



HOPA
Hematology/Oncology
Pharmacy Association

FURTHER DEFINING
THE SCOPE OF
HEMATOLOGY/ONCOLOGY
PHARMACY PRACTICE

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EXECUTIVE SUMMARY

In an effort to describe the evolution of oncology pharmacy and promote a better understanding of the profession, HOPA has updated its 2013 *Scope of Hematology/Oncology Pharmacy Practice*. This new document, *Further Defining the Scope of Hematology/Oncology Pharmacy Practice*, details the roles, responsibilities, tasks, and competencies of hematology/oncology pharmacists (often referred to as oncology pharmacists) in various practice settings. Because advances in the field are occurring rapidly and because oncology pharmacists may enter the profession by a number of pathways, HOPA also explores the importance of board certification for oncology pharmacists serving in each of the roles and positions outlined in the document.

The document discusses these key points:

- The role of a pharmacist has changed dramatically over the years, with a transition in central responsibility from dispensing medication to providing direct patient care at various levels.
- Various organizations dedicated to advancing pharmacy practice and improving patient care have published domains of knowledge, competencies, and standards for oncology pharmacists as a means of ensuring that an appropriately educated and skilled workforce is in place.
- Credentialing and privileging are important elements of advancing pharmacists' role in care while managing risk to their institutions.
- The formation of collaborative practice agreements that create formal relationships between pharmacists and prescribers have led to a further broadening of the responsibilities of oncology pharmacists.
- Common roles for oncology pharmacists include serving as inpatient and ambulatory oncology pharmacists, infusion center or decentralized pharmacists, specialty pharmacy oncology pharmacists, oncology practice managers, and investigational drug services (IDS) pharmacists.
 - **Inpatient clinical oncology pharmacists** are responsible for pharmacotherapy management of adult or pediatric patients with malignancies. Board certification is imperative for those in this role, given the potential complexity of patient cases.
 - **Ambulatory clinical oncology pharmacists** are responsible for the medication management of adult or pediatric patients with malignancies. Board certification and advanced training in oncology are imperative for those serving in this role, given the potential complexity of patient cases.
 - **Infusion center and decentralized oncology pharmacists** are involved in the sterile compounding of anticancer treatments for adult or pediatric patients with malignancies and may also support ambulatory oncology pharmacists. They often have advanced training in pharmacy, and some institutions require or encourage board certification for those who take on this role.
- **Specialty pharmacy oncology pharmacists** are involved in the distribution and dispensing of oral anticancer treatments for adult or pediatric patients with malignancies. They often have advanced training in pharmacy and may be board certified in oncology.
- **Practice management oncology pharmacists** oversee pharmacists who specialize in the care of oncology patients, but they may also take on clinical responsibilities. They often have advanced residency training in pharmacy administration.
- **IDS pharmacists** are responsible for coordinating all processes involved in providing pharmaceutical services related to oncology investigational drug studies in accordance with applicable legal, professional, institutional, and sponsor requirements. IDS pharmacists generally participate in protocol review in an institutional clinical trial review committee to evaluate the validity of all proposed clinical trials.
- **Important alternative roles** that may be less common include roles in academia, medical communications, population health management, and informatics. Core competencies and daily activities for these alternative oncology pharmacist roles can vary greatly.
- HOPA conducted a literature review to document the value of oncology pharmacists in improving quality across a range of areas:
 - clinical care—reducing medication errors and improving supportive care, monitoring, and documentation
 - patient education—improving medication adherence and learning outcomes
 - implementation of informatics—identifying medication errors and aiding with clinical decision support tools used in precision medicine
 - economic benefits related to cost savings, process improvement, and revenue generation.

HOPA's vision is that every individual who has cancer would have an oncology pharmacist as an integral member of the care team. HOPA recommends that oncology pharmacists obtain their oncology board certification in order to further advance the field of oncology, better serve the oncology patient population, help alleviate the effects of a physician shortage, and become frontline practitioners of patient care.

INTRODUCTION

The Hematology/Oncology Pharmacy Association (HOPA) is a professional association that supports pharmacy practitioners. HOPA seeks to optimize the care of individuals affected by cancer by promoting and advancing hematology/oncology pharmacy, with the aim that one day all individuals affected by cancer will have a pharmacist as an integral member of their care team. Hematology/oncology pharmacists are often referred to as oncology pharmacists, which we will do throughout the remainder of this document. HOPA aids in the advancement of oncology pharmacists by

- professionally developing oncology pharmacists as valuable members of the cancer care team
- providing professional resources and tools to support oncology pharmacists
- establishing HOPA as a leader in research on oncology pharmacy interventions and their impact
- advocating for the value of oncology pharmacy and providing an influential voice on patient care issues.

Currently HOPA has more than 2,700 members, many of them pharmacists, but the number also includes trainees, nurses, researchers, and administrators specializing in hematology/oncology.

In 2013, HOPA published *Scope of Hematology/Oncology Pharmacy Practice*.¹ The aim of that document was to describe the evolution of oncology pharmacy and summarize the knowledge, skills, and functions of an oncology pharmacist in a way that would promote a better understanding of the profession. Since that time, employers, employees, and the general public have sought refinement of that information and more details about the knowledge, skills, and functions of the oncology pharmacist. The primary goal of this new document, *Further Defining the Scope of Hematology/Oncology Pharmacy Practice*, is to provide additional information about the roles, responsibilities, tasks, and competencies of oncology pharmacists in various practice settings. In addition, it summarizes the literature—published both in the United States and abroad—that documents the value of the oncology pharmacist as part of the cancer care team.

Oncology pharmacy practice is a specialty practice area within pharmacy practice.¹ This specialty couples the knowledge and skills of general pharmacy practice with an advanced understanding of the treatment and management of hematology and oncology malignancies. Oncology pharmacists have advanced training and expertise that enables them to provide evidence-based care to patients with cancer throughout the spectrum of the disease: from initial treatment decisions to subsequent therapies, from supportive and palliative care to support of the patient through

survivorship.² Additionally, oncology pharmacists can play an active role in the prevention of and screening for cancer.

Like those in other pharmacy specialties, oncology pharmacists represent a broad range of expertise, responsibilities, and levels of practice. Several pathways to becoming an oncology pharmacist exist. The conventional pathway is through completion of an advanced pharmacy practice residency. This is accomplished by a formalized progression through a postgraduate general pharmacy practice residency (postgraduate year 1 [PGY1]) and then a second postgraduate specialty oncology pharmacy practice residency (postgraduate year 2 [PGY2]).³ Pharmacy practice residencies are accredited by the American Society of Health-Systems Pharmacists (ASHP). Advanced residency training in oncology pharmacy requires successful completion of a general pharmacy practice residency program. The second-year oncology pharmacy practice residency program is standardized using ASHP's *Required Competency Areas, Goals, and Objectives for Postgraduate Year Two (PGY2) Oncology Pharmacy Residencies*, published in 2017.³ These standards are based on five outcomes or required competency areas: (1) patient care; (2) advancing practice and improving patient care; (3) leadership and management; (4) teaching, education, and dissemination of knowledge; and (5) oncology investigational drugs. Completion of a PGY2 oncology pharmacy residency program signifies that graduates are competent in these five domains of oncology pharmacy practice.

Pharmacists may also complete a board certification examination specific to oncology after meeting certain criteria (e.g., completion of a PGY2 oncology residency or work in oncology pharmacy for 4 or more years) to become a board certified oncology pharmacist (BCOP).⁴ The BCOP certification, conferred by the Board of Pharmacy Specialties (BPS), is the only formal program currently available to demonstrate the level of expertise, knowledge, and implied skill of an oncology pharmacist.⁵ Oncology was recognized as a distinct specialty area of pharmacy by BPS in 1996.⁶ As of 2016, 2,778 oncology pharmacists have become board certified.⁷ The most recent content outline for oncology pharmacy board certification allows demonstration of competence by examination in five major areas of weighted content: (1) the pathophysiology and molecular biology of cancer; (2) therapeutics, patient management, and education; (3) clinical trials and research; (4) practice management; and (5) public health (see **Appendix 1**).⁴ Once achieved, board certification can be maintained via examination or processing a specified number of BPS-approved continuing education credits every 7 years.

However, a pharmacist is not required to complete residency training or become board certified in oncology to be considered an oncology

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pharmacist. For an oncology pharmacist working in a more operational role, such as in an infusion center, or as a decentralized pharmacist (a pharmacist who carries out both distributive and clinical pharmacy activities) within a cancer center or hospital, institutional competency training is typically required. The lack of available residency-trained and board-certified oncology pharmacists is multifactorial. One reason may be that many pharmacists entered the role of an oncology pharmacist before residency programs or BCOP certifications were available. Other reasons may be the lack of available PGY2 oncology residency programs, the cost of obtaining and maintaining BCOP certification, and the fact that not all institutions require BCOP certification for practicing oncology pharmacists. A nontraditional path in oncology pharmacy typically is taken when the need at an institution increases and the institution looks to current staff members with some experience to cover the oncology needs.

Although the paths to becoming an oncology pharmacist vary, BCOP certification remains the “gold standard” for employers wishing to ensure competence in the field of oncology pharmacy. Successful completion of the BCOP exam confirms that specific eligibility criteria with respect to oncology pharmacy experience have been met. Attaining board certification provides a way to demonstrate competence in a specialized area of pharmacy practice to employers as well as internal and external stakeholders. HOPA advises all oncology pharmacists to obtain BCOP certification and believes it is essential for oncology pharmacists who provide direct patient care (e.g., inpatient or ambulatory care clinical oncology pharmacists) to obtain BCOP certification. Overall, the number of board-certified pharmacists are increasing, which suggests that this credential may be associated with career satisfaction, increased professional recognition, and opportunities for career advancement.⁷

With a shortage of oncology physicians expected by 2020, oncology pharmacists are well poised to function as physician extenders.⁸⁻¹¹ Oncology physicians already look to oncology pharmacists for help with planning treatment, ensuring the safety of chemotherapy, and making recommendations for supportive medications and also as a clinical resource for therapy management. The complexity of oncology drugs and their side effects is increasing as new therapies are being developed. Targeted medications and immunotherapy medications require highly experienced individuals to manage the intricacies of treatment. Board-certified oncology pharmacists are well suited to be the experts for handling medication-related problems. They are trained to recommend, design, implement, monitor, and modify pharmacotherapeutic plans to optimize outcomes in patients with cancer and reduce medication errors.⁷ The board-certified pharmacist serves not only as a resource for the physician and the patient but also as a resource

for other members of the interprofessional team, which includes advanced practice providers, dietitians, social workers, and financial navigators. Additionally, the board-certified oncology pharmacist helps to advocate for the patient going through treatment and provide clinical leadership. With this significant expertise, the board-certified oncology pharmacist is an ideal member to be at the front line in managing patient care.

ADVANCING THE PROFESSION OF PHARMACY

Along with board certification, several other initiatives in the pharmacy profession have advanced professional practice. In 2013, the Center for the Advancement of Pharmacy Education (CAPE) created educational outcomes to guide colleges of pharmacy in education and training,¹² specifically curriculum planning, delivery, and assessment. The *Center for the Advancement of Pharmacy Education 2013 Educational Outcomes* outlines four broad domains to be covered in the doctor of pharmacy curriculum: (1) foundational knowledge, (2) essentials for practicing pharmacy and delivering care, (3) approaches to practice and care, and (4) the ability to develop professional and personal competencies. These outcomes align program-specific learning outcomes with the Accreditation Council for Pharmacy Education (ACPE) guidelines.

Subsequently, the American Association of Colleges of Pharmacy (AACP) has published a list of entrustable professional activities (EPAs), thus making the statement that attaining competence for graduates of pharmacy education is a priority.¹³ Pharmacy EPAs define what activities can be safely entrusted to a new graduate of a doctor of pharmacy program to perform without supervision. EPAs introduce performance-based skills that support the activities pharmacists carry out on a daily basis. Thus, in addition to considering knowledge and theory as a measure of competence, colleges of pharmacy must also validate that each graduate is able to perform the EPAs. EPAs for colleges of pharmacy were developed using the CAPE 2013 educational outcomes and the pharmacists' patient care process as the foundation.

The pharmacists' patient care process was a collaborative effort within the profession to establish a consistent process in the delivery of patient care across the profession.¹⁴ Released by the Joint Commission of Pharmacy Practitioners (JCPP), the process is generalizable to any practice setting or care service where pharmacists provide patient care. The process is based on evidence and principles of pharmacy practice that form a cycle of care consisting of the following steps: collect, assess, plan, implement, and follow up by monitoring and evaluating. The pharmacists' process of care is based on establishing the patient-pharmacist relationship and providing effective communication, collaboration, and infrastructure that supports the cycle.

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The CAPE outcomes and EPA describe the minimum competencies for newly licensed pharmacists entering the profession. Given the complexities of modern medicine, many pharmacists decide to pursue further training and specialization. Several avenues for postdoctoral training are open within oncology pharmacy in different academic tracks, such as research (e.g., a fellowship or doctor of philosophy program), management (e.g., a master of business administration program or a 2-year health-system pharmacy administrative residency program), or clinical care. Those who specialize in oncology pharmacy with the goal of providing direct patient care can pursue completion of an accredited residency program (e.g., PGY1 general residency and then PGY2 oncology residency).

The American College of Clinical Pharmacy (ACCP) released competencies and methodologies for evaluating these competencies as a means of ensuring an appropriately educated and skilled workforce in clinical pharmacy.^{15,16} These statements define a *clinical pharmacist* as a doctor of pharmacy who has successfully completed postgraduate clinical training (or has equivalent experience) and has achieved board certification in a BPS clinical specialty practicing in a team-based direct patient care environment. ACCP has defined six core competencies: (1) direct patient care, (2) pharmacotherapy knowledge, (3) systems-based care and population health, (4) communication, (5) professionalism, and (6) continuing professional development. To complement these competencies, ACCP developed a template highlighting methods of evaluating each core competency.

As the profession continues to advance, so do cancer care and specific standards and guidelines related to that care. Best practices that affect oncology pharmacists' roles and responsibilities are evolving. For example, in 2014 HOPA published the *HOPA Investigational Drug Service Best Practice Standards*, which focused on clinical research in cancer patients to highlight key elements of the pharmacist's role in the life cycle of a protocol as it relates to the pharmacy and medication therapy.¹⁷ The American Society for Blood and Marrow Transplantation has developed resources outlining the role of the hematopoietic cell transplant pharmacist.^{18,19}

Cancer centers, oncology practice sites, and specialty pharmacies responsible for dispensing oral anticancer medications can also pursue various certifications and follow best practices to demonstrate the quality of oncology care they provide. For example, cancer care organizations can become certified by implementing the American Society of Clinical Oncology (ASCO) Quality Oncology Practice Initiative (QOPI) certification standards and measures. The ASCO QOPI standards and measures encourage self-examination and improvement in oncology for practice sites. Similarly, several guidance documents provide standards and best practices pertaining to the safe use of chemotherapy. **Appendix 2** includes references

to these guidelines, standards, and best practices. Specialty pharmacies can become accredited by the Utilization Review Accreditation Commission (URAC), the Accreditation Commission for Health Care (ACHC), the Joint Commission (TJC), or the Community Health Accreditation Partner (CHAP) to demonstrate their value and ability to fulfill the established criteria. Many payers and manufacturers recognize the specialty pharmacy accreditation as a key differentiator and indicator of quality.

CREDENTIALING AND PRIVILEGING

Credentialing and privileging are important elements to consider in a discussion of oncology pharmacists' scope of practice. The purpose of a credentialing process is to demonstrate that the healthcare professional being evaluated has attained the credentials and qualifications to provide the scope of care expected for patient care services in a particular setting.²⁰ Similarly, the purpose of a privileging process is to assure stakeholders that the healthcare professional being considered for certain privileges has the specific competencies and experience to carry out specific services that the organization provides or supports.

Privileging processes are typically institution- or state-specific and may include granting privileges to order laboratory studies, tests, and medications as often done through a collaborative practice agreement (CPA).²¹ Alternatively, privileges may be service-specific, for example, providing disease and drug therapy management, drug safety monitoring, or immunization services; administering medications; or performing a physical exam. Some institutions use the privileging processes for personnel who do not have the credentials to demonstrate competency in oncology pharmacy but may be expected to provide oncology pharmacy care.²² Examples of competency and training programs that might be offered to these noncredentialed personnel would cover, for example, admixing chemotherapy, providing education as part of a specialty pharmacy, and evaluating chemotherapy orders. Credentialing and privileging are evolving areas of oncology pharmacy practice and may prove important in advancing pharmacists' care services while mitigating risk to the institution.

ONCOLOGY PHARMACY: EVOLVING ROLES

Oncology pharmacists operate within a number of practice areas and settings, including hospitals, ambulatory clinics, specialty pharmacies, and infusion centers in academic and community settings. Pharmacists who work in the oncology specialty have a wide range of patient-care, departmental, and institutional responsibilities. Historically, the pharmacist's role was centered on dispensing medications—providing a final check before treatments were delivered to the patient. However, since the 1960s, pharmacists began to expand the scope of their responsibility by providing more direct patient care.²³ For example, oncology pharmacist-led oral chemotherapy clinics have demonstrated improved clinical and economic outcomes in patients with cancer.²⁴ This is accomplished by performing regular adherence checks, doing toxicity monitoring, and improving patient access to medications.^{24–26} Pharmacists have also broadened their responsibilities via CPAs. Since 1979, 48 states and the District of Columbia have approved legislation allowing for the formation of CPAs.^{27,28} CPAs have enabled pharmacists to deliver effective patient care and improve health outcomes.²⁶ As oncology practice has broadened, pharmacists have found many opportunities to be integrated into the oncology care team. For instance, several institutions are developing precision medicine practice models and have turned to oncology pharmacists to provide clinical consultation regarding pharmacologic agent selection, participate in molecular tumor boards, and provide patient education.²⁹

Oncology pharmacists essentially ensure the safety and appropriateness of anticancer therapy for patients. As embedded members of the oncology team, the pharmacist may also be involved in providing direct patient care or making clinical decisions.⁸ However, the specific role and core duties for the oncology pharmacist can vary, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), and the size of the practice or type of oncology patients. Additionally, the pharmacist's essential daily functions can be affected by state or institutional regulations, such as those regarding credentialing, that enable pharmacists to become recognized healthcare practitioners with prescribing ability and CPAs.

Common roles for oncology pharmacists include serving as inpatient and ambulatory clinical oncology pharmacists, infusion center or decentralized oncology pharmacists, specialty pharmacy oncology pharmacists, and oncology practice managers. Activities within these roles may overlap or be shared, depending on the factors listed above. Refer to **Table 1** (p. 14) and **Appendixes 3–7** for detailed descriptions of pharmacists' activities associated with these roles. Pharmacists spend a fair amount of time documenting their work. The level and amount of documentation depends on the pharmacist's roles and responsibilities. However, pharmacists are often

asked to provide additional documentation to support their recommendations and interventions. As the role of the oncology pharmacy evolves, the expectations and requirements for documentation should be consistent with those of other healthcare professionals.

Examples of a typical day for each of these common roles are found in Tables 2–7, and details are provided below. However, it is not uncommon for hybrid positions to be available. For example, some oncology pharmacists may perform activities that are performed by those in both inpatient clinical pharmacist roles and decentralized pharmacist roles. Some oncology pharmacists may further specialize or subspecialize in a particular oncologic disease state or area, such as breast cancer or hematopoietic stem cell transplantation. Evolving fields such as pharmacogenomics may include pharmacists who provide direct patient care or population-based care. In these roles, pharmacists provide care to individualize targeted therapy based on tumor genetics.²⁹

INPATIENT CLINICAL ONCOLOGY PHARMACISTS

Inpatient clinical oncology specialists (**Table 2**) may be responsible for pharmacotherapy management of adult or pediatric patients with malignancies. Given the complexity of the patient cases, it is imperative that they be board-certified oncology pharmacists and have received advanced training in oncology. Traditionally, they are an integral member of a collaborative and interprofessional team that may make formal daily rounds. However, the responsibilities for inpatient oncology pharmacists can vary across institutions. For example, some inpatient oncology pharmacists are decentralized: they work closely with nursing and medical staff but are not in an institution that is able to support the pharmacist's participation in formal daily medical rounds.

Common activities for inpatient clinical oncology pharmacists include collecting and assessing patient-specific information, reviewing anticancer regimens for patients actively receiving therapy, coordinating chemotherapy administration with nursing, assessing appropriateness of supportive care therapies, and providing patient and caregiver education. Other tasks may include assisting with quality improvement initiatives, research, pharmacy residency and pharmacy student education, and scholarly activities.

ONCOLOGY PHARMACY: EVOLVING ROLES

Table 2. Example of a Day in the Life of an Inpatient Clinical Oncology Pharmacist**

Tasks
<p>Review all patients who were admitted.</p> <ul style="list-style-type: none"> Review laboratory data, diagnostic data, medical specialist notes, nursing notes, and concurrent medications for appropriateness and potential medication-related problems, (e.g., potential drug interactions, dose adjustments for organ dysfunction). Provide new medication change recommendations to fellow before rounds.
<p>Round with the team (pharmacy students, PGY1 residents, or PGY2 residents may be the primary members of the rounding team).</p> <ul style="list-style-type: none"> Answer drug information questions. Provide new medication change recommendations based on the team's discussion of each patient.
<p>Review new admission orders.</p> <ul style="list-style-type: none"> Review laboratory data, diagnostic data, medical specialist notes, nursing notes, and concurrent medications for appropriateness and potential medication-related problems (e.g., potential drug interactions, dose adjustments for organ dysfunction). Provide medication change recommendations to the team.
<p>Provide medication-related services to all inpatients.</p> <ul style="list-style-type: none"> Verify all medication orders (including anticancer therapy) entered by other healthcare providers. Modify therapy for institution-related medication protocols (e.g., adjust doses of medications when renal dysfunction is present). Perform medication reconciliation. Perform discharge counseling. Arrange for pharmacy to fill all prescriptions and have them in the patient's room at time of discharge. Ensure that ambulatory care appointments are correct, with proper transitions of care (cancel, change, or schedule new appointments with the oncology team on the basis of a new plan of care).
<p><i>**Both schedule and workload are patient centered. The patient load varies. It is not rare for the pharmacist to stay late in order to meet patients' needs.</i></p> <p><i>*This table presents only an example of a day in the life of the pharmacist. Activities for this and other roles may overlap or be shared, depending on an institution's or healthcare system's pharmacy practice model, size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of oncology patients, and institution and state regulations, such as credentialing.</i></p>

AMBULATORY CLINICAL ONCOLOGY PHARMACISTS

Ambulatory clinical oncology pharmacy specialists (**Table 3**) are responsible for the medication management of adult and/or pediatric patients with malignancies. Given the complexity of the patient cases, it is imperative that they be board-certified oncology pharmacists and have received advanced training in oncology. They collaborate with the medical and nursing staff to maximize the effectiveness of anticancer treatments and minimize toxicities. Tasks vital to accomplishing this goal are performing comprehensive medication therapy reviews to identify drug-drug,

drug-gene, drug-lab, and drug-supplement (both nutritional and herbal supplement) interactions with a proposed cancer regimen. Ambulatory clinical oncology pharmacists also assess medication compliance and may complete follow-up phone calls or appointments with patients to meet the standards of institutions or accrediting bodies (e.g., ASCO QOPI) or specialty pharmacy accreditation standards.

The ambulatory pharmacist may work in a clinic, interacting with interprofessional colleagues, or in an infusion center. The core job functions are related to patient care. These pharmacists are involved with assessing the appropriateness and facilitating the coordination of the complete medication plan, from anticancer treatment to supportive care medicines. The pharmacist may also be involved in various CPA-based activities, which could involve providing patient education and prescribing medications for oncology patients. Other tasks often include assisting with ensuring access to and continuity of care; facilitating and implementing quality improvement and cost-savings initiatives; performing clinical research; and providing pharmacy residency, pharmacy student, and interprofessional education.

Table 3. Example of a Day in the Life of an Ambulatory Clinical Oncology Pharmacist**

Tasks
<p>Print patient schedule for day and begins patient review.</p>
<p>Perform tasks associated with the daily clinic.</p> <ul style="list-style-type: none"> Assist clinicians with selecting appropriate chemotherapy regimens and supportive care. Review pathology reports, laboratory values, and concurrent medications for appropriateness and potential medication-related problems (e.g., potential drug interactions, requirement of genetic alteration for drug indication, dose adjustments for organ dysfunction). Manage adverse effects caused by chemotherapy or disease (e.g., chemotherapy-induced nausea and vomiting, pain, infection risk). Educate patients about chemotherapy and what to expect. Conduct a follow-up interview with patients following chemotherapy administration to identify adverse events and manage them. Answer any drug information questions from the healthcare team. Proactively review chemotherapy orders for accuracy and appropriateness.
<p>If time permits, print the patient schedule for the next day to begin patient review.</p>
<p><i>**Both schedule and workload are patient centered. The patient load varies. It is not rare for the pharmacist to stay late in order to meet patients' needs.</i></p> <p><i>*This table presents only an example of a day in the life of the pharmacist. Activities for this and other roles may overlap or be shared, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of oncology patients, and institution or state regulations, such as credentialing.</i></p>

ONCOLOGY PHARMACY: EVOLVING ROLES

INFUSION CENTER AND DECENTRALIZED ONCOLOGY PHARMACISTS

Infusion center pharmacists (**Table 4**) and inpatient decentralized oncology pharmacists (**Table 5**) are involved in the sterile compounding of anticancer treatments for adult or pediatric patients with malignancies. They often have received advanced training in pharmacy, and some may support ambulatory clinical oncology pharmacists. Some institutions may also mandate or strongly encourage the infusion center or decentralized pharmacist to become board certified within a defined period from date of hire. These pharmacists work closely with the medical and nursing staff in an ambulatory infusion center, inpatient satellite pharmacy, or central pharmacy IV room. Their main responsibilities are to ensure appropriate dosing and safety for patients prior to the delivery of an anticancer treatment. This is accomplished by performing chemotherapy order review and ensuring that appropriate compounding, preparation, and administration measures are used. They have advanced knowledge of safe handling, administration, and disposal of hazardous medications. Infusion center and decentralized oncology pharmacists are also responsible for minimizing medication waste, managing drug shortages, and decreasing the exposure of personnel to hazardous drugs.

Table 4. Example of a Day in the Life of an Infusion Center or Decentralized Oncology Pharmacist**

Tasks [‡]
<p>Perform general tasks depending on the patients who are in the queue to receive infused anticancer therapy or supportive care that day.</p> <ul style="list-style-type: none"> • Verify chemotherapy orders (either as a first or second pharmacy check) including tasks such as these: <ul style="list-style-type: none"> ○ Review patient laboratory and vital signs values, medications, and toxicity assessment information from the nurse's assessment and study protocol requirements (if applicable) to identify medication-related problems, and identify potential drug interactions and treatment needs to be adjusted. ○ Calculate doses to ensure that the correct dose was calculated and that hold parameters have not been met (e.g., a dose to be held in cases of grade 3 neutropenia). ○ Release chemotherapy for a second pharmacist to verify. • Print labels of drugs and release medication to be prepared in the sterile preparation room after two pharmacists have verified the order. • Review and approve technician-prepared medications before releasing them to the nursing staff for administration. • Work closely with the clinical specialist in clinics to optimize the patient's drug therapy.
Participate in committees (e.g., safety-related committees) as assigned by the manager.
Answer any drug-related questions from other healthcare team members.
<p><i>*Responsibilities are part of the typical daily routine. Hours can vary, depending on the workload and non-patient-related tasks that are left to be completed. In a larger institution, the start times of all pharmacists working that day may be staggered, or one pharmacist may be assigned to manage the infusion clinic.</i></p> <p><i>†This table presents only an example of a day in the life of the pharmacist. Activities for this and other roles may overlap or be shared, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of oncology patients, and institution or state regulations, such as credentialing.</i></p> <p><i>‡The pharmacist is responsible for all these tasks throughout the shift.</i></p>

Table 5. Example of a Day in the Life of an Inpatient Decentralized Oncology Pharmacist**

Tasks
<p>Debrief with the night pharmacist to discuss ongoing issues (e.g., expected patient visits, pending chemotherapy orders).</p> <ul style="list-style-type: none"> • Perform clinical tasks including reviewing patient laboratory values, medications, and progress notes to identify medication-related problems; managing patient supportive therapy according to symptoms; and identifying potential drug interactions when a new medication is ordered or recommended. • Work closely with the clinical specialist on the floor to optimize the patient's drug therapy. • Answer any drug-related questions from other healthcare team members.[‡]
Verify chemotherapy orders. [‡]
Debrief with the pharmacist on the next shift to discuss ongoing issues.
<p><i>*Responsibilities are part of the daily routine; hours are scheduled shifts, and anything remaining that needs attention will be addressed by the pharmacist on the next shift.</i></p> <p><i>†This table presents only an example of a day in the life of the pharmacist. Activities for this and other roles may overlap or be shared, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of the oncology patients, and institution or state regulations, such as credentialing.</i></p> <p><i>‡The pharmacist is responsible for all these tasks throughout the shift.</i></p>

ONCOLOGY PHARMACY: EVOLVING ROLES

SPECIALTY PHARMACY ONCOLOGY PHARMACISTS

Specialty pharmacy oncology pharmacists (**Table 6**) are involved in the distribution and dispensing of oral anticancer treatments for adult and/or pediatric patients with malignancies. These pharmacists work closely with the medical and nursing staff at onsite health system–associated specialty pharmacies and at external specialty pharmacies located on or off campus. They often have advanced training in pharmacy and may be board certified in oncology. The core job functions of these pharmacists are to ensure the availability of specialty medications, verify appropriate dosing, provide patient education, perform adherence monitoring, and assess patient safety. They perform ongoing reassessments and monitoring before refilling anticancer prescriptions.

Table 6. Example of a Day in the Life of a Specialty Pharmacy Oncology Pharmacist**

Tasks
<ul style="list-style-type: none"> • For new prescriptions, work with the pharmacy technician to complete all paperwork to obtain insurance approval; assist with appeal and denial letters. • Schedule time to meet with patients and provide education about oral chemotherapy (including appropriate administration, storage, and disposal), the most common side effects and how to identify them, and how to provide appropriate self-care versus notifying the healthcare team); serve as the primary patient contact for discussing any adverse effects or concerns about medication. • Coordinate the answering of any questions received by clinical pharmacists or providers in the clinic. • Dispense oral chemotherapies. • Contact the patient via telephone or telemedicine once per cycle to discuss adherence and side effects. • Make sure that the institution meets Utilization Review Accreditation Commission guidelines, if applicable.
<p><i>*The specialty pharmacy oncology pharmacist works in the clinic as a satellite to the specialty pharmacy; the daily workload is dependent on the number of patients in the clinic on that day.</i></p> <p><i>†This table presents only an example of a day in the life of the pharmacist. Activities for this and other roles may overlap or be shared, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of the oncology patients, and institution or state regulations, such as credentialing.</i></p>

PRACTICE MANAGEMENT ONCOLOGY PHARMACISTS

Those in practice management roles (**Table 7**) may have various titles (e.g., clinical coordinators, leads, managers, assistant or associate directors, and directors). They often have received advanced residency training in pharmacy administration. Pharmacists in these roles typically oversee pharmacists who specialize in the care of oncology patients, but they may also have clinical responsibilities such as those described above for the inpatient or ambulatory oncology pharmacist's roles. Responsibilities of practice management pharmacists often include facilitating the ability of the oncology pharmacy team to provide safe and effective care for cancer

patients, managing fiscal and personnel resources, developing policies and procedures, and developing and leading strategic initiatives such as implementing QOPI certification.

Table 7. Example of a Day in the Life of a Practice Management Oncology Pharmacist**

Tasks
<p>The day's agenda is based on scheduled meetings and tasks required to complete responsibilities, such as the following:</p> <ul style="list-style-type: none"> • Human-resource activities including recruitment, scheduling, staff meetings (monthly), performance evaluations; service expansion (e.g., reviewing productivity, return on investment, clinical outcomes); competencies, credentialing process, and employee rounding • Financial activities including budget creation; managing approvals of high-cost medications; managing manufacturer and payer contracts; reviewing the medication pipeline for developing drugs expected to come to market and the impact on budget • Committee-based activities, including representing the oncology department on multiple committees (e.g., the medication reconciliation committee); attending conferences • Administrative activities: developing policies and procedures, doing facility planning
<p><i>*Many responsibilities vary from day to day; hours can be flexible, but the pharmacist has no coverage for absences from work and tends to require around-the-clock responsibility if needed.</i></p> <p><i>†This table presents only an example of a day in the life of the pharmacist. Activities for this and other roles may overlap or be shared, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of the oncology patients, and institution or state regulations, such as credentialing.</i></p>

INVESTIGATIONAL DRUG SERVICES (IDS) PHARMACISTS

IDS pharmacists are responsible for coordinating all processes involved in providing pharmaceutical services related to oncology investigational drug studies in accordance with applicable legal, professional, institutional, and sponsor requirements. These services include drug ordering, receipt, labeling, storage distribution, inventory control, and recordkeeping activities. These pharmacists oversee the pharmacy technical staff and collaborate with other pharmacists to maintain accurate investigational drug accountability in the department. The core responsibilities of IDS pharmacists are to ensure patients' access to investigational drugs and serve as the medication expert during interactions with IDS sponsors, physicians, nurses, research staff, and all other health professionals. As the medication expert on oncology investigational drugs, the IDS pharmacist may also counsel patients when they are initiating an investigational drug and participate in various toxicity assessments and dose modifications during follow-up. This responsibility may include participating in patient screening specific to contraindicated medications and drug interactions with concomitant medications, often as a component of comprehensive medication reconciliations. Additional responsibilities of the IDS pharmacist include

ONCOLOGY PHARMACY: EVOLVING ROLES

development and participation in institutional research protocols, review of the investigation drug treatment plans in the computerized provider order entry (CPOE) system, determination of whether the investigational product should be classified as a hazardous substance, education of research staff and physicians on study-related issues and investigational medications, and administrative activities to promote efficient, cost-effective operations in the IDS department.

IDS pharmacists generally participate in protocol review in an institutional clinical trial review committee to evaluate the validity of all proposed clinical trials. Their evaluation and feedback related to the proposed investigational drug is factored into the final decision of the committee, which can be approval, approval with stipulations, deferral, or disapproval. Upon approval by the clinical trial review committee, the IDS pharmacist may be asked to assist with determination between standard-of-care and research billing for the investigational medications. This distinction relies on the IDS pharmacist's comparison of treatment within the clinical study and the standard-of-care services that are typically performed in the participant population for the disease being studied. Ultimately, this decision determines whether the medications and services are billed to the sponsor or to the participant. Often the IDS pharmacist is positioned at the core of the randomization process and therefore is directly responsible for ensuring that treatment assignments remain unbiased. Upon receipt of notification that a patient has been successfully enrolled in the study, the IDS pharmacist will manually obtain treatment assignments either through use of a Web-based system or by contacting the unblinded study sponsor, as outlined by institution-specific or study-specific protocols. The IDS pharmacist is then responsible for

coordinating the operational processes of dispensing the assigned treatment to the enrolled patient.

The complexity of clinical trials and novel therapies in hematology and oncology is illustrated by the number and diversity of the tasks and responsibilities assumed by the IDS pharmacist. Furthermore, the increasing number of clinical trials has further established the need for specialized IDS pharmacists and defined their place as an integral member of the investigational drug study support team.

Additional information on the role of oncology IDS pharmacists can be found in the *HOPA Investigational Drug Service Best Practice Standards*.¹⁷

ALTERNATIVE ONCOLOGY PHARMACIST ROLES

Important roles that may be less common include roles in academia (e.g., academic researcher, professor or adjunct professor in a school of pharmacy or school of medicine), medical communications, population health management, informatics, companies associated with pharmacy or health plan sponsorship or pharmacy benefit management, manufacturers and wholesalers, medical liaisons, regulatory agencies (e.g., U.S. Food and Drug Administration), and the pharmaceutical industry. Core competencies and daily activities in these alternative oncology pharmacist roles can vary greatly. The breadth of knowledge about the pathophysiology and molecular biology of cancer, anticancer and supportive care therapeutics, practice management, the healthcare system, and public health that oncology pharmacists have allows them to expertly contribute in these nontraditional roles.

THE VALUE OF THE ONCOLOGY PHARMACIST

In accordance with the pharmacists' patient care process, a large amount of available literature centers on improving the quality of clinical care. We conducted a literature review of PubMed using the search terms "Pharmacists"[Majr] and (oncolog* or hematolog*) or ("oncology pharmacist" or "oncology pharmacists" or hematology pharmacist*). The literature search covered the period January 1951–February 2018. Three hundred sixty-six articles were identified. Of these, abstracts were reviewed and assessed for inclusion or exclusion. Studies were included if they focused on measuring the value or impact of the oncology pharmacist on provider or patient satisfaction, improvement of medication safety, improvement of quality or clinical care outcomes, economics, and intervention acceptance. **Table 8** (p. 19) details studies that have been conducted in the United States that fit these inclusion criteria.^{8,30-60} The studies conducted outside of the United States that were included are listed in **Table 9** (p. 27).⁶¹⁻⁸⁹ Below is a detailed summary of the literature, which documents the value of the oncology pharmacist in providing high-quality clinical care, patient education, informatics, and economic benefit.

HIGH-QUALITY CLINICAL CARE

Oncology trained pharmacists are uniquely positioned and are a valuable asset in meeting oncology-based quality metrics.¹¹ A review by Vulaj and colleagues¹¹ of current QOPI measures identified 67 metrics in which an oncology pharmacist could have an impact and enhance the quality of care in their current scope of practice. Potential areas of impact include, but are not limited to, optimizing drug therapy through the implementation of pharmacy guidelines, patient counseling, and symptom management. In addition, several of these measures overlap with metrics assessed for reimbursement via the Centers for Medicare and Medicaid Services (CMS) merit-based incentive payment system, potentially affecting future revenue for hospital systems and URAC standards.

Multiple studies have shown patient and provider satisfaction rates greater than 90% with pharmacists' incorporation across a variety of practice settings.^{30,42,44,47,49,63,64,69,81,88} In a study by Yeoh and colleagues,⁸⁹ pharmacists' involvement in the medication management of elderly oncology patients is associated with a statistically significant ($p < .001$) improvement in patients' satisfaction levels.

Oncology therapies are associated with a significant amount of medication errors because of the complex patient population.⁷⁸ Pharmacists are associated with a reduction or prevention of medication errors across several oncology care settings. For example, in one study, integrating a pharmacist into the care of the oncology patient reduced medication

errors by as much as 45%.⁵⁰ These interventions contribute to improved patient care. This was demonstrated in a prospective cohort study by Cavero Rodrigo and colleagues⁶⁵ showing that when pharmacists were involved in patient care, interventions increased and significantly reduced the risk of drug-related morbidity.

Furthermore, as demonstrated in other pharmacy literature, the use of students as "extenders" to pharmacists can help identify medication errors.⁸⁹ This is illustrated by an evaluation by Ashjian and colleagues³² in which a third-year introductory pharmacy practice experience (IPPE) student found that 88% ($n = 510$) of patients at a comprehensive cancer center had at least one discrepancy in their medication history.

Multiple studies have characterized a variety of pharmacist interventions.^{31,34,37,51,52,57,70,75,82,86,88} These interventions may include inappropriate medications, untreated indications, inappropriate administrations, underdosing, overdosing, drug interactions, lack of monitoring, administration omissions, and identification of adverse effects.⁹⁰ A key benefit of a pharmacist's service on the interprofessional team is having a medication authority available to critically evaluate medication orders. Studies have demonstrated that the inclusion of a pharmacist can result in a prescriber acceptance rate of pharmacists' interventions as high as 94%.⁷⁸ See Table 8 for more details.

PATIENT EDUCATION

Watkins and colleagues conducted a formative evaluation of medication therapy management (MTM) services offered at a large research-based cancer center and reported that in 60% of encounters ($n = 239$), the incentive for MTM services was chemotherapy teaching and management of potential toxicities.⁵⁷ Indeed, provision of chemotherapy education by oncology pharmacists has been repeatedly demonstrated to be associated with high or increased rates of patient satisfaction.^{43,70,84} Some practice models have successfully integrated provision of patient education as a source of revenue, thereby making it possible to have pharmacist positions that are solely dedicated to providing patient education on chemotherapy.⁵⁵ Further, oncology pharmacist-provided chemotherapy education has been associated with improved learning outcomes,^{44,70,84} which patients were willing to pay for as reported in one survey-based evaluation.⁴⁴ Imparting knowledge is a recognized intervention aimed at improving medication adherence.^{45,91} In fact, a report by Lam and Cheung⁴¹ on pharmacist management and provision of patient education demonstrated an association with increased adherence and consequent improvement in disease-based outcomes.

THE VALUE OF THE ONCOLOGY PHARMACIST

INFORMATICS

Many pharmacists spend significant time on population-based care that includes quality improvement initiatives related to information technology and the EMR. However, the role of the oncology pharmacist in this area is expanding. Pharmacists are often primarily responsible for updating the EMR with any changes to anticancer treatment, such as new drug therapies and drug shortages. However, few studies examining the value of the pharmacist's role in informatics and a related impact on patient care exist. Available studies demonstrate the use of electronic order sets with increased rates of medication error identification.^{34,36,37} Evolving areas in oncology pharmacy that are deeply tied to informatics include precision medicine and specifically the implementation and use of clinical decision support tools.⁹²⁻⁹⁴ Despite the lack of clearly documented improvement in patient care, informatics can have a significant impact on oncology pharmacy workflow. Concern about the amount of oncology pharmacy resources needed to support the use of informatics such as the EMR is growing, along with fear that it may result in decreased time available for direct patient care. More studies evaluating oncology pharmacists' involvement with informatics and the impact on clinical outcomes are needed.

ECONOMIC BENEFITS

Oncology pharmacists have demonstrated monetary value, through a variety of mechanisms, to community practices, health systems, and hospitals. Pharmacist-driven cost savings have been reported in numerous studies.^{49,59} A prospective observational 4-week study demonstrated a cost avoidance of \$282,741 per pharmacist per year based on clinical interventions such as chemotherapy regimen review and patient education.⁴⁹ Wong and colleagues⁵⁹ estimated a cost avoidance of \$125,761 per full-time employee based upon interventions made by a pharmacist in an oral chemotherapy management clinic.

Oncology pharmacists have also demonstrated value through process improvement projects that have positive financial outcomes.^{8,31,36,50,56} Pharmacists are well positioned to implement such projects. One example is the implementation of a rapid-infusion rituximab protocol that resulted in permitting clinics to schedule an additional 2-3 patients per week.⁵⁵ Another example is a pharmacist-implemented blood factor stewardship program that resulted in more than \$4 million in annual cost savings over a 5-year period.³¹ This savings was based on a 45% reduction in total doses of factor products, despite a 22% increase in patients receiving factor products and a decrease in readmission rates. Dose-rounding programs driven by pharmacists have also yielded cost savings.³⁶ One study reported an annual cost savings of \$120,000 after implementation of a dose-rounding

protocol for chemotherapeutics and biologics.³⁶ HOPA has provided additional guidance on dose rounding in its position statement *Dose Rounding of Biologic and Cytotoxic Anticancer Agents*.⁹⁵

In addition to providing numerous opportunities for cost avoidance or cost savings, oncology pharmacists offer new revenue-generating opportunities.^{30,37,42} Health systems with their own specialty pharmacy can increase revenue by including oncology pharmacists in the workflow to increase prescription capture rates. For example, Mancini and colleagues⁴² reported a threefold increase in prescription capture rates and revenue generated after implementation of a pharmacist-managed interdisciplinary oral chemotherapy program in a community cancer center. Health systems with a large oncology patient population should consider implementation of a specialty pharmacy to increase opportunities for capturing revenue.

Oncology pharmacists also offer organizations the ability to decrease physician time both by developing an independent visit model and by performing tasks that would historically be performed by physicians.^{8,30,37,55} The development of a pharmacist-led interdisciplinary supportive care clinic demonstrated the effectiveness of this model.⁵⁵ Upon implementation of visits by independent pharmacists, the presence of physicians was needed for only 42% of supportive care follow-up visits. This resulted in an increase in new patient volume from 4.5 to 6.6 and an increase in encounter volume from 13 encounters per month to 20 encounters per month. Additional opportunities for revenue generation include billing for independent visits such as MTM services and for patient education.^{55,57}

Important to this revenue stream generated through patient encounters is the achievement of recognition as providers at the federal level under Medicare Part B. This recognition would allow qualified pharmacists who provide direct patient care to bill for cognitive services as licensed independent providers (LIPs) similar to current advanced practice providers (APPs) such as nurse practitioners and physician assistants.⁹⁶ HOPA supports initiatives that advance the role of the oncology pharmacist, recognizing that pharmacists are an essential component of patient care delivery and deserve to be recognized as such by all payers under Medicare Part B.

Although several studies documenting the value of the oncology pharmacist in providing high-quality clinical care and improved informatics systems, effective patient education, and economic benefit have been conducted, more studies are needed to fully document the value of the oncology pharmacist's role on the healthcare team. Such studies would include those documenting outcomes (both in improved care and in economic benefits) related to cancer treatment and improved symptoms as well as reductions in the number of hospitalizations, complications, and emergency

THE VALUE OF THE ONCOLOGY PHARMACIST

department visits. For example, studies of pharmacist-provided patient education that showed improved decision making and overall improved patient-related outcomes would fully support the pharmacist's role in patient education. Informatics studies are also needed to document both the impact of changes in informatics systems on patient care outcomes and the pharmacy resources that will be required to complete informatics changes in the healthcare system. Furthermore, if these changes do require pharmacy resources, documentation of a resulting decreased availability and time for pharmacy staff to provide direct patient care activities is needed. Studies that support the value of having pharmacists work closely with APPs are lacking. Often in these situations more pharmacy resources are used to provide the needed support because many oncology advanced practice providers have limited specialty training and knowledge of oncology and pharmacology. Finally, as the landscape of health care changes, additional studies are needed to describe revenue generation in inpatient and ambulatory care, including the outcome of billing for cognitive services and the

value brought by the pharmacist in new payment or healthcare models. Furthermore, it would be beneficial to understand whether this type of revenue generation would allow pharmacy services to be self-supporting rather than a strain on institutional resources.

Revenue streams sufficient to support adequate pharmacist staffing are extremely important. Identifying the source of appropriate revenue streams can be challenging when pharmacists are not being adequately reimbursed for cognitive services as a result of the lack of their federal recognition as licensed independent practitioners. Inadequate reimbursement may have an impact on staffing ratios for clinical pharmacists and lead to ratios that are not ideal for covering all tasks and responsibilities. Having large volumes of patients to care for in the setting of complex medication needs, as seen in cancer care, may lead to high turnover or burnout for clinical pharmacists.⁹⁷ More studies are needed to clarify safe and effective pharmacist-to-patient ratios in all practice settings (e.g., acute and ambulatory care) with respect to pharmacists' cognitive care services.

CONCLUSION

Oncology pharmacists ensure the safety and appropriateness of anti-cancer therapy for patients because they have training and expertise in oncology diseases and management. Many oncology pharmacists are embedded members of the oncology team, providing direct patient care or clinical decision making, whereas others may have a role in overseeing the sterile compounding of anticancer treatments and ensuring that individualized regimens are appropriate and safe for patients receiving their anticancer treatments. Oncology pharmacists may also work in specialty pharmacies where orally administered anticancer agents are dispensed or in practice management roles. However, as discussed above, the specific role and core duties for the oncology pharmacist can vary, depending on an institution's or healthcare system's pharmacy practice model, the size of the institution or organization, the setting (e.g., academic, community), the size of the practice or type of oncology patients, and state or institution regulations.

Whatever the role of the oncology pharmacist, his or her main goal is to provide optimal and safe care in a fiscally responsible manner. Data documenting the value of oncology pharmacists in these roles have been growing since HOPA's first document on the oncology pharmacist's scope of practice was published, and we encourage pharmacists to continue to document outcomes related to individual care and the healthcare system. This second document aims to support the current practice of oncology pharmacists and work toward making HOPA's vision a reality: that every individual who has cancer would have an oncology pharmacist as an integral member of his or her care team. HOPA recommends that oncology pharmacists obtain their oncology board certification in order to further advance the field of oncology, better serve the oncology patient population, help alleviate the effects of a physician shortage, and become front-line practitioners of patient care.

Table 1. Comparison of Common Oncology Roles

	Inpatient Clinical Pharmacist	Ambulatory Clinical Pharmacist	Infusion Center or Decentralized Clinical Pharmacist	Specialty Pharmacy Pharmacist	Practice Management Pharmacist
Introduction	<p>The purpose of this document is to provide a justification of the need for the position, along with guidance for individuals or institutions interested in employing a clinical pharmacist in the care and management of adult and pediatric oncology patients in the inpatient setting.</p> <p>As a member of the interprofessional team, the oncology clinical pharmacist serves as an essential resource to the healthcare team, patients, and caregivers by using his or her extensive specialized knowledge.</p>	<p>The purpose of this document is to provide a justification of the need for the position, along with guidance for individuals or institutions interested in employing a clinical pharmacist in the care and management of adult and pediatric oncology patients in the ambulatory care setting.</p> <p>As a member of the interprofessional team, the oncology clinical pharmacist serves as an essential resource to the healthcare team, patients, and caregivers by using his or her extensive specialized knowledge.</p>	<p>The purpose of this document is to provide a justification of the need for the position, along with guidance for individuals or institutions interested in employing a pharmacist in the care and management of adult and pediatric oncology patients either in an infusion center or as a decentralized pharmacist. Activities of this role include review, preparation, and safe distribution of the anticancer regimen to the patient.</p>	<p>The purpose of this document is to provide a justification of the need for the position, along with guidance for individuals or institutions interested in employing a specialty pharmacist who is involved with oral anticancer therapy for adult and pediatric oncology patients. Activities of this role include review and safe distribution of the anticancer regimen to the patient.</p>	<p>The purpose of this document is to provide a justification of the need for the position, along with guidance for individuals or institutions interested in employing a practice management oncology pharmacist to oversee pharmacists who specialize in the care of oncology patients. This role could be fulfilled by an oncology clinical coordinator, lead pharmacist, manager, assistant director, or director.</p>
Educational Background <i>(All pharmacists should be licensed and have a Doctor of Pharmacy [PharmD] degree from an accredited school of pharmacy or a pharmacy degree with equivalent years of experience.)</i>	<ul style="list-style-type: none"> • Completion of an accredited postgraduate year 1 (PGY1) pharmacy practice residency and postgraduate year 2 (PGY2) oncology practice residency or equivalent years of practicing as a clinical pharmacist in oncology • Board certification in oncology pharmacy (BCOP) or plans to achieve certification within 2 years 	<ul style="list-style-type: none"> • Completion of an accredited postgraduate year 1 (PGY1) pharmacy practice residency and postgraduate year 2 (PGY2) oncology practice residency or equivalent years of practicing as a clinical pharmacist in oncology • Board certification in oncology pharmacy (BCOP) or plans to achieve certification within 2 years 	<ul style="list-style-type: none"> • PGY1 residency (preferred) or completion of a competency or training program; PGY2 residency in oncology or an institution-supported training program • Board certification in oncology pharmacy (BCOP) encouraged 	<ul style="list-style-type: none"> • PGY1 residency (preferred) or completion of a competency or training program; PGY2 residency in oncology encouraged • Board certification in oncology pharmacy (BCOP) encouraged; having a board-certified oncology pharmacist available in the organization to be involved with practice management and quality improvement for oral chemotherapy recommended 	<ul style="list-style-type: none"> • PGY1 and PGY2 residency in oncology or pharmacy administration or equivalent years of professional practice in oncology or administration • Board certification in pharmacy (e.g., those offered by the Board of Pharmacy Specialties, BCOP) • Master's degree in healthcare administration (MHA), health-systems pharmacy administration (MS), or business administration (MBA) strongly encouraged

Table 1. Comparison of Common Oncology Roles (continued)

	Inpatient Clinical Pharmacist	Ambulatory Clinical Pharmacist	Infusion Center or Decentralized Clinical Pharmacist	Specialty Pharmacy Pharmacist	Practice Management Pharmacist
Core Competencies	<ul style="list-style-type: none"> • In-depth knowledge of oncology disease states, with knowledge of evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of the National Comprehensive Cancer Network [NCCN], American Society of Clinical Oncology [ASCO], and Multinational Association of Supportive Care in Cancer [MASCC]) • Specialized knowledge of anticancer therapy, administration, symptom management, and supportive care • Provision of effective patient education and medication counseling • Knowledge of storage, safe handling, administration, and disposal of hazardous medications • Therapeutic drug monitoring • Discharge and admission planning, transitions of care • Policy and guideline development • Education of interprofessional team members and trainees • Familiarity with availability, structure, and design of clinical trials • Knowledge of reimbursement practices, including payment models and patient assistance programs • Ability to communicate effectively with healthcare professionals, patients, and caregivers 	<ul style="list-style-type: none"> • In-depth knowledge of oncology disease states, with knowledge of evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of NCCN, ASCO, and MASCC) • Specialized knowledge of anticancer therapy, administration, symptom management, and supportive care • Provision of effective patient education and medication counseling • Knowledge of storage, safe handling, administration, and disposal of hazardous medications • Therapeutic drug monitoring • Discharge and admission planning, transitions of care • Policy and guideline development • Education of interprofessional team members and trainees • Familiarity with availability, structure, and design of clinical trials • Knowledge of reimbursement practices, including payment models and patient assistance programs • Ability to communicate effectively with healthcare professionals, patients, and caregivers 	<ul style="list-style-type: none"> • Basic knowledge of oncology disease states, familiarity with evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of NCCN, ASCO, and MASCC) • Basic knowledge of anticancer therapy • Specialized knowledge of compounding and sterile preparation principles, stability, compatibility, administration • Knowledge of safe handling, administration, and disposal of hazardous medications • Ability to ensure that treatment plan and chemotherapy orders for all patients are accurate and complete • Familiarity with clinical trials and investigational pharmacy (if applicable) • Knowledge of reimbursement practices, including payment models and patient assistance programs • Ability to communicate effectively with healthcare professionals, patients, and caregivers 	<ul style="list-style-type: none"> • Basic knowledge of oncology disease states • Specialized knowledge of safe handling procedures and processes for hazardous medications • Specialized comprehension of oral anticancer therapy, supportive care, scheduling, and administration • Specialized comprehension of the oral anticancer therapy distribution and payer system (e.g., patient-specific ordering, risk evaluation and mitigation strategy [REMS], inventory management, contracting) • Specialized comprehension of medication assistance programs and payer processes • Proficiency in triage of financial assistance needs • Proficiency in provision of patient and caregiver education • Ability to communicate effectively with healthcare professionals, patients, and caregivers 	<ul style="list-style-type: none"> • Basic knowledge of oncology disease states, familiarity with evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of NCCN, ASCO, MASCC) • Basic knowledge of anticancer therapy • Basic knowledge of compounding and sterile preparation principles, stability, compatibility, administration • Familiarity with availability, structure, and design of clinical trials • Knowledge of safe handling, administration, and disposal of hazardous medications • Familiarity with clinical trials and investigational pharmacy (if applicable) • In-depth knowledge of reimbursement practices, including payment models and patient assistance programs • Ability to communicate effectively with department staff and healthcare professionals • Policy and guideline development
Pharmacist Interventions (to serve the following aims)	<ul style="list-style-type: none"> • Optimize patient outcomes by providing comprehensive medication management and provision of pharmacoeconomic care • Maximize patient and caregiver comprehension of and adherence to medications • Practice fiscal responsibility to patient and institution • Provide the interprofessional team with evidence-based clinical decision support • Improve patient care through scholarly activities 	<ul style="list-style-type: none"> • Optimize patient outcomes by providing comprehensive medication management and provision of pharmacoeconomic care • Maximize patient and caregiver comprehension of and adherence to medications • Practice fiscal responsibility to patient and cancer center • Provide the interprofessional team with evidence-based clinical decision support • Improve patient care through scholarly activities 	<ul style="list-style-type: none"> • Ensure the safe provision of medications through review of cancer treatment plan and verifying and dispensing anticancer regimen • Practice fiscal responsibility to patient and pharmacy • Coordinate patient care within the interprofessional team • Uphold and maintain regulatory requirements (e.g., those of state boards of pharmacy, the Joint Commission, U.S. Pharmacopeia [USP] <797> and <800>) 	<ul style="list-style-type: none"> • Ensure the safe provision of oral anticancer therapy through dispensation and validation of a prescription as it relates to a given anticancer treatment plan • Practice fiscal responsibility to patient and pharmacy • Maximize patient and caregiver comprehension and adherence to medications and self-care • Ensure patients' access to oral anticancer therapy 	<ul style="list-style-type: none"> • Facilitate the ability of the pharmacy team to provide safe and effective pharmaceutical care for cancer patients • Appropriately manage fiscal and personnel resources and productivity • Continue to advance pharmacy practice in the organization

Table 1. Comparison of Common Oncology Roles *(continued)*

	Inpatient Clinical Pharmacist	Ambulatory Clinical Pharmacist	Infusion Center or Decentralized Clinical Pharmacist	Specialty Pharmacy Pharmacist	Practice Management Pharmacist
Pharmacists' Activities	<p>Pharmacists' Patient Care Process*</p> <p><i>Collect</i></p> <ul style="list-style-type: none"> Collect necessary subjective and objective information for the patient, including oncology diagnosis and treatment history. <p><i>Assess</i></p> <ul style="list-style-type: none"> Evaluate the regimen on the basis of disease and patient characteristics and published literature. Review and adjust anticancer therapy orders as appropriate on the basis of patient-specific information. Assess drug-complementary alternative care and drug-disease, drug-drug, and drug-food interactions. Review supportive care medications and laboratory results associated with the chemotherapy regimen (e.g., hydration, nausea and vomiting medications). <p><i>Plan</i></p> <ul style="list-style-type: none"> Recommend appropriate practice setting (inpatient vs. outpatient) for treatment. Provide symptom management and supportive care. Do transition planning, including assisting with transitions of care, medication reconciliation. Facilitate access to medications (e.g., work with prior authorization coordinators and financial counselors, coordinate with retail or specialty pharmacies). 	<p>Pharmacists' Patient Care Process*</p> <p><i>Collect</i></p> <ul style="list-style-type: none"> Collect necessary subjective and objective information for the patient, including oncology diagnosis and treatment history. <p><i>Assess</i></p> <ul style="list-style-type: none"> Evaluate the regimen on the basis of disease and patient characteristics and published literature. Review and adjust anticancer therapy orders as appropriate on the basis of patient-specific information. Assess drug-complementary alternative care and drug-disease, drug-drug, and drug-food interactions. Review supportive care medications and laboratory results associated with the chemotherapy regimen (e.g., hydration, nausea and vomiting medications). <p><i>Plan</i></p> <ul style="list-style-type: none"> Recommend appropriate practice setting (inpatient vs. outpatient) for treatment. Provide symptom management and supportive care. Do transition planning, including assisting with transitions of care, medication reconciliation. Facilitate access to medications (e.g., work with prior authorization coordinators and financial counselors, coordinate with retail or specialty pharmacies). 	<p>Patient Management</p> <ul style="list-style-type: none"> Ensure that the regimen is evidence based and appropriate on the basis of patient-specific information (e.g., diagnosis, organ function, laboratory values, toxicity assessment, appropriate supportive care, sequencing of treatment plan). Ensure that the following elements are correct: drug, dose, route, rate, treatment cycle, and day of cycle. Ensure that the following are correct or have been checked: dose calculation; total volume; expiration date; diluent type and volume; administration fluid type, volume, and tubing; lifetime dose (if applicable); compatibility with other infused drugs; auxiliary label. Conduct a drug-drug interaction review. Assist with medication access (if applicable). Conduct therapeutic drug monitoring. Transcribe orders into the pharmacy system (if applicable). <p>Education</p> <ul style="list-style-type: none"> Assist with education of interprofessional healthcare team members and trainees. Precept pharmacy students. Assist PGY1 and PGY2 trainees. 	<p>Patient Management</p> <ul style="list-style-type: none"> Ensure that prescriptions are accurate and validate doses on the basis of patient-specific information. Ensure that the following are correct: drug, dose, route, treatment cycle, and day of cycle. Conduct a drug-drug interaction review. Assist with medication access. Work with pharmacy technicians to ensure that prescription label and shipping address and phone number are accurate and that timely shipment occurs. Assess patient adherence. Monitor patients. Communicate with the appropriate healthcare provider regarding patient toxicities, issues, and concerns. Empower patients to make sound decisions in the home setting (e.g., calling 911). 	<p>Direct Personnel</p> <ul style="list-style-type: none"> Interview, hire, and train new staff. Conduct annual performance evaluations and facilitate performance improvement plans as needed. Administer competency evaluations for staff. Conduct staff meetings. Evaluate and develop plans to maximize staff engagement and satisfaction. <p>Operations</p> <ul style="list-style-type: none"> Oversee compliance with oncology best practices, certification, accreditations, and regulatory requirements. Design, implement, and update workplace policies and procedures. Manage drug shortages. Address patient complaints in a compassionate and timely fashion. Establish processes to monitor turn-around time, productivity, and patient outcomes. Participate in institutional committees. Facilitate activities of the oncology pharmacy and therapeutics committee (if applicable).

Table 1. Comparison of Common Oncology Roles *(continued)*

	Inpatient Clinical Pharmacist	Ambulatory Clinical Pharmacist	Infusion Center or Decentralized Clinical Pharmacist	Specialty Pharmacy Pharmacist	Practice Management Pharmacist
Pharmacists' Activities <i>(continued)</i>	<p>Pharmacists' Patient Care Process* <i>(continued)</i></p> <p>Implement</p> <ul style="list-style-type: none"> Participate in interprofessional patient care (may include rounds). Coordinate chemotherapy administration with nursing staff. Educate patients and caregivers on anticancer therapy, supportive care medications, symptom management, adherence, and safe handling, administration, and disposal. <p>Follow-Up: Monitor and Evaluate</p> <ul style="list-style-type: none"> Conduct ongoing monitoring of efficacy, toxicity, and organ function, and provide recommendations for adjustments as needed. Conduct therapeutic drug monitoring and adjust therapy. Monitor adherence to anticancer regimen. Practice antimicrobial stewardship. Document pharmacists' patient care process in the electronic medical record (EMR). <p>Education</p> <ul style="list-style-type: none"> Educate interprofessional healthcare team members and trainees. Precept pharmacy students. Precept PGY1 and PGY2 trainees. <p>Practice Management and Quality Improvement</p> <ul style="list-style-type: none"> Assist with policy, guideline, and/or drug monograph development. Serve as patient and professional advocate. Participate on hospital committees (e.g., pharmacy and therapeutics). Ensure that practice meets regulatory requirements, certifications, and accreditations. Enter medication errors and adverse drug events into reporting system. 	<p>Pharmacists' Patient Care Process* <i>(continued)</i></p> <p>Implement</p> <ul style="list-style-type: none"> Participate in interprofessional patient care (may include rounds). Coordinate chemotherapy administration with nursing staff. Educate patients and caregivers on anticancer therapy, supportive care medications, symptom management, adherence, and safe handling, administration, and disposal. <p>Follow-Up: Monitor and Evaluate</p> <ul style="list-style-type: none"> Conduct ongoing monitoring of efficacy, toxicity, and organ function, and provide recommendations for adjustments as needed. Conduct therapeutic drug monitoring and adjust therapy. Monitor adherence to anticancer regimen. Practice antimicrobial stewardship. Document pharmacists' patient care process in the electronic medical record (EMR). <p>Education</p> <ul style="list-style-type: none"> Educate interprofessional healthcare team members and trainees. Precept pharmacy students. Precept PGY1 and PGY2 trainees. <p>Practice Management and Quality Improvement</p> <ul style="list-style-type: none"> Assist with policy, guideline, and/or drug monograph development. Serve as patient and professional advocate. Participate on hospital committees (e.g., pharmacy and therapeutics). Ensure that practice meets regulatory requirements, certifications, and accreditations. Enter medication errors and adverse drug events into reporting system. 	<p>Practice Management and Quality Improvement</p> <ul style="list-style-type: none"> Assist with policy, guideline, or drug monograph development. Ensure that organizational policies are being met and followed. Uphold and maintain state and federal regulatory requirements, certifications, and accreditations (e.g., those of state boards of pharmacy, Joint Commission, USP <797> and <800>). Supervise pharmacy technicians. Participate on committees as deemed necessary. Enforce drug formulary restrictions. Assist with maintaining inventory management. Assist in ensuring compliance with the 340B Drug Pricing Program (if applicable). Ensure that record keeping is compliant with institutional, state, and federal policies and regulations. Enter medication errors and adverse drug events into the reporting system. <p>Information Technology Support</p> <ul style="list-style-type: none"> Have a basic knowledge of the functionality of chemotherapy ordering in the institutional EMR. Have specialized knowledge of automation systems. Maintain appropriate patient information in the EMR (e.g., adverse drug reactions [ADRs], alerts, home medications list, allergies). <p>Clinical Trials and Investigational Pharmacy (if applicable)</p> <ul style="list-style-type: none"> Ensure adherence with investigational pharmacy policies and procedures. Ensure that investigational drug preparation is in accordance with clinical trial protocol. 	<p>Education</p> <ul style="list-style-type: none"> Provide patient and caregiver basic oral anticancer therapy education (e.g., on scheduling and administration, adherence, coordination with meals, and side effects). <p>Practice Management and Quality Improvement</p> <ul style="list-style-type: none"> Assist with policy, guideline, and counseling guide development and handling of hazardous drugs processes. Ensure that record keeping is compliant with accreditation standards (e.g., those of URAC). Lead root cause analysis reviews of medication errors with oral chemotherapies and implement relevant quality improvements. <p>Information Technology</p> <ul style="list-style-type: none"> Support basic knowledge of prescription processing software. Have specialized knowledge of the specialty pharmacy clinical documentation system. Have knowledge of pharmacy automation systems. Have specialized knowledge of reporting systems. 	<p>Finance</p> <ul style="list-style-type: none"> Manage practice and department budgets, including managing the impact of oncology drugs in the pipeline. Ensure that processes are in place to maximize medication reimbursement and ensure payment. Collaborate with the finance department to ensure that a robust medication reimbursement process is in place. Stay up to date with changing reimbursement landscapes. Develop formulary restrictions. <p>Quality Improvement and Safety</p> <ul style="list-style-type: none"> Advocate for EMR technology optimization to improve the management of care for cancer patients. Advocate for and implement automation to improve the management of care for cancer patients. Lead root cause analysis reviews of medication errors with anticancer therapy and implement relevant quality improvements. <p>Strategic Planning</p> <ul style="list-style-type: none"> Collaborate with providers and stakeholders to develop new business strategies and oncology patient services. Justify additional pharmacy resources to optimize patient care.

Table 1. Comparison of Common Oncology Roles *(continued)*

	Inpatient Clinical Pharmacist	Ambulatory Clinical Pharmacist	Infusion Center or Decentralized Clinical Pharmacist	Specialty Pharmacy Pharmacist	Practice Management Pharmacist
Pharmacists' Activities <i>(continued)</i>	<p>Information Technology Support</p> <ul style="list-style-type: none"> • Possess in-depth knowledge of the functionality of anticancer therapy ordering in institutional electronic medical record. • Develop and maintain standardized treatment plan in electronic health record and provide recommendations for changes. • Develop patient-specific treatment plan in electronic health record if standardized plan is unavailable. <p>Research</p> <ul style="list-style-type: none"> • Contribute to institutional and collaborative research and scholarly activities. • Participate in clinical trials (if applicable). • Participate in institutional review board and feasibility committees to review potential protocols. • Review the clinical trial treatment plan and ensure that no protocol deviations occur. • Have knowledge of clinical trials available at the institution. • Provide recommendations for the appropriateness of a clinical trial versus another treatment regimen. <p>Nutrition Support (if applicable)</p> <ul style="list-style-type: none"> • Provide nutrition support for their patients (determine eligibility, daily monitoring, and discontinuation of parenteral and enteral nutritional support). • Work with the clinical nutrition team and dietitians. 	<p>Information Technology Support</p> <ul style="list-style-type: none"> • Possess in-depth knowledge of the functionality of anticancer therapy ordering in institutional electronic medical record. • Develop and maintain standardized treatment plan in electronic health record and provide recommendations for changes. • Develop patient-specific treatment plan in electronic health record if standardized plan is unavailable. <p>Research</p> <ul style="list-style-type: none"> • Contribute to institutional and collaborative research and scholarly activities. • Participate in clinical trials (if applicable). • Participate in institutional review board and feasibility committees to review potential protocols. • Review the clinical trial treatment plan and ensure that no protocol deviations occur. • Have knowledge of clinical trials available at the institution. • Provide recommendations for the appropriateness of a clinical trial versus another treatment regimen. <p>Nutrition Support (if applicable)</p> <ul style="list-style-type: none"> • Provide nutrition support for their patients (determine eligibility, daily monitoring, and discontinuation of parenteral and enteral nutritional support). • Work with the clinical nutrition team and dietitians. 			
<p><i>*Pharmacists perform the duties that are part of the Pharmacists' Patient Care Process and may practice independently if they are permitted to do so by national, state, or institutional practices, regulations, and laws (e.g., those related to collaborative practice agreements and credentialing).</i></p>					

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Alexander M, Rao K, Khan T, Deal A; 2016; <i>J Oncol Pract</i> ³⁰	Pharmacists' impact in hematopoietic stem-cell transplantation: economic and humanistic outcomes	<p>Prospective data collection with 3 phases to assess a pharmacists' involvement in the care of patients undergoing BMT</p> <ol style="list-style-type: none"> 1. Total pharmacist encounters and prescriptions over a 6-month period (inpatient <i>n</i> = 170, ambulatory <i>n</i> = 290) 2. Total pharmacy interventions over a 6-week period and their estimated time savings according to polled providers (844 interventions) 3. Survey of provider and patient expectations and experience with pharmacy services (patients pre, <i>n</i> = 27; patients post, <i>n</i> = 83; providers, <i>n</i> = 50) 	<ul style="list-style-type: none"> • Decreasing Physician Time • Revenue Generation • Satisfaction (Patient/Provider) 	<ul style="list-style-type: none"> • Outpatient discharge revenue of \$990 per patient (approx. \$130,000 annually); Ambulatory revenue increase of \$80 per patient (approx. \$50,000 annually); Mobilization revenue increase of \$9,993 per patient (approx. \$840,000 annually) • 122 physician hours saved (per 6 weeks) • Patient and provider favorable responses (>80%) for all but 1 category: education about BMT process; for patients both pre- and post-surveyed, all results were maintained or improved
Amerine L, Chen S, Daniels R, Key N, Eckel S, Savage S; 2015; <i>Am J Health-Syst Pharm</i> ³¹	Impact of an innovative blood factor stewardship program on drug expense and patient care	Case study including retrospective analysis over a 5-year period before and after the implementation of a blood factor stewardship program	<ul style="list-style-type: none"> • Cost Savings • Decreasing Hospitalizations • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • Total doses reduced by 45%, despite an overall 22% increase in patients receiving clotting factors • More than \$4 million in cost savings annually • Readmissions decreased from 3 to 1 over a fiscal year after conversion from rFVIIa to FEIBA
Ashjian E, Salamin L, Eschenburg K, Kraft S, Mackler E; 2015; <i>J Am Pharm Assoc</i> ³²	Evaluation of outpatient medication reconciliation involving student pharmacists at a comprehensive cancer center	<p>1-year prospective data collection to evaluate a medication reconciliation program for oncology patients (completed by third-year IPPE students), in which pharmacist preceptors updated the EMR and communicated directly with physicians.</p> <p><i>n</i> = 510 patients</p>	<ul style="list-style-type: none"> • Improving Medication Safety 	<ul style="list-style-type: none"> • A total of 88% of patients had at least one discrepancy identified in their medication history and corrected in the EMR. • 11.4% of patients had a medication-related problem identified, which included drug-drug interactions (<i>n</i> = 28), untreated indications (<i>n</i> = 9), failure of the patient to receive a prescribed medication (<i>n</i> = 8), adverse drug reactions (<i>n</i> = 3), and other problems (e.g., inappropriate dosing frequency) (<i>n</i> = 10).
Bates J, Buie L, Amerine L, et al; 2016; <i>Am J Health-Syst Pharm</i> ³³	Expanding care through a layered learning practice model	<p>Two 30-day evaluations were conducted on a oncology patient-centered layered learning practice model (LLPM) – services provided by a pharmacy APPE student or resident whose activities were managed and reviewed by an attending pharmacist.</p> <p><i>n</i> = 42 hematology and 78 oncology patients</p>	<ul style="list-style-type: none"> • Improving Medication Safety • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • Overall discharge capture rate was 51%, in which 61 patients received discharge medication reconciliation services during patient counseling. • Means of 11 prescriptions at discharge for hematology patients and 9.83 for oncology patients • Means of 1.26 (hematology) and 2.1 (oncology) MRPs per patient were identified by the pharmacist during discharge medication reconciliation. • Overall mean face time spent per patient was 21.3 minutes.

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Battis B, Clifford L, Huq M, Pejoro Em Mambourg S; 2016; <i>J Oncol Pharm Practice</i> ³⁴	The impacts of a pharmacist-managed outpatient clinic and chemotherapy-directed electronic order sets for monitoring oral chemotherapy	A pharmacist-managed oral chemotherapy monitoring clinic was established within a VA including the development of a collaborative practice agreement and the creation of drug-specific electronic order sets. Scheduled follow-ups were made every two weeks for two months for all patients new to oral chemotherapy and then once a month for all established patients. The 8-month data collection period was between September 2014 and April 2015. <i>n</i> = 68 patients	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care Informatics 	<ul style="list-style-type: none"> 31 patients (45%) were identified as having a therapy-related problem with their oral chemotherapy. The clinic helped to reestablish care for 3 patients (4.4%) who were lost to follow-up. The clinic identified 12 patients (17.6%) nonadherent to their prescribed regimen. Medication regimen errors were discovered for 5 patients, accounting for a 7.3% medication-related error rate. 7 patients (10.3%) were found to have an adverse reaction attributed to their oral chemotherapy, in which 2 patients (2.9%) were categorized as severe.
Chackunkal E, Vogel VD, Gryucio M, Kostoff D; 2017; <i>J Oncol Pharm Practice</i> ³⁵	Improving adherence to the Epic Beacon ambulatory workflow	Retrospective, quasi-experimental study of ambulatory care workflow. Low rate of compliance, followed by educational intervention (live didactic session) of infusion center staff led by oncology pharmacists <i>n</i> = 100 patient encounters	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Composite compliance increased after intervention (38% vs. 83%; <i>p</i> < .001). Pharmacist prereview of orders day before therapy increased after intervention (1% vs. 32%). Compliance significantly improved for allergy and vital signs documentation and double-checking by second nurse before administration.
Chung C, Collins A, Cui Nancy; 2011; <i>Am J Health-Syst Pharm</i> ³⁶	Development and implementation of an interdisciplinary oncology program in a community hospital	Retrospective data collection of <i>n</i> = 96 chemotherapy orders before program implementation and <i>n</i> = 75 orders after program implementation Program development included the creation of standardized order forms, establishing pharmacy collaborative agreements and protocols, the addition of an oncology pharmacist specialist position, competency and training program requirements, etc.	<ul style="list-style-type: none"> Cost Savings Improving Medication Safety 	<ul style="list-style-type: none"> 45% reduction in total errors related to chemotherapy drugs (<i>p</i> > .0625); most common source of error was missing information. Dose-rounding protocol resulted in an annual cost saving of \$120,000.
Finn A, Bondarenka C, Edwards K, Hartwell R, Letton C, Perez A; 2017; <i>J Oncol Pharm Practice</i> ³⁷	Evaluation of electronic health record implementation on pharmacist interventions related to oral chemotherapy management	A retrospective interventional study that evaluated pharmacy interventions for a 3-month period before and after implementation of an oral chemotherapy program managed by clinical pharmacists electronically through Epic Beacon. <i>n</i> = 240 patients with 450 prescriptions (both pre- and post-intervention periods) <i>n</i> (orders) =134 (pre); <i>n</i> = 316 (post) <i>n</i> = 3 providers responded to survey	<ul style="list-style-type: none"> Cost Savings Decreasing Physician Time Improving Medication Safety Improving Quality/Clinical Care Informatics 	<ul style="list-style-type: none"> Increase in prescription volume of chemotherapy orders from 134 to 316. 660% more pharmacist interventions. Identification of over 500% more chemotherapy order errors Responding practitioners felt that pharmacist involvement in oral chemotherapy management improved patient safety and that the pharmacists contributed clinically relevant interventions; in addition, they all felt it helped save them time and they would like to see the program expanded.

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Hansen E, Pietkiewicz J, Blum B; 2014; <i>J Pharm Pract</i> ³⁸	Evaluation of the feasibility and utility of a pharmacist-centered collaborative drug therapy management program for oncology-based symptom management	Data collection over a 4-month period to assess the management of 3 symptoms by the collaborative drug therapy management (CDTM) pharmacists: CINV, CIPN, and women's health. <i>n</i> = 12 patients enrolled in the CDTM clinic during 4-month pilot <i>n</i> = 11 patient surveys returned <i>n</i> = 5 physician surveys	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> 12 patients were referred to CDTM pharmacists (8 CIPN, 3 CINV, 1 women's health). 54 visit/phone consultations, with a mean time of 16.9 minutes spent with each patient per consultation 70 interventions and 6 medication-related adverse effects were identified. Patient and physician satisfaction surveys were supportive of the program. Of symptomatic patients at the time of CDTM enrollment, symptom scores illustrated a decrease or stabilization of symptoms from baseline.
Holle L, Puri S, Clement J; 2016; <i>J Oncol Pharm Practice</i> ³⁹	Physician–pharmacist collaboration for oral chemotherapy monitoring: Insights from an academic genitourinary oncology practice	Prospective data collection over an 18-month period following the implementation of an oral cancer therapy monitoring program led by an oncology pharmacist. Following each visit, the pharmacist completed a log documenting types of encounters, assessments, medication-related problems identified, and recommendations. <i>n</i> = 20 patients (all males)	<ul style="list-style-type: none"> Improving Medication Safety 	<ul style="list-style-type: none"> Out of 123 encounters with 20 patients, 37.9% were collaborative clinic visits with a physician, 14.5% were solo clinic visits, 36.3% were telephone follow-up, and 11.3% were e-mail follow-up. Medication-related problems were identified in 25% of the 315 encounter assessments, including 40% adverse drug reactions (ADRs), 20% inappropriate therapy, and 18% noncompliance. The pharmacist made 131 recommendations including modification of lab monitoring (25%), therapy modification (12%), drug discontinuation (6.9%), drug information and coordination of care (30%).
Jones K, Barnett C, Gauthier M, Boster B, Espirito J, Michaud L; 2011; <i>J Oncol Pharm Practice</i> ⁴⁰	Clinical outcomes of a pharmacist-managed anticoagulation service for breast cancer patients	Retrospective review of patients with breast cancer receiving warfarin therapy for venous thromboembolism (VTE) managed by the pharmacist-run Anticoagulation Management Service (AMS) between 1998 and 2005. <i>n</i> = 145 patients	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> The median time followed by the AMS was 151 days. 53% of lab draws were within the target therapeutic INR range 2–3. Recurrent thrombosis occurred in 4.1% of patients. Minor bleeding occurred in 18.6% of patients, and major bleeding occurred in three patients (2.1%). Conclusion: patients maintained a therapeutic INR at a rate similar to or slightly higher than other oncology populations in the published literature. However, rates of recurrent VTE and bleeding events were lower.

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Lam M, Cheung N; 2015; <i>J Oncol Pharm Practice</i> ⁴¹	Impact of oncology pharmacist-managed oral anticancer therapy in patients with chronic myelogenous leukemia	Retrospective data collection of patients diagnosed with CML treated with oral tyrosine kinase inhibitors (TKIs) managed by oncology pharmacists during a 6-year period. <i>n</i> = 56 patients (45 treated with imatinib)	<ul style="list-style-type: none"> Improving Adherence Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Patients managed by oncology pharmacists resulted in a higher percentage of imatinib adherence rate compared to usual care (88.6% vs. 65.8%, <i>p</i> = .0046). There were 567 pharmacist interventions documented, which included side effect monitoring/management (16.8%); drug interaction detection (19.2%); TKI dose adjustment (14.5%); laboratory monitoring (35.3%); non-CML-related drug choice (13.1%); and copay assistance (1.2%). Mean of 10.1 interventions per patient.
Mancini R, Kaster L, Vu B, Modlin J, Wilson D; 2011; <i>J Hematol Oncol Pharm</i> ⁴²	Implementation of a pharmacist-managed interdisciplinary oral chemotherapy program in a community cancer center	To evaluate the effectiveness of an oral chemotherapy program through prospective data collection of the annual costs and revenue of the program during 1 fiscal year, pharmacy interventions from the EHR during a 16-month period, as well as physician/nurse surveys. <i>n</i> = 15 nurses (out of 25) and 7 oncologists (out of 10) responded to surveys	<ul style="list-style-type: none"> Improving Quality/Clinical Care Revenue Generation Satisfaction (Provider) 	<ul style="list-style-type: none"> Nearly 1,500 prescriptions for 552 patients Prescriptions increased from 40 to 120 per month, correlating with increased revenue from \$100,000 to \$300,000 per month. Estimated yearly revenue of \$2.4 million, with an operating cost of only \$230,000 An estimated 75%–85% of prescriptions now remain within the health system compared with less than 25% before program implementation. 83% of nurses were very satisfied or satisfied with the process overall; 5 of 7 oncologists were extremely satisfied, with 2 reporting indifference.
McCune J, Games D, Espirito J; 2005; <i>J Oncol Pharm Practice</i> ⁴³	Assessment of ovarian failure and osteoporosis in premenopausal breast cancer survivors	A retrospective chart review to determine the adequacy of pharmacist-led ovarian failure and osteoporosis assessment/management in premenopausal breast cancer survivors. <i>n</i> = 20 women (over 4.5-year period)	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Median duration of follow-up was 4.62 years. The assessment of ovarian failure mainly occurred by documenting menstrual periods (has been questioned as a reliable method?), in which menses stopped while or shortly after receiving chemotherapy in 11 women. Prior to and during cyclophosphamide administration, osteoporosis screening/counseling was not documented for any patient; after chemotherapy completion, 8 patients were counseled, and 7 were screened for osteoporosis (5 women had DXA scans indicative of osteopenia).
McKee M, Frei B, Garcia A, Fike D, Soefje S; 2010; <i>J Oncol Pharm Practice</i> ⁴⁴	Impact of clinical pharmacy services on patients in an outpatient chemotherapy academic clinic	An observational study consisting of the distribution of a 20-item, 2-page survey to oncology patients actively receiving treatment. <i>n</i> = 77 patient surveys (out of 112 distributed)	<ul style="list-style-type: none"> Patient Education Satisfaction (Patient) 	<ul style="list-style-type: none"> 86% stated that it is important for patients to discuss their treatment with a pharmacist. 76% requested pharmacy follow-up at future visits. 93.2% were satisfied or very satisfied with the time spent with the pharmacist. 84.3% stated that they learned something new during pharmacist counseling. 83% stated that they would be willing to either pay out-of-pocket or have insurance assist for pharmacy counseling services; 28.9% were willing to pay \$10–20, and 19.7% were willing to pay more than \$20.

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
McNamara E, Redoutey L, Mackler E, Stevenson J, Peterson L, Mahmood T; 2016; <i>J Oncol Pract</i> ⁴⁵	Improving oral oncolytic patient self-management	Performed Michigan Oncology Quality Consortium (MOQC) baseline self-assessment and retrospective review of medical records for 25 patients prescribed an oral oncolytic. After the implementation of MOCQ resources (oral oncolytic tracking system, patient education and self-care guidelines, adherence questionnaire, and modified workflow), a retrospective post-intervention review was completed. <i>n</i> = 25 patients pre-intervention <i>n</i> = 24 patients post-intervention	<ul style="list-style-type: none"> Improving Adherence Improving Quality/Clinical Care 	<ul style="list-style-type: none"> At baseline, self-assessment revealed a lack of start-date documentation and consistent follow-up; medical records showed 48% of patients discontinued medication without consulting their physician, and start-date documentation was available for only 52% of patients. After intervention, 100% of patients had a documented start date, and no patients discontinued medications on their own.
Patel J, Holle L, Clement J, Bunz T, Niemann C, Chamberlin K; 2015; <i>J Oncol Pharm Practice</i> ⁴⁶	Impact of a pharmacist-led oral chemotherapy-monitoring program in patients with metastatic castrate-resistant prostate cancer	Retrospective comparison of 2 cohorts of patients receiving abiraterone, bicalutamide, or enzalutamide for metastatic castrate-resistant prostate cancer seen 21 months before and 24 months after the implementation of a pharmacist-led oral chemotherapy-monitoring program. <i>n</i> = 31 patients (<i>n</i> = 14 pre-intervention; <i>n</i> = 17 post-intervention)	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Average number of interventions per patient increased from 2.6 to 6.9 (<i>p</i> = .004). Adherence to lab parameter monitoring increased from 3 to 10 (<i>p</i> = .04). No significant change in overall time on therapy Interventions addressing adherence increased almost 8-fold (<i>p</i> = .018).
Patterson C; 2013; <i>J Manag Care Pharm</i> ⁴⁷	Best practices in specialty pharmacy management	Quarterly analysis of compliance to protocols (developed by the P&T committee) after establishing an oncology clinical pharmacist position, placing prescribers in key roles, and providing more specialist-specific education.	<ul style="list-style-type: none"> Cost Savings Satisfaction (Provider) 	<ul style="list-style-type: none"> Protocol compliance increased from 62% to 80% in less than 1 year (100% in quarter 4). Case scenarios describe the pharmacist's role in using supporting evidence to approve off-label use on the basis of evidence. Pharmacist-led educational programs received positive feedback, in which 80% of 680 participants responded that the information was valuable and could possibly have an impact on their practices.
Punke AP, Waddell JA; 2017; <i>J Oncol Pharm Pract</i> ⁴⁸	Creation and evaluation of a cancer chemotherapy order review guide for use at a community hospital	Creation of a chemotherapy order evaluation guide was created and then used to assess non-oncology trained pharmacist's ability to accurately review chemotherapy orders using the guide. <i>n</i> = 19	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> A significant difference was detected between the pre- and post-education for both the general chemotherapy (<i>p</i> = .00032) order and carboplatin dosing order (<i>p</i> = .031).
Randolph L, Walker C, Nguyen A, Zachariah S; 2016; <i>J Oncol Pharm Practice</i> ⁴⁹	Impact of pharmacist interventions on cost avoidance in an ambulatory cancer center	A prospective, observational 4-week study in which cost avoidance values were assigned to interventions performed by a pharmacy resident and a centralized oncology pharmacist in an ambulatory cancer center. Anonymous patient and staff satisfaction surveys based on a 5-point Likert scale were distributed to assess the perceived benefit of a pharmacist. <i>n</i> = 962 interventions <i>n</i> = 8 for patient surveys <i>n</i> = 8 for staff surveys	<ul style="list-style-type: none"> Cost Savings Improving Quality/Clinical Care Patient Education Satisfaction (Patient/Provider) 	<ul style="list-style-type: none"> Estimated cost avoidance of \$282,741 per pharmacist per year, yielding a net benefit of \$138,441 962 interventions in 4 weeks with most common interventions being chemotherapy regimen review (<i>n</i> = 815) and patient counseling (<i>n</i> = 102); Acceptance rate > 95% Patient and staff surveys (<i>n</i> = 16) yielded a 100% positive perception of the pharmacist.

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Reardon D, Atay J, Ashley S, Churchill W, Berliner N, Connors J; 2015; <i>J. Thromb. Thrombolysis</i> ⁵⁰	Implementation of a hemostatic and antithrombotic stewardship program	Retrospective comparison of the costs per fiscal year associated with the implementation of a Hemostatic and Antithrombotic (HAT) Stewardship Program (including a pharmacist, hematology attending, and medical director) in hemophilia patients Efforts of the HAT Stewardship program included update HIT management guidelines including clinical surveillance and follow-up, optimization of clotting factor use, oversight of patients on ECMO, and decreasing gaps in transition of care for patients with mechanical circulatory support devices.	<ul style="list-style-type: none"> • Cost Savings • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • A decrease in the per-patient utilization of DTIs in patients with HIT from an average of 8.2 vials of bivalirudin per patient to 6.8, resulting in an estimated costs savings of \$228,200 per fiscal year. • For a patient with a history of multiple admissions secondary to complications of hemophilia A, their average cost per patient day decreased from \$75,392 to \$44,364 due to preferential prescribing of FEIBA and use of rFVIIa. • The estimated economic impact of the stewardship for the fiscal year was \$1,449,417.
Ruder A, Smith D, Madsen M, Kass F; 2010; <i>J Oncol Pharm Practice</i> ⁵¹	Is there a benefit to having a clinical oncology pharmacist on staff at a community oncology clinic?	Retrospective descriptive analysis of clinical interventions (drug-related and consultative) by the clinical oncology pharmacist from September 2004 to October 2006. Drug-related interventions included medication reconciliation, dosing, and adverse effect management and prevention. Consultations incorporated drug information questions, patient visits, and patient education sessions.	<ul style="list-style-type: none"> • Cost Savings • Satisfaction (Patient) 	<ul style="list-style-type: none"> • \$210,000 in cost savings • 583 clinical interventions were documented among 199 patients (2.9 times per patient over the course of treatment). Total intervention time was 5,705 minutes (average 10 minutes each). • Patient and colleague surveys evaluated pharmacist services with positive ratings of 95% and 98%, respectively.
Sessions J, Valgus J, Barbour S, Iacovelli L; 2010; <i>J Oncol Pract</i> ⁸	Role of oncology clinical pharmacists in light of the oncology workforce study	Perspective article advocating for the utilization of oncology pharmacists in light of the anticipated shortage of oncologists and hematologists Descriptive results of the implementation of clinical pharmacist practitioners (CPPs) at several health systems.	<ul style="list-style-type: none"> • Cost Savings • Decreasing Physician Time 	<ul style="list-style-type: none"> • After CPP implementation, 89 patients were seen in nearly 300 visits the first year; only 42% of visits were attended by a physician • Estimated that nearly 600 hours of infusion time were saved, after the first year of a pharmacist-led rapid-infusion rituximab protocol
Shah NN, Casella E, Capozzi D, et al; 2016; <i>J Oncol Pract</i> ⁵²	Improving the safety of oral chemotherapy at an academic medical center	Quality improvement project in which a multidisciplinary team analyzed the current oral chemotherapy (OC) process and identified lack of pharmacist review as an area of improvement. OC orders placed in the EMR were then routed to an oncology-specific pharmacist. Results for 7 months are reported. <i>n</i> = 63 orders for 45 patients	<ul style="list-style-type: none"> • Improving Medication Safety • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • Interventions were made on 35% of OC orders • Of the 22 interventions made, 12 were recommendations for additional drug monitoring, 9 were identification of an interacting drug, and 1 was a dosage adjustment
Shah S, Dowell J, Greene S; 2006; <i>Ann Pharmacother</i> ⁵³	Evaluation of clinical pharmacy services in a oncology outpatient setting	Retrospective data collection to evaluate the services of a oncology clinical pharmacy in the outpatient setting. <i>n</i> = 423 patient visits (from Nov 1, 2002, to Oct 31, 2003)	<ul style="list-style-type: none"> • Improving Medication Safety • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • 342 supportive care issues were addressed, including anemia (34%), pain management (22%), constipation/diarrhea (15%), and nausea and vomiting (8%). • There were 308 drug-specific interventions; major ones included drug addition (41%), discontinuation (23%), and adjustment (21%).

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Skledar S, Doedyns A, Yourich B; 2015; <i>Am J Health-Syst Pharm</i> ⁵⁴	Building an outpatient cancer center pharmacy program across a tristate region	Integrated a pharmacist on site into 13 of their 19 clinic sites and developed a system in which there is a two-pharmacist check of antineoplastic orders. Twelve-month follow-up in which the interventions were tracked and categorized. Descriptive results of the implementation of adding a pharmacist into clinics and having a hybrid model for remote order verification.	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care Patient Education 	<ul style="list-style-type: none"> 2,266 medication interventions 641 were major interventions which were correction of initial dosing or recommending changes on laboratory monitoring. 1,082 minor interventions related to premedication dose suggestions or clarifications 441 interventions related to oral chemotherapy medication counseling and improving the use of erythropoietin stimulating agents
Valgus J, Jarr S, Schwartz R, Rice M, Bernard S; 2010; <i>J Oncol Pract</i> ⁵⁵	Pharmacist-led, interdisciplinary model for delivery of supportive care in the ambulatory cancer clinic setting	Description and early analysis of a pharmacist-led supportive care consultation service. Data was collected both prospectively (demographics, symptom scores) and retrospectively (meds, substance abuse, insurance). 8 symptoms (pain, SOB, nausea, mood, constipation, insomnia, delirium, and fatigue) were assessed on a 5-point Likert-type scale developed for the Palliative Care Consult Service. <i>n</i> = 89 patients in 292 encounters (18-months)	<ul style="list-style-type: none"> Decreasing Physician Time Improving Quality/Clinical Care 	<ul style="list-style-type: none"> 3/4 of all consultations were for pain management. The physician was present for only 40% of all visits. Patient volume increased from 4.5 to 6.6 new patients/month and 13 to 20 encounters/month. Initial analysis of the first 49 patients seen who were entered in the research database showed improvements in all symptom scores, including pain, nausea, and constipation, by the second visit.
Valgus JM, Faso A, Gregory K, et al; 2011; <i>Am J Health-Syst Pharm</i> ⁵⁶	Integration of a clinical pharmacist into the oncology clinics at an academic medical center	Description and early analysis of a pharmacist-led supportive care consultation service. The clinical pharmacist practitioner (CPP) had authority to prescribe with physician oversight under established protocols. <i>n</i> = 89 patients in 292 encounters (18-months)	<ul style="list-style-type: none"> Improving Quality/Clinical Care Patient Education Revenue Generation 	<ul style="list-style-type: none"> The pharmacist made 186 interventions and wrote 136 prescriptions. The pharmacist established a chemotherapy counseling service that provided more than 900 billable patient education sessions. The pharmacist led an effort to increase use of a rituximab rapid infusion among eligible patients, permitting the clinics to schedule an additional 2-3 patient visits per week.
Watkins J, Landgraf A, Barnett C, Michaud L; 2003; <i>J Am Pharm Assoc</i> ⁵⁷	Evaluation of pharmacist-provided medication therapy management services in an oncology ambulatory setting	A 3-month retrospective review of all medication therapy management (MTM) visits to evaluate the effects on pharmacist workload as well as to describe the population receiving MTM, describe the services provided, and determine the reimbursement rate for billed MTM services. <i>n</i> = 239 MTM visits (completed by 24 pharmacists in 13 outpatient clinics)	<ul style="list-style-type: none"> Improving Quality/Clinical Care Patient Education Revenue Generation 	<ul style="list-style-type: none"> Face-to-face visits ranged from 15 to 127 minutes, with a median of 20 minutes. Documentation ranged from 5 to 90 minutes, with a median of 18 minutes. No claims have been rejected to date, and reimbursement rates range from 47% to 79%, depending on the insurance provider. MTM visits were prompted for evaluation of patients' complete medications list (60%), chemotherapy teaching and toxicity management (21%), post stem cell treatment follow-up (16%), and LMWH/hormone therapy/supplement counseling and education (3%).

Table 8. U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Wong S-F, Bounthavong M, Nguyen C, Bechtoldt K, Hernandez E; 2014; <i>Am J Health-Syst Pharm</i> ⁵⁸	Implementation and preliminary outcomes of a comprehensive oral chemotherapy management clinic	A retrospective observational (3 month) cohort study measured patient demographics, self-rated depression scores, and data on concurrent medications, types of interventions, and outcomes at baseline and at follow-up visits for up to three months. Analysis of outcomes and costs savings was performed by 2 pharmacists who did not directly work with the patients and who reviewed the medical records independently. <i>n</i> = 30 patients (9 men, 21 women with median age of 64.5 years)	<ul style="list-style-type: none"> • Cost Savings • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • About 70% of oral chemotherapy management clinic interventions were associated with positive outcomes (i.e., complete resolution of event or improved response to therapy). • 67% and 36% of interventions resulting in potential cost avoidance and cost savings, respectively, with a preliminary estimation of cost avoidance of \$1,000 per patient • 83% of interventions occurred within the first month with downward trends in amount and types of interventions over time.
Wong S-F, Bounthavong M, Nguyen C, Chen T; 2016; <i>J Natl Compr Canc Netw</i> ⁵⁹	Outcome assessments and cost avoidance of an oral chemotherapy management clinic	A case series report of all patients referred to the oral chemotherapy management clinic. Data collected included patient demographics, depression scores, current medications, and types of intervention, including detection and management outcomes collected at baseline, 3-day, 7-day, and 3-month follow-ups. <i>n</i> = 86	<ul style="list-style-type: none"> • Cost Savings • Improving Medication Safety • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • The total estimated annual cost avoidance per 1 full-time employee (FTE) was \$125,761.93. • A total of 201 interventions occurred in 201 visits, with more than 75% occurring within the first 14 days. • A persistence rate was observed in 78% of 41 evaluable patients. • 53 were adverse drug event interventions, in which 48 were grade 2 or higher in severity and 7 of 21 drug interactions were major. • 9 interventions were for medication errors.
Wychowski MK, Ruscio CL, Kouides PA, Sham RL; 2017; <i>J Thromb Thrombolysis</i> ⁶⁰	The scope and value of an anticoagulation stewardship program at a community teaching hospital	Prospective-retrospective comparison of the cost savings from implementation of an Anticoagulation Stewardship Program (including two clinical pharmacists with specialization in anticoagulation, hematologists and hematology medical director) <i>n</i> = 1930	<ul style="list-style-type: none"> • Cost Savings • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • Intervention acceptance rates were 91% to medical team and 83% to surgical teams. • Inappropriate prothrombin complex concentrate (PCC) orders decreased from 56% to 2.6% post implementation. • Intervention cost-avoidance was \$694,217. • Projected annual cost savings for PCC is \$385,473. • Estimated financial impact of program was \$799,690 saved.

ADRs = adverse drug reactions; APPE = advanced pharmacy practice experience; BMT = bone marrow transplant; CINV = chemotherapy-induced nausea and vomiting; CIPN = chemotherapy-induced peripheral neuropathy; DRP = drug-related problem; DTI = direct thrombin inhibitor; DXA = dual energy X-ray absorptiometry; ECMO = extracorporeal membrane oxygenation; EHR = electronic health record; EMR = electronic medical record; GCSF = granulocyte colony-stimulating factor; HIT = heparin-induced thrombocytopenia; INR = international normalized ratio; IPPE = introductory pharmacy practice experience; LMWH = low-molecular-weight heparin; MRP = Medication Reconciliation Post-Discharge; VTE = venous thromboembolism.

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Au B, Dersch-Mills D, Ghosh S, Jupp J, Chambers C, Cusano F, Danilak M; 2018; <i>J Onc Pharm Practice</i> ⁶¹ Canada	Implementation of additional prescribing authorization among oncology pharmacists in Alberta	Descriptive, cross-sectional survey of all oncology pharmacists in Alberta using a web-based questionnaire over a 4-week period in March and April 2016. response rate 41% ($n = 71$) Attempt to describe practice settings and prescribing practices of pharmacists.	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Median number of prescriptions written in an average week: 5 Antiemetics were prescribed most often. Pharmacists report prescribing was most useful for ambulatory patient assessment and follow-up.
Balk TE, van der Sijs IH, van Gelder T, Janssen JJB, van der Sluis IM, van Leeuwen RWF, Engels FK; 2017; <i>Pediatr Blood Cancer</i> ⁶² Netherlands	Drug-drug interactions in pediatric oncology patients	Prospective, observational, descriptive study during a 4-month period of outpatients younger than 18 years to investigate prevalence and clinical relevance of drug-drug interactions (DDIs) in outpatient pediatric oncology patients. $n = 73$ DDIs and proposed interventions were presented to a hospital pharmacist, internist-clinical pharmacologist, and resident in internal medicine.	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> 67 DDIs were identified. Medication reviews resulted in 35 interventions related to 11 different DDIs; majority of DDIs concerned noncytostatic drugs (25/35).
Cavero Rodrigo E, Climente Martí M, Navarro Fontestad MC, Jiménez Torres NV; 2007; <i>Farm Hosp</i> ⁶³ Spain	Quality assessment of two pharmaceutical care models for onco-haematological patients	A prospective cohort study in the oncology departments of a university hospital over a 26-month period to compare the quality of two pharmaceutical care models (with and without pharmacist participation in the clinical team). A centralized model was used from 16 months, followed by a decentralized model for 10 months. $n = 1,939$ patients.	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> The rate of patients identified with DRPs increased from 10.8% to 31.2% ($p = .0001$), and the frequency of DRPs identified increased from 17.6% to 59% ($p < .0001$). The rate of medication errors intercepted before reaching the patient increased from 4.5% to 9.8% ($p < .0001$). The rate of significant pharmaceutical interventions (including a reduction in risk of drug-related morbidity), increased from 6.5% to 26.4% ($p < .0001$).
Chan A, Shih V, Chew L; 2008; <i>J Oncol Pharm Practice</i> ⁶⁴ Singapore	Evolving roles of oncology pharmacists in Singapore: a survey on prescribing patterns of antiemetics for chemotherapy induced nausea and vomiting (CINV) at a cancer centre	Pharmacy-led, single-center, nonrandomized survey to evaluate oncologists' prescribing patterns of antiemetics for CINV as well as their perception of antiemetic counseling by oncology pharmacists. $n = 20$ oncologists returned surveys (27 distributed)	<ul style="list-style-type: none"> Satisfaction (Provider) 	<ul style="list-style-type: none"> Most oncologists closely adhered to guidelines; however, results showed a trend of overprescribing acute antiemetics for low emetogenic chemotherapy regimens. Majority of oncologists found pharmacists' counseling on antiemetics to be effective. 75% ranked 4 or above on a 5-point scale, with 5 being most effective.

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Chan A, Shih V, Chiang J; 2013; <i>J Oncol Pharm Practice</i> ⁶⁵ Singapore	Clinical pharmacy services and research for lymphoma patients at a cancer center	Descriptive article outlining the services and research activities conducted by clinical pharmacists of a lymphoma team at the National Cancer Centre Singapore. Prospective data collection was performed over a 1-year period of all pharmacist interventions. <i>n</i> = 295 interventions for 116 patients Two independent reviewers rated the impact of each intervention from 0 to 4 using a standardized grid.	<ul style="list-style-type: none"> Improving Quality/Clinical Care Intervention Acceptance 	<ul style="list-style-type: none"> Description of services provided include granulocyte-colony stimulating factors stewardship, antiemetic stewardship, appropriate tumor lysis prevention, therapeutic drug monitoring of high-dose methotrexate, improvement of resource utilization (rapid Rituximab infusion), medication safety (preventing drug-related problems). 97% of the interventions were accepted by oncologists, with 23% of the impact ratings assigned a 3 and above on a 4-point scale, demonstrating that these interventions were highly impactful and promote desirable outcomes.
Chew C, Chiang J, Yeoh TT; 2015; <i>J Oncol Pharm Practice</i> ⁶⁶ Singapore	Impact of outpatient interventions made at an ambulatory cancer centre oncology pharmacy in Singapore	A two-month prospective intervention study in which pharmacists documented the reason for intervening and its related drug(s). Each intervention was evaluated for its clinical significance by an expert panel: two oncologists and a pharmacist using a five-point scale. <i>n</i> = 331 interventions	<ul style="list-style-type: none"> Improving Quality/Clinical Care Intervention Acceptance 	<ul style="list-style-type: none"> 147 interventions were due to missing chemotherapy orders. 184 interventions had potential DRPs, in which 60 were order clarification and the remainder (124) had DRPs. Acceptance rate of interventions was 93%. 47% of interventions by pharmacists were evaluated as clinically "significant" or "very significant." The concordance coefficient was calculated to be 0.612 (<i>p</i> < .001), while weighted kappa test results showed fair agreement.
Cioffi P, Antonelli D, Belfiglio M, Melena S, Pertrelli F, Grappasonni I; 2012; <i>J Oncol Pharm Practice</i> ⁶⁷ Italy	The impact of a pharmacist as a member of health care team on facilitating evidenced-based prescribing of innovative drugs in an Italian oncology department	Data collection over a 3-year period. <i>n</i> = 843 total patients treated with 716 appropriate uses and 127 off-label uses of drugs <i>n</i> = 15 for physician questionnaire	<ul style="list-style-type: none"> Improving Medication Safety 	<ul style="list-style-type: none"> On the basis of evidence-based monitoring, the percentage of off-label prescriptions decreased from 28.3% to 9.6%. The number of reported ADRs increased from 10/year to 27/year. 68.3% of pharmacist-proposed suggestions were implemented by the clinician; all 15 positions reported the usefulness of the pharmacist as a facilitator in evidence-based prescribing.
Corrêa PM, Zuckermann J, Fischer G, Castro M; 2016; <i>Pharm Practice (Granada)</i> ⁶⁸ Brazil	Immunosuppressive serum levels in allogeneic hematopoietic stem cell transplantation: pharmaceutical care contribution	Quasi-experimental study that included a pre-intervention control group and a post-intervention group that included pharmacist consultation. The study evaluated the impact of pharmaceutical care in the maintaining of proper serum levels of immunosuppressive medications in patients who have undergone allo-HSCT. Data was collected from the patients' medical records and the levels taken into account were those from the first 6 months after hospital discharge. <i>n</i> = 22 postintervention <i>n</i> = 44 preintervention	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Proper serum levels increased from 65% in the control group to 82% in the post-intervention group (<i>p</i> = .004).

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Coutsouvelis J, Corallo C, Dooley M, Foo J, Whitfield A; 2010; <i>Support Care Cancer</i> ⁶⁹ Australia	Implementation of a pharmacist-initiated pharmaceutical handover for oncology and haematology patients being transferred to critical care units	Intervention study to evaluate the effectiveness of a pharmacist-initiated pharmaceutical handover (PIPH) for patients being transferred from the oncology unit to critical care units at a major teaching hospital. The PIPH was delivered in written format or combined written and verbal format. Specific therapies included in the study were mouth care, chemotherapy regimen, GCSF, and antibiotics. <i>n</i> = 30 patients pre-intervention (retrospective) <i>n</i> = 22 patients post-intervention (prospective)	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care Transitions of Care 	<ul style="list-style-type: none"> The number of interventions related to specific therapies was reduced from 144 to 26 (<i>p</i> < .0001). There was a 32% reduction in the total number of patients who required interventions with respect to specific therapies (<i>p</i> = .001) The proportion of specific therapies administered on time increased from 57% to 96% (<i>p</i> < .0001). The average errors/omissions per transfer decreased from 4 to 0.45 (<i>p</i> < .0001).
Crespo A, Tyszka M; 2017; <i>J Oncol Pharm Practice</i> ⁷⁰ Canada	Evaluating the patient-perceived impact of clinical pharmacy services and proactive follow-up care in an ambulatory chemotherapy unit	Observational, cross-sectional survey of patients during their second clinic visit to evaluate the clinical services they received (face-to-face education during their first visit and proactive telephone follow-up 3–5 days later). <i>n</i> = 113 respondents (of 190 surveys distributed)	<ul style="list-style-type: none"> Patient Education Satisfaction (Patient) 	<ul style="list-style-type: none"> 95.5% of respondents indicated that face-to-face pharmacist education was worthwhile, and 92.6% reported an increased understanding of their medication regimen. 92.6% of respondents indicated that the pharmacist call-back program was worthwhile, and 91.4% stated that the pharmacist input helped them to manage side effects at home. 94.7% were either "Very Satisfied" or "Satisfied" with the time the pharmacist spent with them, and 92.9% with the pharmacist's ability to answer their questions.
Delpeuch A, Leveque D, Gourieux B, Herbrecht R; 2015; <i>Anticancer Res</i> ⁷¹ France	Impact of clinical pharmacy services in a oncology inpatient setting	A prospective, descriptive, observational study was carried out from May 2012 to May 2013. Medication reviews concerning hospitalized adult cancer patients were performed twice a week. Medication problems, pharmaceutical interventions and acceptance rate by the oncologists were recorded by a clinical pharmacist. <i>n</i> = 4393 prescriptions (chemotherapy & support) of 489 adult cancer patients	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care Intervention Acceptance 	<ul style="list-style-type: none"> The pharmacist identified 552 drug-related problems (12.6% of prescriptions) primarily related to anti-infective agents (59.5%). MRPs included: inappropriate meds (20.6%), untreated indications (14.8%), inappropriate administrations (14.1%), underdosing (11.7%), drug interactions (14.3%), lack of monitoring (9.6%), overdosing (8.9%), administration omissions (3.5%), and side-effects (2.5%). Most (96%) of the interventions were accepted and implemented by the medical staff.
Edwards SJ, Abbott R, Edwards J; 2014; <i>J Pharm Practice</i> ⁷² Canada	Outcomes assessment of a pharmacist-directed seamless care program in an ambulatory oncology clinic	A randomized control study that measured clinical and humanistic outcomes of a pharmacist-directed seamless care program (SCP) (intervention) in an ambulatory oncology clinic. <i>n</i> = 100 patients (control) <i>n</i> = 100 patients (intervention) <i>n</i> = 56 surveys completed that were distributed to family physicians, hospital pharmacists, and oncology nurses associated with the SCP intervention group patients	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> The SCP pharmacist identified an average of 3.7 DRPs per intervention patient (most common was untreated indications). The SCP pharmacist identified an average of 2.57 medications per patient through completing a med history; this number increased to 3.96 after follow-up with the patient's community pharmacy. On average, health care professionals were satisfied with the SCP intervention, indicating that the information collected and distributed was useful.

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Farias T, Aguiar K, Rotta I, Belletti K, Carlotto J; 2016; <i>Einstein (Sao Paulo)</i> ⁷³ Brazil	Implementing a clinical pharmacy service in hematology	An interventional study was done with and without a clinical pharmacy service that consisted of antineoplastic prescription validation (analysis of patients' characteristics, laboratory tests, compliance with the therapeutic protocol and with pharmacotechnical parameters). <i>n</i> = 7,894 prescriptions (during 1-year pre-intervention period) <i>n</i> = 5,671 prescriptions (during 1-year post-intervention period)	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care 	<ul style="list-style-type: none"> An increased detection of drug-related problems by 106.5% after implementing the service. The most commonly found problems were related to dose (33% vs. 25%) and cycle day (14% vs. 30%). The majority had a significant impact (71% vs. 58%), and with potential fatal impact noted for 1 patient during the post-intervention period. The main pharmaceutical interventions were dose adjustment (35% vs. 25%) and drug withdrawal (33% vs. 40%).
Han J-M, Ah Y, Suh S; 2016; <i>Int J Clin Pharm</i> ⁷⁴ South Korea	Clinical and economic impact of pharmacist's intervention in a large volume chemotherapy preparation unit	Retrospective review of pharmacy intervention records from May 2012 to April 2013. The clinical significance of interventions was rated by 1 physician and 1 pharmacist. A cost-benefit analysis was conducted. The benefit was estimated through both cost avoidance based on the potential to avoid an ADE and cost savings related to reducing discarded products. Cost was estimated from the pharmacists' salary corresponding to the time spent in reviewing chemotherapy prescriptions. <i>N</i> = 39,649 chemo prescriptions in 6,364 patients	<ul style="list-style-type: none"> Cost Savings Improving Medication Safety Improving Quality/Clinical Care Intervention Acceptance 	<ul style="list-style-type: none"> 631 interventions were performed for 435 patients, in which incidence of pharmacist intervention was estimated to be 1.59%. Of the pharmacy interventions, 60.9% were dose-related problems. The acceptance rate was 72.1%. 50.4% of the interventions were considered as clinically more than "significant." The cost-benefit analysis showed a net cost-benefit of \$116,493 and a cost-benefit ratio of 3.64:1.
Ho L, Akada K, Messner H, Kuruville J, Wright J, Seki J; 2013; <i>Can J Hosp Pharm</i> ⁷⁵ Canada	Pharmacist's role in improving medication safety for patients in an allogeneic hematopoietic cell transplant ambulatory clinic	6-month pilot project using two pharmacists for a half day clinic to perform medication history and review for patients less than 3 months post-transplant	<ul style="list-style-type: none"> Improving Medication Safety Intervention Acceptance 	<ul style="list-style-type: none"> Pharmacist saw 35 patients for a total of 100 patient visits (4 hour/week for 26 weeks). 50 medication discrepancies and 70 drug therapy problems were identified and resolved. 99% of the pharmacist's recommendations were accepted.
Iihara H, Ishihara M, Matsuura K, et al; 2012; <i>J Eval Clin Practice</i> ⁷⁶ Japan	Pharmacists contribute to the improved efficiency of medical practices in the outpatient cancer chemotherapy clinic	Retrospective data collection before and after the assignment of two pharmacists to an outpatient chemotherapy clinic included: number of patients, amounts of mixing of anticancer injections (carried out by pharmacists using a computer-assisted biohazard safety cabinet developed recently in their hospital), hospital revenue, and management of chemotherapy-induced nausea and vomiting in breast cancer patients receiving the combination chemotherapy with anthracycline and cyclophosphamide.	<ul style="list-style-type: none"> Cost Savings Decreasing Physician Time Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Pharmacists spent 75 hours per month in patient education and ADR monitoring. The average number of outpatients per month increased from 128 to 183 (<i>p</i> < .001) and annually from 1,573 to 2,193. Mixing anticancer injections increased by 88% (<i>p</i> < .001). Revenue increased from \$1.42 to \$2.84 million. The number of patient educations increased every month during data collection. The rate of complete response to CINV prophylactic treatment was elevated from 36% before treatment to 48% after treatment, with a cost savings of 16%.

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Imamura M, Ogawa D, Takatori T, Yamaguchi M, Takata T, Hada T, Ota Y, Uehara T; 2017; <i>Biol Pharm Bull</i> ⁷⁷ Japan	A retrospective study of the effects of oncology pharmacist participation in treatment on therapeutic outcomes and medical costs	Retrospective comparative analysis of the treatment details and clinical course of patients cared for by oncology pharmacists. Patients included were gynecologic oncology population managed by the oncologist only, a noncancer specialist physician and oncology pharmacist, and a generalist physician only.	<ul style="list-style-type: none"> • Cost Savings • Decreasing Physician Time 	<ul style="list-style-type: none"> • Medical cost per course was significantly lower for patients in the oncology pharmacist and physician arm • However, the outpatient treatment rate in the oncology pharmacist and physician arm was high • No difference was observed in clinical outcomes such as recurrence rate and survival
Lopez-Martin C, Siles M, Alcaide-Garcia J, Felipe V; 2014; <i>Int J Clin Pharm</i> ⁷⁸ Spain	Role of clinical pharmacists to prevent drug interactions in cancer outpatients: a single-centre experience	3-month study of all drug interactions in oncology patients were analyzed along with recommendations for clinically significant interactions. <i>n</i> = 75 patients	<ul style="list-style-type: none"> • Improving Medication Safety • Intervention Acceptance 	<ul style="list-style-type: none"> • 31 patients (41%) presented with clinically significant interactions • The hospital pharmacist intervened on 20 occasions (on 35% of patients presenting drug interactions). • Recommendations were accepted 94% of the time.
Lustig A; 2000; <i>Pharm World Sci</i> ⁷⁹ Israel	Medication error prevention by pharmacists—an Israeli solution	Prospective 6-month study of the frequency of medication order errors in a general hospital, thereby assessing the impact of pharmacist intervention in preventing potential harm. Medication error rate by degree of severity was calculated per 100 patient days. <i>n</i> = 14,385 total prescriptions	<ul style="list-style-type: none"> • Improving Medication Safety • Patel 	<ul style="list-style-type: none"> • Overall error rate: 11.2 per 1,000 prescriptions. • The highest medication error rate was found in oncology (2.48), followed by intensive care (0.82), surgery (0.48), and internal medicine (0.26). • 160 medication errors were detected, which included incorrect dosage of drug ordered (27.5%), interactions between drugs (20%), incorrect name of drug (12.5%). • Pharmacist intervention in changes in medication orders was accepted 87.5%.
Patel H, Gurumurthy P. 2017; <i>J Oncol Pharm Practice</i> ⁸⁰ India	Implementation of clinical pharmacy services in an academic oncology practice in India	Prospective interventional study within a private academic oncology care setting that took place over 3 years. Medication-related problems (MRPs) identified by clinical pharmacists were discussed and resolved with the cancer care team. These interventions and MRPs were tracked along with clinical significance of each as “major,” “moderate,” and “minor.” <i>n</i> = 1,359 (MRPs)	<ul style="list-style-type: none"> • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • MRPs were identified from 2,120 medication orders and 1,362 patients. • Most common MRP was suboptimal supportive care. • Clinical pharmacist interventions were implemented to resolve all MRPs.
Periasamy U, Mohd Sidik S, Rampal L, Fadhilah SI, Akhtari-Zavare M, Mahmud R; 2017; <i>Health Qual Life Outcomes</i> ⁸¹ Malaysia	Effect of chemotherapy counseling by pharmacists on quality of life and psychological outcomes of oncology patients in Malaysia: a randomized control trial	A single-blind randomized controlled trial from July 2013 to February 2014. Intervention group received structured, specialized chemotherapy counseling by the pharmacist over 4 visits; the control group received general education from the pharmacist based on their own knowledge over 1 visit. <i>N</i> = 161	<ul style="list-style-type: none"> • Improving Quality/Clinical Care 	<ul style="list-style-type: none"> • The intervention group, with repetitive counseling, showed significant improvement in QOL, including physical health (<i>p</i> = .001), psychological health (<i>p</i> = .001), social relationships (<i>p</i> = .001), and environment (<i>p</i> = .001), and a decrease in anxiety (<i>p</i> = .000) and depression (<i>p</i> = .000).

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Ramadaniati H, Lee Y, Hughes J; 2014; <i>PLoS One</i> ⁸² Australia	The difference in pharmacists' interventions across the diverse settings in a children's hospital	Prospective observational study of all interventions performed by clinical pharmacists for between 35 and 37 days on 5 study wards in 3 practice settings: general medical, general surgical, and oncology. N= 982 interventions on 16,700 medication orders	<ul style="list-style-type: none"> Improving Medication Safety Improving Quality/Clinical Care Intervention Acceptance 	<ul style="list-style-type: none"> Medical histories and patient counseling were most common in the general settings and made up more than half of all interventions. In the oncology setting, drug therapy changes were the most common (37.4%). Active interventions (i.e., leading to therapy change) were less than ¼ in the general setting compared to nearly ½ in oncology. 88.1% of a random sample of active interventions were rated clinically significant. 91.4% of active interventions were accepted.
Ryan N, Chambers C, Ralph C, England D, Cusano F; 2013; <i>J Oncol Pharm Practice</i> ⁸³ Canada	Evaluation of clinical pharmacists' follow-up service in an oncology pain clinic	Prospective descriptive study of all the activities performed by the 2 pharmacists in a pain and symptom control clinic over a 10-week period. Online surveys were completed by healthcare professionals and telephone surveys were completed by patients 1 month post clinic visit. n = 56 patients assessed at the clinic n = 19 patients surveyed (out of 31 distributed) n = 13 healthcare professionals surveyed (out of 28 distributed)	<ul style="list-style-type: none"> Improving Quality/Clinical Care Satisfaction (Patient/Provider) 	<ul style="list-style-type: none"> 44 patients required follow-up. An average of 2.3 interactions per patient and an average time of 85 minutes spent outside clinic per patient 3 activities that occurred most frequently included interacting with other healthcare professionals (n = 163), altering medication regimens (n = 126), and organizing refills (n = 110). The pharmacists addressed 41 adverse events. All health professionals felt the pharmacists' follow-up service was valuable, and nearly all patients reported a positive experience.
Subongkot S, Srisawat S, Johns N, Sookprasert A; 2009; <i>Isan Journal of Pharmaceutical Sciences</i> ⁸⁴ Thailand	Outcome of chemotherapy counseling in oncology patients by pharmacist	Prospective descriptive study to evaluate the outcome of chemotherapy counseling with standard questionnaires by a pharmacist who participated in an oncology care team. Counseling took place at discharge (first visit), at 1 month (second visit), and at 2 months (third visit). N= 82 patients.	<ul style="list-style-type: none"> Improving Quality/Clinical Care Patient Education Satisfaction (Patient) 	<ul style="list-style-type: none"> Patients had an improved knowledge score based on disease and chemotherapy, possible side effects, and self-care behavior ($p < .01$). Satisfaction score also improved ($p < .01$). GI side effects were the most common after 1 evaluation period (91.5%) but were reported to be less severe in frequency and degree in the second and third evaluation periods.
Suzuki S, Abbott R, Sakurai H, Kawasumi K, Johnson PE, Tahara M, Yamaguchi M, Saito S, Yee GC, Endo K; 2017; <i>Jpn J Clin Pharm</i> ⁸⁵ Japan	Evaluation of community pharmacists' ability to ensure the safe use of oral anticancer agents: a nationwide survey in Japan	A 2-month study to evaluate community pharmacists' education and training in oral anticancer agents via online and postal mail survey using the survey from a previously published study. n = 300 online response n = 283 mailed responses	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> 10.1% of respondents felt they had adequate education in oncology and oral chemotherapy. 40% felt comfortable providing oral chemotherapy education to patients.

Table 9. Non-U.S. Studies Documenting the Value of the Oncology Pharmacist (continued)

Author; Year; Journal Country	Article Title	Study Design and Methodology	Outcomes Evaluated	Results
Suzuki S, Chan A, Nomura H, Johnson P, Endo K, Saito S; 2017; <i>J Oncol Pharm Practice</i> ⁸⁶ Japan	Chemotherapy regimen checks performed by pharmacists contribute to safe administration of chemotherapy	Retrospective 12-month chart review to evaluate how pharmacists contributed to safe cancer treatment using "paper-based pharmacy records" to check regimens that were input from CPOE. <i>N</i> = 35,062 chemotherapy regimens for 18,515 outpatients	<ul style="list-style-type: none"> Improving Medication Safety 	<ul style="list-style-type: none"> Pharmacist interventions occurred on 1.1% of all chemotherapy orders, of which 53.1% were modified and accepted by prescribers. Reasons for interventions included unclear regimen changes (49.5%), physicians' errors (22%), suggestions to improve chemotherapy (15.1%), and differences between physicians' chemotherapy records and their chemotherapy prescriptions (13.2%).
Suzuki S, Sakurai H, Kawasumi K, Tahara M, Shinichiro S, Endo K; 2016; <i>Int J Clin Pharm</i> ⁸⁷ Japan	The impact of pharmacist certification on the quality of chemotherapy in Japan	A nationwide survey to evaluate the impact of oncology pharmacist certification on the quality of chemotherapy. Two groups of hospitals were identified, those with two or more improper regimens and those with one improper regimen or fewer. <i>n</i> = 274 cancer-designated hospitals responded (of 388 surveys mailed out) <i>n</i> = 428 general hospitals responded (of 984 surveys mailed out)	<ul style="list-style-type: none"> Improving Quality/Clinical Care 	<ul style="list-style-type: none"> Cancer-designated hospitals were more likely to have more than 400 beds ($p < .001$), perform more than 10 chemotherapy treatments/day ($p < .001$), and have more oncology-certified health care compared to general hospitals. Factors related to less improper dose regimens included location with a cancer-designated hospital ($p < .01$), performance of 10 chemotherapy treatments/day ($p < .05$), presence of more than 500 beds ($p < .01$), and having either a Japanese Society of Pharmacy Healthcare and Sciences-certified senior oncology pharmacist ($p < .01$) or a Japanese Society of Medical Oncology-certified oncologist ($p < .01$).
Tuffaha H, Abdelhadi O, Omar S; 2012; <i>Int J Clin Pharm</i> ⁸⁸ Jordan (collaboration with U.S.)	Clinical pharmacy services in the outpatient pediatric oncology clinics at a comprehensive cancer center	Description of the development and implementation of a clinical pharmacy service in an outpatient pediatric oncology setting. Self-reported interventions were collected and classified. <i>n</i> = 939 interventions	<ul style="list-style-type: none"> Improving Quality/Clinical Care Patient Education 	<ul style="list-style-type: none"> Interventions were classified as safety (53%), education (26%), clarification (12%), and therapeutic (9%). Most common single interventions included patient counseling (26%) and chemotherapy evaluation (24%).
Yeoh TT, Si P, Chew L; 2013; <i>Support Care Cancer</i> ⁸⁹ Singapore	The impact of medication therapy management in older oncology patients	Prospective study of a medication therapy management (MTM) service provided to elderly cancer patients (>65). Pre- and post-service patient satisfaction surveys were conducted. Detected DRPs and pharmacist interventions were recorded and evaluated by a panel of 3 judges for clinical significance. <i>n</i> = 118 patients received MTM. <i>n</i> = 72 patients completed satisfaction surveys.	<ul style="list-style-type: none"> Improved Quality/Clinical Care Improving Medication Safety Intervention Acceptance Satisfaction (Patient) 	<ul style="list-style-type: none"> 361 DRPs were identified, in which 32.4% were drug interactions, 31.6% were adverse effects, and 13.3% were nonadherence. 91% of interventions were accepted by physicians Almost 2/3 were deemed significant (or higher) by the judges There was statistically significant improvement in patients' satisfaction levels after the service was provided ($p < .001$); in which 100% reported that their overall health and well-being improved because of their MTM.

ADE = adverse drug event; ADR = adverse drug reaction; CINV = chemotherapy-induced nausea and vomiting; CPOE = computerized physician order entry; DRP = drug-related problem; GCSF = granulocyte colony-stimulating factor; HSCT = hematopoietic stem cell transplantation; MRP = medication related problem; QOL = quality of life.

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APPENDIX 1. CONTENT OUTLINE DOMAINS, TASKS, AND KNOWLEDGE STATEMENTS FOR BOARD CERTIFICATION IN ONCOLOGY PHARMACY^{4*}

Tasks	Knowledge Needed
Domain I: Pathophysiology and Molecular Biology of Cancer: Identify the pathophysiological and molecular information that is needed to establish an appropriate and individualized treatment plan.	
Apply knowledge of oncology literature to identify the information needed about pertinent pathophysiology and molecular biology in order to optimize patient care.	<ol style="list-style-type: none"> 1. Etiology and pathophysiology and cancer-related complications 2. Cancer-related molecular biology and testing 3. Molecular pathways affected by drug therapy 4. Cancers, including staging, diagnosis, and prognosis
Use genomic (i.e., germline and somatic) and molecular (i.e., prognostic and predictive) test results in order to optimize therapeutic decision making for individual patients	<ol style="list-style-type: none"> 1. Molecular heterogeneity of cancer 2. Somatic and germline aberrations 3. Next-generation sequencing technologies 4. Genomics, transcriptomics, proteomics, pharmacogenomics 5. Prognostic tests and data 6. Predictive tests and data 7. Liquid biopsies (e.g., cell-free DNA, circulating tumor cells) 8. Passenger and driver aberrations
Assess situations that require companion diagnostics in order to enhance the value and effectiveness of therapy.	<ol style="list-style-type: none"> 1. Cancer therapies that require a companion diagnostic test 2. Appropriate use and interpretation of biologic tests with respect to treatment decision making 3. Adverse impact if tests are not used or test results are not used appropriately
Identify potential mechanisms of tumor resistance in order to design or modify pharmacotherapeutic regimens.	<ol style="list-style-type: none"> 1. Mechanisms of tumor resistance 2. Implications of resistance with respect to treatment decision making
Domain II: Therapeutics, Patient Management, and Education. Optimize drug therapy for all patients with cancer through the design, recommendation, implementation, monitoring, and modification of individualized pharmacotherapeutic (treatment and supportive) plans in collaboration with the multidisciplinary healthcare team and through the education of patients, caregivers, healthcare providers, and trainees.	
Establish therapeutic goals related to pharmacotherapeutic plans in order to determine appropriate treatment.	<ol style="list-style-type: none"> 1. Cancer-specific pathology results, molecular biology and testing 2. Patient-specific oncologic history and current diagnosis 3. Factors that influence treatment goals (e.g., comorbidities, performance status, allergies, adherence) 4. Disease-specific, social, educational, cultural, and financial factors that influence treatment decisions and outcomes 5. Expected treatment-dependent efficacy and safety outcomes 6. Palliative and end-of-life care

Tasks	Knowledge Needed
Design or modify evidence-based individualized pharmacotherapeutic plans on the basis of the assessment of pertinent patient information by integrating pathophysiological, pharmacologic, pharmacogenomic, pharmacokinetic, pharmacodynamic, and pharmacoeconomic considerations.	<ol style="list-style-type: none"> 1. Cancer-specific pathology results, molecular biology and testing 2. Patient-specific oncologic history and current diagnosis 3. Factors that influence treatment goals (e.g., comorbidities, performance status, allergies, adherence) 4. Disease-specific, social, educational, cultural, and financial factors that influence treatment decisions and outcomes 5. Expected treatment-dependent efficacy and safety outcomes 6. Current treatment guidelines and literature 7. Pharmacotherapies and other treatment modalities related to cancer treatment and supportive care 8. Complementary and alternative therapies 9. Drug resistance 10. Drug interactions 11. Toxicity grading and assessment 12. Drug administration and routes of delivery
Use prevention and monitoring strategies to address complications and toxicities in order to optimize treatment outcomes.	<ol style="list-style-type: none"> 1. Prevention strategies 2. Monitoring strategies 3. Cancer complications 4. Treatment-related complications 5. Toxicity grading and assessment
Establish survivorship care plans and associated management strategies.	<ol style="list-style-type: none"> 1. Short- and long-term complications 2. Cancer screening and follow-up in survivors 3. Application of current survivorship guidelines and literature 4. Pharmacotherapies related to survivorship 5. Nonpharmacological treatments
Educate patients and caregivers regarding pharmacotherapeutic plans.	<ol style="list-style-type: none"> 1. Pharmacotherapeutic regimens, schedules, and anticipated complications 2. Prevention of cancer-related complications and techniques for managing them 3. Cancer staging, diagnosis, prognosis, and treatments 4. Complementary and alternative medicines 5. Toxicity grading and assessment 6. Drug administration, interactions, and routes of delivery 7. Hazardous drug handling and disposal techniques 8. Social, educational, cultural, and financial factors that may influence treatment decisions 9. Appropriate educational techniques and assessment of comprehension
Provide training and education to trainees and healthcare providers regarding oncologic treatment and supportive care.	<ol style="list-style-type: none"> 1. Effective educational techniques appropriate for learners' needs and learning styles 2. Development of learning objectives and assessment strategies 3. Pharmacotherapeutic regimens, schedules, and anticipated complications 4. Prevention of cancer-related complications and techniques for managing them 5. Cancer staging, diagnosis, prognosis, and treatments 6. Complementary and alternative medicines 7. Toxicity grading and assessment 8. Drug administration, interactions, and routes of delivery 9. Hazardous drug handling, beyond-use dates, and disposal techniques 10. Social, educational, cultural, and financial factors that may influence treatment decisions 11. Appropriate educational techniques and assessment of comprehension

Tasks	Knowledge Needed
Domain III: Clinical Trials and Research. Contribute to the care of patients with cancer through the generation, design, and analysis of studies and through the interpretation, integration, and dissemination of research findings related to oncology.	
Evaluate the literature with regard to study design, methodology, and statistical analysis in order to determine the applicability of results to the oncology population.	<ol style="list-style-type: none"> 1. Methods for and considerations in conducting literature searches 2. Types of observational and interventional studies 3. Study design (e.g., hypothesis generation, limitations) 4. Internal and external validity 5. Relevance of the patient population 6. Calculation and interpretation of biostatistics in medical literature 7. Graphical representations in oncology literature 8. Endpoints of research studies 9. Clinical significance and statistical significance
Apply knowledge of the drug development process as it relates to oncology clinical trials.	<ol style="list-style-type: none"> 1. Phases of, objectives for, and design of oncology clinical trials 2. Study designs that incorporate genomics 3. Approval of investigational new drugs 4. Approval of biosimilars 5. Collaborative trial groups
Perform scholarly activities in order to promote patient-centered care.	<ol style="list-style-type: none"> 1. Identification of gaps in the literature (e.g., unanswered research questions) 2. Design of a hypothesis-driven research study 3. Venues and processes for disseminating new information (e.g., publication, presentations)
Apply knowledge of regulations as they pertain to the conduct of research and clinical trials.	<ol style="list-style-type: none"> 1. Role of the institutional review board (IRB) and regulatory bodies 2. Compliance with policies and procedures of the IRB and regulatory bodies 3. Ethical issues related to the conduct of research and clinical trials 4. Investigational drug management
Domain IV: Practice Management. Establish, implement, and monitor systems, policies, and procedures to ensure the safe, effective, and appropriate use of medications for patients with cancer and the integration of value and access into clinical decision making.	
Establish institutional drug-use guidelines, policies, procedures, and formularies that are consistent with evidence, regulation, and current practice guidelines and standards in collaboration with other stakeholders.	<ol style="list-style-type: none"> 1. Clinical practice guidelines and best practices for cancer treatment and supportive care 2. National accreditation and regulatory organizations and their requirements 3. Professional practice standards and guidelines for safety (e.g., American Society of Clinical Oncology/Oncology Nursing Society Chemotherapy Administration Safety Standards, American Society of Health-System Pharmacists' Guidelines on Handling Hazardous Drugs, U.S. Pharmacopeia <800> Hazardous Drugs—Handling in Healthcare Settings, National Institute for Occupational Safety and Health guidelines)
Maintain systems and technology to ensure the safety and effectiveness of the oncology medication use process.	<ol style="list-style-type: none"> 1. Electronic health information systems 2. Medication use evaluation, root cause analysis, Institute for Safe Medication Practices communications, and other quality improvement strategies 3. Technologies that enhance the safety and quality of the dispensing process 4. Requirements for staff competence with regard to oncology pharmacy practice consistent with professional practice standards 5. Chemotherapy order set development and maintenance
Apply knowledge of the procurement and reimbursement of oncology medications and services in order to optimize health care cost effectiveness.	<ol style="list-style-type: none"> 1. Medication reimbursement models 2. Pharmacy purchasing (e.g., Public Health Service pricing, group purchasing organization contracts) 3. Reimbursement for clinical pharmacy services 4. Specialty pharmacy services

Tasks	Knowledge Needed
Optimize processes in order to ensure the availability of oncology medications for patients.	<ol style="list-style-type: none"> 1. Patient assistance programs 2. Drug shortage management 3. Risk evaluation and mitigation strategy (REMS) programs 4. Compassionate-use processes
Domain V: Public Health. Contribute to public health knowledge by providing information about cancer prevention, screening, and early detection.	
Apply knowledge about cancer prevention, screening, and early detection strategies.	<ol style="list-style-type: none"> 1. Modifiable and nonmodifiable risk factors 2. Prevention strategies 3. Screening guidelines 4. Early detection strategies
Inform the public about reliable sources of information and cancer-support organizations.	<ol style="list-style-type: none"> 1. General resources to be used in informing the public about cancer and its treatment 2. Cancer-support organizations and resources
<p><i>*For up-to-date information, visit https://www.bpsweb.org/bps-specialties/oncology-pharmacy/.</i></p>	

APPENDIX 2. GUIDELINES, STANDARDS, AND BEST PRACTICES FOR HANDLING CHEMOTHERAPY AGENTS

1. Hematology/Oncology Pharmacy Association (HOPA). Available at www.hoparx.org

Resources include professional tools such as guidelines, standards, and position statements. The repository, which is continually being expanded and updated, includes the following:

- *Scope of Hematology/Oncology Pharmacy Practice* (published in 2013)
- *HOPA Investigational Drug Service Best Practice Standards* (published in 2014)
- *Dose Rounding of Biologic and Cytotoxic Anticancer Agents* (published in 2017)
- *Ensuring Healthcare Worker Safety When Handling Hazardous Drugs*, a joint position statement of the American Society of Clinical Oncology (ASCO), Oncology Nursing Society (ONS), and HOPA (published in 2017)

2. American Society of Health-System Pharmacists (ASHP). Available at <https://www.ashp.org>

Resources specific to oncology:

- *Required Competency Areas, Goals, and Objectives for Postgraduate Year Two (PGY2) Oncology Pharmacy Residencies* (prepared jointly with HOPA and published in 2017).

Available at <https://www.ashp.org/-/media/assets/professional-development/residencies/docs/pgy2-newly-approved-oncology-pharmacy-2016.ashx>

- *ASHP Guidelines on Handling Hazardous Drugs* (published in 2018). Available at <https://www.ashp.org/-/media/assets/policy-guidelines/docs/guidelines/handling-hazardous-drugs.ashx>
- *ASHP Guidelines on Preventing Medication Errors with Chemotherapy and Biotherapy* (published in 2014)

3. American Society of Clinical Oncology (ASCO). Available at <https://www.asco.org>

Resources for oncology pharmacy practice:

- ASCO's Quality Oncology Practice Initiative (QOPI)
- ASCO/Oncology Nursing Society Chemotherapy Administration Safety Standards (published in 2016)
- *Ensuring Healthcare Worker Safety When Handling Hazardous Drugs*, a joint position statement of the American Society of Clinical Oncology (ASCO), Oncology Nursing Society (ONS), and HOPA (published in 2017)

4. United States Pharmacopeia (USP). Available at <https://www.usp.org>

Resources include guidelines for preparing parenteral products, including hazardous drugs.

- <797> *Pharmaceutical Compounding—Sterile Preparations*
- <800> *Hazardous Drugs—Handling in Healthcare Settings*

5. International Society of Oncology Pharmacy Practitioners (ISOPP). Available at www.isopp.org

Resources include international standards of practice.

- ISOPP Standards of Practice (published in 2007)

6. Centers for Disease Control (CDC) National Institute for Occupational Safety and Health (NIOSH)

Resources include a list of hazardous drugs and recommendations for handling (updated 2014).

APPENDIX 3. THE ROLE OF THE INPATIENT CLINICAL ONCOLOGY PHARMACIST

INTRODUCTION

The purpose of this document is to provide rationale for need and guidance to individuals or institutions who are interested in employing a clinical pharmacy specialist in the care and management of adult and pediatric oncology patients in the inpatient setting.

As a member of the interprofessional team, the clinical oncology pharmacist serves as an essential resource to the healthcare team, patients, and their caregivers by using his or her extensive specialized knowledge.

EDUCATIONAL BACKGROUND

- Licensed pharmacist
- Doctor of Pharmacy (PharmD) degree from an accredited school of pharmacy or a pharmacy degree with equivalent years of experience.
- PGY1 and PGY2 residency in oncology or equivalent years of practicing in oncology
- Board certification in oncology pharmacy (as Board Certified Oncology Pharmacist [BCOP]) required

CORE COMPETENCIES

- In-depth knowledge of oncology disease states including their pathophysiology and therapeutic management
- Specialized knowledge of anticancer therapy, including extravasation management
- Provision of effective patient education and medication counseling
- Knowledge of storage, safe handling, administration, and disposal of hazardous medications
- Specialized knowledge of symptom management (e.g., pain control, nausea and vomiting, palliative care)

- In-depth knowledge of therapeutic drug monitoring
- Proficiency in discharge planning and transitions of care
- Familiarity with policy and guideline development
- Proficiency in educating interprofessional healthcare team members and trainees
- Knowledge of evidence-based treatment, including standard-of-care treatment as produced and validated by national organizations (e.g., the National Comprehensive Cancer Network, American Society of Clinical Oncology, and Multinational Association for Supportive Care in Cancer)
- Familiarity with the availability, structure, and design of clinical trials
- Knowledge of reimbursement practices, including payment models and patient assistance programs
- Ability to communicate effectively with healthcare professionals, patients, and caregivers
- In-depth knowledge of the functionality of anticancer therapy ordering in the institutional electronic medical record (EMR).

INTERVENTIONS (to serve the following aims)

- Optimize patient outcomes by providing comprehensive medication therapy management and provision of pharmacoeconomic care (ensuring fiscal responsibility to both the patient and the institution).
- Maximize patient and caregiver comprehension of and adherence to medications.

- Provide the interprofessional team with evidence-based clinical decision support.
- Improve patient care through scholarly activities.

ACTIVITIES

Pharmacists' Patient Care Process

Collect

- Collect necessary patient subjective and objective information, including oncology diagnosis and treatment history.

Assess

- Evaluate regimen on the basis of disease and patient characteristics and published literature.
- Review and adjust anticancer therapy orders as appropriate based upon patient-specific information (e.g., organ function, laboratory values).
- Assess drug-complementary or alternative care, drug-disease, drug-drug, and drug-food interactions.
- Conduct review of supportive care medications and laboratory results, drug-drug and drug-food interactions, and pharmacogenetics for dose modifications.

Plan

- Recommend appropriate practice setting (inpatient vs. outpatient) for treatment.
- Provide symptom management and supportive care.
- Perform transition planning, including assisting with transitions of care, medication reconciliation.
- Facilitate access to medications (e.g., work with prior authorization coordinators and financial counselors, coordinate with retail or specialty pharmacies).

Implement

- Participate in interprofessional patient care rounds.
- Coordinate chemotherapy administration with nursing staff.
- Educate patients and caregivers on anticancer therapy; supportive care medications; symptom management; adherence; and safe handling, administration, storage and disposal of medication.

Follow-Up: Monitor and Evaluate

- Provide ongoing monitoring of efficacy, toxicity, changes in organ function, and results of diagnostic tests and provide dose or therapy recommendations for adjustments as needed.
- Provide therapeutic drug monitoring and adjusting therapy.
- Practice antimicrobial stewardship.

Education

- Educate interprofessional healthcare team members and trainees.
- Precept pharmacy students and PGY1 and PGY2 trainees.

Practice Management and Quality Improvement

- Assist with policy, guideline, and drug monograph development.
- Serve as patient and professional advocate.
- Participate on hospital committees (e.g., pharmacy and therapeutics).
- Ensure that practice meets regulatory requirements, certifications, and accreditations.
- Enter medication errors and adverse drug events into the reporting system.
- Remain knowledgeable about current literature regarding advances in standards of care.

Information Technology

- Develop and maintain a standardized treatment plan in the EMR.
- Provide a paper-based backup process for interruptions (planned or otherwise) in the electronic process.

Research (if applicable)

- Contribute to institutional and collaborative research and scholarly activities.
- Participate in institutional review board and feasibility committees to review potential protocols.
- Review the clinical trial treatment plan and ensure that no protocol deviations occur.
- Have knowledge of clinical trials available at the institution.
- Provide recommendations for appropriateness of a clinical trial versus another treatment regimen.

Nutrition Support (if applicable)

- Provide nutrition support for his or her patients.
- Work with the clinical nutrition team to determine eligibility, daily monitoring, and discontinuation of parenteral and enteral nutritional support.

APPENDIX 4. THE ROLE OF THE AMBULATORY CLINICAL ONCOLOGY PHARMACIST

INTRODUCTION

The purpose of this document is to provide guidance to individuals or institutions who are interested in employing a clinical pharmacy specialist in the care and management of adult and pediatric oncology patients in the ambulatory care setting.

As a member of the interprofessional team, the clinical oncology pharmacist serves as an essential resource to the healthcare team, patients, and caregivers by using his or her extensive specialized pharmaceutical knowledge.

EDUCATIONAL BACKGROUND

- Licensed pharmacist
- Doctor of Pharmacy (PharmD) degree from an accredited school of pharmacy or a pharmacy degree with equivalent years of experience
- PGY1 and PGY2 in oncology or equivalent years of professional practice in oncology
- Board certification in oncology pharmacy (as Board Certified Oncology Pharmacist [BCOP]) required

CORE COMPETENCIES

- In-depth knowledge of oncology disease states, including their pathophysiology and therapeutic management
- Specialized knowledge of anticancer agents
- Specialized knowledge of supportive care medications used for patients undergoing treatment and for cancer survivors (e.g. pain control, nausea and vomiting, palliative care, infectious disease management)
- Ability to counsel on parenteral and oral medications and corresponding supportive care treatments for cancer patients
- Knowledge of safe handling, administration, and disposal of hazardous medications

- Knowledge of therapeutic drug monitoring
- Proficiency in discharge planning and transitions of care
- Familiarity with policy and guideline development
- Proficiency in educating interprofessional healthcare team members and trainees
- Knowledge of evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of the National Comprehensive Cancer Network, American Society of Clinical Oncology, and Multinational Association for Supportive Care in Cancer)
- Familiarity with availability, structure, and design of clinical trials
- Knowledge of reimbursement practices, including payment models and patient assistance programs
- In-depth knowledge of the functionality of chemotherapy ordering in the institutional electronic medical record (EMR).

INTERVENTIONS (to serve the following aims)

- Optimize patient outcomes by providing comprehensive medication therapy management, including economical provision of medication-related care.
- Maximize patients' and caregivers' comprehension of medication administration and side effects.
- Provide evidence-based clinical decision support to the interprofessional team.

ACTIVITIES

Patient Management and Monitoring

- Provide thorough patient profile and medication review to identify medication therapy-related problems.
- Optimize cancer therapy management by
 - evaluating appropriateness of regimen on the basis of disease and patient characteristics
 - reviewing and adjusting cancer therapy orders as appropriate based upon patient-specific information
 - reviewing supportive care medications and laboratory results associated with chemotherapy regimen (e.g., hydration, antiemetic medications)
 - providing ongoing monitoring of regimen efficacy, toxicity, and organ function and making recommendations for adjustments as needed
 - conducting adherence assessment
 - performing therapy-related toxicity assessment and prevention and management.
- Assist with medication access by
 - performing therapeutic drug monitoring
 - ensuring appropriate ordering of laboratory tests to monitor
 - evaluating results
 - recommending therapy adjustments.
- Provide symptom management including the following:
 - supportive care (e.g., managing nausea and vomiting, mucositis)
 - pain and palliative care
 - infectious disease prevention and treatment.

- Provide transition planning and management by
 - providing medication reconciliation
 - collaborating on admission and discharge planning and management
 - facilitating transitions to hospice or palliative care where appropriate.

Education

- Provide education on chemotherapy regimen, supportive care medications, symptom management, and safe handling and disposal of medications to patients and caregivers.
- Provide education to interprofessional healthcare team members and trainees.

Practice Management and Quality Improvement

- Assist with policy, guideline, and drug monograph development.
- Serve as patient and professional advocate.
- Participate on institutional committees.

Information Technology

- Review the building of treatment plans in the EMR and make recommendations for changes.

Research (if applicable)

- Contribute to institutional, collaborative research, and scholarly activities (e.g., medication use evaluations, research publications).

- Participate in institutional review board and feasibility committees to review potential protocols.
- Review clinical trial treatment plans and ensure that no protocol violations occur.
- Maintain knowledge of clinical trials available at the institution.
- Provide recommendations for the appropriateness of a clinical trial versus another treatment regimen.

APPENDIX 5. THE ROLE OF THE INFUSION CENTER OR DECENTRALIZED ONCOLOGY PHARMACIST

INTRODUCTION

The purpose of this document is to provide guidance to individuals or institutions who are interested in employing an operational staff pharmacist in the care and management of adult and pediatric oncology patients.

As a member of the interprofessional team, the oncology pharmacist serves as an essential member of the healthcare team that ensures the appropriate dosing and safety of patients during their anticancer treatment.

EDUCATIONAL BACKGROUND

- Licensed pharmacist
- Doctor of Pharmacy (PharmD) degree from an accredited school of pharmacy or a pharmacy degree with equivalent years of experience
- PGY1 (preferred), completion of a competency or training program; PGY2 in oncology or institution-supported training program
- Board certification in oncology pharmacy (as Board Certified Oncology Pharmacist [BCOP]) encouraged

CORE COMPETENCIES

- Basic knowledge of oncology disease states
- Basic knowledge of anticancer therapy, including extravasation management
- Specialized knowledge of compounding and sterile preparation principles, stability, compatibility, and administration
- Knowledge of safe handling, administration, and disposal of hazardous medications
- Knowledge of components required in treatment plan and chemotherapy orders

- Familiarity with evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of the National Comprehensive Cancer Network, American Society of Clinical Oncology, and Multinational Association for Supportive Care in Cancer)
- Knowledge of reimbursement practices, including payment models and patient assistance programs
- Ability to communicate effectively with healthcare professionals, patients, and caregivers
- Basic knowledge of the functionality of chemotherapy ordering in the institutional electronic medical record
- Specialized knowledge of automation systems

INTERVENTIONS (to serve the following aims)

- Ensure safe provision of medications through review of the cancer treatment plan and through verifying and dispensing the anticancer regimen.
- Practice fiscal responsibility to the patient and the pharmacy.
- Coordinate patient care among members of the interprofessional team (e.g., coordinating the timing of medications and providing continuity of care across levels of care [ambulatory, inpatient, etc.]).
- Uphold and maintain regulatory requirements (e.g., those of state boards of pharmacy, the Joint Commission, USP <797> and <800>).

ACTIVITIES

Patient Management

- Ensure that the regimen is evidence based and appropriate on the basis of patient-specific information (e.g., diagnosis, organ function, laboratory values, toxicity assessment, appropriate supportive care, sequencing of treatment plan).
- Ensure that the following are correct: drug, dose, route, rate, treatment cycle, and day of cycle.
- Ensure that the following are correct or have been checked: dose calculation, total volume, expiration date, diluent type and volume, administration fluid type and volume, and tubing, lifetime dose (if applicable), compatibility with other infused drugs, auxiliary label.
- Collect necessary subjective and objective information about the patient, including oncology diagnosis and treatment history.

Education

- Assist with education of interprofessional healthcare team members and trainees.
- Precept pharmacy students.
- Assist in PGY1 and PGY2 trainee education.

Practice Management and Quality Improvement

- Assist with policy, guideline, and drug monograph development.
- Ensure that organizational policies are being followed.
- Uphold and maintain state and federal regulatory requirements, certifications, and accreditations (e.g., those of state boards of pharmacy, the Joint Commission, U.S. Pharmacopeia <797> and <800>).

- Supervise pharmacy technicians.
- Participate on committees as deemed necessary.
- Enforce drug formulary restrictions.
- Assist with maintaining inventory management.
- Assist in ensuring compliance with 340B Drug Pricing Program (if applicable).
- Ensure that record keeping is compliant with institutional, state, and federal policies and regulations.
- Enter medication errors and adverse drug events into reporting system.

Information Technology Support

- Maintain appropriate patient information in the electronic medical record (e.g., adverse drug reactions, alerts, home medications list, allergies).

Research (if applicable)

- Ensure adherence to investigational pharmacy policies and procedures.
- Ensure investigational drug preparation in accordance with the clinical trial protocol.

APPENDIX 6. THE ROLE OF THE SPECIALTY PHARMACY ONCOLOGY PHARMACIST

INTRODUCTION

The purpose of this document is to provide guidance to individuals or institutions who are interested in employing a pharmacist to oversee the medication use process pertaining to adult and pediatric oncology patients in a specialty pharmacy setting.

The specialty pharmacy oncology pharmacist acts to ensure the safe distribution of oral anti-cancer medications.

EDUCATIONAL BACKGROUND

- Licensed pharmacist
- Doctor of Pharmacy (PharmD) degree from an accredited school of pharmacy or a pharmacy degree with equivalent years of experience
- PGY1 residency (preferred) or completion of a competency or training program; PGY2 residency in oncology encouraged
- Board certification in oncology pharmacy (as Board Certified Oncology Pharmacist [BCOP]) encouraged

CORE COMPETENCIES

- Basic knowledge of oncology disease states
- Specialized knowledge of safe handling procedures and processes
- Specialized comprehension of oral anticancer therapy, supportive care, scheduling, and administration
- Specialized comprehension of the oral anticancer therapy distribution and payer system (i.e., patient-specific ordering, risk evaluation and mitigation strategy (REMS), inventory management, contracting, etc.)
- Specialized comprehension of medication assistance programs and payer processes
- Proficiency in triaging financial assistance needs

- Proficiency in providing patient and caregiver education
- Ability to communicate effectively with healthcare professionals, patients, and caregivers
- Proficiency in using prescription-processing software
- Specialized knowledge of the specialty pharmacy clinical documentation system
- Knowledge of pharmacy automation systems
- Specialized knowledge of reporting systems

INTERVENTIONS (to serve the following aims)

- Ensure safe provision of oral anticancer therapy and supportive cancer medications through dispensation and validation of a prescription as it relates to a given anticancer treatment plan.
- Practice fiscal responsibility to the patient and the pharmacy.
- Maximize patients' and caregivers' comprehension of and adherence to medication administration instructions and understanding of the need for self-care.
- Ensure patients' access to oral anticancer therapy.

ACTIVITIES

Patient Management

- Ensure that prescriptions are accurate and validate doses on the basis of patient-specific information.
- Ensure that the following are correct: drug, dose, route, treatment cycle, and day of cycle.
- Conduct drug-drug interaction review.
- Assist with medication access.
- Work with pharmacy technicians to ensure that the prescription label and shipping

address and phone number are accurate and that timely shipment occurs.

- Assess patient adherence.
- Monitor patients throughout therapy to ensure optimal efficacy and minimal toxicity.
- Communicate with the appropriate healthcare provider regarding patient toxicities, issues, and concerns.
- Empower patients to make sound decisions in the home setting (e.g., deciding when to call the provider vs. calling 911).
- Education
- Provide patient and caregiver oral anticancer therapy education (i.e., scheduling and administration, adherence, coordination with meals, and side effects).

Practice Management and Quality Improvement

- Assist with policy, guideline, and counseling guide development and handling of hazardous drugs processes.
- Ensure that record keeping is compliant with accreditation standards (e.g., those of the Utilization Review Accreditation Commission).
- Lead reviews of root cause analyses of medication errors with oral chemotherapies and implement relevant quality improvements.

Information Technology

- Provide a paper-based backup process for interruptions (planned or otherwise) in the electronic process.
- Maintain clinical documentation of patient and provider interactions.

APPENDIX 7. THE ROLE OF THE PRACTICE MANAGEMENT ONCOLOGY PHARMACIST

INTRODUCTION

The purpose of this document is to provide guidance to individuals or institutions who are interested in employing an oncology pharmacist in a practice management role. This role could be filled by an oncology clinical coordinator, lead pharmacist, manager, or director.

This pharmacist oversees pharmacists who specialize in the care of oncology patients, but the practice management pharmacist may also have clinical responsibilities.

EDUCATIONAL BACKGROUND:

- Licensed pharmacist
- Doctor of Pharmacy (PharmD) degree from an accredited school of pharmacy or a pharmacy degree with equivalent years of experience
- PGY1 and PGY2 residency in oncology, PGY1 and PGY2 residency in health system pharmacy administration, or equivalent years of professional practice
- Board certification in oncology pharmacy (as Board Certified Oncology Pharmacist [BCOP]) encouraged
- Master's degree in healthcare administration (MHA), health-system pharmacy administration (MS), or business (MBA) strongly encouraged

CORE COMPETENCIES (including clinical practice competencies if applicable)

- In-depth knowledge of oncology disease states, including their pathophysiology and therapeutic management
- Specialized knowledge of antineoplastics and infectious disease medications

- Discharge planning and transitions of care
- Education of interprofessional healthcare team members and trainees
- Knowledge of evidence-based treatment, including standard-of-care treatment guidelines (e.g., those of the National Comprehensive Cancer Network, American Society of Clinical Oncology, and Multinational Association for Supportive Care)
- Familiarity with the availability, structure, and design of clinical trials
- Knowledge of reimbursement practices, including payment models and patient assistance programs
- Knowledge of safe handling, administration, and disposal of hazardous medications
- In-depth knowledge of and proficiency in policy and guideline development
- Specialized knowledge of the Joint Commission, U.S. Pharmacopeia, and other governing guidance requirements
- Experience with leading committees

ACTIVITIES

- Lead a team of pharmacists, pharmacy technicians, and those in other roles (as applicable) to safely and effectively provide care for cancer patients.
- Interview, hire, and train new staff.
- Oversee compliance with governing bodies, regulatory agencies, and oncology best practices.
- Manage staffing resources and productivity.
- Work with providers and stakeholders to develop new business strategies and oncology patient services.

- Design, implement, and update workplace policies and procedures.
- Oversee staff meetings.
- Oversee annual performance evaluations and oncology competencies for staff.
- Manage department budgets, including projecting the impact of oncology medications in the pipeline.
- Design and oversee processes to ensure maximum medication reimbursement capture rates.
- Oversee electronic medical record technology used by oncology pharmacists.
- Address patient complaints in a compassionate and timely fashion.

INTERVENTIONS (to serve the following aims)

- Optimize patient outcomes by overseeing the management of drug therapy for cancer patients, including economical provision of medication-related care.
- Support oncology pharmacists.
- Demonstrate fiscal responsibility regarding the drug and pharmacy department budgets.
- Maximize the quality of the staff, patient, and caregiver experience.
- Provide the interprofessional team with evidence-based decision support.