

Evaluation of Overridden Drug Utilization Review (DUR) Alerts in an Ambulatory Pharmacy Dispensing System: Patterns, Documentation Practices, and Opportunities for Optimization

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ABSTRACT

Introduction

Drug utilization review (DUR) systems are important for ensuring medication safety by identifying medication-related issues, such as Drug-Drug interactions and therapy duplications. While DUR alerts support clinical decision-making, excessive or clinically irrelevant alerts can lead to alert fatigue. This can potentially cause pharmacists to overlook crucial warnings and jeopardize patient safety. Despite the significance of DUR systems, research evaluating these alerts, and offering actionable improvements remains limited.

Objectives

This study aims to evaluate overridden DUR alerts within an outpatient pharmacy dispensing system to identify opportunities for optimizing alert type, frequency, and clinical relevance, to enhance pharmacist workflow, and patient safety.

Methods

A retrospective review was conducted across 9 outpatient pharmacies within a single health system using the Epic Willow Ambulatory dispensing system, the most robust pharmacy dispensing system used by the health system that also contained information on infusion patients. Data was collected on all DUR alerts overridden from October 1, 2024 to December 31, 2024. Information included alert type, category, severity, pharmacist override response, and free-text comments. Descriptive statistics and qualitative analysis were used to assess alert characteristics and pharmacist override responses.

Results

During the 3-month period, 93,010 alerts were overridden by 73 staff pharmacists for 16,653 patients. The most common alert types were Duplicate Therapy (36.3%), Drug-Food (28.9%), and Drug-Allergy (23.7%) alerts. Of the 4 radial buttons available for pharmacists to click to override the alerts, the most common override response was Clinician Reviewed (89.4%). Only 1.2% of overridden Drug-Drug alerts, all of which were severe and contraindicated Drug-Drug interactions, had accompanying free-text comments that explained why pharmacists overrode the alerts. The range of DUR alerts overridden per medication fill review was 1 to 89 alerts (median: 2 alerts; interquartile range: 1-2 alerts).

Discussion

Findings revealed that a significant volume of DUR alerts may be poorly tailored to pharmacist workflows, leading to reliance on routine habit to override alerts. Recommended improvements include removing low-value alerts (e.g., Drug-Food), refining Duplicate Therapy alert logic based on timing of prescription dates, and enhancing override options to capture more specific reasoning.

Conclusions

This study identifies key areas for optimizing DUR alerts, offering recommendations to enhance the design and pharmacist interaction with alerts. These findings can guide improvements in DUR systems across various pharmacy practice settings, including infusion pharmacies. By refining alert systems, pharmacies can enhance medication review processes, reduce alert fatigue, and improve patient safety.

Keywords: drug utilization review, DUR alerts, alert fatigue, medication safety, quality improvement, pharmacy dispensing system

Introduction

Drug utilization review (DUR) is a systematic process used to evaluate the prescribing, dispensing, and use of medications to ensure safe and effective therapy. DUR involves a comprehensive review of a patient's drug therapy and medical history against predetermined criteria for appropriate drug therapy.¹ Pharmacists can engage with DUR systems as part of medication therapy management and clinical decision support system. DUR systems can help pharmacists identify Drug-Drug interactions, drug-patient precautions, and drug-disease contraindications to better inform clinical decision-making. Alerts triggered from DUR systems thus serve as valuable tools for improving patient care, enhancing patient outcomes, and reducing overall health care costs.²

These clinical decision support systems, however, have some drawbacks. For example, there are discrepancies between the evidence provided for various alerts and the clinical significance of the evidence. As the number and frequency of DUR alerts—especially those that are redundant, clinically irrelevant, or erroneous—appear when reviewing patient medications, alert fatigue can occur.³ Alert fatigue can be dangerous, especially when a clinician overrides a number of alerts but misses one that can jeopardize patient care and safety. Thus, it is imperative that DUR alerts are clinically relevant and accurate to minimize alert fatigue and optimize patient care.

There are published studies examining pharmacists' perceptions of DUR alerts, but a limited number of those studies consider how these alerts should be improved upon.⁴⁻⁶ This lack of information is suboptimal, especially since one of the best practices outlined in the 2017 Institute for Safe Medication Practices (ISMP) Medication Safety Self-Assessment for Community/Ambulatory Pharmacy is the periodic evaluation of pharmacy computer systems for "clinically insignificant and false positive alerts," as well as "action taken to minimize alert fatigue."⁷ The publication of specific analyses that pharmacies have performed to improve their alert system would be helpful to inform other pharmacies on best practices they may want to consider adopting.

This study aims to address this gap by analyzing DUR alerts overridden in the outpatient pharmacy medication dispensing system within our health system. We selected the system used in our outpatient pharmacies

because it is the most robust platform available to us for capturing a large data set. Although infusion medications are dispensed through other systems in our organization, medication profiles for our infusion patients can still be found in our outpatient pharmacy medication dispensing system. By examining pharmacist responses and documentation within this primary system, we aim to provide actionable recommendations to optimize alert frequency, type, and presentation. These recommendations are intended to be applicable to all pharmacy dispensing systems, including those used in infusion practice settings, though we acknowledge that alert logic and workflows can vary across vendors. Ultimately, this will support improved clinical review processes and lay the foundation for future studies comparing DUR alert performance across other systems to enhance medication safety, regardless of specific pharmacy dispensing system.

Methods

This was a retrospective study conducted across 9 outpatient pharmacies within a single health system. Inclusion criteria were limited to DUR alerts for all medications overridden in the pharmacy dispensing system (Epic Willow Ambulatory) from October 1, 2024, to December 31, 2024. A 3-month period was selected to capture patients who receive 90-day supplies of medication. In our pharmacy dispensing system, DUR alerts are triggered during medication fill review, which is an event that can occur during pharmacist clinical review (i.e., first fill review completed by a pharmacy technician but needs to be reviewed by a pharmacist) or final verification of a single medication. Alerts that resulted in prescription changes, as well as alerts that were not overridden, were not captured to avoid introducing selection bias.

Institutional Review Board (IRB) approval was obtained prior to data collection. Data collected included pharmacy location, date and time when DUR alert was triggered, medications involved, alert name, alert category (i.e., Dose, Drug-Allergy, Drug-Food, Duplicate Therapy, Lactation, Pregnancy), and alert severity (i.e., Low, Medium, High, Very High). The alert severity levels were locally configured based on a combination of third-party drug information sources and consensus from our health system's clinical informatics council. Pharmacist override responses were also collected, including the selected override reason (i.e., Clinician Reviewed, Benefit Outweighs Risk, Dose Appropriate, Inaccurate Warning) and any accompanying free-text comments.

Descriptive statistics were performed to characterize the type, frequency, and presentation of DUR alerts. Override responses and free-text comments provided by pharmacists were analyzed by the primary author using qualitative content analysis to identify recurring themes, then independently reviewed and confirmed by the two coauthors.

Results

Overall Review of DUR Alerts

Over the 3-month period, a total of 93,010 alerts were overridden by 73 pharmacists for 16,653 patients. The number of DUR alerts overridden per medication fill review ranged from 1 to 89 alerts (median: 2 alerts; interquartile range: 1 alert) (Figure 1).

The top 3 alert types were Duplicate Therapy (36.3%), Drug-Food (28.9%), and Drug-Allergy (23.7%). The full breakdown of alert types and frequencies can be found in Table 1.

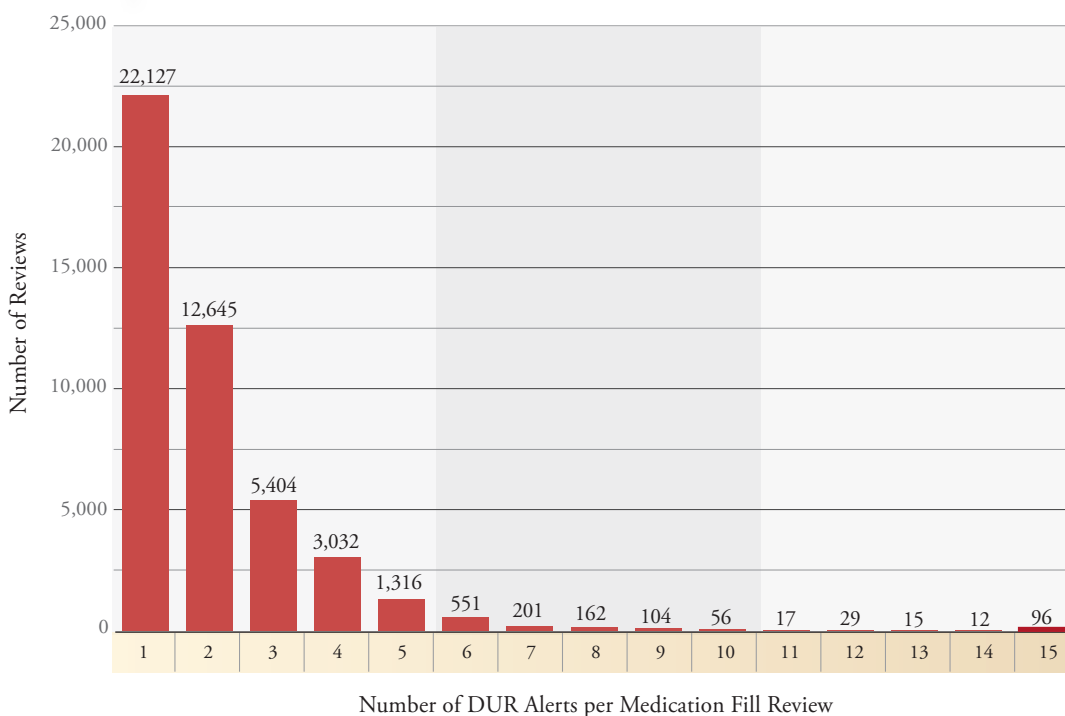
Alert types were also assigned different levels of importance (i.e., Low, Medium, High, Very High) based on how the specific alert was programmed in the pharmacy dispensing system. For example, all Duplicate Therapy alerts were considered of High importance. Drug-Food alerts were categorized depending on the urgency of the need for modification of diet based on references

TABLE 1 | DUR Alerts by Category

Alert Type	n (%)
Duplicate Therapy	33,765 (36.3)
Drug-Food	26,909 (28.9)
Drug-Allergy	22,087 (23.7)
Drug-Drug	6,923 (7.4)
Dose	1,779 (1.9)
Pregnancy	1,401 (1.5)
Lactation	146 (0.2)
Total	93,010

to the system's tertiary drug information sources: Low importance indicated that a change in diet was possibly needed, and Medium importance indicated that a change in diet may be necessary. Drug-Allergy alerts were similarly categorized based on the classification of allergy symptom severity: High importance indicated that the severity of symptoms to the allergen was significant based on drug information references but was not able to be automatically classified by the electronic medical record (EHR), and Very High importance indicated both a significant severity based on drug information references and an automatic classification by the EHR. Instances when the Drug-Allergy alert severity could not be categorized by our

FIGURE 1 | Number of DUR Alerts Overridden per Medication Fill Review



pharmacy dispensing system occurred when pieces of information in the prescription (e.g., route of medication administration) were missing. The full breakdown of DUR alert categories by alert importance can be found in Table 2.

Pharmacist Responses to DUR Alerts

Of the 4 radial buttons available for pharmacists to click to override the alerts, the most common response was Clinician Reviewed (89.4%). The full breakdown of pharmacist responses and frequency can be found in Table 3.

TABLE 2 | DUR Alert Categories by Alert Importance

Alert Importance	n (%)
Low	7,156 (7.7)
Drug-Food	7,156 (7.7)
Medium	20,305 (21.8)
Drug-Food	19,753 (21.2)
Pregnancy	552 (0.6)
High	42,288 (45.5)
Duplicate Therapy	33,765 (36.3)
Drug-Drug	6,471 (7.0)
Dose	1,481 (1.6)
Drug-Allergy	530 (0.6)
Pregnancy	41 (0.0)
Very High	5,046 (5.4)
Drug-Allergy	3,640 (3.9)
Pregnancy	808 (0.9)
Drug-Drug	452 (0.5)
Lactation	146 (0.2)
(No Importance Level Provided)	18,215 (19.6)
Drug-Allergy	17,917 (19.3)
Dose	298 (0.3)

TABLE 3 | Pharmacist Responses to DUR Alerts

Override Reason*	n (%)
Clinician Reviewed	83,139 (89.4%)
Dose Appropriate	9,323 (10.0%)
Benefit Outweighs Risk	495 (0.5%)
Inaccurate Warning	48 (0.1%)
(Left Blank; Comment Only)	5 (<0.1%)

*Override reason provided by clicking 1 of 4 radial buttons. A free-text comment may be added for additional context or can serve as the override reason.

Pharmacist free-text responses to Drug-Drug alerts were also reviewed, since one of the primary responsibilities of pharmacists is to ensure that concomitant medications are taken safely. The pharmacy dispensing system only requires review and override of High and Very High importance Drug-Drug alerts, which comprise severe and contraindicated Drug-Drug interactions, respectively. A key finding was that of the 6,923 total Drug-Drug alerts overridden in the system, only 78 (1.2%) of these had comments that further explained why reviewing pharmacists overrode the alerts. The full breakdown of Drug-Drug alert response by importance severity can be found in Table 4.

TABLE 4 | Drug-Drug Alert Response by Severity

Drug-Drug Alert Severity	n (%)
Severe Interaction	6,471 (93.5)
<i>No comments provided for 6,404 (92.5%) of alerts</i>	
<i>Comments provided for 67 (1.0%) of alerts</i>	
Clinician Reviewed	5,742 (82.9)
Dose Appropriate	693 (10.0)
Benefit Outweighs Risk	33 (0.5)
Inaccurate Warning	3 (<0.1)
Contraindicated	452 (6.5)
<i>No comments provided for 441 (6.4%) of alerts</i>	
<i>Comments provided for 11 (0.2%) of alerts</i>	
Clinician Reviewed	389 (5.6)
Dose Appropriate	59 (0.9)
Inaccurate Warning	2 (<0.1)
Benefit Outweighs Risk	2 (<0.1)
Lactation	146 (0.2)

A summary of the major themes gathered from review of the free-text comments provided by pharmacists overriding severe or contraindicated Drug-Drug interactions can be found in Table 5.

TABLE 5 | Summary of Free-Text Comments Provided by Pharmacists Overriding Severe or Contraindicated Drug-Drug Alerts

- Continuation of therapy from inpatient admission
- Patient has tolerated medication or combination of medications before
- Medication was filled years ago
- Clarification of the clinical situation (e.g., holding medication before surgery)
- Acknowledgment that the provider is aware of the DUR alert, medication doses have been modified, and/or the patient has been counseled on potential adverse events

Discussion

High Volumes of Overridden DUR Alerts

The results of this study demonstrate that a large number of alerts were overridden in the pharmacy dispensing system and reviewed by outpatient pharmacists. An average of approximately 1,011 DUR alerts were reviewed in the pharmacy dispensing system each day. In addition, 2 DUR alert categories (Duplicate Therapy and Drug-Food) accounted for most alerts (65.2%) versus Drug-Drug alerts comprising only 7.4% of alerts.

These findings raise some important questions: How valuable are all these alerts when clinically reviewing prescriptions? Do they contribute to alert fatigue and potentially obscure more serious alerts (e.g., Drug-Drug alerts)? Targeting these high-volume categories for refinement could significantly reduce alert burden and improve pharmacist focus on clinically relevant issues.

Proposed Changes to Duplicate Therapy Alerts

Deeper investigation of the pharmacy dispensing system revealed that Duplicate Therapy alerts were configured solely on the presence of multiple (i.e., 2 or more) active medication prescriptions from the same therapeutic class, regardless of timing, or clinical context. Active prescriptions as defined in the pharmacy dispensing system included scripts with or without remaining fill quantities, expired scripts (which are not equivalent to discontinued scripts), and patient-reported medications. This often led to unnecessary alerts for medications that may not have been previously discontinued by an ordering physician or reviewed by pharmacist but were not actively being taken by the patient at the time of alert.

To improve clinical relevance, we recommend a more refined approach to setting Duplicate Therapy alert thresholds based on the number of active prescriptions within a specific time window (e.g., 120 days). A 120-day timeframe could be considered to balance capturing medications that a patient is likely still taking—particularly those dispensed in 90-day quantities—while avoiding inclusion of prescriptions that are no longer clinically relevant. This approach would help distinguish between clinically appropriate overlaps and true therapeutic duplications, reducing unnecessary interruptions. Pilot testing would be

needed to evaluate the impact of this time-based threshold on alert volume, workflow efficiency, and clinical accuracy before broader implementation.

Review of Duplicate Therapy alerts also raises the broader question: Should outpatient pharmacists be empowered to discontinue duplicate medications or those that the patient reports they are no longer taking? While this could help maintain cleaner medication profiles and reduce future alert burden, it must be balanced against the potential for increased workload and risk of not having full clinical context. Ultimately, responsibility for maintaining accurate medication lists should be shared among prescribers, inpatient teams, and both outpatient dispensing and clinical pharmacists, with clear protocols to support efficient and collaborative medication management.

Proposed Changes to Drug-Food Alerts

The utility of Drug-Food alerts was questioned by pharmacists, who generally perceived these alerts as having minimal value during prescription review. They also believed in most cases, these alerts may be more appropriate for the patient counseling process rather than DUR intervention.

In light of their high frequency and limited perceived relevance to pharmacist decision making during dispensing, Drug-Food alerts contribute substantially to alert burden, accounting for 28.9% of all overridden alerts. These alerts could be removed from the DUR workflow and converted to non-interruptive, informational prompts. This targeted approach may better balance workflow efficiency with patient safety. Shifting food-related guidance to patient-facing education, such as auxiliary prescription labels and counseling prompts, would reduce alert fatigue while ensuring that higher-risk food interactions remain visible to pharmacists.

Pharmacists' Override Responses

Results of pharmacists' override responses raised concerns regarding radial button selection and documentation. Despite recognition that radial buttons were intended to streamline workflow and improve efficiency of DUR alert review and override, review of trends challenge the utility of radial buttons with respect to medication safety. In our pharmacy dispensing system, Clinician Reviewed was the most commonly selected override response by pharmacists. This response also appears as the first radial button

among the 4 available options (order from left to right in the response box is Clinician Reviewed, Dose Appropriate, Benefit Outweighs Risk, and Inaccurate Warning). This suggests that routine action may be a contributing factor to its volume of response.

Furthermore, “Clinician Reviewed” is vague and does not clearly indicate what specific assessment was made, such as an in-depth review of a patient’s medical record or contact with the prescriber. Override documentation to support radial button responses was also found to be lacking in clarity. Especially for Drug-Drug alert overrides, free-text comments were rarely added (1.2% of all Drug-Drug alerts), thus limiting insight into pharmacist reasoning for why severe or contraindicated Drug-Drug interactions were overridden. This raises another critical question: How can override options be improved to increase documentation specificity?

Proposed Changes to Pharmacist Override Responses

The relative lack of detailed explanations for why DUR alerts were overridden raises concerns about the robustness of documentation practices and the potential for compromised patient safety. This finding suggests a need for system-level changes that promote more meaningful pharmacist engagement during alert review. One approach could be to require free-text documentation for high- and very-high-severity alerts. However, such a change could increase workflow burden and contribute to override fatigue if not implemented thoughtfully. Alternatively, radial buttons could be enhanced to present more specific override reasons—such as “Discussed with Provider,” “Patient Tolerated Previously,” or “Other—See Comment”—which would balance workflow efficiency with improved clarity and accountability. Piloting revised radial buttons and/or selectively requiring free-text documentation for high-severity alerts could help determine the impact on pharmacist efficiency and alert fatigue.

Strengths and Limitations

Overall, this study included a comprehensive evaluation of a large volume of DUR alerts across multiple outpatient pharmacy locations within a health system, providing robust insight into real-world pharmacist interactions with DUR alerts. By categorizing alert types and assessing override behaviors, we were able to identify actionable targets for system improvement that can be implemented in similar pharmacy settings. It is

important to note that although this study generated concrete recommendations for system changes, actual implementation may depend on the technical capabilities and priorities of health system information technology and software vendor teams.

The findings of this study are limited by its retrospective design and the short 3-month review period. Additionally, the data reviewed did not capture DUR alerts that were not overridden and thus not pushed forward in the workflow for subsequent dispense. If pharmacists performing clinical review decided to go back to the prescription and make an intervention on the prescription after responding to the alert prompt, that information was not captured. The study also did not assess the clinical appropriateness of overrides or downstream patient outcomes (e.g., if any adverse drug events occurred as a result of overridden alerts), which could be areas for future research.

Finally, results were specific to one pharmacy dispensing system (Epic Willow Ambulatory), and other pharmacy dispensing systems may have their own nuances with respect to DUR alert builds. Expanding this evaluation to infusion and inpatient dispensing platforms would also be valuable to determine whether similar alert trends and intervention opportunities exist across settings. Although the studied pharmacy dispensing system provided the most comprehensive DUR data and includes medication profiles for many of the health system’s infusion patients, the logic, severity classification, and workflow integration may vary across vendors and system builds. Our health system uses additional dispensing platforms for infusion patients, and DUR alert performance may vary across these environments. Future studies comparing alert patterns across multiple systems would help determine the generalizability of these findings and identify systemwide enhancements to medication safety.

Conclusion

This is the first retrospective analysis of DUR alert data within our pharmacy dispensing system since implementation approximately 3.5 years ago. Findings from this study will help other pharmacy services conduct similar reviews within their respective pharmacy dispensing platforms. Although this analysis focused on one specific pharmacy dispensing system that was not dedicated to solely infusion patients, it was selected because it provided the most robust and

comprehensive DUR data within the health system and still included medication profiles for infusion patients. As a result, the patterns identified here offer a meaningful starting point for understanding how DUR alerts function across practice settings, even though infusion-specific alerts were not directly evaluated.

Because DUR alert review is applicable to all pharmacy environments, the insights gained from this study are likely to be relevant to infusion pharmacy workflows, where alert fatigue and documentation clarity are also critical to patient safety. Systematic evaluation of alerts—regardless of the software used—can inform improvements in alert type, frequency, and presentation to optimize pharmacist clinical review and minimize unnecessary interruptions. Infusion, inpatient, ambulatory care, and community pharmacies should all periodically assess DUR alert performance and analyze trends to ensure that alerts remain clinically meaningful and aligned with workflow. Future studies comparing DUR alert behavior across multiple dispensing systems, including those used for infusion therapy, would help with generalizability across pharmacy dispensing systems and enhance identification of opportunities to improve pharmacist medication fill reviews while reducing alert fatigue.

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