Leveraging Pharmacy Informatics to Standardize Pharmacists' Review of Oral Oncolytics for Hospitalized Patients

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Over the past decade, advances in oncology practice have led to an increase in the development and U.S. Food and Drug Administration approval of several new, targeted oral oncolytics. Oral oncolytic agents are often thought to be safer than parenteral formulations; however, an error with an oral agent can be equally dangerous as an error with an intravenous agent.[1] In 2012, the Institute for Safe Medication Practices released results from its *Medication Safety Self Assessment for Oncology* survey that focused on the safe management of oral oncolytics.[2] Of the 352 reporting institutions, 311 (88.4 percent) attested to allowing oral oncolytic use at their institution.[2] However, only 153 (43.5 percent) established safety measures for oral oncolytic orders.[2] Lack of safety measures regarding the prescribing, administering, and monitoring of oral oncolytic therapies while patients are hospitalized increases the potential for error and patient harm due to some of the challenges listed in Table 1, page 48. These challenges highlight the need to develop a standardized process to review and monitor the use of oral oncolytics during patient hospitalizations. Unfortunately, there is little literature available to guide the implementation of this process.

Our teams also used pharmacy informatics to develop a checklist in the form of a structured note in the clinical portion of the EHR to standardize review of a prescribed oral oncolytic medication(s).

Pharmacists as Gatekeepers

In 2018, the Hematology/Oncology Pharmacy Association released its pharmacy practice standards for the management of oral oncolytics.[3] These standards focused on the role of oncology pharmacists on patients' cancer care teams in relation to prescribing, educating, dispensing, distributing, and monitoring oral oncolytics, in addition to conducting follow-ups with patients to improve treatment adherence and side effect management.[3] Literature continues to emerge supporting pharmacist-led oral oncolytic outpatient clinics.[3-5] However, there is minimal literature demonstrating the gatekeeper role that pharmacists can play in ensuring safe medication use during a patient's hospitalization. Hospital-based pharmacists are in an ideal position to collaborate with physicians, nurses, and patients to address the challenges identified in Table 1; ensure order accuracy; and monitor for drug interactions and side effects while patients are admitted.[3]

Table 1. Challenges to Oral Oncolytic Therapy During Hospitalization

Complex regimens	Various dosing schedules, including daily, weekly, and cyclical frequencies
High cost	Non-formulary at most hospitals
Provider unfamiliarity with medications	Prescribing normally limited to oncology providers. Most are not reviewed by hospital medical staff committees as part of formulary review process
Unique side effect profile and monitoring	Each oral oncolytic agent possesses a broad range of unique side effects and specific monitoring parameters
Drug interactions	Pharmacokinetics of these medications lead to a high incidence of potential drug interactions
Transition of care information	Most agents are obtained through a specialty pharmacy, making it difficult to easily obtain a medication history from a local outpatient pharmacy

The Role of Pharmacy Informatics

Sarasota Memorial Hospital, an 839-bed community teaching hospital and Commission on Cancer-accredited institution in Sarasota, Fla., uses a pharmacy specific software module within its electronic health record (EHR) to verify every medication order. This module contains a catalog of medication codes that can be ordered during patients' hospital admissions. These catalog items are built and maintained by the pharmacy informatics team. The pharmacy module then interfaces with the clinical module of the EHR to alert for any potential issues, such as kidney dysfunction or drug-drug interactions. Thus, pharmacy informatics is an important tool that can be leveraged to help clinical inpatient pharmacists ensure the safe use of oral oncolytics during a patient's hospital stay.

Oral Oncolytic Catalog Items

The rate at which oral oncolytics continue to emerge on the market makes it challenging to keep up with the building of all approved medications in the pharmacy system catalog. If a patient is admitted on a medication that does not have a corresponding catalog item, pharmacists must enter the medication via a "free-text" patient's own hazardous medication generic catalog item. Because this is a generic order, the cross-reference to the medication information database in the EHR that provides alerts on drug-drug interactions, contraindications, and duplicate therapy is not available, meaning that a key safety mechanism is bypassed.

In 2019, our pharmacy informatics and oncology pharmacy teams completed a review of approximately 50 patients who were prescribed an oral oncolytic medication during a hospitalization at our institution. We found that most oral oncolytics did not have a corresponding catalog item in the pharmacy system and were, in fact, ordered using the "free-text" patient's own hazardous medication catalog item. After this review, our two teams built all oral oncolytics without a corresponding catalog item into the pharmacy informatics system. To streamline ordering and improve safety, oral oncolytic items were then placed into a specific oral oncolytic order set restricted to pharmacy, which allows an oncology pharmacist to review orders prior to administration to a patient.

Developing a New Workflow

After completing the new catalog items and order sets, our oncology pharmacy and pharmacy informatics teams developed a workflow diagram to standardize the process for oncology pharmacists' review of all oral oncolytics (Figure 1, right). As illustrated in this workflow, once oncologists give the recommendation to continue an oral oncolytic during a hospital admission, an oncology pharmacist is automatically consulted to follow the patient throughout admission.

Oncology Pharmacist Consults

Our teams also used pharmacy informatics to develop a checklist in the form of a structured note in the clinical portion of the EHR to standardize review of a prescribed oral oncolytic medication(s). Oncology pharmacists gather pertinent information, such as a patient's oncology treatment clinic, complete oral oncolytic regimen, side effects, current medications, and laboratory values, as shown in Figure 2, page 50. Pharmacists then complete an assessment based on discussions and communication with the patient, the inpatient attending physician, and the oncologist. If a patient did not have an oncologist consultation during their hospital admission, oncology pharmacists advocated for a medical oncology consult based on patient presentation, drug interactions, and other risk factors that could potentially influence the continuation of the oral oncolytic(s). The completed pharmacy consult structured note is placed in the EHR and contains the information listed above, any pharmacy interventions, and an assessment and plan for the oral oncolytic therapy during the hospitalization. After the initial consult, oncology pharmacists continue to follow the patient daily to review for drug interactions, side effects, and abnormal labs.

Study Design

The next step: evaluation and measurement of the impact of implementing a standardized process for oncology pharmacist review of oral oncolytics ordered during an inpatient admission. Our institutional review board-approved, retrospective, observational study included patients 18 years and older who were admitted to the hospital between January 2020 and May 2020

(Continued on page 51)

Figure 1. Pharmacist Workflow Process for Review of Oral Oncolytics

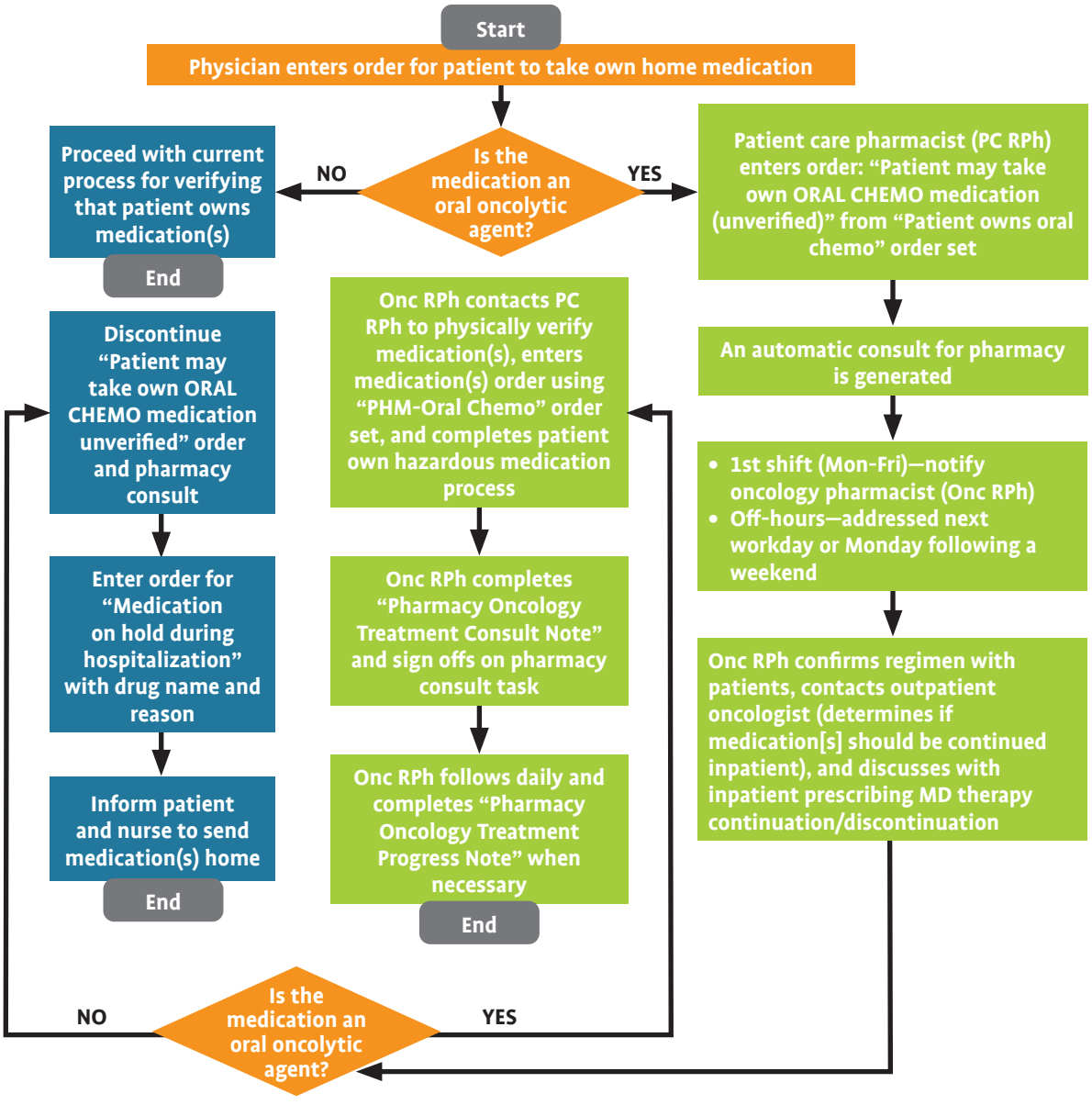

Figure 2. Pharmacy Oncology Treatment Consult Note

Pharmacy Oncology Treatment Consult Note

Patient Information

Gender: o M o F	Height:	Weight:		
Tmax:	BP	HR:	RR:	CrCl:

Cancer Center/Clinic Information

Outpatient Oncologist:	Cancer Center Info:
Cancer Diagnosis:	Diagnosis Date:
Reason for Admission	Pertinent Medical History

What cancer treatment is the patient currently receiving?

Select one of the following tabs Pharmacy Consult for:

Immune Checkpoint Inhibitor Therapy	Chemotherapy/Oncolytic (Oral)	Chemotherapy/Oncolytic (Parenteral)

Dosing Information

Oral Chemotherapy/Oncolytic:	Strength:	Frequency:	
Dosed in cycles? o Yes o No	Cycle #:	Day #:	Details regarding cycle:

o Take with food o Take without food o Take with or without food

Medication information obtained from □ Patient □ Prescriber □ Outpatient Pharmacy □ Cancer Center □ Other: _____

Pharmacy Name:	Pharmacy Phone Number:

Patient to receive medication during hospitalization? o Yes o No

Is the patient experiencing any of the following signs or symptoms? If yes, please check applicable

Adverse event information obtained from: □ Patient interview □ Review of medical records

Cardiovascular	Dermatologic	Gastrointestinal	General	Hematologic	Musculoskeletal	Neurologic
□ Hypertension □ Palpitations □ QT prolongation	□ Rash □ Redness □ Swelling	□ Constipation □ Diarrhea □ Dyspepsia □ Nausea □ Vomiting	□ Chills □ Fatigue □ Fever	□ Bleeding □ Bruising □ Leukopenia □ Myelosuppression □ Neutropenia	□ Back pain □ Muscle pain	□ Headache □ Peripheral Neuropathy □ Seizure □ Tremors □ Vertigo

Information from Electronic Health Record

Allergies *Clear*	*Current Meds* *Clear*	*Home Meds* *Clear*	*Lab Results* *Clear*

Are there any significant drug-drug interactions Identified? o Yes o No

Assessment and Plan

Assessment:	Recommendations:

Time spend on consult (minutes): _____

Table 2. Types of Pharmacist Interventions

Types of Interventions (*n* = 33)	Percentage of Total Interventions
Therapy held	
Side effects	27.3
Acute illness*	18.1
Patient no longer taking medication	6
Drug interactions	
Major**	9
Minor***	54.5
Clarification of regimen cycle/day	24.2
Obtain oncology consult	15.2

* Examples of acute illness included sepsis, pneumonia, and COVID-19 active infection or rule-out testing.
** Required change in therapy.
*** Required change in monitoring (not recorded as an intervention in primary result).

(Continued from page 48)

nd who had an oral oncolytic order. Patients with oral methotrexate orders were excluded from the study due to the majority of these being used for non-oncology indications; hormone-regulating agents were also excluded. Our primary outcome was the total number of pharmacist interventions that occurred. Our secondary outcomes included the percentage of patients requiring an intervention, the types of interventions performed, the percentage of recommendations accepted, and pharmacists' time spent at an initial consult.

During the study period, 63 patients were admitted to the hospital and there were a total of 66 distinct oral oncolytic orders. Seven of the 66 orders were excluded from analysis because they were not reviewed by a pharmacist due to a patient's discharge or a patient not being able to supply the medication. The final patient population included for analysis consisted of 57 patients and 59 distinct oral oncolytic orders.

Outcomes

The primary endpoint of total pharmacist interventions was 33, with an acceptance rate of 94 percent as a secondary outcome. Fifty-six percent of patients required a pharmacist's intervention and the median time spent in the pharmacy-oncology consult was 45 minutes (±20.4 minutes). The types of interventions that were recommended are included in Table 2, left.

Our study showed that oncology pharmacists made interventions for more than 50 percent of patients with an oral oncolytic order, highlighting the need for identification and close monitoring of these patients. Pharmacists helped bridge the outpatient management of these patients to inpatient by collaborating with the inpatient healthcare team and understanding when to recommend an oncologist consult. Although this process is time-consuming, with a median time of 45 minutes spent on each consult, this patient-centered approach to reviewing every oral oncolytic order proved to be vital during patients' inpatient stays. Seventy-six percent of consults were completed within 24 hours of order entry, even with limited access to oncology pharmacists.

Takeaways

Our study supports the gatekeeper role that pharmacists provide for hospitalized patients, as well as the use of pharmacy informatics to streamline the identification of potential issues for patients on oral oncolytics. Any institution can implement a similar process by using the checklist as a resource when reviewing an oral oncolytic therapy. Implementing a standardized process for the review of oral oncolytics during hospital admissions can lead to improved communication between pharmacists and physicians, patient monitoring, identification of side effects, drug interactions, and clarification of dosing regimens. OI

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