. We leverage qualitative interviews with pharmacists and pharmacy technicians in outpatient community pharmacies to answer the following question: *When medication changes are made by a prescriber using CancelRx, what information is needed by pharmacy staff to make correct and effective decisions in their roles in medication management?* The aim of this study is to better understand pharmacy-specific information needs at the time of CancelRx receipt to improve communication between clinical and outpatient community pharmacy settings and thereby reduce the risk of medication-related patient safety events.

2. Methods

2.1. Study design, setting and data collection

CancelRx was implemented in January 2019 in 11 pharmacies within a large academic healthcare organization that is the subject of this study. The EHR system for this healthcare organization was independent of the pharmacy management software, and thus required the use of CancelRx to enable communication between clinics and pharmacies. During implementation, the health care system elected to suppress CancelRx messages with medication reorders to prevent confusion if pharmacies received both a cancellation and a new prescription at the

same time (particularly in instances where external community pharmacies hadn't implemented the electronic CancelRx and thus might receive a faxed cancellation message). CancelRx enables notification of prescription cancellations via a "one-to-one" match between a cancelled prescription in the clinic software with a message in the pharmacy software. When a CancelRx message arrives in the pharmacy software, it attempts to "match" the cancellation to a prescription for a given patient. The CancelRx workflow within the pharmacy setting has been well-documented and described elsewhere.^{5,9} Although pharmacy technicians frequently acknowledge matched cancellations, institutional policy requires pharmacists to address cancellations that are not automatically matched within the pharmacy software.⁶

We report the details of this study in accordance with the Standards for Reporting Qualitative Research (SRQR) guidelines.^{19,20} Our qualitative analysis was conducted as part of a larger human-centered design focused study examining safety and usability issues associated with the implementation of CancelRx (AHRQ Grant #5R21HS026584-02).

2.2. Recruitment

For this study, we analyzed interviews with pharmacy staff, including pharmacy technicians and pharmacists from three outpatient community pharmacies within a single large academic healthcare organization that serves patients from diverse outpatient practices. Pharmacy staff were eligible if they worked at a participating community pharmacy and were recruited via organizational email communication based on lists provided by site managers. A total of 11 pharmacy staff (six pharmacists and five pharmacy technicians) agreed to participate. Of these 11 staff, 7 identified as female and 4 as male. Tenure in respective roles (whether pharmacist or technician) ranged between 1 and 20 years, with nearly half responding that they had been in practice between 2 and 4 years.

2.3. Interview process

The study was designed by an interdisciplinary team of researchers, including those with backgrounds in general internal medicine and pharmacy as well as experts in human factors, health care quality improvement, and patient safety. As part of a larger qualitative study, the team developed a semi-structured interview guide for health professionals (used for both prescribers and outpatient pharmacy staff). A full copy of the interview guide can be found in Appendix A. Respondents were asked questions pertaining to the usability and clarity of the medication discontinuation workflow and the impacts upon communication between pharmacy staff, clinicians, and patients. Interviews were conducted virtually via Zoom between August 2020 to June 2022 and recorded. Audio recordings were then transcribed. Study protocols were approved by the institutional review board (IRB) for the health system studied. Informed consent was obtained from participants before interviews were conducted. Participants were also offered a gift card to thank them for their participation.

2.4. Data analysis

An interdisciplinary team, including those involved in the development of the interview guides as well as experts in health services research and organizational theory, took part in the coding of all interview transcripts. The research team used a combination of inductive and deductive thematic approaches to coding and the creation of an initial codebook.²¹

For this paper, inductive analysis was conducted of all excerpts from interviews with pharmacists or pharmacy technicians that were identified under the code "information needs." Three coders from the core team completed iterative coding of transcripts together before agreeing upon the characterization of broad themes pertaining to identified information needs of pharmacists and pharmacy technicians as well as

accompanying actions and goals. A coding matrix was utilized to track and compare individual coder's identification of information needs and disagreements between coders were resolved by consensus. Particular attention was paid to how information needs linked to specific actions and goals and whether these connections varied across interviews conducted with pharmacists versus pharmacy technicians. All coding was analyzed using Dedoose software (SocioCultural Research Consultants, Los Angeles, CA).

3. Results

All interviewees identified critical information needs pertaining to the use of CancelRx at times of medication changes. Three common information need themes emerged: 1) the prescriber intent when initiating the CancelRx (e.g., discontinue the medication without replacement, change the dose, or replace the medication with an alternate therapy); 2) the clinical rationale for the medication change (e.g., dose adjustment to improve blood pressure control, adverse reaction to the medication); and 3) the intended medication regimen following the CancelRx message (Table 1).

These themes were consistently identified by both pharmacists and pharmacy technicians and were often mentioned together. For example, one pharmacist highlighted the helpfulness of understanding both the clinical rationale and the prescriber intent when they receive a CancelRx:

"...when cancellations do come down there's no info attached to it. So, when a cancellation comes from [the electronic health record (EHR)] over, it doesn't tell you why it was cancelled or what's going on. [Clinical rationale] Then it gets into that are we inpatient and we're just clearing the med list to

Table 1
Supporting Excerpts for Information Needs Themes among Pharmacists and Pharmacy Technicians.

Theme	Supporting Excerpt (Pharmacists)	Supporting Excerpt (Pharmacy Technicians)
Clinical Rationale	<p>"So, when a cancellation comes from [the electronic health record (EHR)] over, it doesn't tell you why it was cancelled or what's going on."</p> <p>"...[I]t's so important to understand, especially for our critically ill patients, why we're doing what we're doing because they're going to ask us and if we don't have that information at our fingertips, we're going to struggle, waste their time, not understand..."</p>	<p>"[I]f a prescriber decides to switch or change and usually, they'll put—most of the time, they'll clearly mark on the prescription that this is, you know discontinue one statin and do the other. But other times, you just have to be on the ball and be like, wait a minute. You know, and then once you can see, once you process the prescription, it'll go into the profile, and you can see all their medication history. And you kind of have to be on alert to say, wait a minute, this is a duplicate therapy, this doesn't make sense. And, you know, alert the pharmacist to reach out to the provider just for clarification"</p>
Prescriber Intent	<p>"...we'll go in and see that 20 mg is no longer there and it's been replaced with 40, so we'll know that it's been cancelled."</p>	<p>"Well, if they cancel this medication are you sending another medication for them or will you be taking them off that medication."</p>
Intended Medication Regime	<p>"I go into [the EHR], I don't know, 50 times a day into patient profiles to look at their most current medications"</p>	<p>"You also have to check the patient's medication list to see the last time it was written and how many refills it was for. If you don't see that on that list... then you have to basically sort out those prescriptions to see if these were cancelled due to dose change or alternate therapy, or no longer needed."</p>

reorder, or are we really canceling it? [Prescriber intent] PHA200 (Pharmacist), Site 2.

Our analysis also examined how pharmacy staff made use of information. Following receipt of a CancelRx message, pharmacy staff frequently sought additional information to achieve the following two goals: 1) ensure correct medication dispensing to the patient when there was a medication change and 2) provide patients with information and/or counseling about.

their medication changes. Both pharmacists and pharmacy technicians desired additional information to communicate with patients following medication changes. Pharmacists noted that they may not have sufficient information to answer patient questions about the reason for a medication change. From one pharmacist's perspective:

"...[I]t's so important to understand, especially for our critically ill patients, why we're doing what we're doing because they're going to ask us and if we don't have that information at our fingertips, we're going to struggle, waste their time, not understand, and then the end result could be.... I'm not sure why the physician changed your dose. I don't see in the notes clearly why they have done this." [Clinical rationale] PHA201 (Pharmacist), Site 1.

In contrast, the same pharmacist noted that when they had sufficient information about the clinical rationale for the change, their counseling could reinforce this information with patients:

"A patient comes in the pharmacy and says why am I on this new medication. And we're struggling to find maybe in the notes why the physician changed their medication [Clinical rationale]. But if we get that head on within their note or we get it head on while they're doing the order, it comes up on CancelRx, that will help us do a sufficient job at counseling and then we can go deeper." PHA201 (Pharmacist), Site 1.

Although they do not provide counseling to patients, pharmacy technicians described providing first-line information when patients arrived to pick up a medication not knowing that it had been cancelled. This often necessitated the involvement of the pharmacist to provide appropriate counseling. As explained by one technician:

"[S]ometimes the patient does come and pick up the medication and they have been canceled, but we don't have adequate information to provide the patient to let them know why it was canceled [Clinical rationale] or if the doctor chose to do something different [Intended regimen]... We always try to make sure they get their care. Well, if they cancel this medication are you sending another medication for them or will you be taking them off that medication [Prescriber intent]. And has this been communicated to the patient as well? That's usually on the pharmacist's end, but I know on the pharmacy tech end we usually encounter that when we are at the register and they are physically coming to pick up." PHA101 (Pharmacy Technician), Site 3.

Although some pharmacists noted that they could deduce the planned change in medication if there was a clear replacement prescription for a different dose or a new medication, some preferred when the prescriber intent (e.g., change medication, change dose) and the intended medication regimen were explicitly provided and linked together. This could occur through use of the "notes to pharmacy" in addition to receiving the CancelRx message, which our interviewees identified as a common workaround. As described by one pharmacist:

"The provider notes actually help out a lot... if they would say, you know, discontinuing {drug 1} and {drug 2}, [Prescriber intent] new regimen is {drug 3}[Intended regimen], then were to date it, put the date that they—today's date, that is ideal." PHA202 (Pharmacist), Site 2.

However, to be confident in their decision about which prescriptions to deactivate when managing unmatched cancellations (which were addressed only by pharmacists rather than pharmacy technicians), pharmacists described looking in the EHR for documentation of the intended medication regimen. As the same respondent stated:

"I go into [the EHR], I don't know, 50 times a day into patient profiles to look at their most current medications [Intended regimen]...we'll go in and

see that 20 milligrams is no longer there and it's been replaced with 40, so we'll know that it's been canceled." [Prescriber intent] PHA202 (Pharmacist), Site 2.

Pharmacy staff reported engaging in a significant amount of "investigative work" to identify which prescriptions should be cancelled and to ensure accuracy of dispensed medications. Sometimes, this involved searching for clarity concerning correct medications for a specific patient in medication lists embedded within the EHR as noted by this pharmacy technician:

"[Y]ou have to basically sort out those prescriptions to see if these were cancelled due to dose change or alternate therapy, or no longer needed [Prescriber intent]. So I do a lot of that, a lot of investigative work." PHA201 (Pharmacy Technician), Site 2.

Pharmacy technicians also described needing information when entering data on new prescriptions to ensure that the correct prescriptions were dispensed. As described by one technician:

"[I]f a prescriber decides to switch or change and usually, they'll put—most of the time, they'll clearly mark on the prescription that this is, you know discontinue one statin and do the other. But other times, you just have to be on the ball and be like, wait a minute. You know, and then once you can see, once you process the prescription, it'll go into the profile, and you can see all their medication history [Intended regimen]. And you kind of have to be on alert to say, wait a minute, this is a duplicate therapy, this doesn't make sense." PHA100 (Pharmacy Technician), Site 3.

Taken together, these excerpts highlight that pharmacy staff frequently made use of an information workaround in the form of seeking confirmation of medication discontinuations or cancellations via patient medication lists or other documents within EHR systems. These investigatory tasks draw attention to areas for potential improvement within the structure of CancelRx to ensure accurate information exchange between practices and pharmacies and to reduce additional informational burdens that currently characterize the work tasks of pharmacists and pharmacy technicians within outpatient community pharmacy settings.

4. Discussion

Our qualitative analysis identified three information needs themes among pharmacy staff at the time of medication changes using CancelRx: 1) the prescriber intent when initiating the CancelRx; 2) the clinical rationale for the medication change; and 3) the intended medication regimen following the CancelRx. Pharmacists and pharmacy technicians both spoke to the helpfulness of receiving these three information needs together, such as in the "notes to pharmacy" section of a CancelRx message, but also frequently noted that such a feature was inconsistently used to communicate critical information. When these information needs were poorly met, pharmacy staff members struggled to appropriately counsel or follow up with patients to ensure clarity of medication regimens.

Notably, both pharmacists and pharmacy technicians sought information from the EHR as a workaround to securing information not easily located within the CancelRx message, underscoring an unmet information need within pharmacy information software following receipt of a CancelRx transaction. This finding is echoed in a recent study examining CancelRx's impact on workflow within three outpatient community pharmacies tied to an academic teaching hospital, where the study authors noted that pharmacists undertook investigation via patient medication profiles or EHRs with approximately 46% of CancelRx messages.²² To the extent that the goal of CancelRx is to facilitate clear communication about medication changes or cancellations between clinic and pharmacy staff, searching for clarity concerning prescriber intent, clinical rationale or intended regimen in EHRs underscores a lack of needed features in CancelRx to provide this information consistently and accurately. Our study found that pharmacists and pharmacy technicians sought answers to these information needs to achieve two shared goals - the correct dispensing of medications and supporting patient self-

management. This gap is particularly important since, unlike our outpatient community pharmacy study sites, many commercial pharmacies in the US do not have access to EHRs to seek information beyond what is included in e-prescription or e-cancellation messages.

Although a growing body of research demonstrates that CancelRx effectively relays medication discontinuations or cancellations between clinic and pharmacy settings, our study is the first to qualitatively underscore unmet needs among pharmacists and pharmacy technicians in the context of CancelRx use. Specifically, our qualitative analysis highlights that the information chain that pharmacy staff seek out via CancelRx is the prescriber's intended change resulting in an intended medication regimen which in turn is justified by clinical rationale. Pharmacists and pharmacy technicians emphasized the helpfulness of having these pieces of information together, particularly when presented through a workaround such as the "notes to pharmacy" feature within CancelRx as a mechanism for sharing context. However, prior research has identified several limitations to the use of the "notes to pharmacy" feature, including (a) it is attached to a new prescription, not a prescription cancellation; (b) notes are persistent with a refill of a prescription, and thus may not be accurate over time; (c) the note may not be seen by pharmacy staff, who then risk missing critical information; and (d) the feature has been used to communicate less relevant or inappropriate information.²³ Furthermore, the voluntary nature of this free text feature means that, as highlighted by the participants in this study, it is inconsistently used by clinicians even when there is helpful information to be shared with pharmacy staff.

These limitations highlight the need for a design feature that supports routine communication of needed information at the time of a medication change, such as a mandatory structured data element that specifies the clinical rationale for a medication change or cancellation within CancelRx such as allergy, intolerance, ineffectiveness, expense, completion of treatment, dose/form change, or replacement by another treatment. Another recommendation to improve the communication of information needs between prescribers and pharmacy staff would be to link a medication cancellation or discontinuation to a particular diagnosis or clinical indication, if, for example, a CancelRx and a new prescription for the same indication are transmitted in a single session. A mandatory data element that specifies the clinical indication could preclude the need for the "investigative work" that pharmacy technicians highlighted in our interviews. Both formative and summative usability evaluation by pharmacy end users are needed to ensure that an enhanced version of CancelRx provides the information pharmacists and pharmacy technicians need to support effective medication management.

Pharmacists and pharmacy technicians both highlighted a shared goal of supporting patient self-management. Pharmacists are responsible for providing in-depth medication counseling to patients, which they described as a "bi-directional" activity (i.e., pharmacists both initiate counseling about medication regimens with patients and respond to questions that patients raised with them about their medications). Although they do not provide counseling, pharmacy technicians also sought additional information to communicate with patients, sometimes through "jogging a patient's memory" about the details pertaining to a given medication so that they could clarify knowledge gaps and appropriately refer patients to pharmacists. Ensuring patients are adequately counseled about how to manage their medication regimes is closely linked to adherence, which in turn has important implications for patient safety.²⁴

In implementation at the health system that was the subject of this study, CancelRx messages were not sent for medication reorders. Importantly, this can result in duplicate active prescriptions in the pharmacy and, as a result, multiple prescriptions may need to be deactivated when a prescription is cancelled. This system-wide choice may have contributed to some of the information seeking that emerged through these analyses. Sending a CancelRx transaction with every reorder would result in a significant increase in CancelRx transactions at

the pharmacy but would preserve the one-to-one matching of a prescription and cancellation, which may reduce the need to identify multiple prescriptions to discontinue.^{25,26}

Our study underscores a number of potential design changes that may be beneficial to ensuring clear communication between prescribers and pharmacy staff while using CancelRx. Ideally, the prescriber would provide sufficient information through the CancelRx transaction to enable the pharmacy management software to automatically identify all prescriptions that need to be deactivated and reduce the need for individual decision-making. Providing dedicated, mandatory free text fields to communicate information to pharmacy staff about the prescriber intent, clinical rationale for change, and intended medication regimen may allow pharmacy staff to verify the actions of the system and could reduce the necessity of searching for additional information in EHRs to confirm medication discontinuations or cancellations. By extension, such a feature could also improve the timeliness of communication and patient counseling following medication changes.

5. Strengths and limitations

To our knowledge, this is the only qualitative study examining information needs pertaining to the use of CancelRx from community pharmacy-embedded users. One strength of this study is our inclusion of both pharmacist and pharmacy technician perspectives in parallel, which allowed us to explore how shared information needs in the context of CancelRx emerge for each group via their respective workflows and scope of responsibilities. This study has several important limitations. First, this qualitative study relied upon a small sample size of pharmacists and pharmacy technicians ($n = 11$). However, these participants consistently identified three key information needs, although there may be additional needs that we did not identify. Additionally, our interviews were limited to pharmacy staff from outpatient pharmacies within a single health care system. All three sites have direct communication linkages to the associated prescribers and direct access to patient health records in the EHR. While we anticipate that these information needs themes would be similarly identified at commercial pharmacies that do not have access to EHRs, they may have additional information needs that we did not identify. Future research that examines the specific information needs of a larger sample of pharmacists and pharmacy technicians within both outpatient community and commercial pharmacies could contribute to our understanding of the extent to which the information needs for pharmacy staff in these settings are shared, as well as whether unique information needs exist that limit CancelRx usability for pharmacy staff in non-community pharmacy settings.

6. Conclusions

CancelRx enables the transmission of e-cancellations from clinics to pharmacies with a goal to enhance medication safety and reduce the risk of ADEs. Achieving this goal requires critical evaluation of whether CancelRx adequately meets the needs of end users, particularly pharmacy staff. Our qualitative analysis identifies three important information needs among outpatient community pharmacists and pharmacy technicians utilizing CancelRx – 1) prescriber intent, 2) clinical rationale for medication change or discontinuation, and 3) intended medication regimen. To our knowledge, this study is the first to specifically assess information needs associated with CancelRx from the perspective of pharmacists and pharmacy technicians. As such, it provides important insights into how it might be modified (such as through the inclusion of required structured data elements) to better support pharmacy-centered efforts to improve medication management and counseling for patients and thus contribute to system-wide patient safety.

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Declaration of Competing Interest

The authors have no competing interests to disclose.

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Appendix A. Supplementary data

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