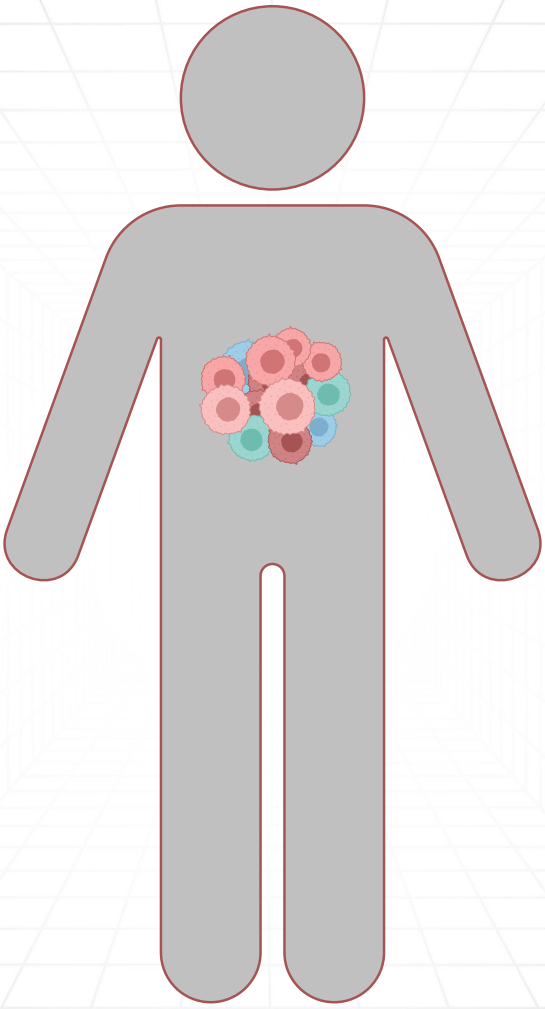
HOPA NEWS

Pharmacists Optimizing Cancer Care

VOLUME 22 | ISSUE 3



Adoptive Cellular Therapy for Solid Tumors

page 3

HOPA
Hematology/Oncology
Pharmacy Association

23 Less is More: Chemotherapy Free and "Chemotherapy-lite" Approaches for Acute Lymphoblastic Leukemia

32 Dosing the Mind: Psychedelic Assisted Psychotherapy and the Oncology Pharmacist

VOLUME 22 | ISSUE 3

Send administrative correspondence or letters to the editor to HOPA, 555 East Wells Street, Suite 1100, Milwaukee, WI 53202, or e-mail info@hoparx.org.

HOPA News is published by the Hematology/Oncology Pharmacy Association.

HOPA-0825-149

HOPA
Hematology/Oncology Pharmacy Association

Pharmacists Optimizing Cancer Care®

CONTENTS

3 **Feature**
Adoptive Cellular Therapy for Solid Tumors

8 **Reflection on Personal Impact and Growth**
A Journey of a Thousand Miles Begins with a Single Step Navigating the Path to a Leadership Position

10 **Practice Management**
Navigating the Complexity of 505(b)(2) Drugs in Health System Practice: Operational, Clinical, and Regulatory Considerations

13 **Quality Initiatives**
Recipients of the Certificate of Recognition for Exemplary Research on Quality of Care in Oncology

15 **Executive Director Update**
Building Momentum and Driving Change: Council Accomplishments from 2024–2025

16 **Clinical Pearls**
Intravenous Immunoglobulin (IVIG) Use in Patients Receiving Bispecific Antibodies for B-cell Malignancies

20 **The Resident's Cubicle**
Yeah, Well, You Know, That's Just, Like, Your Hypothesis, Man: Developing, Executing, and Publishing Peer Reviewed Literature After Residency

23 **Feature**
Less is More: Chemotherapy Free and "Chemotherapy-lite" Approaches for Acute Lymphoblastic Leukemia

27 **Focus on Patient Care**
Out-of-Pocket But Not Out of Mind: Approaching Patient Conversations Regarding Treatment Costs

30 **Highlights of Members' Research**
Outcomes of Patients with Newly Diagnosed AML and Hyperleukocytosis

32 **Clinical Controversies**
Dosing the Mind: Psychedelic Assisted Psychotherapy and the Oncology Pharmacist

35 **Board Update**
Unyielding Commitment to Oncology Pharmacists and Patients

FEATURE

Adoptive Cellular Therapy for Solid Tumors

C. Brooke Adams, PharmD, BCOP
Clinical Pharmacy Specialist: Malignant hematology, Stem Cell Transplant, and Cellular Therapy
PGY2 Oncology Pharmacy Residency Program Coordinator
Orlando Health Cancer Institute

Adoptive Cellular Therapies and Challenges in their Development for Solid Tumors

Adoptive cellular therapy (ACT) research dates to the early 1980s when it was discovered that interleukin-2 (IL-2) could stimulate peripheral blood mononuclear cells and differentiate into a non-specific killer cell that he named LAK, or lymphocyte-activated killer cell therapy. This resulted in FDA approval of IL-2 and LAK cell therapy in 1984 for several solid tumor malignancies including renal cell, melanoma, and lung cancer. Two years later, a group discovered a class of T-cells in tumor-infiltrating tissues, named tumor infiltrating lymphocytes (TILs) and in 1988, TIL therapy was used to treat the first melanoma patients. In the early 1990s, investigators developed the use of a cytokine-induced killer (CIK) cell therapy that was later FDA approved in 2018. In 2006, ACT research took a significant step forward, as researchers began using genetically modified T-cell receptor (TCR) T-cells to treat melanoma, proving for the first time the feasibility of a genetically modified TCR in tumor therapy.[1]

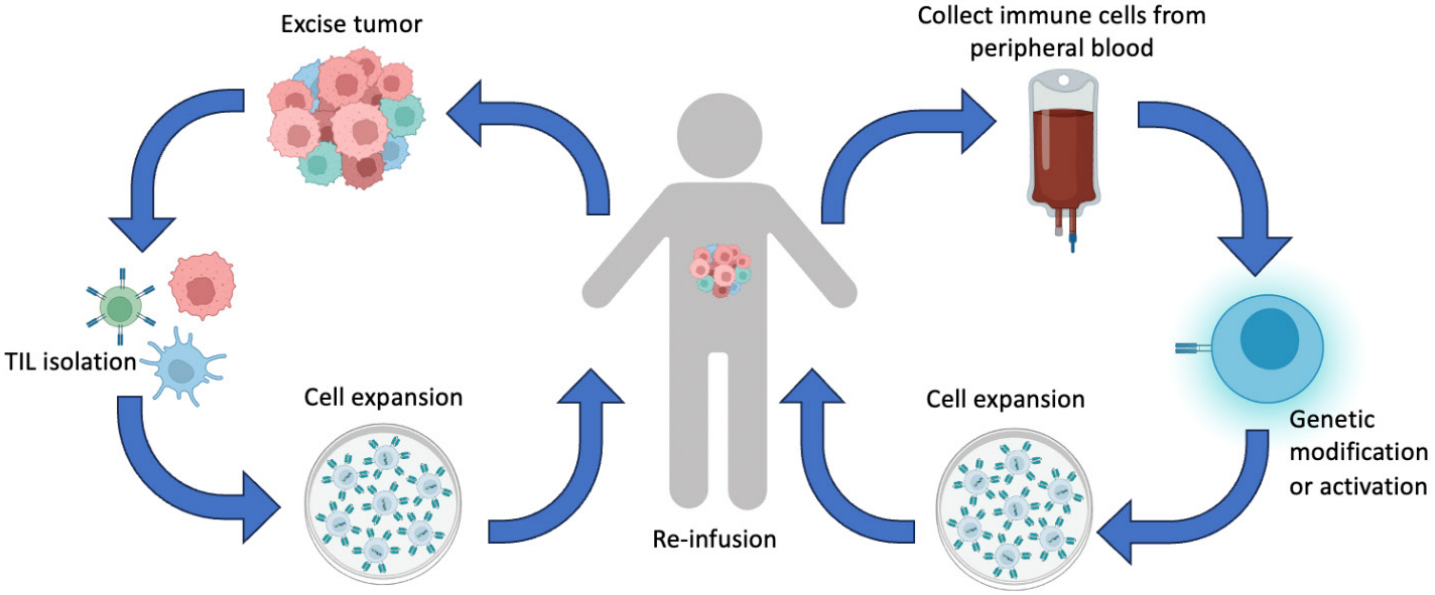
> **"After many decades of research, ACTs are finally making their way into the solid tumor treatment paradigm."**

The ACT process can be simplified into 3 key steps shown in figure 1: (1) collection of immunoreactive cells from peripheral blood mononuclear cells (PBMC) or tumor tissues of patients; (2) in vitro cell amplification and in some cases genetic engineering or cell activation, and (3) cell transfusion back into patient to directly eliminate tumor cells or stimulate the immune response and tumor cell death. While the process may sound simple, there have been numerous challenges in the development of ACT for solid tumors. One of the barriers specifically for TCRs and CAR T-cells is target antigen heterogeneity.[1,2]

The successes of ACT trials in hematologic malignancies were largely dependent on three factors. First, there was a clear identifiable antigen. Second, this antigen was homogeneously expressed in the disease of interest. Third, toxicities associated with T-cell activity on other parts of the body (so-called on-target/off-tumor effects) were manageable and expression on tumor was much higher than healthy cells, allowing for a therapeutic window. In contrast, solid tumor malignancies tend to have more heterogeneity in their antigen profiles, particularly because the formation of these cancers is not always dependent on clonal expansion of an aberrantly expressed antigen, as in lymphomas or leukemias. While many of these antigens may be overexpressed in some tumor tissue, consistent expression is lacking due to intratumoral heterogeneity, which generally results from genomic instability. Intratumoral heterogeneity is of greatest concern in diffusely metastatic disease.[2]

Another key challenge includes T-cell trafficking and infiltration and the tumor microenvironment (TME). For effector

Figure 1: ACT Process Overview[1]



Steps of adoptive cellular therapy include (i) collection of immunoreactive cells from peripheral blood mononuclear cells or tumor tissues of patients; (ii) in vitro cell amplification; and (iii) cell infusion back into patient to directly eliminate tumor cells or stimulate the immune response to cause tumor cell death. In some cases, ACT also requires genetic engineering or cell activation.

T-cell-mediated cell death to occur, a T-cell must be able to effectively traffic to a tumor and subsequently overcome any suppressive cytokines that would prevent it from fulfilling its goal. It is well known that many metastatic lesions lack lymphocytes, thus providing evidence that effector T-cells are not adequately localizing their targets. The TME is a complex and dynamic system that has a crucial impact on cancer progression and immune response to ACT. The harsh TME makes it difficult for immune cells to penetrate and survive. This is an ongoing area of research, as we know TME plays a key role in a malignancy's response or lack of response to various immunotherapies.[3]

FDA Approval of the first TIL: Lifileucel

On February 16, 2024, the FDA granted accelerated approval to lifileucel for the treatment of adult patients with unresectable or metastatic melanoma previously treated with a PD-1 blocking antibody and, if BRAF V600 positive, a BRAF inhibitor with or without a MEK inhibitor. This accelerated approval was based on the results of the phase 2, open-label, multicohort, non-randomized C-144-01 trial (NCT02360579). Patients needed to have disease that could be measured and resected to manufacture lifileucel. Patients with active CNS disease, a life expectancy of less than 3 months, and comorbidities that would exclude them from receiving high dose lymphodepletion and IL-2 were excluded.

This study had patients on four cohorts in order to optimize manufacturing and logistical aspects of lifileucel therapy. Cohorts 1 and 3, included patients that were treated with a first generation non-cryopreserved TIL (different from the process than for lifileucel), and cohorts 2 and 4 used a cryopreserved lifileucel product. Cohorts 2 and 4 are the two main efficacy cohorts that included a total of 153 patients enrolled from April 2017 through December 2019 treated with lifileucel. The primary endpoint was overall response rate (ORR) and key secondary endpoints included duration of response (DOR), progression free survival (PFS), overall survival (OS), and safety.

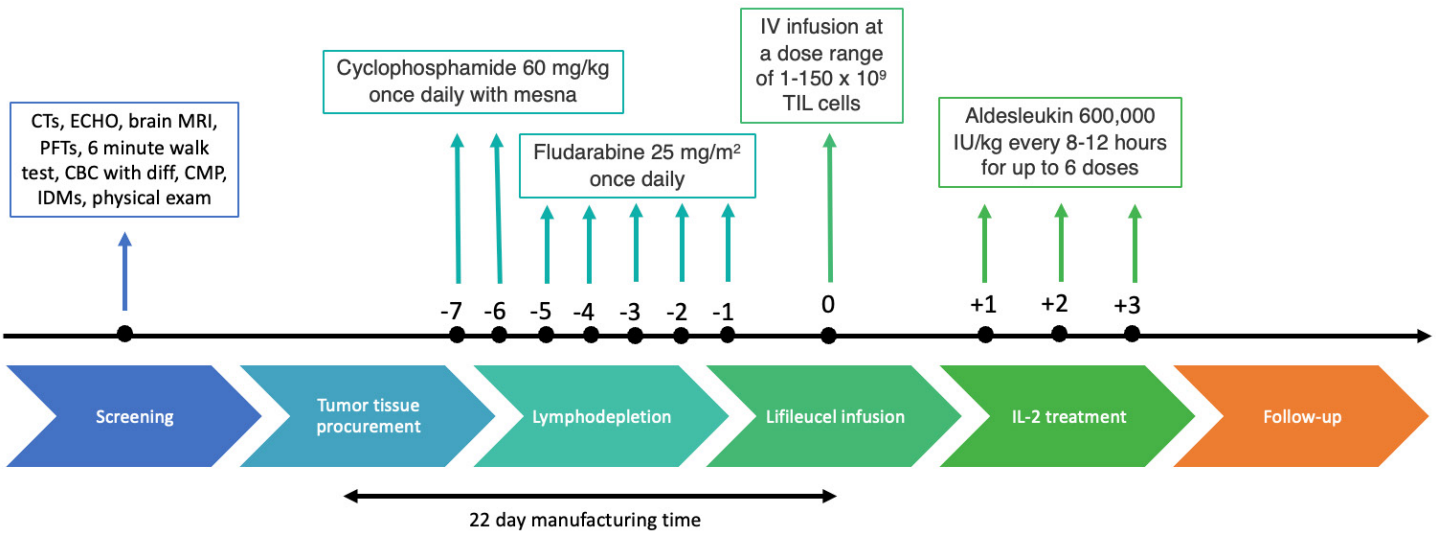
The treatment timeline for cohort 2 and 4 is referenced in figure 2. Patients underwent extensive prescreening to ensure they could tolerate high-dose lymphodepletion and high dose IL-2. If they met criteria, they then underwent tissue procurement which consisted of a resection of a tumor(s) ≥1.5cm to ≤4.0cm in aggregate diameter. Lifileucel was manufactured within specification in 94.7% of patients across cohorts 2 and 4 within 22 days. After the product was manufactured, patients underwent high dose lymphodepletion to prepare the TME.[4] Of note, the doses of cyclophosphamide and fludarabine are much higher than what is seen for lymphodepletion with other cellular therapies, like CAR-T cell therapy. There are ongoing trials (NCT06151847) evaluating lower doses of lymphodepletion and IL-2 in order to expand patient eligibility for this therapy.[5] At least 24 hours after the last dose of fludarabine, lifileucel was then thawed and infused with pre-medications, including acetaminophen and diphenhydramine 30-60 minutes prior to the infusion, followed by high-dose IL-2 beginning 3-24 hours after the last bag of lifileucel for up to a total of 6 doses.

Systemic corticosteroids should be avoided as both an antiemetic and pre-medication prior to the cryopreserved infusion, given their ability to interfere with the tumor microenvironment and induce T-cell apoptosis, therefore theoretically impeding the mechanism of action of lifileucel.[4]

It is important to note that IL-2 solely functions as a supportive treatment to enhance T-cell activity and development after the TIL infusion, and not for therapeutic efficacy. In patients deemed ineligible for IL-2 because of age, organ function, or other comorbidities (NCT01468818), the ORR was 29.4% (5/17), suggesting that TIL therapy may be effective in the absence of IL-2.[6] Also, no clear correlation has been observed between the total number of IL-2 doses administered and the efficacy of lifileucel, making the key point that once a patient begins to experience toxicity it is imperative to delay or discontinue IL-2 therapy.[6-7]

The primary endpoint of ORR for the pooled efficacy cohorts was 31.4%. The majority of responses, 26.1%, were partial

Figure 2: Cohort 2 and 4 Treatment Timeline[4]



responses, with only 5.2% being complete responses. Most patients had stable disease (SD), 46.4%, with 17.6% having progressive disease. In the pooled cohort, the median DOR was not reached (95% CI: 8.3 months to not reached) at a median study follow-up of 27.6 months.[4] Patterns of the 48 patients that did achieve a response can be found in table 1. The 16 patients that deepened their response over time, defined as initially having SD followed by a PR then CR, truly saw the greatest long-term benefit of lifileucel with an OS rate at 4 years of 68.2%.[8]

Treatment-emergent adverse events (TEAEs) shown in table 2 were consistent with the underlying disease and known adverse event profiles of lymphodepletion and high-dose IL-2. All patients experienced at least 1 TEAE. Six deaths did occur within the first 30 days, four of which were attributed to AEs and two from progressive disease. The four TEAE-related deaths were all attributed to either the lymphodepletion or the high dose IL-2. The median number of IL-2 doses patients were able to tolerate was 6 (1-2 doses: n=16; 3-4 doses: n=26; 5-6 doses: n=109; 2 did not receive IL-2). The incidence of TEAEs decreased rapidly within the first 2 weeks after the lymphodepletion, lifileucel infusion, and high dose IL-2.[4]

As required by the FDA, with all accelerated approvals, a confirmatory trial is ongoing. In addition, the IOV-COM-202 study is evaluating the efficacy and safety of lifileucel plus pembrolizumab in patients with immune checkpoint inhibitor-I unresectable or metastatic melanoma. Initial results shown an ORR of 85.7% (CR rate, 42.9%), supporting the potential for improved response rates, including CR rates, with earlier TIL cell therapy.[9] An ongoing phase 3 trial, TILVANCE 301 (NCT05727904), is evaluating lifileucel in combination with pembrolizumab versus pembrolizumab alone for frontline advanced, unresectable, or metastatic melanoma with an estimated completion date of March, 2030. Lifileucel is also being evaluated for metastatic non-small cell lung cancer (mNSCLC) without an actionable driver mutation in a phase 2, open-label, multi-cohort, non-randomized, multicenter study, IOV-LUN-202 (NCT04614103) for those who have progressed on or following a single line of approved systemic therapy consisting of combined immune checkpoint inhibitors (ICI) + chemotherapy ± bevacizumab with estimated completion by the end of this year.[12]

FDA Approval of the first Genetically Engineered TCR: Afamitresgene autoleucel

On August 2, 2024, the FDA granted accelerated approval to afamitresgene autoleucel (TECELRA, Adaptimmune, LLC), a melanoma-associated antigen A4 (MAGE-A4)-directed genetically modified autologous T-cell immunotherapy, for adults with unresectable or metastatic synovial sarcoma (SS) who have received prior chemotherapy, are HLA-A*02:01P, -A*02:02P, -A*02:03P, or -A*02:06P positive and whose tumor expresses the MAGE-A4 antigen.[10] MAGE-A4 is an intracellular cancer-testis antigen (CTA) expressed in several solid tumor cell types including SS. It has low expression in normal tissues except the placenta and testis, making it an attractive therapeutic target. MAGE-A4 participates in the regulation of cell growth, the cell cycle, and apoptosis through the expression of p53-related genes, and maintains the replication function of DNA, therefore playing a crucial role in the development and progression of various malignancies. Additionally, MAGE-A4 can be processed intracellularly into antigenic peptides, forming complexes with HLA molecules making it an enticing target for TCR therapies.[11]

The accelerated approval of afamitresgene autoluecel (afami-cel) was based on the results of the phase 2, open-label, international, multi-center, SPHEARHEAD-1 trial that evaluated patients aged 16-75 years with select sites down to 10 years of age with metastatic or unresectable SS or myxoid round cell liposarcoma (cohort 1 only) expressing MAGE-A4. Patients also were required to have good performance status defined as an ECOG of 0 or 1, adequate

Table 1: Patterns of response[8]

	Early Responders[a] n=39	Late Responders[b] n=9	Responders with Deepened Response[c] n=16	Responders without Deepened Response n=32	All Responders n=48
OS rate at 4 years, % (95% CI)	48.3 (31.9, 62.9)	41.7 (10.9, 70.8)	68.2 (39.5, 85.4)	37.2 (21, 53.5)	47.3 (32.5, 60.7)
Median DOR, mo (95% CI)	NR (6.1, NR)	19.8 (4.1, NR)	NR (8.3, NR)	26.2 (4.1, NR)	NR (8.3, NR)

[a]Patients with CR or PR on day 42 visit. [b]Patients with CR or PR after day 42 visit. [c]Patients who had SD and improved to PR then improved to CR.

DOR=duration of response; NR=not reached; OS=overall survival

Table 2: Treatment-emergent adverse events[4]

Treatment-emergent adverse events (TEAEs), n=156	Any grade n (%)	Grade 3/4 n (%)
Thrombocytopenia	129 (82.7)	120 (76.9)
Chills	117 (75)	8 (5.1)
Anemia	97 (62.2)	78 (50)
Neutropenia	66 (42.3)	45 (28.8)
Febrile neutropenia	65 (41.7)	65 (41.7)
Leukopenia	54 (34.6)	42 (26.9)
Hypotension	52 (33.3)	17 (10.9)
Fatigue	51 (32.7)	6 (3.8)
Lymphopenia	49 (31.4)	38 (24.4)
Diarrhea	48 (30.8)	2 (1.3)

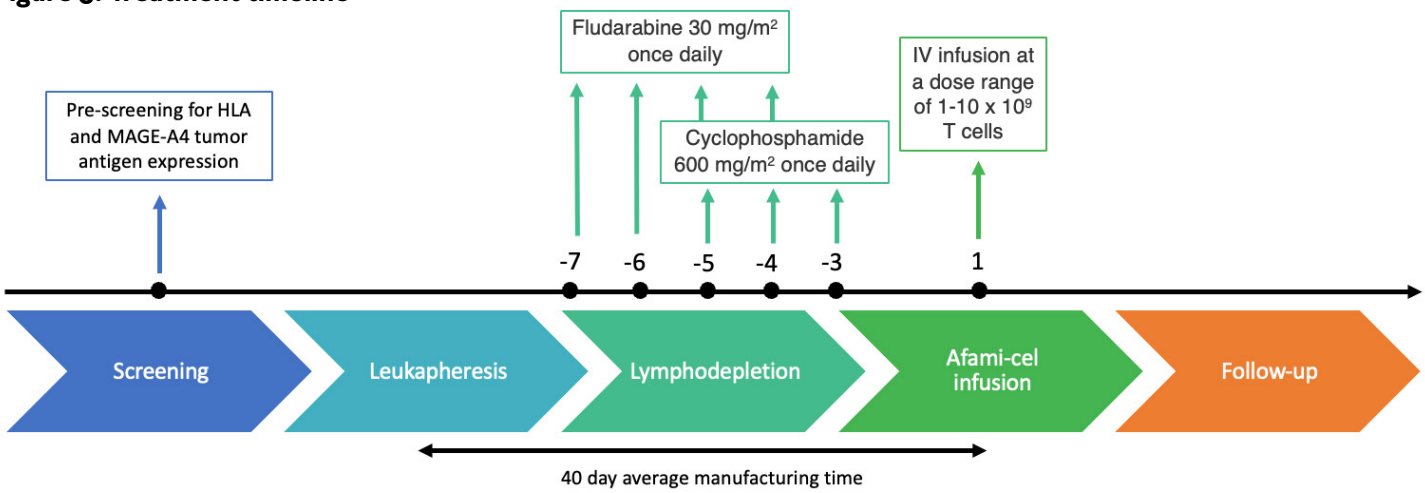
organ function, HLA-A*02:01P, -A*02:02P, -A*02:03P, or -A*02:06P, and failed at least 1 prior line of therapy that included an anthracycline or ifosfamide. The primary end point was overall response rate (PR or better) evaluated in the main investigational cohort with key secondary endpoints including PFS, OS, and safety.[10] With all accelerated approvals, a required confirmatory trial is underway to ensure these results are reproducible.

Afami-cel was given on day 1 after the completion of lymphodepletion with fludarabine and cyclophosphamide as seen in figure 3. It's key to note there is no "day 0" as many cellular therapy programs are accustomed to, with cellular infusion occurring on day 1. The recommended dose of afami-cel is between 2.68 x 10^9 to 10 x 10^9 MAGE-A4 TCR positive T-cells administered as a single IV infusion. Pre-medications with acetaminophen and an H1-antagonist are recommended 30-60 minutes prior to the infusion. As with lifileucel, systemic corticosteroids should be avoided.[10]

A total of 373 patients were pre-screened for HLA eligibility and MAGE-A4 expression with 268 not meeting criteria. A total of 52 patients were treated with afami-cel, 44 of which had SS and the other 8 patients having myxoid round cell liposarcoma. Patients included were heavily pre-treated with the median number of prior lines being three (IQR 2-4). The ORR for those with SS was 39%, with all responses being partial responses. Most patients (52%) had SD, with only 9% having progressive disease. The median time to first response was 4.9 weeks (95% CI 4.3 – 8.1 weeks) with the median DOR being 11.6 months (95% CI 4.4 – 18 months). The median PFS was 3.8 months (95% CI 2.6 – 6.4 months) with median overall survival not yet reached at a follow-up of 27.8 months (95% CI 15.4 – not reached).[10]

The most common grade ≥3 AEs in patients who received afami-cel were cytopenias. Grade ≥3 leukopenia was seen in 81% of patients; 96% experienced lymphopenia, and 85% experienced neutropenia. Anemia was seen in 31% of patients, and thrombocytopenia in 19%. These cytopenias have the potential to be prolonged; 19% of patients continued to have grade ≥3 cytopenia four weeks after afami-cel treatment. However, only one patient

Figure 3: Treatment timeline[10]



was still experiencing this by week 12. Despite the high incidence of cytopenias, infection rates were low overall; rates of grade ≥3 infections of any type did not exceed 4%.[10]

Cytokine release syndrome (CRS) was common, with 71% of patients developing CRS of any grade. This was primarily low grades of 1 and 2 (52% and 20%, respectively). One patient developed grade 3 CRS. The median time of onset of CRS was 2 days (IQR, 2-3), with a median duration of 3 days (IQR, 2-5). Thirty-seven percent of patients received tocilizumab with two also needing systemic corticosteroids. All cases of CRS resolved. Immune effector cell-associated neurotoxicity (ICANS) was rare, with one patient experiencing grade 1 ICANS concomitantly with CRS. This resolved after 1 day.[10]

While afami-cel is a novel TCR therapy offering a new approach for treating this aggressive cancer, unfortunately only a small subset of patients will qualify given the HLA typing and MAGE-A4 expression restrictions. This is also a very specialized therapy that only authorized treatment centers can administer. Currently there are only 27 treatment centers across the entire United States, making access to care difficult for patients who do qualify. Thirty-three states do not have a single center that is able to administer afami-cel. The time from leukapheresis until afami-cel is manufactured, completed sterility testing, preserved, and returned to the institute for the patient to receive must be taken into consideration when proceeding with treatment. There is a risk of disease progression and/or changes in clinical status that could result in the patient no longer being fit enough to receive afami-cel during the manufacturing process. In SPEARHEAD-1, the median time from leukapheresis until afami-cel was manufactured was 40 days (IQR 35-50).[10]

Conclusion

After many decades of research, ACTs are finally making their way into the solid tumor treatment paradigm. Challenges in ACT development have been largely due to target antigen heterogeneity and the immunosuppressive TME. One TIL, a genetically engineered TCR therapy, and two immune cell engagers are currently FDA approved in the solid tumor space with many more in the pipeline. This is only the beginning. ●●

REFERENCES:

1. Xu MY, Zeng N, Liu CQ, et al. Enhanced cellular therapy: revolutionizing adoptive cellular therapy. Exp Hematol Oncol. 2024 Apr 25;13(1):47. doi: 10.1186/s40164-024-00506-6.
2. Kirtane K, Elmariah H, Chung CH, et al. Adoptive cellular therapy in solid tumor malignancies: review of the literature and challenges ahead. J Immunother Cancer. 2021 Jul;9(7):e002723. doi: 10.1136/jitc-2021-002723.
3. Du S, Yan J, Xue Y, Zhong Y, Dong Y. Adoptive cell therapy for cancer treatment. Exploration (Beijing). 2023 Jul 2;3(4):20210058. doi: 10.1002/EXP.20210058.
4. Chesney J, Lewis KD, Kluger H, et al. Efficacy and safety of lifileucel, a one-time autologous tumor-infiltrating lymphocyte (TIL) cell therapy, in patients with advanced melanoma after progression on immune checkpoint inhibitors and targeted therapies: pooled analysis of consecutive cohorts of the C-144-01 study Journal for ImmunoTherapy of Cancer 2022;10:e005755. doi: 10.1136/jitc-2022-005755
5. Muhammad Umair Mushtaq et al. Reduced dose fludarabine/cyclophosphamide lymphodepletion for tumor-infiltrating lymphocytes therapy (LN-144, lifileucel) in metastatic melanoma. JCO 42, TPS9608-TPS9608(2024). DOI:10.1200/JCO.2024.42.16_suppl.TPS9608
6. Betof Warner A, Hamid O, Komanduri K, et al. Expert consensus guidelines on management and best practices for tumor-infiltrating lymphocyte cell therapy. J Immunother Cancer. 2024 Feb 29;12(2):e008735. doi: 10.1136/jitc-2023-008735.
7. Hassel JC, Sarnaik A, Chesney J, et al. Number of IL-2 doses and clinical outcomes of tumor-infiltrating lymphocyte (TIL) cell therapy: post hoc analysis of the C-144-01 trial of lifileucel in patients with advanced melanoma. Immuno-Oncology and Technology 2022;16:100140. 10.1016/j.iotech.2022.100140
8. Wermke M, Chesney J, Whitman E, et al. Long-term efficacy and pa erns of response of lifileucel tumor-infiltrating lymphocyte (TIL) cell therapy in patients with advanced melanoma: a 4-year analysis of the C-144-01 study. Ann Oncol. 2023;20(suppl 1):100589. doi: 10.1016/iotech/iotech100589
9. Thomas SS, In KG, Doger B, et all. Safety and efficacy of lifileucel (LN-144), an autologous, tumor infiltrating lymphocyte cell therapy in combination with pembrolizumab for immune checkpoint inhibitor naïve patients with advanced melanoma. J Clin Oncol. 2021;39(suppl 15):9537. doi:10.1200/JCO.2021.39.15_suppl.9537
10. D'Angelo SP, Araujo DM, Abdul Razak AR, et al. Afamitresgene autoleucel for advanced synovial sarcoma and myxoid round cell liposarcoma (SPEARHEAD-1): an international, open-label, phase 2 trial. Lancet. 2024 Apr 13;403(10435):1460-1471. doi: 10.1016/S0140-6736(24)00319-2.
11. Zhu, W., Yi, Q., Chen, Z. et al. Exploring the role and mechanisms of MAGEA4 in tumorigenesis, regulation, and immunotherapy. Mol Med 31, 43 (2025). https://doi.org/10.1186/s10020-025-01079-8
12. Iovance Biotherapeutics Study Team,Iovance Biotherapeutics. Autologous LN-145 in Patients With Metastatic Non-Small-Cell Lung Cancer. ClinicalTrials.gov identifier: NCT04614103. Updated April 9, 2025. Accessed June 1, 2025. https://clinicaltrials.gov/study/NCT04614103

A Journey of a Thousand Miles Begins with a Single Step Navigating the Path to a Leadership Position

Hematology Oncology Pharmacist Association News

Mary Walters, PharmD, BCOP
Director Pharmacy Precision Medicine – Illinois and Wisconsin Divisions
Advocate Health

Peter Stuessy, PharmD, BCOP
Clinical Pharmacy Manager – Oncology, Illinois and Wisconsin Divisions
Advocate Health

A formal leadership position was not on the vision board for either of us. We were both enjoying our comfortable daily clinical work, not dreaming about what other opportunities may manifest. Comfortable on the path we were on, we just kept our heads down, putting one foot in front of the other. The problem with keeping your head down and sticking to the path you know is that you may walk straight past the wounded bird in the underbrush, the rare flower blooming off-trail, or the strange animal tracks that hint at a deeper story. In medicine, this means missing the chance to treat the overlooked, to study the unexpected, or to question the well-trodden routes of policy and practice. The forest may seem safer when you don't stray, but growth lives in the tangled edges – where curiosity leads, and change begins.

"The forest may seem safer when you don't stray, but growth lives in the tangled edges – where curiosity leads, and change begins."

Mary:
I have always had a keen passion for the "why" everything. Why is the sky blue? Why do you do it like that? Why do some people get sick, and others don't? Early in my career, this was what drew me to biochemistry and research. Despite the detailed focus and ability to answer some of the "whys", I was dissatisfied with the broader impact of the work I was doing as a medicinal chemistry intern and lack of connection to individual patients with "benchtop" scientific research. Once some of "whys" were answered, I found myself stuck on "so what?" Then I found Precision Oncology as a PGY2 pharmacy resident-- a field where the molecular biology of cancer (the "why") informs tailored treatment approaches that improve outcomes for patients. I finally found my "so what" and have been a clinical pharmacist in Precision Oncology for the past four years.

Peter:
My experience was quite different. Initially, I had no interest in oncology, favoring cardiology, infectious disease, and critical care. I covered these specialties for six years before discovering the appeal of oncology through discussions with oncology pharmacy leaders within my organization. When our organization began adding pharmacists to cancer infusion clinics, I took the leap to become an outpatient general infusion clinic pharmacist. After building several years of experience, I moved into a coordinator role within the oncology service line managing projects, providing clinical support, and creating standards and treatment protocols.

Embracing the Unforeseen Call to Lead - Why Not Me?

Mary:
When I first started in the Precision Oncology program, I was the only pharmacist on the service, a service piecemealed from a variety of departments under the oncology service line without clear ownership. As our organization expanded and the demand for clinical support from Precision Oncology and associated Molecular Tumor Board services grew, our team did not. I advocated for a change after recognizing the stress this was putting on my teammates and the potential to adversely affect the quality of the patient. The Director of Pharmacy Precision Medicine role was created early 2025 to address the increasing demands for precision oncology services, practice standardization, and coordinated workflows. At first, I was reluctant to apply for this new position-- one which would depart from the direct patient care activities I enjoyed most in favor of more administrative and strategic activities. However, with the support of former preceptors, colleagues, and my supervisor, I realized this was the best avenue to ensure continued growth and success of the program. With my experience and passion for the program, I asked myself "why not me" for this role. A short time later, I was fortunate to have been selected. I now oversee the activities of the Precision Oncology and more broad Precision Medicine Pharmacy services for the Mi clinical pharmacists.

Reflection on Personal Impact and Growth

Peter:
I was content with my role as a clinical coordinator for many years. Like Mary's story, the organization's oncology pharmacy services began to expand, and an operations manager position for the cancer clinics became available. In my coordinator role, I took on several leadership opportunities and enjoyed that work. While talking to my direct leader about this new manager position, he encouraged me to apply. I applied for that role but was, unfortunately, not selected. Though I was not chosen for this job, I continued to volunteer for leadership opportunities, hoping another chance would come. Years later, a new clinical manager position was created. This role would be the leader of my coordinator team at the time--which I already knew well--and oversee clinical pharmacy practice for oncology patients in the Midwest area of our healthcare system. Encouraged by my colleagues and leader, I applied for this position and was chosen.

Practice Makes Perfect

Experience in clinical practice with direct patient care was critical in preparing both of us for our current roles. Building strong relationships with patients, healthcare providers, and colleagues was fundamental to delivering high-quality care. The same skill sets (i.e., active listening, emotional intelligence, conflict resolution, effective follow up, personal integrity, cultural competency, mentorship and coaching) developed in the clinics are the same as those required in leadership. The difference now is that our network and diversity of relationships has expanded. With this expanded scale and scope, strong relationships are even more crucial--relying on trust, collaboration, and mutual respect--to drive strategic initiatives forward.

Mary:
Additionally, my direct patient care experience gives me the ability to shift lenses and refocus perspectives based on the task. Strategic planning in management involves a global perspective to anticipate long-term objectives, broad impact, resource allocation, and future challenges. My clinical practice experience helps me appreciate and anticipate the individual needs, perceptions, and impact of initiatives on front-line team members.

Peter:
I would like to also highlight the importance of understanding clinical practice challenges and how decisions impact patient care. In my time in the infusion clinics and as a clinical coordinator, I saw how initiatives both positively and negatively impacted patient care and identified patterns consistent with success. This experience locked my focus on patient care as the anchoring principle to my decision-making as a leader.

Bigger Really is Better

Both of us have discussed how the platform of our new leadership roles has expanded the impact of initiatives and the ability to help team members within the organization.

Mary:
I particularly value building and growing Precision Oncology expertise and seeing the positive impact it has on getting the right patient, the right drug, at the right dose, at the right time.

Peter:
Leadership has given me an expanded appreciation of the new relationships I am building with team members and leaders within and outside of the organization.

Leadership has equipped us with more resources to tackle increasingly complex problems that previously frustrated us and felt out of reach in our clinical roles. These new positions challenge our prior beliefs and promote the development of new skillsets as we continue to explore the interdependence of departments and workflows within the organization.

Advice for Those Seeking Career Changes

For both of us, leadership was not part of the plan but rather an identified need, an opportunity to make an improvement or a bigger impact. To do this, we had to listen. Listening to the needs of patients, care teams, departments, and organizations helped identify how our experience and skillsets could bridge the gaps. Listening helps us gather all the necessary information critical for careful decision-making. Embrace every fork in the road as an opportunity to learn and develop new skills and perspectives. Having the courage to say yes to a less beaten path, try and fail, and challenge oneself is crucial for growth.

Conclusion

Sometimes the journey to leadership does not have to be on the roadmap, but rather finds an individual, beckoning them to rise above their reservations and take charge in service to others. Our journeys from clinical pharmacy to leadership roles within the oncology service line for our organization highlights the importance of listening, curiosity, service, and the support of professional networks. We want to underscore the value of clinical practice in preparing both of us for our strategic and managerial roles; clinical practice built the foundations for strong professional relationships and the continuous pursuit of learning and development. For anyone considering a career change, we hope our story and insights can provide a roadmap for growth and success in the ever-evolving spectrum of pharmacist career opportunities. Keep your head up, looking for new trails along the way.

Navigating the Complexity of 505(b)(2) Drugs in Health System Practice: Operational, Clinical, and Regulatory Considerations

Clayton C. Irvine, PharmD, MBA, MS
Senior Manager, Oncology Cancer Care Pharmacy, Mayo Clinic

Scott Soefje, PharmD, MBA, BCOP, FCCP, FHOPA
Director of Pharmacy, Cancer Care, Mayo Clinic

Overview of Navigating the Impact of 505(b)(2) Drugs

Generic drugs are not new, but recently a different type of generic drug, 505(b)(2) generics, are creating chaos in hematology oncology pharmacy practice. Originally introduced by the Drug Price Competition and Patent Term Restoration Act of 1984, more commonly known as the Hatch-Waxman Act, this "hybrid" New Drug Application (NDA) pathway bridges the gap between full 505(b)(1) NDAs and the customary generic application, 505(j) Abbreviated NDA.[1,2] With more than 500 drugs approved via the 505(b)(2) pathway since 2015 and a steady upward trend in use, 505(b)(2) products offer strategic advantages in drug development.[3,4] These include the potential for reduced clinical trial burden, eligibility for market exclusivity, and the ability to accelerate product timelines by leveraging existing data.

"These include the potential for reduced clinical trial burden, eligibility for market exclusivity, and the ability to accelerate product timelines by leveraging existing data."

However, as emphasized in our HOPA 2025 Annual Meeting presentation[5] and further supported by in-depth Vizient research,[6] the 505(b)(2) pathway introduces a unique and often underappreciated set of clinical, operational, and reimbursement challenges. These challenges can be particularly disruptive in infusion centers and health system practices where medication-use processes must align with regulatory compliance and payer expectations. This article synthesizes findings from our HOPA session,[5] Vizient's real-world data,[6] and recent Food and Drug Administration (FDA)[2] and Centers for Medicare and Medicaid Services (CMS) policy developments[7] to provide pharmacy leaders with actionable insights on how to identify, manage, and optimize the use of 505(b)(2) drugs.

Understanding the Pathway: Clinical Innovation Meets Regulatory Nuance

A 505(b)(2) NDA allows a pharmaceutical manufacturer to rely on publicly available data or prior FDA findings of safety and effectiveness for a previously approved drug, while submitting limited new studies to support a modified version of the reference listed drug (RLD) product. These modifications may include changes to the route of administration, formulation, dosage strength, combination of active ingredients, salt form, or therapeutic indication. Unlike generics that are approved through the 505(j) pathway and are expected to be fully substitutable and therapeutically equivalent (TE) to their RLD, 505(b)(2) products may have significant differences that preclude substitution, and the FDA does not automatically review the 505(b)(2) product for TE.[2]

This regulatory nuance leads to important implications in clinical and operational practice. On the positive side, a 505(b)(2) formulation may offer improved safety, better dosing convenience, or a novel delivery mechanism. For example, subcutaneous bortezomib, a 505(b)(2) reformulation of its intravenous predecessor, has demonstrated reduced peripheral neuropathy[8] and enhanced workflow efficiency in infusion clinics.[9] On the other hand, the lack of TE ratings from FDA for many 505(b)(2) products can introduce confusion in medication selection, procurement, substitution decisions, and reimbursement processes.

Reimbursement and Coding: A Paradigm Shift from CMS

Historically, CMS grouped 505(b)(2) products under the same Healthcare Common Procedure Coding System (HCPCS) J-code as their reference drug, effectively treating them like generics. However, in 2022, CMS issued a reinterpretation of Section 1847A of the Social Security Act that reclassified non-interchangeable 505(b)(2) products as single-source drugs if they are not TE. Beginning in January 2023, CMS started assigning unique HCPCS codes to these drugs and using manufacturer-specific Average Sales Price (ASP) data to determine reimbursement.[7,10]

This policy change had a significant and immediate operational impact. Hospitals and health systems were required to update their charge description masters (CDMs), electronic health records (EHRs), and billing workflows to reflect new codes and reimbursement structures. Organizations that failed to make these updates promptly experienced claim denials, loss of revenue, and added administrative burden. Vizient has documented a marked increase in denials and prior authorization complexity directly tied to these 505(b)(2) specific billing transitions.[6]

Operational Pitfalls: From EHR to Dispensing

The operational impact of 505(b)(2) drugs extends across the entire medication-use continuum. Within the EHR, electronic systems should be configured to clearly distinguish these products from generics and their reference listed drugs by building unique medication records that include specific National Drug Codes (NDCs), HCPCS codes, and accurate formulary status. In invento-

ry and dispensing workflows, the similar naming and packaging of 505(b)(2) products compared to generics can increase the risk of inadvertent substitutions. This makes it essential to physically separate these drugs in storage, apply clear bin labels, and implement barcode scanning safeguards during compounding and administration. On the procurement and formulary management side, pharmacy buyers must be able to identify 505(b)(2) products with accuracy. NDC preference lists, standardized formulary review tools, and catalog flags from distributors can help prevent unintentional purchases of high-cost formulations. Finally, payer coverage and prior authorization present another layer of complexity. Since many 505(b)(2) products are not deemed TE, they frequently need distinct insurance authorization processes. Claims denials often result when there is an NDC to J-code mismatch, which occurs when an NDC for a 505(b)(2) drug is "stacked" with other generic drugs in the reference drug file, or if a drug with a different J-code was dispensed than the J-code that was used for prior authorization, leading to avoidable delays in patient care.

Oncology Spotlight: Financial and Clinical Implications

Oncology infusion centers are particularly vulnerable to the effects of 505(b)(2) complexity. These centers routinely manage high-cost injectable therapies that fall under Medicare Part B reimbursement rules. When a 505(b)(2) drug lacks a TE rating but shares the same generic name and appearance as a traditional generic, confusion in product selection and billing is almost inevitable.

One example that was shared from our practice included 505(b)(2) lanreotide formulation introduced to the market as a cost-saving alternative. Despite the initial financial incentive, the site experienced inventory mismanagement, patient confusion, and delays in therapy during a subsequent supply disruption. In contrast, subcutaneous bortezomib, when introduced with clear operational workflows and coverage verification, showed benefits in terms of reduced chair time and adverse events.

Best Practices for Pharmacy Leaders

Based on the findings of the Vizient focus group, the HOPA presentation, and lessons from early adopters, several best practices have emerged to guide effective management of 505(b)(2) drugs.[5,6,10] Pharmacy departments should create distinct medication records within the EHR to clearly differentiate between these products, ensuring the correct linkage to their associated billing codes. Formulary decisions should be supported by structured evaluation tools that consider clinical impact, reimbursement potential, and operational readiness. Procurement processes can be optimized by flagging preferred or restricted NDCs in both internal systems and distributor catalogs. In the pharmacy, 505(b)(2) drugs should be stored in designated areas with clear visual labeling to minimize dispensing errors. Routine audits of the CDM should be conducted to confirm that billing codes are accurately mapped and aligned with current CMS guidance. Insurance processes must be equally rigorous, requiring that prior authorization requests explicitly include the product's J-code and NDC and that approved authorizations are linked directly to the corresponding medication records. Finally, ongoing education is essential to ensure that pharmacists, technicians, and billing staff understand the distinctions between 505(b)(2) products and other branded or generic drugs, helping avoid confusion and prevent costly mistakes.

Regulatory Outlook: FDORA and Future Therapeutic Equivalence Ratings

The Food and Drug Omnibus Reform Act (FDORA) of 2022 introduced new requirements for FDA to evaluate TE for certain categories of 505(b)(2) drugs, particularly sterile parenteral, ophthalmic, and otic solutions. Under this provision, the FDA must issue a TE determination within 180 days of approval when a 505(b)(2) drug differs from its RLD only by minor formulation components.[11]

This legislative development could eventually simplify substitution and reimbursement for select 505(b)(2) drugs. However, implementation remains limited, and for most products, the absence of an FDA-assigned TE rating means that substitution must be assessed case by case. Pharmacy leaders should continue to monitor the Orange Book and FDA announcements to stay informed about any changes in TE designations.

Conclusion: Strategic Vigilance and Interdisciplinary Collaboration Are Key

As the number of 505(b)(2) approvals continues to grow, pharmacy departments must be prepared to implement structured, cross-functional approaches to product evaluation, IT configuration, reimbursement navigation, and education. Failure to do so can result in billing errors, regulatory noncompliance, and patient care disruptions. Pharmacists are central to managing this complexity. Their roles span clinical evaluation, operational readiness, revenue protection, and stakeholder education. Institutions that prioritize proactive governance and interdepartmental communication are best positioned to balance therapeutic innovation with safe, efficient, and sustainable medication use. ●●

REFERENCES:

1. Congress.gov. "The Hatch-Waxman Act: A primer." September 18, 2016. Accessed May 21, 2025. https://www.congress.gov/crs-product/R44643.
2. FDA. "Determining whether to submit an ANDA or a 505(b)(2) application guidance for industry". May 2019. Accessed October 10, 2024. https://www.fda.gov/media/124848/download.
3. Premier Consulting. "2020 505(b)(2) NDA approvals: A year in review, and what a year it was". 14 April 14, 2021. Accessed October 25, 2024. https://premierconsulting.com/resources/blog/2020-505b2-nda-approvals-a-year-in-review-and-what-a-year-it-was/.
4. FDA. "NDA and BLA calendar year approvals". March 15, 2024. Accessed October 25, 2024 https://www.fda.gov/drugs/nda-and-bla-approvals/nda-and-bla-calendar-year-approvals.

5. Irvine CC, Soefje SA. 505(b)(2) Drugs: New Chaos for Infusion Centers. Presented April 11, 2025 at Hematology Oncology Pharmacy Association (HOPA) Annual Conference. Portland, OR.
6. Vizient. Vizient Focus Group: 505(b)(2) Approved Medications. February 2025.
7. CMS. "HCPCS level II coding for 505(b)(2)-approved drug or biologics. FAQ". Accessed October 17, 2024. https://www.cms.gov/files/document/frequently-asked-questions-single-source-drugs-and-biologicals.pdf.
8. Yang Y, Zhao B, Lan H, et al. Bortezomib-induced peripheral neuropathy: Clinical features, molecular basis, and therapeutic approach. Crit Rev Oncol Hematol. 2024:197:104353. https://doi.org/10.1016/j.critrevonc.2024.104353.
9. Barbee MS, Harvey RD, Lonial S, et al. Subcutaneous versus intravenous bortezomib: efficiency practice variables and patient preferences. Ann Pharmacother. 2013;47(9):1136-42. doi: 10.1177/1060028013503122.
10. Wood T. Understanding the 505(b)(2) pathway. *Pharmacy Practice in Focus: Health Systems*. 2024;13(4):23-25.
11. Congress.gov. HR 2617 – Food and Drug Omnibus Reform Act (FDORA). Accessed May 23, 2025. https://www.congress.gov/117/bills/hr2617/BILLS-117hr2617enr.pdf. p. 1349

Recipients of the Certificate of Recognition for Exemplary Research on Quality of Care in Oncology

Kelly Gaertner Brandt, PharmD, BCOP, BCPS
Oncology Clinical Pharmacy Specialist
Allegheny Health Network Cancer Institute

The Hematology/Oncology Pharmacy Association (HOPA) congratulates the three recipients of the Certificate of Recognition for Exemplary Research on Quality of Care in Oncology. Awarded during the 2025 HOPA Annual Conference in Portland, Oregon, these projects were selected based on their innovation, quality metrics, and potential for broad application and value to oncology practice. The following is a summary of the awarded projects, which encompass pharmacist-driven initiatives with demonstrated benefits including coordination with the care team to provide cost savings and minimize toxicity, reduction in unplanned healthcare utilization via emergency department (ED) visits and hospitalizations, and optimization of patient care.

Discontinuation of Tyrosine Kinase Inhibitor Therapy in Patients with Chronic Myeloid Leukemia Within Veterans Integrated Services Network 21[1]

Presenter: Kirsten Werner, PharmD

For patients with chronic myeloid leukemia (CML), treatment with tyrosine kinase inhibitors (TKIs) is typically lifelong. For select patients with sustained response to therapy and meeting certain criteria, TKI discontinuation followed by close monitoring is a guideline-supported option. Dr. Kristen Werner and colleagues recognized that while TKI discontinuation has potential benefits including cost reduction and toxicity minimization, a formal process to evaluate for TKI discontinuation was not present within the Veterans Integrated Service Network (VISN) 21.

The primary objective of this project was therefore to evaluate the potential cost avoidance with TKI discontinuation, while secondary objectives included an evaluation of health outcomes associated with TKI discontinuation, including relapse of CML, reported side effects, long-term remission, and TKI withdrawal syndrome. Current Veterans with an active prescription for a TKI for chronic phase CML within the VISN 21 were eligible for inclusion if they met the following criteria: age ≥18 years; receiving oncology care at a VISN 21 facility or referred to a community oncology provider; and on TKI therapy ≥3 years with a stable molecular response. Patients were excluded if they had advanced phase CML, had undergone a prior trial of TKI discontinuation, had a history of noncompliance, or chose to continue TKI therapy. Once eligible patients were identified, Clinical Pharmacy Practitioners within the VISN 21 were notified, facilitated discussion with providers, and established a monitoring plan upon treatment discontinuation, if applicable.

A total of 15 patients were identified as eligible for TKI discontinuation. The calculated potential yearly cost avoidance based on Average Wholesale Price for these patients was $1.2 million. While imatinib was the most used TKI in this cohort (11/15), nilotinib contributed to the largest portion of cost savings (n = 3; $935,000).

The authors concluded that the establishment of a formal TKI discontinuation process for patients with CML improved collaboration with the care team, and was associated with significant potential cost avoidance. A dashboard was created to aid in ongoing identification of patients meeting criteria for TKI discontinuation. Several barriers to TKI discontinuation were noted, such as concern for relapse, necessity of close monitoring, discontinuation syndrome, and buy-in from providers. The authors state that future research opportunities include the evaluation of potential clinical and biological predictors of successful TKI discontinuation. This study demonstrates a significant potential for cost savings via the development of a formal process to identify patients with CML eligible for TKI discontinuation and facilitate discussion with the care team.

"Oncology pharmacists can provide added value and enhance patient care in a variety of settings and through different pathways."

Impact of Clinically Embedded Oncology Pharmacists on Immune Checkpoint Inhibitor Treatment Outcomes[2]

Presenter: Colton Zwart, PharmD, BCOP

While previous literature has demonstrated the beneficial role of pharmacists in the optimal management of immune checkpoint inhibitor (ICI) toxicities[3-5], there remains a gap as to the subsequent effect on clinical outcomes. Therefore, Dr. Colton Zwart and colleagues aimed to describe the impact of two embedded pharmacists on the clinical outcomes of patients receiving treatment with ICIs.

In this single-center, retrospective analysis that included information on encounters and interventions over an approximately six-year timeframe, standard nurse-based education and symptom monitoring was compared to the intervention of Pharmacists Optimizing Oncology Excellence in Michigan (POEM) PharmD-based education and symptom monitoring. The analysis included ED visits and hospitalizations related to cancer symptoms, treatment toxicity, or for reasons unknown. Overall, 267 patients were included in the evaluation: 133 patients received standard of care, and 134 patients received pharmacist-based care. Between both the pre- and post-intervention groups, the majority of patients were female (64% vs 70%), the most utilized ICI was pembrolizumab (43% vs 52%), and the intent of therapy was curative in 17% and 34%, respectively. More patients received education prior to ICI initiation

in the post-intervention group compared with the pre-intervention group (99% vs 86%; p=0.002).

This study found that embedded pharmacist care resulted in a 53% and 54% lower odds of ED visits and hospitalizations (odds ratio [OR]: 0.47 [0.28,0.78]; OR: 0.46 [0.27,0.78]), respectively, during the first six months of treatment with an ICI. The authors concluded that embedded clinical pharmacists improved care for patients with cancer receiving ICIs, including greater rates of education and decreased incidence of unplanned healthcare utilization.

Impact of Embedded Clinical Pharmacists on Health Utilization Outcomes in a Large Community Oncology Practice[6]

Presenter: Mark Wagner, PharmD, BCOP

A single-center, retrospective analysis by Dr. Mark Wagner and colleagues aimed to compare healthcare utilization outcomes in a large community oncology practice before and after the integration of two embedded clinical pharmacists via the POEM program. Patients who received standard of care underwent nurse-based education and symptom management; those in the intervention arm received POEM PharmD-based education and symptom management. Eligible patients had newly prescribed anticancer therapy in any of the following areas: for a gynecologic oncology diagnosis; an ICI-containing regimen; or an oral anticancer agent (OAA)-containing regimen. ED visits and hospitalizations due to cancer symptoms, treatment toxicity, or for reasons unknown were included in the analysis.

Among the 748 patients included in the evaluation spanning an approximately 6-year period, 398 patients received standard and 350 received pharmacist care. There were no significant differences in demographics between groups. The majority of patients were female in both the standard and pharmacist care arms (69% vs 57%), ovarian cancer was the most common diagnosis (22% vs 15%), and 39% were receiving treatment with curative intent in both groups. The division of the clinical focus between the standard and pharmacist care arms included OAA (33% vs 38%), ICI (33% vs 38%), and gynecologic oncology diagnosis (33% vs 23%) This study found that the addition of an embedded clinical oncology pharmacist resulted in 29% and 28% lower odds of an ED visit or hospitalization (OR: 0.71 [0.51, 0.98]; OR: 0.72 [0.5,1.02], respectively, in the first six months of systemic anticancer treatment. This led the authors to conclude that clinical pharmacists embedded in the care of oncology patients reduced the incidence of ED visits in the initial six months of systemic anticancer treatment initiation.

These projects highlight the significant contributions of oncology pharmacists to improve the quality of patient care as evidenced by enhanced patient education, increased monitoring, reduced utilization of emergency and hospital healthcare resources, and cost savings. Oncology pharmacists can provide added value and enhance patient care in a variety of settings and through different pathways, as shown here via clinically meaningful interventions. These authors demonstrate excellent examples of identifying an unmet need within their practices and recognizing opportunities for significant pharmacist intervention to improve the quality of cancer care.

REFERENCES:

1. Werner K, Carmichael J, Flynn S, et al. Discontinuation of Tyrosine Kinase Inhibitor Therapy in Patients with Chronic Myeloid Leukemia Within Veterans Integrated Services Network 21. Presented at: Hematology/Oncology Pharmacy Association Annual Conference 2025; April 9 – April 12, 2025; Portland, OR.
2. Zwart C, Wagner M, Farris K, et al. Impact of Clinically Embedded Oncology Pharmacists on Immune Checkpoint Inhibitor Treatment Outcomes. Presented at: Hematology/Oncology Pharmacy Association Annual Conference 2025; April 9 – April 12, 2025; Portland, OR.
3. Renna CE, Dow EN, Bergsbaken JJ, Leal TA. Expansion of pharmacist clinical services to optimize the management of immune checkpoint inhibitor toxicities. J Oncol Pharm Pract. 2019;25(4):954-960.
4. Le S, Chang B, Pham A, Chan A. Impact of pharmacist-managed immune checkpoint inhibitor toxicities. J Oncol Pharm Pract. 2021;27(3):596-600.
5. Myers G, Stevens J, Flewelling A, et al. Evaluation and clinical impact of a pharmacist-led, interdisciplinary service focusing on education, monitoring, and toxicity management of immune checkpoint inhibitors. J Oncol Pharm Pract. 2023;29(1):145-154.
6. Wagner M, Zwart C, Farris K, et al. Impact of Embedded Clinical Pharmacists on Health Utilization Outcomes in a Large Community Oncology Practice. Presented at: Hematology/Oncology Pharmacy Association Annual Conference 2025; April 9 – April 12, 2025; Portland, OR.

Building Momentum and Driving Change: Council Accomplishments from 2024–2025

Anne N. Krolikowski, CAE
Executive Director

As HOPA continues to lead in the advancement of hematology/oncology pharmacy practice, the work of our Councils and Committees plays a vital role in ensuring patient-centered care, high-quality education, impactful advocacy, and meaningful professional development. Here are highlights from this past year's achievements across all four Councils.

Advocacy & Awareness Council: Empowering Member Voices and Patient-Centered Policy

The **Public Policy Committee (PPC)** led both in-person and virtual Hill Days, engaging members in advocacy and policy action. A national environmental scan on pharmacist billing practices is being transformed into a practical tool for HOPA members. PPC also helped redesign the Annual Advocacy Update session alongside the **Patient Outreach & Education Committee (POEC)**—which elevated patient and caregiver voices at the 2025 Annual Conference.

POEC's signature achievement was the **Patient Advocacy Summit**, which explored critical issues like cancer screening, fertility, and OTC/supplement use. The committee created patient-facing tools—including a medication roadmap and guidance for engaging with pharmacists—and published four HOPA News articles centered on patient care, financial toxicities, and health policy impacts.

Education Council: Expanding Access, Strengthening Partnerships, and Advancing Lifelong Learning

The **BCOP Oversight Committee** successfully hosted a hybrid planning meeting at the 2025 Annual Conference and continued to elevate the standard of BCOP education. Key collaborations—with ASTCT, PTCE, AVAHO, and others—were strengthened, with improvements implemented for future joint programs. Subcommittees remained on track to deliver high-quality, clinically relevant content, while demonstrating HOPA's commitment to accessibility and innovation.

The **Education Development Committee** continued to broaden the reach of its offerings, expanding the **Oncology Case Series** to better support residents and early-career practitioners. A new collaboration with *JHOP* launched the "How I Support" series, highlighting pharmacist contributions in supportive care. The **HOPA Journal Club Series** remained a cornerstone of member engagement and clinical dialogue.

The **Annual Conference Committee** curated a diverse and timely program featuring nationally relevant topics, a compelling keynote speaker, and increased visibility around on-demand CE availability—ensuring lasting impact beyond the event itself.

The **Practice Management Committee** successfully transitioned its flagship program to a virtual platform, increasing accessibility while maintaining quality. Committee members also supported leadership development through the mentorship program and contributed thought leadership through two insightful HOPA News articles.

Professional Practice Council: Supporting Recognition, Belonging, and Growth

The **Recognition Committee** saw record-setting award applications and updated key processes to ensure clarity and fairness.

The **Membership Committee** analyzed member profiles, launched targeted welcome communications, awarded 75 travel grants, and supported new SIG development—including adding SIG leadership to the VAC.

Finally, the **Leadership Development Committee & Mentorship Subcommittee** expanded committee-level mentoring, presented on career ladders, hosted a successful alumni breakfast, and increased social media visibility celebrating mentoring pairs.

Research & Quality Council: Advancing Practice Through Insight and Innovation

The **Practice Outcomes and Professional Benchmarking Committee (POPBC)** published its Workload Unit project and launched the Task Valuation manuscript. Mentorship and continuity were prioritized to strengthen committee impact.

Research Grant Reviewers (RGR) Committee awarded three grants and streamlined operations, enhancing grant review and submission processes.

The **Quality Oversight Committee (QOC)** made strides in developing FAQs, launching an EMR-focused workgroup, and finalizing a white paper on the pharmacist's role in QI. They published multiple articles, supported the HOPA/ASCO QTP partnership, and awarded three Quality Research Certificates.

The **Oral Chemotherapy Collaborative (OCC)** finalized updated Practice Standards and a white paper on ROI for pharmacists. They advanced multiple publications and tools while auditing and improving web-based practice resources.

Looking Ahead

The collective efforts of our Councils and Committees continue to shape HOPA's impact—driving innovation, amplifying voices, and improving the lives of patients with cancer. With new initiatives already underway, the momentum from 2024–2025 sets the stage for another year of progress and collaboration. Thank you to the hundreds of volunteers whose work is instrumental in advancing the mission and vision of HOPA!

Intravenous Immunoglobulin (IVIG) Use in Patients Receiving Bispecific Antibodies for B-cell Malignancies

James A. Davis, PharmD, BCOP
Clinical Pharmacy Specialist - Lymphoma/Myeloma
Medical University of South Carolina
Affiliate Assistant Professor - MUSC College of Pharmacy

Victoria R. Nachar, PharmD, BCOP
Clinical Pharmacy Specialist - Lymphoma/Myeloma
University of Michigan Rogel Cancer Center

Background: T-cell engaging bispecific antibodies (bsAbs) which bind CD3 on T-cells and a B-lineage antigen on malignant cells represent a welcome addition to the treatment armamentarium for patients with relapsed/refractory B-cell malignancies such as non-Hodgkin lymphoma (NHL) and multiple myeloma (MM). The nascent example is blinatumomab, a bispecific T-cell engager (BiTE) originally approved in 2014 in relapsed/refractory B-cell acute lymphoblastic leukemia (B-ALL), achieving substantial response rates.[1] Since then, numerous bsAbs have been developed and FDA approved across hematologic and solid tumor malignancies.

- *B-ALL:* Blinatumomab (CD19) is approved for B-ALL and has become part of the standard of care in refractory B-ALL or MRD-positive B-ALL.[1]
- *NHL:* Several CD20-targeting agents are approved for B-cell NHL including mosunetuzumab, glofitamab, and epcoritamab. All have shown high response rates in relapsed/refractory follicular lymphoma and diffuse large B-cell lymphoma.[2]
- *MM:* BCMA-targeting agents teclistamab and elranatamab as well as GPRC5D-targeter talquetamab are approved for relapsed and refractory MM after 4 prior lines of therapy including anti-CD38 monoclonal antibody, proteasome inhibitor, and immunomodulatory agent.[3]
- *Solid Tumors:* tarlatamab is a CD3xDLL3-targeting bsAb approved for extensive-stage small cell lung cancer (ES-SCLC) with disease progression on or after platinum-based chemotherapy.[4]

Despite their impressive response rates, patients receiving T-cell-engaging bsAbs often experience immune dysregulation manifested by cytokine release syndrome (CRS), cytopenias, and B-cell aplasia with resultant hypogammaglobulinemia (HGG).[5] With teclistamab, any-grade neutropenia and lymphopenia occurred in 73% (grade 3–4 in 62%) and 95% of patients (grade 3–4 in 78%), respectively.[5] In the pivotal bsAb myeloma studies, up to ~70–75% of patients developed IgG levels <400 mg/dL.[5-7] Talquetamab also caused IgG <500 mg/dL in 71–87% of patients.[6]

These immunosuppressive effects translate into a high incidence of infection concurrently with HGG, typically occurring later in the treatment course after step-up dosing is complete. Prolonged treatment periods and repeated dosing further increase the risk.[7-9] In multiple myeloma, ≥ 80% of patients experienced at least one infection, about 40-55% had grade ≥3 infections and notably, 6-13% of patients died from an infection.[5,6,10] In a systematic review and meta-analysis of CD20xCD3 bsAbs in NHL, any-grade infections occurred in 44% patients with 20% of patients experiencing a grade ≥3 infection.[11] A retrospective analysis found the cumulative risk of grade ≥3 infection was higher with bsAbs (40%) compared to CAR T-cell therapy (26%) with all infection-related deaths occurring in those who received bsAb group (7% vs 0%).[12] Both modalities cause HGG for a similar duration, but patients on bsAbs have additional factors like continuous T-cell activation/exhaustion, cumulative steroid exposure, and prolonged lymphopenia due to repeated dosing. Interestingly, the SCLC bsAb tarlatamab reported a lower rate of infection (15%), indicating that risk may not be entirely related to T-cell engagement but rather disease biology and tumor antigen target.[4]

"Historically, intravenous immunoglobulin (IVIG) replacement as a means to replace functional antibodies and prevent infections has been considered controversial, as efficacy data has shown conflicting results.[8,10]"

Historically, intravenous immunoglobulin (IVIG) replacement as a means to replace functional antibodies and prevent infections has been considered controversial, as efficacy data has shown conflicting results.[8,10] However, with the widespread adoption of bsAbs and their associated high rates of HGG and infections, many care teams have incorporated IVIG as part of supportive care therapy.

History of IVIG: Introduced in the 1950s, immunoglobulin replacement primarily consists of IgG fractionated from plasma provided by human donors.[13,14] Initially administered intramuscularly, IgG supplementation was painful, limited by absorption issues, and associated with high rates of anaphylactic type reactions.[14] In the 1980s, IV administration was introduced and allowed for larger doses as well as less painful administration and has since been established as a treatment for patients with a variety of immune diseases.[14] IVIG supplementation provides passive immunity and has been retrospectively associated with decreased incidence of pneumonia and other bacterial infections in immunodeficient patients.[15,16] There are currently over a dozen products available with differences seen in amounts of sugar, sodium, osmolality, pH, and IgA content, with variations based on manufacturing process, starting materials, modifications, and stabilizers.[14] Much of the currently available data for IVIG in patients with B-cell malignancy stems from use in patients with chronic

lymphocytic leukemia (CLL) with recurrent infections and after receipt of CAR T-cell therapy or stem cell transplantation. Like bsAbs, these therapies and their preceding lymphodepleting chemotherapy are associated with HGG, cytopenias, and infections.[17] Despite limited retrospective data for IVIG after CAR T-cell therapy and transplant, IVIG administration has been adopted by many institutions for these patients with IgG ≤ 400mg/dL or in those who have recurrent infections.[17]

Indications for IVIG with bsAb: There are no prospective trials that validate use and efficacy of IVIG in patients receiving bsAbs. Many early bsAb trials did not include IVIG support in their protocols, and investigators managed infections reactively. Recently, there has been a growing number of expert consensus recommendations and retrospective studies aimed at filling these gaps. A panel of experts as well as the International Myeloma Working Group (IMWG) Immunotherapy Committee issued consensus recommendations for bsAbs in myeloma. They recommend maintaining IgG >400 mg/dL with IVIG replacement, along with antimicrobial prophylaxis.[7,18] These guidelines suggest initiating IVIG by the second month of bsAb therapy (after initial CRS risk is over) and continuing until IgG recovers or treatment is stopped. In NHL, consensus recommendations state immunoglobulin levels should be monitored regularly and IVIG should be considered for individuals with recurrent infections, as per institutional standards.[19] There are no current recommendations for adult patients with B-ALL or solid tumor bsAbs, where the risks of HGG and resultant infections may be not as pronounced.[20,21]

The emerging consensus recommendations to be proactive with IVIG in bsAb-treated patients, rather than waiting for serious infections to occur, mark a shift from older guidelines which generally required both HGG and recurrent severe infections before administering IVIG. Several recent retrospective studies have evaluated the impact of IVIG prophylaxis in patients receiving bsAbs. Among 225 patients treated with BCMA-directed bsAbs, there was no significant difference in the 12-month cumulative incidence of infections with vs without IVIG prophylaxis (56% vs 60%, p=0.72), defined as initiating IVIG prior to the first documented infection.[10] However, infection-free survival was significantly prolonged in the IVIG group: the median time to first infection was 7.7 months with IVIG vs 3 months without IVIG (p=0.021). Patients receiving IVIG had longer median progression-free survival (15 vs 8 months) and overall survival (44 vs 16 months; p=0.007).[10] On multivariate analysis, primary IVIG prophylaxis was independently associated with a 63% reduction in the risk of death (HR 0.37, p=0.021). While the authors attempted to account for immortal time bias by proper statistical adjustments, patients who did poorly might not have lived long enough to receive IVIG, which may have affected survival. A single-center study by Lancman et al. examined 37 patients treated with BCMA-directed bsAbs.[5] The investigators performed a self-controlled analysis which compared periods when patients were receiving IVIG vs periods they were not. During IVIG periods, the rate of serious infections was 90% lower than during periods off IVIG (incidence rate ratio 0.10, 95% CI 0.01–0.80, p=0.03). In contrast, IVIG did not significantly affect the rate of mild infections (grade 1–2). The authors did not identify any other risk factors for infection aside from lack of IVIG. Lastly, a retrospective series from the Netherlands looked at 52 patients receiving teclistamab.[22] Uniquely, the authors instituted a practice of primary IVIG prophylaxis for IgG <400 mg/dL, while initially observing some patients without IVIG until they had a serious infection. This created two groups: those who received early IVIG vs those who were observed despite low IgG. The 6-month cumulative incidence of serious infections was different – only 5.3% in the prophylactic IVIG group vs 54.8% in the observation group (p < 0.001).[22]

Collectively, these studies indicate that IVIG prophylaxis may reduce serious infections in patients receiving bsAbs. They also suggest an association with improved treatment continuity and possibly survival, although only a randomized prospective trial could definitively confirm a survival benefit. Importantly, no major safety concerns emerged in these analyses. Despite encouraging findings, it must be acknowledged that current evidence for IVIG in patients receiving bsAb comes from retrospective and non-randomized data. There are limitations such as potential bias in which patients were selected for IVIG. Immortal time bias can overestimate benefit if not properly adjusted. Additionally, sample sizes are modest, patient populations may differ, and short follow-up and longer-term effects are not well described. Additionally, as most data are in multiple myeloma, it remains to be proven that the same benefit of IVIG would apply in lymphoma or solid tumors given differences in target antigens and disease-related risk.

Practical Considerations:

Based on the totality of evidence, our institutional protocols align with the following for patients receiving a bsAb for myeloma or B-cell lymphoma:

- **Monitoring:** Check baseline IgG levels prior to initiation of bsAb therapy. Monitor IgG levels and for infections every 4-8 weeks while on treatment.
- **Initiation Criteria:** IVIG replacement can be given to patients with IgG <400 mg/dL and recurrent or severe infections. Regardless of infection history, if IgG falls below 400 mg/dL at any point during bsAb treatment, consider initiation of primary IVIG prophylaxis weighing the risk of IVIG replacement with unclear potential benefit. Some centers use <500 mg/dL as the trigger in myeloma given nearly all such patients will drop below that eventually. If IgG is 400–600 mg/dL and the patient has had one or more significant infections, consider IVIG initiation.
- **Dosing:** Initial IVIG replacement dose of ~0.4 g/kg IV every 4-8 weeks. IVIG may be administered on the same day as the bsAb as real-world data have shown receiving both on the same day may not impact efficacy.[23-25]
- **Targets:** Aim to maintain IgG trough levels >400 mg/dL. Recheck IgG before each IVIG cycle initially; once stable, consider re-checking IgG every 2-3 months. If trough IgG remains <400

with IVIG, consider dose increase (e.g. 0.5 g/kg or every 3 weeks) to achieve adequate levels.

- **Duration:** Continue IVIG throughout bsAb therapy if HGG persists. If the bsAb is discontinued, immunoglobulins should be rechecked in 4-12 weeks. B-cell recovery after bsAb cessation may take time and IVIG may be continued post-discontinuation until IgG naturally recovers. If a patient finishes a fixed duration bsAb (i.e., 12 cycles of glofitamab) and IgG normalizes, IVIG may be stopped. If a patient remains on indefinite bsAb therapy, IVIG may be needed the entirety of treatment.
- **Special Situations:** If a patient has HGG before starting the bsAb (patients post CART frequently have low IgG), consider IVIG concurrently during cycle one based on the above recommendations. In patients with IgG myeloma, IVIG should be considered based on the clinical situation, regardless of IgG levels, as high levels represent dysfunctional immunoglobulins which may not offer natural protection from infection.

Future Directions and Conclusion: Prospective randomized trials[26,27] examining the efficacy of IVIG replacement in patients with B-cell malignances are ongoing. Until then, we are left with existing retrospective data. Future research may also identify biomarkers beyond total IgG to stratify risk including B-cell reconstitution markers, T-cell function, cytokine or gene expression profiles, and pathogen-specific antibody titers as well as optimization of IVIG dosing and determination of optimal trough IgG range. An area of particular interest is modifying bsAb therapy to mitigate immune suppression. Trials are further evaluating fixed durations as well as extended dosing intervals which has shown to potentially reduce infection risk.[6,28] In summary, the growing body of retrospective evidence supports the proactive use of IVIG in patients receiving T-cell engaging bsAbs for B-cell malignancies, highlighting the potential to reduce serious infections, improve treatment continuity, and possibly enhance survival. ●●

REFERENCES:

1. Omer MH, Shafqat A, Ahmad O, et al. Bispecific Antibodies in Hematological Malignancies: A Scoping Review. *Cancers (Basel)*. Sep 14 2023;15(18)doi:10.3390/cancers15184550
2. Davis JA, Granger K, Sakowski A, et al. Dual target dilemma: navigating epcoritamab vs. glofitamab in relapsed refractory diffuse large B-cell lymphoma. *Expert Rev Hematol*. 2023;16(12):915-918. doi:10.1080/17474086.2023.2285978
3. Granger K, Gaffney KJ, Davis JA. Newly approved and forthcoming T-cell-redirecting bispecific antibodies for the treatment of relapsed/refractory multiple myeloma. *J Oncol Pharm Pract*. Apr 2023;29(3):722-726. doi:10.1177/10781552231154809
4. Ahn MJ, Cho BC, Felip E, et al. Tarlatamab for Patients with Previously Treated Small-Cell Lung Cancer. *N Engl J Med*. Nov 30 2023;389(22):2063-2075. doi:10.1056/NEJMoa2307980
5. Lancman G, Parsa K, Kotlarz K, et al. IVIg Use Associated with Ten-Fold Reduction of Serious Infections in Multiple Myeloma Patients Treated with Anti-BCMA Bispecific Antibodies. *Blood Cancer Discov*. Nov 01 2023;4(6):440-451. doi:10.1158/2643-3230.BCD-23-0049
6. Yee AJ. Improving outcomes with anti-BCMA bispecific antibodies with attention to infection. *Blood Cancer J*. Jul 8 2024;14(1):110. doi:10.1038/s41408-024-01091-x
7. Raje N, Anderson K, Einsele H, et al. Monitoring, prophylaxis, and treatment of infections in patients with MM receiving bispecific antibody therapy: consensus recommendations from an expert panel. *Blood Cancer J*. Aug 1 2023;13(1):116. doi:10.1038/s41408-023-00879-7
8. Garfall AL, Stadtmauer EA. Understanding Infection Risk with Anti-BCMA Bispecific Antibodies. *Blood Cancer Discov*. Nov 1 2023;4(6):427-429. doi:10.1158/2643-3230.BCD-23-0157
9. Hammons LR, Szabo A, Janardan A, et al. Kinetics of Humoral Immunodeficiency With Bispecific Antibody Therapy in Relapsed Refractory Multiple Myeloma. *JAMA Netw Open*. Oct 3 2022;5(10):e2238961. doi:10.1001/jamanetworkopen.2022.38961
10. Mohan M, Szabo A, Cheruvalath H, et al. Effect of Intravenous Immunoglobulin (IVIG) Supplementation on infection-free survival in recipients of BCMA-directed bispecific antibody therapy for multiple myeloma. *Blood Cancer J*. Apr 23 2025;15(1):74. doi:10.1038/s41408-025-01282-0
11. Reynolds GK, Maclean M, Cliff ERS, et al. Infections in patients with lymphoma treated with bispecific antibodies: a systematic review and meta-analysis. *Blood Adv*. Jul 9 2024;8(13):3555-3559. doi:10.1182/bloodadvances.2024012916
12. Nath K, Shekarkhand T, Nemirovsky D, et al. Comparison of infectious complications with BCMA-directed therapies in multiple myeloma. *Blood Cancer J*. May 31 2024;14(1):88. doi:10.1038/s41408-024-01043-5
13. Wilson BE, Freeman CM. Immunoglobulin therapy for immunodeficiency. *Allergy Asthma Proc*. Sep 1 2024;45(5):364-370. doi:10.2500/aap.2024.45.240053
14. Lemm G. Composition and properties of IVIg preparations that affect tolerability and therapeutic efficacy. *Neurology*. Dec 24 2002;59(12 Suppl 6):S28-32. doi:10.1212/wnl.59.12_suppl_6.s28
15. Busse PJ, Razvi S, Cunningham-Rundles C. Efficacy of intravenous immunoglobulin in the prevention of pneumonia in patients with common variable immunodeficiency. *J Allergy Clin Immunol*. Jun 2002;109(6):1001-4. doi:10.1067/mai.2002.124999
16. Orange JS, Grossman WJ, Navickis RJ, Wilkes MM. Impact of trough IgG on pneumonia incidence in primary immunodeficiency: A meta-analysis of clinical studies. *Clin Immunol*. Oct 2010;137(1):21-30. doi:10.1016/j.clim.2010.06.012
17. Hill JA, Giralt S, Torgerson TR, Lazarus HM. CAR-T - and a side order of IgG, to go? - Immunoglobulin replacement in patients receiving CAR-T cell therapy. *Blood Rev*. Nov 2019;38:100596. doi:10.1016/j.blre.2019.100596
18. Rodriguez-Otero P, Usmani S, Cohen AD, et al. International Myeloma Working Group immunotherapy committee consensus guidelines and recommendations for optimal use of T-cell-engaging bispecific antibodies in multiple myeloma. *Lancet Oncol*. May 2024;25(5):e205-e216. doi:10.1016/S1470-2045(24)00043-3
19. Crombie JL, Graff T, Falchi L, et al. Consensus recommendations on the management of toxicity associated with CD3xCD20 bispecific antibody therapy. *Blood*. Apr 18 2024;143(16):1565-1575. doi:10.1182/blood.2023022432
20. Wo S, Levavi H, Mascarenhas J, et al. Immunoglobulin repletion during blinatumomab therapy does not reduce the rate of secondary hypogammaglobulinemia and associated infectious risk. *Blood Res*. Jun 30 2022;57(2):135-143. doi:10.5045/br.2022.2021163
21. Zugmaier G, Topp MS, Alekar S, et al. Long-term follow-up of serum immunoglobulin levels in blinatumomab-treated patients with minimal residual disease-

CLINICAL PEARLS (continued)

positive B-precursor acute lymphoblastic leukemia. *Blood Cancer J*. Sep 5 2014;4(9):244. doi:10.1038/bcj.2014.64

22. Frerichs KA, Verkleij CPM, Mateos MV, et al. Teclistamab impairs humoral immunity in patients with heavily pretreated myeloma: importance of immunoglobulin supplementation. *Blood Adv*. Jan 9 2024;8(1):194-206. doi:10.1182/bloodadvances.2023011658
23. Dima D, Davis JA, Ahmed N, et al. Safety and Efficacy of Teclistamab in Patients with Relapsed/Refractory Multiple Myeloma: A Real-World Experience. *Transplant Cell Ther*. Mar 2024;30(3):308 e1-308 e13. doi:10.1016/j.jtct.2023.12.016
24. Mohan M, Monge J, Shah N, et al. Teclistamab in relapsed refractory multiple myeloma: multi-institutional real-world study. *Blood Cancer J*. Mar 5 2024;14(1):35. doi:10.1038/s41408-024-01003-z
25. Riedhammer C, Bassermann F, Besemer B, et al. Real-world analysis of teclistamab in 123 RRMM patients from Germany. *Leukemia*. Feb 2024;38(2):365-371. doi:10.1038/s41375-024-02154-5
26. A Randomized, Multi-Center, Parallel, Double-Blinded, Placebo-Controlled Clinical Trial to Evaluate Efficacy, Safety, and Pharmacokinetics of XEMBIFY® Plus Standard Medical Treatment Compared to Placebo Plus Standard Medical Treatment to Prevent Infections in Patients With Hypogammaglobulinemia and Recurrent or Severe Infections Associated With B-cell Chronic Lymphocytic Leukemia, Multiple Myeloma, and Non-Hodgkin Lymphoma. National Library of Medicine (US). https://clinicaltrials.gov/study/NCT05645107
27. Immunoglobulin Replacement Therapy and Infectious Complications After CD19-Targeted CAR-T-Cell Therapy. National Library of Medicine (US). https://clinicaltrials.gov/study/NCT05952804
28. Bumma N, Richter J, Jagannath S, et al. Linvoseltamab for Treatment of Relapsed/Refractory Multiple Myeloma. *J Clin Oncol*. Aug 1 2024;42(22):2702-2712. doi:10.1200/JCO.24.01008

Yeah, Well, You Know, That's Just, Like, Your Hypothesis, Man: Developing, Executing, and Publishing Peer Reviewed Literature After Residency

Ryan Beechinor, PharmD, BCPS, BCOP
Senior Pharmacist, Hematology/Oncology
UC Davis Comprehensive Cancer Center
Assistant Professor, UC Davis School of Medicine
Assistant Professor, UCSF School of Pharmacy

A seminal white paper published by the American College of Clinical Pharmacy Board of Regents in 2016 underscored the critical importance of research and scholarly activity within pharmacy training programs. This document not only highlighted the value of pharmacist-led investigations, but also delineated significant barriers impeding the conduct of high-quality, impactful research by pharmacy professionals.[1] Evidence of scholarship and publication is often a requirement for advancement in academic settings, and grant-funded research led by pharmacists is becoming more common. Previous surveys of pharmacists have shown that engaging in research is increasingly recognized as a valuable means of advancing pharmacy practice and contributing to the broader healthcare landscape.[2] Furthermore, with the ever changing landscape hematology/oncology treatments, research is particularly important to practitioners of cancer care. The Hematology/Oncology Pharmacy Association's (HOPA) scope of practice, for instance, explicitly advocates for pharmacists to "contribute to cancer research by leading clinical studies, reporting important observations from practice, and supporting investigational drug service programs."[3] This directive is reinforced by other reviews that emphasize the unique contributions of oncology pharmacists to patient care and their essential participation in clinical research initiatives.[4]

> **"Engaging in post-residency research is not merely an option but a crucial component of lifelong learning, professional development, ..."**

While postgraduate pharmacy residency programs provide advanced training primarily focused on clinical skills, they also serve as a crucial period for residents to gain foundational experience in practice-related projects and research. However, the transition from the structured environment of residency to independent professional practice often presents new challenges for maintaining or initiating research involvement. Specifically, a survey of pharmacy practitioners showed that when it comes to research, pharmacists report that they have inadequate knowledge of research/publication methods, insufficient time to complete research, or they struggle to come up with feasible/original research projects.[2,5,6] This article aims to provide guidance and strategies for pharmacists looking to continue or embark on research endeavors after completing their residency training.

Strategies for Continuing Research Post-Residency

Initiating and completing research requires intentionality and strategic planning. Below are 11 pieces of advice to help with scholarship after residency.

1. **Acknowledging the Challenge.** Publishing peer-reviewed literature is hard. Estimates of poster abstracts presented at pharmacy meetings that went on to be published in PubMed-indexed journals vary between 4.6% - 17.5%.[7,8] Numerous barriers can hinder successful publication; these include balancing clinical responsibilities, other professional opportunities, or personal commitments can leave limited time for complete research. Having an open and honest conversation with your direct supervisor laying out your goals to continue scholarship can improve expectations as you begin your first position. Specifically, laying out SMART goals has been shown to be an effective practice on goal attainment. [9-10]
2. **Leverage Your Residency Foundation:** Your residency research project provided invaluable experience in the research process. The skills gained in formulating research questions, conducting literature reviews, understanding study design, and managing projects are transferable and should be built upon. Reflect on the challenges faced during your residency project (e.g., data collection, statistical analysis, writing) and identify areas where you may need further development.
3. **Publish Your Residency Research Project:** It has been shown that residents who successfully publish their PGY1 or PGY2 research are twice as likely to sustain scholarly publication efforts within five years post-residency compared to their non-publishing counterparts.[11] The prevailing thought is that there is a mental shift that comes with getting your first publication across the finish line and seeing it in press. It instills confidence, reinforces research self-efficacy, and serves as a catalyst for future sustained academic productivity.
4. **Get to Know Your Institutions Resources:** If you are employed at a center where you did not do your post-doctoral training, identify a resource (mentor, coordinate with the residency program, etc.) to provide training on institution specific IRB practices, data collection tools (e.g. RedCap), and Research Ethics/Compliance/Safety requirements (e.g. Collaborative Institutional Training Initiative). Taking these steps early on post-residency will be instrumental towards overcoming the

feelings of becoming overwhelmed and contribute towards a more sustainable scholarship practice.

5. **Seek and Cultivate Support Networks:** Continued mentorship and collaboration are paramount. Identify colleagues, former residency preceptors, or faculty members experienced in research who can provide guidance and support. Collaborating with an academic-based research team, as described in one successful model, can provide structured mentorship, ensure study feasibility, and offer assistance with methodology and data analysis.[12] Engaging in multidisciplinary efforts can also broaden perspectives and strengthen research projects. Additionally, early on during a research career, many choose to partner collaboration with pharmacy residents. This model promotes productivity, while also providing meaningful mentorship, which may be more sustainable model for busy clinicians.
6. **Identify a Physician Collaborator:** Partnering with a physician can enhance the visibility, credibility, and overall impact of the research. Physicians often have more frequent opportunities to participate in scholarly activity due to the structure of their training and the traditional academic hierarchy. As a result, they may have greater access to resources, such as funding, data, and institutional support. Collaborating with a physician can also streamline the path to publication, as many peer-reviewed journals may place higher value on multidisciplinary projects, particularly those led or co-authored by physicians.
7. **Find an Accountability Partner:** Research has shown that individuals who shared goals and had regular accountability check-ins achieved significantly higher success rates compared to those who pursued goals independently.[13,14] Applied to research, an accountability partner can help pharmacists maintain momentum through regular progress reviews, shared deadlines, and mutual encouragement. This support structure can be especially valuable in clinical settings, where competing responsibilities often derail research timelines.
8. **Identify Relevant Research Questions:** Post-residency practice offers a rich source of research ideas. Consider problems encountered in clinical practice, evaluate the implementation or sustainability of evidence-based care or new services at your institution, explore questions related to quality measures, justify the value of pharmacy services, or identify areas for process improvement. Examining gaps in the existing literature or documenting interesting patient cases can also lead to valuable research projects. Focusing on questions that are patient-focused and applicable to multiple settings can increase the potential impact and "publish-ability" of your work.[15,16]
9. **Define a Focused and Feasible Scope:** One key to completing research projects, especially within the constraints of professional practice, is keeping the scope tightly focused. Selecting a project that is feasible given available time, resources, and access to data is critical. Retrospective chart reviews or limited-scope reviews may be more manageable starting points compared to complex prospective studies.[17]
10. **Commit to Dissemination:** Aim to disseminate your research findings through presentations at professional meetings and peer-reviewed publications. Manuscript preparation requires dedication, but it is essential for sharing valuable knowledge with the broader profession. Be aware of authorship criteria and establish roles and expectations with collaborators early on. Consider journals or specific sections within journals, such as the *AJHP Resident Edition*, *Pharmacy Practice in Focus: Oncology*, or even *HOPA News*, that may be more suitable for certain types of projects or early-career researchers.
11. **Utilize Available Resources:** Professional organizations like ACCP and ASHP advocate for pharmacist-led research and offer resources to support engagement. Consider pursuing research certificate programs offered by organizations such as ASHP to enhance specific skills like planning and conducting credible research. Previous peer reviewed publication cited throughout this article, and specifically cited here,[18-24] can serve as a guide for early-career practitioners.

Conclusion

Over time, pharmacist-authored contributions to high-impact medical journals have increased, reflecting the profession's expanding role in clinical research. These findings underscore pharmacy's growing presence in interdisciplinary scholarship and suggest that pharmacists are increasingly recognized as essential contributors to advancing evidence-based medicine and improving patient care outcomes.[25-26] While the transition to independent practice presents new challenges, it also opens doors to research opportunities stemming directly from real-world clinical issues. By leveraging the skills gained during residency, strategically identifying relevant questions, actively seeking mentorship and collaboration, managing project scope effectively, and committing to dissemination, pharmacists can successfully initiate and complete research endeavors after residency. Engaging in post-residency research is not merely an option but a crucial component of lifelong learning, professional development, and contributing to the evolution and advancement of pharmacy practice and patient care. ●●

REFERENCES:

1. Deal EN, Stranges PM, Maxwell WD, et al; American College of Clinical Pharmacy. The importance of research and scholarly activity in pharmacy training. Pharmacotherapy. 2016;36(12):e200-e205
2. Armour C, Brillant M, Krass I. Pharmacists' views on involvement in pharmacy practice research: strategies for facilitating participation. Pharm Pract. 2007;5(2):59–6
3. Scope of Hematology/Oncology Pharmacy Practice. Hematology/Oncology Pharmacy Association. 2013. Accessed March 11, 2024. https://www.hoparx.org/documents/111/HOPA13_ScopeofPracticeBk1.pdf

4. Holle LM, Boehnke Michaud L. Oncology pharmacists in health care delivery: vital members of the cancer care team. J Oncol Pract. 2014;10(3):e142-e145.
5. Armour C, Brillant M, Krass I. Pharmacists' views on involvement in pharmacy practice research: strategies for facilitating participation. Pharm Pract. 2007;5(2):59–66.
6. Babar ZU, Scahill S, Nagaria RA, Curley LE. The future of pharmacy practice research - Perspectives of academics and practitioners from Australia, NZ, United Kingdom, Canada and USA. Res Social Adm Pharm. 2018;14(12):1163-1171.
7. Wooten KM, Arnall JR, Bowser KM, et al. Publication rates of hematology/oncology abstracts presented at major pharmacy association meetings. Journal of Oncology Pharmacy Practice. 2021;28(3):582-587.
8. O'Dell KM, Shah SA. Evaluation of pharmacy practice residents' research abstracts and publication rate. J Am Pharm Assoc (2003). 2012;52(4):524-527.
9. Bahrami Z, Heidari A, Cranney J. Applying SMART Goal Intervention Leads to Greater Goal Attainment, Need Satisfaction and Positive Affect. International Journal of Mental Health Promotion. 2022;24(6): 869-882
10. Kleingeld A, van Mierlo H, Arends L. The effect of goal setting on group performance: a meta-analysis. J Appl Psychol. 2011;96(6):1289-1304.
11. Stranges PM, Vouri SM. Impact of resident research publication on early-career publication success. Am J Health Syst Pharm. 2016;73(12):895-900.
12. Brown JN, Kemp DW, Parker MH, Wilkinson ST. Methods to Promote Preceptor Scholarship through Resident Collaboration. Hosp Pharm. 2013;48(8):646-649.
13. Jackson SE, Steptoe A, Wardle J. The influence of partner's behavior on health behavior change: the English Longitudinal Study of Ageing. JAMA Intern Med. 2015;175(3):385-392.
14. Matthews G. Goal setting and achievement: A study of accountability and success. Dominican University of California. Accessed May 28, 2025. https://bossasaservice.com/blog/accountability-partner-statistics/
15. Beechinor, RJ, Angerman, CJ, Steele, AP. Making residency research project patient centered: An example of how retrospective research projects can have a large impact on cancer care. Pharmacy Practice in Focus: Oncology.2024; 6(3): 24-26
16. Lipowski EE. Developing great research questions. Am J Health Syst Pharm. 2008;65(17):1667-1670.
17. Smith KM. Building upon existing evidence to shape future research endeavors. Am J Health Syst Pharm. 2008;65(18):1767-1774.
18. Ecarnot, F., Seronde, M. F., Chopard, R., Schiele, F., Meneveau, N. Writing a scientific article: A step-by-step guide for beginners. Eur Geriatr Med. 2015; 6(6):573-579
19. Montagnes DJS, Montagnes EI, Yang Z. Finding your scientific story by writing backwards. Mar Life Sci Technol. 2021;4(1):1-9.
20. Hoogenboom BJ, Manske RC. How to write a scientific article. Int J Sports Phys Ther. 2012;7(5):512-517.
21. Bahl M. A Step-by-Step Guide to Writing a Scientific Review Article. J Breast Imaging. 2023;5(4):480-485.
22. Karlsson J, Reider B, Wojtys EM, Zaffagnini S. Tips and tricks for building a good paper: what editors want. J Exp Orthop. 2020;7(1):57.
23. Murphy JE, Azad, A, Barreto JN et al. Best practices for supporting and improving pharmacy resident research and quality improvement projects. J Am Coll Clin Pharm. 2024;7(1).
24. ASHP Foundation. Research Resource Center. https://www.ashp.org/pharmacy-practice/resource-centers/research-resource-center Accessed May 25, 2022
25. Touchette DR, Bearden DT, Ottum SA. Research publication by pharmacist authors in major medical journals: changes over a 10-year interval. Pharmacotherapy. 2008;28(5):584-590.
26. Strong DM, Fuji KT. A Descriptive Study Examining Trends in Pharmacist-Authored Original Research Publications in the Journal of the American Medical Association Network from 2000 to 2019. Pharmacy (Basel). 2021;9(1):40.

FEATURE

Less is More: Chemotherapy Free and "Chemotherapy-lite" Approaches for Acute Lymphoblastic Leukemia

Jeffrey Baron, PharmD, BCOP, DPLA
Clinical Pharmacist Specialist: Leukemia
Department of Pharmacy, Roswell Park Comprehensive Cancer Center

Acute Lymphoblastic Leukemia (ALL) is characterized by uncontrolled proliferation of immature T or B lymphoblasts. Despite only accounting for approximately 2% of all lymphoid malignancy diagnoses annually, ALL has a binodal age distribution, occurring at higher frequencies in children/adolescents and older adults.[1,2] Traditionally cytotoxic chemotherapy has formed the basis of management for ALL. These cytotoxic regimens are associated with numerous short and long term toxicities including myelosuppression, infections, neutropenic fever, cardiotoxicity, secondary malignancies, and avascular necrosis amongst others.[3] Given this, a paradigm shift is occurring– the use of less and less chemotherapy. However, there is concern with the use of less chemotherapy; how does one maintain appropriate efficacy and long-term survival? The answer is incorporation of novel targeted agents to create deep remissions.

"Chemotherapy free and reduced intensity chemotherapy regimens are possible for the treatment of ALL."

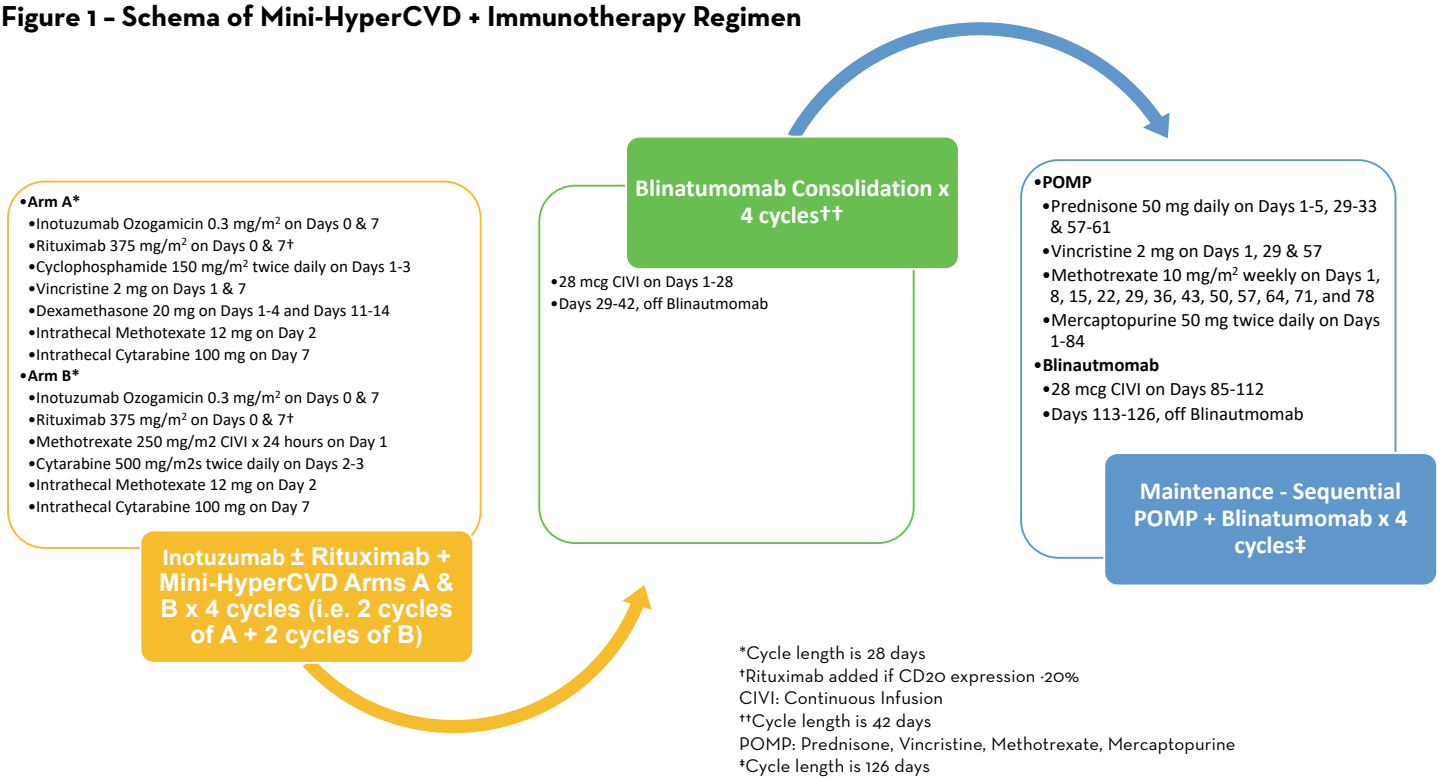
Ph+ Acute Lymphoblastic Leukemia – Oral BCR-ABL Inhibitors + Blinatumomab

The presence of the Philadelphia chromosome [t(9;22); BCR-ABL1 oncogene], or Ph+, is one of the hallmark pathologic features associated with ALL, occurring in 25% of adult ALL.[4] Historically Ph+ was considered an adverse feature, but that changed with the use of tyrosine kinase inhibitors (TKIs). Despite the use of BCR-ABL TKIs in combination with chemotherapy and/or steroids, relapses have been seen. Given the established efficacy of second & third generation BCR-ABL inhibitors and blinatumomab, it was hypothesized that a chemotherapy-free combination of these two agents would lead to deep and durable remissions.[5,6] TKI + blinatumomab was given for a total of 5 cycles followed by TKI alone as maintenance therapy. Combining TKI (either dasatinib or ponatinib) with blinatumomab led to complete remissions (CR) in almost every patient (96-98%) and the majority (≥ 50%) achieved a complete molecular response (CMR). These deep remissions translated into long-term survival benefits and sparing the need for allogeneic stem cell transplant. In addition, combining TKI with blinatumomab was well tolerated with few discontinuations of TKI or blinatumomab. Based on the high efficacy along with sparing the toxicities associated with chemotherapy and the need for allogeneic stem-cell transplant, TKI + blinatumomab therapy is currently listed as a recommended regimen per the National Comprehensive Cancer Network (NCCN) guidelines.

Based on the literature, dasatinib and ponatinib are the two most utilized TKIs when given in combination with blinatumomab. In the absence of head-to-head trial data, the choice of TKI should be based on provider experience as well as patient specific factors such as concomitant drug-drug interactions and medical comorbidities. Given its superiority potency as a pan BCR-ABL inhibitor and activity against BCR-ABL resistance mutations (including T315I) ponatinib, a third generation BCR-ABL inhibitor, is our go to TKI here at Roswell Park Comprehensive Cancer Center (RPCCC).[7] However ponatinib is associated with significant toxicity concerns including hepatotoxicity, pancreatitis, as well as cardiovascular (CV) events (heart failure, venous thromboembolism, and arterial occlusive events).[8] For those who are to receive ponatinib, it is recommended they be started on receive aspirin prophylaxis as well as statin therapy for cardioprotection.[6,9] Once a major molecular response is obtained via PCR (BCR-ABL transcript level <0.1%), ponatinib therapy can be reduced to lower maintenance dosing at 15 mg daily based on results from the OPTIC trial showing decreased risk of CV events with maintaining disease control.[10] In those with history of cardiac comorbidities, dasatinib, a second generation BCR-ABL inhibitor, should be the preferred TKI of choice over ponatinib.

Blinatumomab is a bispecific T-cell engager (BiTE), specifically targeting CD-19 on the surface of ALL cells and CD3 on the surface of immune T-cells.[11] It activates endogenous T-cells through connecting CD3 on the T-cell surface with CD19 on the B-cells (both malignant & benign); this leads to a cytolytic synapse which mediates proliferation of inflammatory cytokines as well as T-cells, resulting in lysis of CD19 positive cells. Given its mechanism of action as immunotherapy, use of blinatumomab is associated with cytokine release syndrome (CRS) as well as neurological side effects, including immune effector cell-associated neurotoxicity syndrome (ICANS). When utilized as initial front-line therapy, the risk of CRS and ICANS is heightened given the large disease burden.[12] It is therefore best to cytoreduce with TKI plus corticosteroids to a peripheral WBC count of less than 10 x 10^9/L before initiation blinatumomab.[5] Use of pre-phase steroids + TKI, was associated with low incidence of CRS & neurotoxicity (< 5%). Dosage of steroids for the pre-phase varies across clinical trials as well as institutions/centers. At RPCCC, we utilize dexamethasone 10 mg/m^2/day. In addition, initiation of blinatumomab therapy should be done in the inpatient setting with close monitoring for CRS and ICANS.[11] We at RPCCC utilize ICE scores daily to monitor for ICANS specifically. If toxicity develops, then monitoring increases to twice daily until resolution of said toxicity. Once patients have been shown to tolerate blinatumomab therapy without toxicity, they can be safely

Figure 1 – Schema of Mini-HyperCVD + Immunotherapy Regimen



*Cycle length is 28 days
†Rituximab added if CD20 expression ·20%
CIVI: Continuous Infusion
††Cycle length is 42 days
POMP: Prednisone, Vincristine, Methotrexate, Mercaptopurine
‡Cycle length is 126 days

discharged and continue to receive the remainder of the 28-day continuous infusion as an outpatient. Outpatient blinatumomab therapy (delivered as 7-days bags most commonly, but 2-day, 3-day and 4-day bags may also be utilized) may be done through a home-care pharmacy or utilization of an institution's infusion center; this is dependent on many factors including reimbursement, insurance coverage, distance to & from institution, amongst others. Starting with Cycle 2 and beyond, the entirety of the blinatumomab course is given in the outpatient setting.

Ph- Acute Lymphoblastic Leukemia – "Chemo-lite Regimen" with Inotuzumab Ozogamicin ffl Rituximab + Mini-HyperCVD + Blinatumomab

For elderly patients and younger patients with significant medical comorbidities, intensive chemotherapy results in more adverse effects and lower response rates. One third of patients who achieve a CR may die of myelosuppression associated complications from intensive chemotherapy.[13] Given that the goal here is to maintain or improve efficacy and reduce toxicity, the Mini-HyperCVD + immunotherapy regimen was developed (Figure 1).[14] Mini-HyperCVD is of lower intensity compared to conventional HyperCVAD by removing the anthracycline in Arm A and dose reductions of chemotherapy. Vincristine is kept at the standard dose of 2 mg flat. For the "A Arms", cyclophosphamide and dexamethasone are dose reduced by 50% compared to doses used in conventional HyperCVAD. And for the "B Arms", methotrexate is dose reduced by 75% and cytarabine by 50% compared to the doses used in conventional HyperCVAD. Given their ability to produce deep remission rates, their novel mechanisms of action and improved toxicity profiles, inotuzumab ozogamicin and blinatumomab were added, with the addition of rituximab given to those with CD20 expression ≥ 20%. Mini-HyperCVD + immunotherapy was shown to be highly effective with an overall response rate of 99%, with 89% achieving a CR and 9% achieving a CR with incomplete count recovery (CRi). Of those who responded, 94% achieved minimal residual disease (MRD) negative status. 2-year progression free survival (PFS) was 58.2% and 5-year PFS was 44%. 2-year overall survival (OS) was 63.6% and 5-year OS was 46%.[15-17] This is a significant improvement, as historically the estimated cure rates of elderly ALL was 10-20%.[18] Reduced intensity chemotherapy + immunotherapy was well tolerated overall, with most toxicities being Grade 1-2 severity. While the severity of toxicity with Mini-HyperCVD + immunotherapy was lessened, myelosuppression and infectious complications are still possible to a decreased extent. Therefore, it is still prudent to monitor and support patients as they receive this regimen. At RPCCC, we shift inotuzumab ozogamicin and rituximab to outpatient administrations on Days 0 & 7 of each cycle to minimize costs in the inpatient setting.

Based on the high efficacy and safety profile, NCCN recommends the Mini-HyperCVD + immunotherapy regimen for adults less than 65 years old without comorbidities, adults greater than or equal to 65 years old, or adults with substantial comorbidities. This essentially allows for universal use across adults, young or elderly regardless of medical history.

The Future is Bright!!

Chemotherapy free and reduced intensity chemotherapy regimens are possible for the treatment of ALL. They have been shown to

be highly efficacious, leading to long-lasting remissions and more importantly are safe. Extrapolating the amazing success seen with ALL, treatment de-escalation may be possible across all tumor types. Akin to ALL, the success of de-escalation is dependent on the need for appropriate targets and biomarkers. ●●

REFERENCES:

1. Aldoss I, Forman SJ, Pullarkat V. Acute Lymphoblastic Leukemia in the Older Adult. *Journal of oncology practice / American Society of Clinical Oncology*. Feb 2019;15(2):67-75. doi:10.1200/JOP.18.00271
2. Siegel RL, Kratzer TB, Giaquinto AN, et al. Cancer statistics, 2025. *CA: a cancer journal for clinicians*. Jan-Feb 2025;75(1):10-45. doi:10.3322/caac.21871
3. DeVine A, Landier W, Hudson MM, et al. The Children's Oncology Group Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers: A Review. *JAMA Oncol*. May 1 2025;11(5):544-553. doi:10.1001/jamaoncol.2024.6812
4. Moorman AV, Chilton L, Wilkinson J, et al. A population-based cytogenetic study of adults with acute lymphoblastic leukemia. *Blood*. Jan 14 2010;115(2):206-14. doi:10.1182/blood-2009-07-232124
5. Foa R, Bassan R, Vitale A, et al. Dasatinib-Blinatumomab for Ph-Positive Acute Lymphoblastic Leukemia in Adults. *The New England journal of medicine*. Oct 22 2020;383(17):1613-1623. doi:10.1056/NEJMoa2016272
6. Jabbour E, Short NJ, Jain N, et al. Ponatinib and blinatumomab for Philadelphia chromosome-positive acute lymphoblastic leukaemia: a US, single-centre, single-arm, phase 2 trial. *The Lancet Haematology*. Jan 2023;10(1):e24-e34. doi:10.1016/S2352-3026(22)00319-2
7. O'Hare T, Shakespeare WC, Zhu X, et al. AP24534, a pan-BCR-ABL inhibitor for chronic myeloid leukemia, potently inhibits the T315I mutant and overcomes mutation-based resistance. *Cancer cell*. Nov 6 2009;16(5):401-12. doi:10.1016/j.ccr.2009.09.028
8. Iclusig (ponatinib) [prescribing information]. Cambridge, MA: Takeda Pharmaceuticals America Inc; September 2024.
9. Caocci G, Mulas O, Abruzzese E, et al. Arterial occlusive events in chronic myeloid leukemia patients treated with ponatinib in the real-life practice are predicted by the Systematic Coronary Risk Evaluation (SCORE) chart. *Hematol Oncol*. Aug 2019;37(3):296-302. doi:10.1002/hon.2606
10. Jabbour E, Apperley J, Cortes J, et al. Dose modification dynamics of ponatinib in patients with chronic-phase chronic myeloid leukemia (CP-CML) from the PACE and OPTIC trials. *Leukemia*. Mar 2024;38(3):475-481. doi:10.1038/s41375-024-02159-0
11. Blincyto (blinatumomab) [prescribing information]. Thousand Oaks, CA: Amgen Inc; April 2025.
12. Morris EC, Neelapu SS, Giavridis T, Sadelain M. Cytokine release syndrome and associated neurotoxicity in cancer immunotherapy. *Nature reviews Immunology*. Feb 2022;22(2):85-96. doi:10.1038/s41577-021-00547-6
13. O'Brien S, Thomas DA, Ravandi F, et al. Results of the hyperfractionated cyclophosphamide, vincristine, doxorubicin, and dexamethasone regimen in elderly patients with acute lymphocytic leukemia. *Cancer*. Oct 15 2008;113(8):2097-101. doi:10.1002/cncr.23819
14. Jabbour E, Short NJ, Senapati J, et al. Mini-hyper-CVD plus inotuzumab ozogamicin, with or without blinatumomab, in the subgroup of older patients with newly diagnosed Philadelphia chromosome-negative B-cell acute lymphocytic leukaemia: long-term results of an open-label phase 2 trial. *The Lancet Haematology*. Jun 2023;10(6):e433-e444. doi:10.1016/S2352-3026(23)00073-X
15. Gokbuget N, Dombret H, Bonifacio M, et al. Blinatumomab for minimal residual disease in adults with B-cell precursor acute lymphoblastic leukemia. *Blood*. Apr 5 2018;131(14):1522-1531. doi:10.1182/blood-2017-08-798322
16. Kantarjian HM, DeAngelo DJ, Stelljes M, et al. Inotuzumab Ozogamicin versus Standard Therapy for Acute Lymphoblastic Leukemia. *The New England journal of medicine*. Aug 25 2016;375(8):740-53. doi:10.1056/NEJMoa1509277
17. Litzow MR, Sun Z, Mattison RJ, et al. Blinatumomab for MRD-Negative Acute Lymphoblastic Leukemia in Adults. *The New England journal of medicine*. Jul 25 2024;391(4):320-333. doi:10.1056/NEJMoa2312948
18. Geyer MB, Hsu M, Devlin SM, et al. Overall survival among older US adults with ALL remains low despite modest improvement since 1980: SEER analysis. *Blood*. Mar 30 2017;129(13):1878-1881. doi:10.1182/blood-2016-11-749507

We can reach more people about cancer clinical trials *together*

Thank you!

REGENERON
SCIENCE TO MEDICINE®

HOPA
Hematology/Oncology Pharmacy Association

TIME TO TALK

Out-of-Pocket But Not Out of Mind: Approaching Patient Conversations Regarding Treatment Costs

Jeffrey Pilz, PharmD, MPA, MS
Assistant Director of Pharmacy
The Ohio State University Wexner Medical Center

Imagine opening the mail to find a new medical bill or receiving a notification of a new charge in a patient portal…does that trigger a sinking feeling or angst? Financial toxicity is considered when selecting a treatment regimen for a patient, but how prepared are patients for their actual out-of-pocket cost contribution? Will there be a surprise bill? What hidden expenses will be incurred? Healthcare in the US is expensive, outpacing inflation annually, with medications contributing a significant part.[1] Pharmacists are well-positioned to help patients plan smartly for the fees associated with their treatment, as well as navigate the complexities of medical billing. Proactive discussion on what to expect financially can avoid the unfortunate surprise of opening a bill with an extravagant number listed under "what you owe".

The Problem

Since 1970, health spending has dramatically increased according to Centers for Medicare and Medicaid Services (CMS) data, tripling to reach $4.5 trillion in 2022 or roughly 1 out of every 5 dollars spent in the US. Out-of-pocket (OOP) expenditures have also increased during this same period, to $1,425 per person. The OOP costs are not equitably distributed, with patients in the top 1% of annual health spending accounting for 27% of all OOP expenditures. Survey data on healthcare debt identified that half of US adults have difficulty affording healthcare costs. CMS projects that per-person health spending will increase to 4.8% per capita annually through 2031.[1] OOP costs also do not consistently follow trends in negotiated reductions or rebates for acquisition costs for branded medications .[2] Individual OOP costs are also unique to the insurance plan, so different patients sharing the same payor may experience stark differences in coverage for services. Financial toxicity has been linked to reduced quality-of-life, decreased survival, and poor treatment adherence, and thus is an important issue to discuss up front with patients.[3]

"CMS projects that per-person health spending will increase to 4.8% per capita annually through 2031."

Revenue Cycle at a Glance

Many factors impact patient charges, including:

- Billing codes
- Indication(s)
- Site of care (including in- vs out-of-network care)
- Admission status
- Dose, route, and frequency of medications
- Indirect and ancillary fees
- Insurance payor type (government, public, or private) and plan details
- Prior authorization
- Previous expenses paid or accrued during the benefit period
- OOP maximums

At the most basic level, once a service is provided, a billing charge is sent to the payor. The payor assesses criteria to determine the validity of the charge and reimbursement amount. Payment is then provided, at which time if there is a patient responsibility for payment it is billed as OOP charges. Of course, the full process contains many caveats and exceptions. There are many distinct payment models in the US healthcare system, and significant differences exist between models used for inpatient, outpatient, and hospital observation care.[4]

When charges are submitted to the payor, they are checked against one of several options that serve as a formulary for the specific payor. Commercial insurance payors will set specific inclusion and exclusion criteria for medications and may include other cost controls such as step therapy, cost sharing differentials, and restrictions on use. CMS plans are subject to Local Coverage Determinations (LCD) and National Coverage Determinations (NCD).[5] For eligible third-party payors, reimbursement may be tied to having an accepted prior authorization (PA) or pre-certification in place for that specific treatment.[4] Of note, almost all Medicare Advantage enrollees are required to obtain prior authorizations for some services.[6]

The plan outlines OOP requirements from the total charge amount. This may involve coinsurance, based on a percentage of charges, or a copayment, both influenced by any outstanding deductible(s) for the benefit period. If applicable, there may be a maximum OOP amount after which services are covered by the third-party payor in full.

For medications specifically, payment may be part of either the plan's medical or prescription benefit. The medical benefit includes items that are linked to provider services, like infusions given in an ambulatory clinic. Prescription benefits cover most retail pharmacy prescriptions and any Medicare Part D drugs.[4] One key distinction between these two benefits is the patient OOP cost-sharing amount, which is often higher for the prescription benefit.

To determine actual reimbursement for a medication, a test claim (for prescriptions) or pre-authorization (for medical benefit) may be submitted. However, this is not always applicable to all situations or payors (e.g., traditional Medicare plans). It can be extremely difficult to identify a patient's specific OOP cost for a medication in advance of submitting the formal charges.

Approaching Patient Conversations

One of the best interventions to limit financial toxicity is establishing sound processes and procedures within your pharmacy practice to ensure appropriate billing and authorizations.[3,6] These steps are within institutional control, minimize the opportunities for payor denials, and promote a timely appeals process to maintain reimbursement when denials are received. However, the limiting step remains the variability in patient plans as the payors are a third party. Thus, patient counseling can further hedge against unexpected financial charges later in treatment by setting realistic expectations.[3]

- *Consider the "why" behind elevated costs*

Patients may lament the high costs of some line items on their medical bills. Identifying the limits of the current payment models and sharing what is covered as part of a counseling session may help reduce the shock of such a cost. For example, why does an acetaminophen tablet sometimes "cost" double digits on a hospital bill? Explaining that the cost represents other services in the hospital (pharmacy costs, nursing administration costs, utilities, etc.) can clarify the costs. This can also set expectations for how much a treatment may cost, even if using older generic medications that have a perception as being inexpensive.

Given the confusing and fragmented structure of US health insurance, patients who are unfamiliar with the various players and terms may benefit from a simplified explanation of the payment model and their cost responsibilities. Identifying who has power over a cost (i.e., when the insurance payor is the one to contact) can also avoid back and forth telephone calls over a disputed charge.

- *Leverage tools to improve the conversation*

Healthcare provider time and resources are at a premium. Pharmacists are well-positioned to discuss potential OOP costs, given familiarity with prescription copayments and different benefit types. When pharmacist resources are limited, financial counselors or case managers familiar with medical billing may assist.[3] If available, a medication assistance team can provide expertise in charities, discount programs, and other support for which the patient may qualify. Telemedicine and patient-friendly handouts can also substitute in-person counseling.[3]

NCCN publishes the Distress Thermometer and Problem List tool that can help prioritize patients with financial hardships or risk of financial toxicity.[7] Similarly, modern EHRs may incorporate scoring tools to identify patients based on risk factors or trigger medications for either pharmacist or financial counselor follow-up.

Several value frameworks also exist in publication, including Avalere's Patient Perspective Value Framework (PPVF) and ASCO's cancer-focused value framework.[8] The PPVF is unique in that it considers patient values and expectations to assign value, instead of focusing on system-wide healthcare costs. Use of a value framework can support shared decision-making and promote patient participation when developing a care plan.[8] Similarly, these validated value framework tools can inspire development of a home-grown scoring system to identify patients at highest risk of extreme OOP requirements.[9]

- *Warn patients of pitfalls and hidden costs*

While the OOP of a treatment may be the primary concern, additional costs can accrue through direct nonmedical and indirect costs.[10] Direct costs include ancillary services, such as labs, genetic testing, and some supportive care related to the primary medication. Direct nonmedical costs include travel, parking fees, childcare fees, and so forth incurred due to the care received but not expressly tied to the medical expenses.[10] Indirect costs are lost productivity or opportunities because of medical intervention, such as lost work hours.[10] Honesty as to the requirements of a particular regimen or clinical trial empower the patient to make an informed decision on whether to proceed, in addition to budgeting for these expenses when predictable.

Another potential challenge adding to patient costs exists with alternative funding programs (AFPs) for some specialty or expensive therapies.[11] As many novel antineoplastic drugs used in the outpatient setting are designated as specialty drugs, the utilization of AFPs is increasing, with over 10% of large employers already implementing AFP payment models.[11] AFPs may carve the medication from plan coverage altogether, intentionally shifting patients into a patient assistance program (PAP) for access. Here, if patients are unable to meet criteria for PAP coverage, they may be required to pay 100% of their medication cost.[11] If income is too high to qualify, PAP funding may not be an option. If covered, the AFP medication costs may not count towards the insurance deductible or OOP maximum.[11]

Information is powerful when it comes to preparing patients for OOP costs associated with their cancer treatment. While every situation is unique and third-party payors can be unpredictable, proactive discussion is encouraged rather than reacting to an existing charge or surprise bill. Beyond identifying patients at high risk of financial toxicity, healthcare teams and particularly pharmacists can offer support or alternative options to stave off further unsustainable financial costs with treatment. ●●

REFERENCES:

1. Amin K, Cox C, Ortaliza J. et al. Health Care Costs and Affordability. In Altman, Drew (Editor), Health Policy 101, (KFF, May 28, 2024) https://www.kff.org/health-policy-101-health-care-costs-and-affordability/ (accessed 20 May 2025).
2. Rome BN, Feldman WB, Desai RJ, et al. Correlation Between Changes in Brand-Name Drug Prices and Patient Out-of-Pocket Costs. *JAMA Netw Open.* 2021;4(5):e218816. doi:10.1001/jamanetworkopen.2021.8816
3. Edward J, Petermann VM, Eberth JM, et al. Interventions to address cancer-related financial toxicity: Recommendations from the field. J Rural Health. 2022 Sep;38(4):817-826. doi: 10.1111/jrh.12637. Epub 2021 Dec 3. PMID: 34861066; PMCID: PMC9163204.
4. Kirschenbaum B. Financial Management: Telling the Patient's Story Accurately, Completely, and in a Codeable Fashion. Presentation presented at ASHP Leaders Conference. Chicago, IL; 2016 Oct.
5. Centers for Medicare and Medicaid Services. Medicare Coverage Document Type Descriptions (Dec 2023). https://www.cms.gov/medicare-coverage-

database/help/Document_Type_Descriptions.pdf (accessed 28 May 2025).

6. Fuglesten Biniek J, Sroczynski N, Freed M, et al. Medicare Advantage Insurers Made Nearly 50 Million Prior Authorization Determinations in 2023. KFF (Jan 28, 2025). https://www.kff.org/medicare/issue-brief/nearly-50-million-prior-authorization-requests-were-sent-to-medicare-advantage-insurers-in-2023/ (accessed 20 May 2025).
7. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Distress Management Version 1.2025. © National Comprehensive Cancer Network, Inc. 2025. All rights reserved. Accessed 25 May 2025. https://www.nccn.org/docs/default-source/patient-resources/nccn_distress_thermometer.pdf?sfvrsn=ef1df1a2_6
8. Willke RJ, Chapman RH, Seidman JJ, et al. Current Value Frameworks—What's New? *Value in Health* (2019); 22(6, Supplement): S7-S11. ISSN 1098-3015. https://doi.org/10.1016/j.jval.2019.04.1916.
9. Liang M, Huh WK. Financial toxicity – an overlooked side effect. *Gynecol Oncol* (2018);150(1):3-6. doi: 10.1016/j.ygyno.2018.05.012.
10. Chisolm MA, Vaillancourt AM, Shepherd M. Pharmacy Management, Leadership, Marketing, and Finance. 2nd ed. Burlington MA: Jones & Bartlett Learning; 2014: 301-303.
11. Richter A, Snively A. Alternative Funding Programs: Don't Be Fooled by Promises of 'Free' Specialty Cancer Drugs. Oncology Nursing Society (2024) https://www.ons.org/publications-research/voice/news-views/01-2024/alternative-funding-programs (access 20 May 2025).

Outcomes of Patients with Newly Diagnosed AML and Hyperleukocytosis

Grace Park, PharmD, BCOP
Clinical Pharmacy Specialist - Leukemia
University of Texas MD Anderson Cancer Center

Background

Acute myeloid leukemia (AML) is frequently associated with life-threatening complications at presentation, particularly in patients with hyperleukocytosis—defined as a white blood cell (WBC) count exceeding 50 × 10^9/L or 100 × 10^9/L.[1] This condition, affecting up to 18% of patients at diagnosis, poses a critical risk due to its association with leukostasis, tumor lysis syndrome (TLS), disseminated intravascular coagulation (DIC), and early multiorgan failure.[2-5] Certain genetic subtypes of AML, particularly monocytic/myelomonocytic variants and KMT2A-rearranged leukemias, are more frequently associated with hyperleukocytosis. Mutations commonly observed in this subset include *FLT3-ITD*, *NPM1*, *DNMT3A*, *CEBPA*, *TET2*, and those involved in the RAS signaling pathway.[6-7] The leukemic burden results in inflammatory responses that compromise organ perfusion, particularly in the lungs, kidneys, and brain, elevating early mortality risks.[1-4] This study was conducted to identify predictors of early death and overall survival (OS) in hyperleukocytic AML and evaluate management strategies to improve outcomes.

"The leukemic burden results in inflammatory responses that compromise organ perfusion, particularly in the lungs, kidneys, and brain, elevating early mortality risks.[1-4]"

Methods

A retrospective cohort study was conducted on adult patients with newly diagnosed AML and WBC ≥100 × 10^9/L admitted to MD Anderson Cancer Center between January 2010 and April 2020. Patients diagnosed with acute promyelocytic leukemia were excluded. Clinical leukostasis (CL) was defined by the presence of at least one of the specific symptoms of hypoxia, chest pain, neurologic deficits, priapism, intestinal ischemia, or renal failure attributable to hyperleukocytosis. Patients were evaluated for baseline laboratory values, genetic mutations, and treatment strategies, including the use of corticosteroids, hydroxyurea, cytarabine, and leukapheresis. Early mortality was defined as death within 4 weeks of presentation. Multivariate logistic regression and Cox proportional hazards models were employed to determine predictors of early mortality and OS.

Results

A total of 129 patients met inclusion criteria, with a median age of 65 years. The median WBC count at diagnosis was 146 × 10^9/L, and 75 (58%) presented with signs of CL. Common manifestations included renal failure (43%), hypoxia (39%), and headache (27%). Intensive care unit (ICU) admission was required for 85 (66%) patients. Genetic profiling revealed frequent *FLT3* mutations (63%) and RAS pathway mutations (27%). TLS occurred in 24(19%) of patients, with no significant difference in TLS incidence based on cytoreductive agent used. Intracranial hemorrhage (ICH) occurred in 9(11%) out of 80 patients undergoing brain imaging, predominantly in those with WBC ≥150 × 10^9/L.

Initial management included hydroxyurea in 124 (96%) patients and cytarabine in 69 (54%) patients, while 31 (24%) patients underwent leukapheresis. Corticosteroids were administered to 91 (71%) patients. Definitive induction therapy varied, with 62 (49%) receiving high-dose cytarabine based regimen, 13 (10%) intermediate-dose cytarabine based regimen, and 52 (41%) low-intensity cytarabine regimens. Early mortality occurred in 9% of patients, all of whom were aged ≥65 years. The majority of deaths were related to CL-associated complications, including acute kidney injury and hypoxia, often in the absence of infection. Multivariate analysis identified older age (OR 1.21), CL (OR 7.70), and platelet count <40 × 10^9/L (OR 8.33) as independent predictors of early mortality.

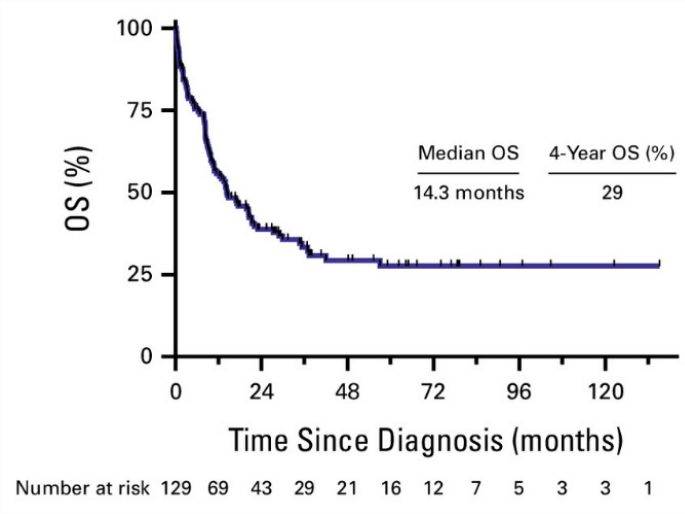
The median OS was 14.3 months, with a 4-year OS of 29% (Figure 1). Survival was significantly reduced in patients ≥65 years (median OS 8.0 months) compared to younger patients (median OS 42.0 months). Multivariate Cox regression revealed that older age (HR 7.66), CL (HR 2.05), TLS (HR 3.30), elevated lactate (HR 5.08), high LDH (HR 2.01), and poor-risk cytogenetics (HR 2.57) independently predicted worse OS.

Discussion

This study underscores the critical risks associated with AML and hyperleukocytosis, especially in older patients and those presenting with CL or thrombocytopenia. Despite advances in supportive care and cytoreductive therapy, early mortality remains substantial. The findings reinforce the importance of aggressive supportive care measures, including early ICU admission, preemptive nephrology involvement, and prompt management of coagulopathy and sepsis. Notably, lactic acidosis emerged as a marker of poor prognosis, emphasizing the need for early lactate measurement and aggressive hemodynamic support.

Management strategies have evolved in response to these risks. Fractionated and lower dose cytarabine over prolonged infusions appears to be a safer approach to cytoreduction, especially in frail or elderly patients, potentially reducing complications associated with rapid blast lysis. The use of corticosteroids to modulate the

Figure 1. OS of patients with AML and hyperleukocytosis in the entire cohort[8]



inflammatory cascade in hyperleukocytic AML is gaining traction, supported by pathophysiological evidence linking cytokine-driven endothelial damage to organ failure. Additionally, leukapheresis, while utilized in select patients, did not demonstrate a mortality benefit, consistent with mixed evidence in prior studies.

The study's limitations include its retrospective design, variability in cytoreductive strategies, and a relatively small sample size. Nonetheless, the robust multivariate analyses lend credibility to the identified prognostic markers. Future research should investigate prospective interventions aimed at cytokine modulation and explore alternative cytoreductive agents with potentially less endothelial toxicity. Evaluating outcomes in patients with WBC thresholds between 50 and 100 × 10^9/L could also refine early intervention strategies.

Conclusion

Hyperleukocytosis in AML constitutes a hematologic emergency with a significant risk of early death, particularly among older adults and those with clinical leukostasis or thrombocytopenia. Key strategies to mitigate this risk include ICU-level supportive care, preemptive renal support, cautious cytoreduction using hydroxyurea and fractionated cytarabine, early corticosteroid administration to suppress inflammatory responses, and vigilant monitoring for neurologic and coagulopathic complications. Early identification of high-risk patients using age, platelet count, lactate, LDH, and cytogenetic profiles can guide more aggressive management. The integration of cytokine-targeted therapies and novel cytoreductive approaches may further improve survival outcomes in this vulnerable patient population. ●●

REFERENCES:

1. Röllig C, Ehninger G. How I treat hyperleukocytosis in acute myeloid leukemia. Blood. 2015 May 21;125(21):3246-52. doi: 10.1182/blood-2014-10-551507. Epub 2015 Mar 16. PMID: 25778528.
2. De Santis GC, de Oliveira LCO, Romano LGM, et al. Therapeutic leukapheresis in patients with leukostasis secondary to acute myelogenous leukemia. J Clin Apher 26:181-185, 2011;26(4):181-5. doi: 10.1002/jca.20290. Epub 2011 May 13. PMID: 21574176.
3. Marbello L, Ricci F, Nosari AM, et al. Outcome of hyperleukocytic adult acute myeloid leukaemia: a single-center retrospective study and review of literature. Leuk Res. 2008 Aug;32(8):1221-7. doi: 10.1016/j.leukres.2008.01.004. Epub 2008 Mar 3. PMID: 18313749.
4. Stahl M, Shallis RM, Wei W, et al. Management of hyperleukocytosis and impact of leukapheresis among patients with acute myeloid leukemia (AML) on short- and long-term clinical outcomes: A large, retrospective, multicenter, international study. Leukemia 34:3149-3160, 2020 Dec;34(12):3149-3160. doi: 10.1038/s41375-020-0783-3. Epub 2020 Mar 4. PMID: 32132655; PMCID: PMC8155811.
5. Macaron W, Sargsyan Z, Short NJ. Hyperleukocytosis and leukostasis in acute and chronic leukemias. Leuk Lymphoma. 2022 Aug;63(8):1780-1791. doi: 10.1080/10428194.2022.2056178. Epub 2022 Mar 31. PMID: 35357988.
6. Largeaud L, Bertoli S, Bérard E, et al. Genomic landscape of hyperleukocytic acute myeloid leukemia. Blood Cancer J. 2022 Jan 5;12(1):4. doi: 10.1038/s41408-021-00601-5. PMID: 34987148; PMCID: PMC8733030.
7. Tien F-M, Hou H-A, Tsai C-H, et al. Hyperleukocytosis is associated with distinct genetic alterations and is an independent poor-risk factor inde novoacute myeloid leukemia patients. Eur J Haematol. 2018 Jul;101(1):86-94. doi: 10.1111/ejh.13073. Epub 2018 May 22. PMID: 29624746.
8. Haddad FG, Sasaki K, Senapati J, et al. Outcomes of Patients With Newly Diagnosed AML and Hyperleukocytosis. JCO Oncol Pract. 2024 Dec;20(12):1637-1644. doi: 10.1200/OP.24.00027. Epub 2024 Jul 16. PMID: 39013130.

Dosing the Mind: Psychedelic Assisted Psychotherapy and the Oncology Pharmacist

Andrew Whitman, PharmD, BCOP
Lead Clinical Pharmacist – Hematology/Oncology
University of Virginia Health

Back in 2016, I was giving a lecture on medical cannabis at a local Virginia pharmacy conference. At the time, I commented to the audience how interesting and exciting it was that I had the opportunity to stand up in front of everyone and talk about marijuana for an hour; truly a novel experience. I had a similar feeling flood over me as I presented on psychedelic medicines at the 2025 HOPA Annual Conference in Portland, Oregon. In both cases, the best part of the experience was unlocking another potential tool for our patients with cancer that may help manage complex symptoms and improve their quality of life. It's obvious to say that every single person in the practice of cancer care has seen patients that unnecessarily suffer. They have experiences that involve physical, emotional, and spiritual crises that go untreated or undertreated. In all of my research on this topic, one sentence has stood out to me the most: "[psychedelic medicines] took away the emotional walls that they had put up when they were given their life-threatening disease diagnosis and allowed them to see their lives and their diseases in a more objective way."[1] I personally want to be a part of breaking down "emotional walls" and I believe the field of pharmacy has much to offer.

"[psychedelic medicines] took away the emotional walls that they had put up when they were given their life-threatening disease diagnosis..."

On the whole, the clinical, scientific, political, historical, and social impacts of psychedelics are all certainly worth exploring, but the area I believe pharmacists, in particular, can play the biggest role is in creating the basic "therapeutic framework" of psychedelic administration. More specifically, this is considering the *context* in which we can provide these medicines in safe, evidence-based manner. Within this framework, I think there are two essential topics requiring additional focus.

1. Connecting pharmacology and psychotherapy in a new way

Psychedelic medicines include drug therapies like psilocybin, lysergic acid diethylamide (LSD), dimethyltryptamine (DMT), mescaline, ketamine, and 3,4-Methylenedioxymethamphetamine (MDMA) to name a few.[1] Many of the purported uses are for psychiatric disorders like anxiety, depression, post-traumatic stress disorder (PTSD), and end of life existential distress. The traditional model of mental health treatment includes daily administration of a medication, potentially for very long durations, if not indefinitely. These drug classes include SSRIs, SNRIs, and atypical antipsychotics, each of which have had varying successes in the management of cancer associated anxiety and depression and all of which have several troublesome adverse effects.[2] The framework of psychedelic assisted psychotherapy (PAP) turns the traditional model upside down. Many studies support single doses or only a few sequential doses to see dramatic benefits. For example, in the 2016 study by Ross et al., a single moderate dose of psilocybin combined with PAP led to rapid, substantial, and sustained reductions in anxiety and depression among patients with life-threatening cancer. At a 6.5-month follow-up, up to 80% of patients maintained clinically significant improvement in their symptoms.[3]

The design of studies on psychedelic medicines have evolved since the late 1950s. The pattern has moved from loosely controlled or anecdotal observational studies into more structured trials that are randomized, double-blind, and placebo controlled. These newer generation studies incorporate rigorous psychologic risk factor screening, standardized dosing, validated outcome measures, and even neuro-imaging and biomarker assessment.[4] Pharmacists, I believe, have the unique skill set to fine tune protocol development even further. We have in-depth knowledge on pharmacology, adverse effect mitigation and monitoring, drug-drug interactions, and drug-disease state interactions. Moreover, oncology pharmacist are expert "trackers" of symptom control post anti-cancer therapies, so they may be the ideal clinician to mimic this expertise in psychedelic studies. Nevertheless, pharmacists will also need to adapt their practices with the new paradigm shift away from "daily dosing," likely in ways that still need to be defined or explored. Considering the present state of practice, examples of oncology pharmacists' potential contributions to protocol development may include:

- Screening of psychiatric disorders and cardiovascular conditions that may be contraindicated or put patients at risk for adverse effects (i.e., tachycardia, hypotension, or hypertension) during PAP sessions
- Outlining dosing schemas for various psychedelic medicines, including safe storage, handling, and administration (i.e., ideal routes of administration)
- Selection of clinically appropriate active placebos (control groups)
- Review of relevant drug-drug interactions already reported in the literature and assessment of drug therapies that may be high risk but lack evidence
- The development of tapering plans, washout periods before psychedelic administration (i.e., tapering SSRIs) and predicting

potential impacts of certain drug-drug interactions on outcomes (such as blunted effects)
- Creating protocols for emergency management during psychedelic sessions, including selecting appropriate drug therapies or antidotes that are needed on site (i.e., allergic reactions, cardiovascular adverse effects, acute psychiatric reactions)
- Standardized follow up (e.g., adverse effects, tracking symptom control in the context of cancer care) – specifically using pharmacotherapy knowledge to help delineate whether new symptoms are from cancer, the psychedelic medicine, or another cause
- Exploration of long-term effects of psychedelics versus active controls
- Investigating direct comparisons between traditional antidepressants and/or anxiolytics versus psychedelic medicines

2. Educating patients, caregivers, and fellow clinicians

One area of my oncology practice that I have always enjoyed is what I call "predicting the pharmacotherapeutic future." The essence of this is not only education but educating the right way. As pharmacists, we are the keyholders and experts of drug therapy knowledge. Translating information to various target audiences will help tell the story of "what's to come" with a particular medication. The effects of psychedelic medicines, arguably more than some drugs, need to be clearly defined for our patients, their caregivers, and other clinicians. Structures already exist in the psychedelic literature that emphasize preparatory sessions, set and setting, and integration therapies but I believe clear, succinct education are at the core of each and pharmacists could impact each phase in a positive way.

Some additional areas focused on education are worth noting. Basic teachings on pharmacology (i.e., mechanisms of action), drug-drug interactions, assessment of clinical trial evidence and interpretation of data, and even understanding the legality of psychedelic medicines in various countries are needed. Keeping abreast of DEA and FDA regulations, laws, and opinions will be necessary as the landscape changes for psychedelic medicines. In the oncology pharmacy space, we are already dealing with drug approval growth that is somewhat unprecedented, so many of us have the tools to keep up with literature and understand the impact of these changes.

Finally, coming back to the paradigm shifting PAP model as compared to the traditional "daily dosing" model of mental health, pharmacists could be leaders in understanding the pharmacoeconomic impacts. It's unclear how this shift would impact the field of mental health economics, but I believe education, personal story telling, clear literature interpretation, and person-centered care are keys to breaking down "economic walls" of caring for our patients with cancer, and doing it the right way. ●●

REFERENCES:

1. White CM, Weisman N, Dalo J. Psychedelics for patients with cancer: a comprehensive literature review. *Ann Pharmacother*. 2023;57(9):1062-1075. doi: 10.1177/10600280221144055.
2. Grassi L, Caruso R, Riba MB, Lloyd-Williams M, Kissane D, Rodin G, et al. Anxiety and depression in adult cancer patients: ESMO Clinical Practice Guideline. *ESMO Open*. 2023;8(2):101155. doi: 10.1016/j.esmoop.2023.101155.
3. Ross S, Bossis A, Guss J, Angin-Liebes G, Malone T, Cohen B, et al. Rapid and sustained symptom reduction following psilocybin treatment for anxiety and depression in patients with life-threatening cancer: a randomized controlled trial. *J Psychopharmacol*. 2016;30(12):1165-1180. doi: 10.1177/0269881116675512.
4. Kishon R, Modlin NL, Cycowicz YM, Mourtada H, Wilson T, Williamson V, et al. A rapid narrative review of the clinical evolution of psychedelic treatment in clinical trials. *Npj Ment Health Res*. 2024;3(1):33. doi: 10.1038/s44184-024-00068-9.

Introducing

ONCOLOGY PHARMACIST DAY

Every April 3rd

HOPA
Hematology/Oncology Pharmacy Association

Board Update

Unyielding Commitment to Oncology Pharmacists and Patients

Robert Mancini, PharmD, BCOP, FHOPA
HOPA President (2025-2026)
Oncology Pharmacy Program Coordinator & PGY2 Oncology Residency Program Director, St. Luke's Cancer Institute, Boise, ID
Adjunct Clinical Instructor, Oncology, Idaho State University – College of Pharmacy, Meridian, ID

HOPA recently changed the name of our Diversity, Equity, and Inclusion (DEI) Advisory Group to the Access, Representation, and Opportunity (ARO) Advisory Group. We have also updated how we describe on our website our approach to optimizing care for *all people with cancer*.

While the terminology may have changed, our mission and approach are unyielding. Optimizing care for all people with cancer by supporting oncology pharmacists from all backgrounds and experiences remains our north star.

ARO in Action

Below are just a few examples of how our work toward access, representation, and opportunity continues.

- **HOPA Hill Day is September 30**
  Members, patients, and staff will spend Tuesday, September 30, 2025, on Capitol Hill to advocate for:
  - Patient access to the best possible care
  - The vital role of hematology/oncology pharmacists in cancer care
  - Solutions to cancer drug shortages
  - Funding for federal cancer prevention, surveillance, and research programs from the NIH, NCI, CDC, FDA and more

  Thank you to all who contribute to our advocacy efforts – your voices are more important now than ever!
- **Clinical Trials Resources Available in Multiple Languages**
  Thanks to ongoing support of Industry sponsors, our Time to Talk (TTT) Clinical Trials resources are now available in English, Arabic, French, Chinese, Spanish, and Vietnamese. The TTT Clinical Trials landing page is also available in Spanish, as are each of the newly created campaign videos.

  Please take a moment to visit hoparx.org/clinical-trials to access these resources, and others, as they are added.
- **New Learning Management System**
  The HOPA Education team recently stood up a new learning management system (LMS) to streamline how you purchase and learn on HOPA Learn. The new LMS will enhance your user experience and make navigation and accessibility easier for all!

Time to Celebrate Hematology/Oncology Pharmacy

On behalf of the entire HOPA Board, I want to say thank you to all of our members for the work you do across the continuum of cancer care. Whether you are in clinical, specialty, industry, academia, or less traditional roles, we celebrate you! Here are a few examples:

- **October is American Pharmacists Month**
  All through the month of October, HOPA will be giving shout-outs to all of you via our social media channels. If you don't already, please follow us on LinkedIn, Facebook, Instagram, and X.
- **Newly Designated National Oncology Pharmacist Day**
  April 3 has been certified as Oncology Pharmacist Day by HOPA and the National Days Archive. We sought this designation as a way to highlight our niche, yet broad, profession with a day that is all our own. We chose April 3 because HOPA was founded on that day in 2004.
- **Member Awards & Recognition**
  As of this writing, there are several weeks left to nominate yourself or a colleague for a HOPA Member Award or to seek the Fellow of HOPA (FHOPA) designation. Applications close on October 3, 2025.

  We also will hold our annual board elections starting November 3. This year, we will elect a President-Elect and two At-Large Board Members.

Looking Ahead: Strategic Planning Going on Now

The Board, council leaders, and staff recently attended a two-day strategic planning session in Denver, Colorado. We feel inspired by everything we hope to accomplish in the next 3-5 years.

Soon, we will begin the difficult work of narrowing our focus into achievable goals across education, advocacy, research, professional practice, and organizational excellence. We may even make some changes to how we define our strategic pillars, but more to come on that in early 2026!

In the meantime, please see the Executive Director's Updates on page 15 for Council Updates. Thanks to all of you, we have accomplished so much – and we are confident we will continue to reach our goals together. ●●

HOPA
Hematology/Oncology
Pharmacy Association

555 East Wells Street, Suite 1100
Milwaukee, WI 53202
hoparx.org

HOPA 2026

WE MARCH ON.

MARCH 25-27 NEW ORLEANS, LOUISIANA

We March On to HOPA 2026 in New Orleans!
Next spring, HOPA Annual Conference will head to New Orleans, calling the Big Easy home, March 25-27, 2026.

Expect three fully packed days of educational programming, cutting-edge science, engaging presenters, exciting networking, and plenty of other entertaining events and surprises - all surrounded by the electric atmosphere of a one-of-a-kind city. And if that wasn't enough, HOPA 2026 will offer 35 CE credits - including 8 BCOP credits.

Watch for our full agenda and event website in mid-October 2025. Registration and housing will follow up in early December.