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Resident Research Abstract Booklet

2024-2025

Incidence and outcomes of pleural effusion culture positivity following lung transplantation

Arzate M, Nailor MD, Tokman S, Goodlet KJ

Purpose: Among lung transplant recipients, pleural complications frequently occur during the early post-transplant period and may contribute to declines in graft function. Among these complications, pleural space infections (PSIs) have historically been associated with high mortality. However, whether PSIs continue to represent life-threatening events in the current era of modern immunosuppression and infection prophylaxis is unknown. The primary objective of this study was to describe one-year outcomes of lung transplant recipients requiring pleural drainage and compare culture-positive and culture-negative groups.

Methods: This retrospective cohort study was approved by the Institutional Review Board of St. Joseph's Hospital and Medical Center (SJHMC). The study population included SJHMC lung transplant recipients first transplanted from March 2013 to December 2023 who had one or more pleural fluid cultures obtained within 90 days of transplantation. Re-transplant patients were excluded. Standard post-transplant prophylaxis included antibiotics targeting *Pseudomonas* and MRSA (immediate post-operative period), inhaled amphotericin and tobramycin (transplant hospitalization), and lifelong itraconazole, valganciclovir, and trimethoprim/sulfamethoxazole. Changes in pulmonary function tests (e.g. forced expiratory volume in one second [FEV1]), biopsy-proven acute cellular rejection (ACR), and all-cause mortality were assessed through one year after transplantation, and outcomes were compared between patients with and without PSI.

Results: Of 1,005 lung transplant recipients, 376 patients met inclusion criteria. The median age at transplant was 66 years, 61% of patients were male, and 62% of patients had a transplant indication of restrictive lung disease. A total of 72 patients (7.2%) developed post-transplant PSI. The most common pathogens were coagulase-negative staphylococci (27.6%), *Candida spp* (25.3%), and *Enterococcus spp* (14.9%), while gram-negative bacteria were rare. The median pleural fluid white blood cell count was 1500 cells/uL, with neutrophil predominance in >50% of the samples. At the time of the initial pleural culture, the median FEV1 was 2.16 L and 1.6 L in the negative and positive culture (PSI) patients, respectively ($p<0.01$). At one-year post-transplant, this difference in median FEV1 was no longer statistically significant (2.33 L versus 2.17 L, $p=0.17$). Among patients with PSI, a trend toward increased ACR was observed (65% versus 45%, $p=0.06$); however, this did not appear to be associated with immunosuppression reduction and almost all cases of rejection were classified as mild. One-year post-transplant mortality occurred among 17 patients (6%) in the culture-negative group and 6 patients (8%) in the culture-positive group ($p=0.43$).

Conclusions: In this retrospective study conducted at a large U.S. lung transplant center utilizing universal antimicrobial prophylaxis, infections of the pleural space were most commonly caused by gram-positive bacteria and fungal organisms. Although pulmonary function was reduced around the time of infection, this impairment appeared transitory, with no significant difference in FEV1 versus patients without PSI by 1 year. Similarly, 1-year mortality was low and comparable to lung transplant recipients without PSI. Collectively, these data suggest that PSIs represent manageable complications of lung transplant and do not necessarily predispose these patients to poor post-transplant survival or long-term impairments in allograft function.

Miranda Arzate, PharmD

Miranda received her PharmD from Midwestern University – Glendale and completed her PGY1 pharmacy residency at St. Joseph's Hospital and Medical Center. Her professional interests include infectious diseases. Miranda will be continuing her training as a PGY2 infectious diseases resident at Norton Healthcare in Louisville, KY.

Mentors: Kellie Goodlet, PharmD, BCIDP, BCPS, BCTXP; Michael Nailor, PharmD, BCPS

Presented at ASHP Midyear (December 2024, New Orleans, LA) and AzPA Southwestern States Residency Conference (June 2025, Tucson, AZ)

Winner - Best Residency Project (Southwestern States Residency Conference)

Vascular access for parenteral nutrition - Focus on midline administration

Johns O, Eslinger C, Lam J, Lam E

Purpose: Currently, there is limited evidence to demonstrate the harm or safety of peripheral parenteral nutrition (PPN) via a midline. Despite the lack of literature suggesting risk of adverse drug events (ADEs) with midline administration of PPN, the Infusion Therapy Standards of Practice explicitly states midlines should not be used to administer PPN. These concerns have not been validated by literature and more information on midline complication rates specific to PPN in comparison to general complication rates are needed. Notably, past studies have reported overall midline complication rates of around 10.3-13.2% and rates of peripheral and central line complications between 33-36% and 3.9-7.2%, respectively. The purpose of this study is to assess safety of midline PPN administration by capturing rates of line-related adverse drug events.

Methods: This was a single-center, retrospective, descriptive analysis including patients from St. Joseph's Hospital and Medical Center (SJHMC), a 587-bed quaternary academic medical center located in Phoenix, Arizona. Adult patients aged 18 years or older were included in this study if they received PPN between January 1, 2020 and December 31, 2023 via a midline. Patients were excluded if PPN duration was less than 24 hours. Data regarding PPN duration, indication, number of bags, and ADE date and type were collected from the electronic medical record. Osmolarity information was collected from the pharmacy software for PPN compounding. Up to six PPN bags were included for analysis. Possible ADEs included phlebitis, extravasation, thrombosis, bloodstream infection, symptomatic upper-extremity deep vein thrombosis (DVT), catheter occlusion, accidental dislodgement, leaking from exit site, thrombophlebitis, infiltration, and superficial thrombophlebitis. The Naranjo Scale was used to assess the likelihood of the PPN causing the ADE.

Results: One hundred fifty-seven patients were screened and 86 met inclusion criteria. The most common reason for exclusion was no midline (34), unable to determine IV access PPN was infused through (13), and other IV access used (13). The median osmolarity was 874.4 mOsm/L. ADEs potentially related to midline administration of PPN occurred in 11 patients (12.8%). Ten patients had a possible and one patient had a probable ADE related to midline administration of PPN based on the Naranjo Scale. Leaking from exit site was the predominant ADE in 9 patients (10.5%). Line occlusion occurred in 3 patients (3.5%) and infiltration in 3 patients (3.5%). One patient experienced multiple events concurrently, including thrombosis, symptomatic upper extremity DVT, infiltration, and leakage.

Conclusions: Midline administration of PPN was most frequently associated with leaking from exit sites. More notable ADEs, such as infiltration, thrombosis, and occlusion occurred at lower rates. The frequency of complications in our study was consistent with general midline complication rates and lower than peripheral line complication rates reported in past literature. This suggests that the use of midlines for PPN may be safer than peripheral line administration and not more harmful than its utilization for standard medication administration. Larger, prospective studies are necessary to guide future updates to infusion therapy standards.

Olivia Johns, PharmD

Olivia received her PharmD from the University of Tennessee Health Science Center College of Pharmacy – Memphis. She completed her PGY1 pharmacy residency at St. Joseph's Hospital and Medical Center. Olivia's professional interests include trauma, emergency medicine, and medication safety. Following residency, Olivia will practice as an acute care clinical staff pharmacist at Banner Gateway Medical Center in Gilbert, AZ.

Mentors: Christian Eslinger, PharmD, MBA, Meng, BCPS; Erwin Lam, PharmD, BCPS; Jade Lam, PharmD, BCCP

Presented at ASHP Midyear (December 2024, New Orleans, LA) and AzPA Southwestern States Residency Conference (June 2025, Tucson, AZ)

Predictive value of thromboelastography with platelet mapping on hematoma expansion in spontaneous intracerebral hemorrhage

Sammani N, Martinez S, Gonzalez D, Schroeder T, Radosevich J, Sheehan T, Haller JT

Purpose: Spontaneous intracerebral hemorrhage (ICH) accounts for about 10% of strokes in the United States and is linked to high mortality and morbidity. Hematoma expansion independently predicts poor outcomes. Thromboelastography with platelet mapping (TEG-PM) has shown predictive value for hematoma expansion in traumatic ICH, but its role in spontaneous ICH is unclear.

Methods: This retrospective cohort study assessed the predictive value of TEG-PM, focusing on arachidonic acid (AA) and adenosine diphosphate (ADP) inhibition, for hematoma expansion in spontaneous ICH patients. Patients with spontaneous ICH who received TEG-PM and an initial CT scan within 6 hours of symptom onset between January 2018 and April 2024 were included. The primary outcome was the predictive value of TEG-PM findings on hematoma expansion.

Results: Among 117 patients (median age 62 years; 61.5% male), hematoma expansion occurred in 19 (16.2%). TEG-PM parameters—AA% (6.0% vs. 9.9%; p = 0.37) and ADP% inhibition (16.1% vs. 21.0%; p = 0.77)—did not differ significantly between those with and without expansion. Use of hemostatic agents like desmopressin (12.0%) and tranexamic acid (18.8%) was similar. In-hospital mortality or discharge to hospice occurred in 17.1%, with no significant difference by expansion status (21.1% vs. 16.3%; p=0.62).

Conclusions: TEG-PM parameters did not predict hematoma expansion in this cohort. The low expansion rate may have limited detection of predictive value. These results suggest limited utility of TEG-PM to guide management in spontaneous ICH patients without overt platelet dysfunction or anticoagulation.

Nora Sammani, PharmD

Nora received her PharmD from the University of Arizona R. Ken Coit College of Pharmacy. She completed her PGY1 pharmacy residency at the Southern Arizona VA Healthcare System (SAVAHCS) and her PGY2 critical care residency at St. Joseph's Hospital and Medical Center. Her professional interests include critical care pharmacy with emphasis in medical ICU management. Following residency, Nora will practice as a critical care pharmacist at Abrazo Arrowhead in Phoenix, AZ.

Mentors: Tyler Haller, PharmD, BCCCP; John Radosevich, PharmD, BCCCP, BCPS

Presented at ASHP Midyear (December 2024, New Orleans, LA) and AzPA Southwestern States Residency Conference (June 2025, Tucson, AZ)

Evaluating the safety of the 40 mEq limit for potassium chloride extended-release tablets

Tan A, Lam E, Kim C, Patel H

Purpose: The potassium chloride (KCl) extended-release package insert (PI) reports adverse events of upper and lower gastrointestinal (GI) conditions. To minimize potential adverse events, the PI recommends not to exceed 40 mEq per dose. Limited evidence exists regarding GI adverse events with single doses >40 mEq. This study evaluated the incidence of GI hemorrhage, obstruction, perforation, and minor adverse events following single-dose oral KCl administration exceeding 40 mEq to assess safety.

Methods: This single-center, retrospective cohort study evaluated adverse events following single doses of potassium chloride extended-release (KCl ER) tablets at St. Joseph's Hospital and Medical Center, a 576-bed quaternary academic medical center located in Phoenix, Arizona. Adult patients who received a single dose of KCl ER tablets of 40, 60, 80, 100, and 120 mEq between January 1, 2020 to January 1, 2024 were identified via an electronic health record database. Patients included were 18 years of age or older, administered a single dose of KCl, and admitted to the hospital for at least 24 hours post-administration to assess for adverse events. Primary outcomes included major GI events such as gastrointestinal hemorrhage, obstruction, and perforation; secondary outcomes included nausea, vomiting, flatulence, abdominal pain and discomfort, and diarrhea.

Results: One hundred and ninety-one patients were included in the analysis: 60 patients each were included in the 40, 60, and 80 mEq group, 4 patients in the 100 mEq group, and 7 patients in the 120 mEq group. Baseline demographics revealed statistically significant differences between groups in median age (p=0.0085) and median BMI (p=0.0384). No significant difference in sex (p=0.998) or race (p=0.409) distribution was found. No major adverse events, including gastrointestinal hemorrhage, obstruction, or perforation, were observed in all studied doses. Minor adverse events occurred infrequently. Diarrhea occurred in 2 patients (3.3%) in the 40 mEq group, 1 (1.7%) in the 60 mEq group, and 1 (14.3%) in the 120 mEq group (p=0.196). Nausea was observed in one patient each (1.7%) in the 60 and 80 mEq groups. Vomiting occurred in one patient each (1.7%) in the 40 and 80 mEq groups. Flatulence was seen in one patient (1.67%) in the 80 mEq group. Abdominal pain/discomfort was observed in one patient (1.67%) in the 60 mEq group. No statistical differences were found in all minor adverse events between groups.

Conclusions: Single-dose administration of KCl ER tablets up to 120 mEq was not associated with major GI adverse events in this cohort, challenging the existing 40 mEq dose limit recommendation based on this cohort's safety data. Minor adverse events were infrequent and occurred at similar rates across all dose groups. These findings suggest the safety of single doses exceeding 40 mEq when clinically indicated for effective potassium repletion in hospitalized adults. The study's retrospective nature necessitates confirmation through large-scale prospective randomized controlled trials to validate these findings and further establish the safety of higher-dose regimens.

Amy Tan, PharmD

Amy received her PharmD from Midwestern University College of Pharmacy – Glendale and completed her PGY1 pharmacy residency at St. Joseph's Hospital and Medical Center. Her professional interests include critical care medicine. Following residency, Amy will practice as an internal medicine and critical care pharmacist at Abrazo West Campus Hospital in Goodyear, AZ.

Mentors: Caroline Kim, PharmD, BCPS; Erwin Lam, PharmD, BCPS; Hiren Patel, PharmD, BCCCP, BCPS

Presented at ASHP Midyear (December 2024, New Orleans, LA) and AzPA Southwestern States Residency Conference (June 2025, Tucson, AZ)

Optimizing heparin induced thrombocytopenia risk assessment: Investigating the role of the 4Ts score after lung transplantation

Unwin N, Goodlet KJ, Padiyar J, Tokman S, Pham C, Garcia R

Purpose: Heparin induced thrombocytopenia (HIT) is a prothrombotic complication due to exposure to heparin. The American Society of Hematology recommends using the 4Ts score to predict risk of HIT and determine the need for subsequent platelet factor 4 (PF4) antibody and serotonin release assay (SRA) laboratory diagnostic testing. While the 4Ts score is a validated pretest for identifying patients at low risk for HIT, its utility in lung transplant recipients is unclear. Lung transplant patients are at increased thrombotic risk and frequently receive heparin post-transplant. This study aims to determine the correlation of 4Ts scores and confirmed HIT in this population.

Methods: This single-center retrospective cohort study was approved by the institutional review board of St. Joseph's Hospital and Medical Center. Patients were included if they were a lung transplant recipient, received anticoagulants associated with potential HIT (e.g. unfractionated heparin, low molecular weight heparin), and had a PF4 antibody test ordered between January 2020 and June 2024 (with or without SRA testing). Exclusion criteria included age <18 years, a prior history of HIT, or other allergy to heparin products. The 4Ts score was calculated using the sum of points (0-2) from four categories: thrombocytopenia, timing of platelet count fall, thrombosis or other sequelae, and other causes of thrombocytopenia. Risk of HIT was classified as low (4Ts score ≤3), intermediate (4-5), or high (≥6). All included lung transplant recipients had a 4Ts score calculated by two independent investigators, with discrepancies resolved by consensus. The 4Ts risk classification was correlated with PF4-antibody and SRA results, with a positive SRA test representing confirmed HIT.

Results: During the study period, 226 HIT tests involving lung transplant recipients were performed. Of these, 205 patients (90.7%) were included in the study. Exclusion reasons were allergy to heparin (n=3, 1 confirmed HIT), HIT test pre-transplantation (n=10), age <18 (n=1), and no heparin exposure (n=7). The study population was 61.5% male and were a mean age of 63 ± 10 years old at transplant. Most patients (99%) underwent bilateral lung transplantation, with 6.3% redo transplants, and 1.5% multiorgan transplants. Prior to HIT testing, 11.7% received therapeutic heparin, 63.4% received prophylactic heparin, 1% received prophylactic enoxaparin, and 23.9% received both prophylactic and therapeutic dosing prior to testing. The mean 4Ts score was 2.7, with 153 (75%) patients classified as low risk, 50 (24%) intermediate risk, and 2 (1%) high risk. Thrombosis was suspected in 31 (15.1%) patients, with 28 (13.7%) having confirmed thrombosis on Doppler imaging. A total of 20/205 (9.8%) patients tested positive for PF4 antibodies, though only 6/205 (2.9%) were SRA positive. Among the SRA-positive patients, the mean 4Ts score was 4.5, with all scoring classified as intermediate risk.

Conclusions: This study supports the use of a low 4Ts score to exclude HIT in lung transplant recipients, as all SRA-positive patients had a 4Ts score >3. The results also indicate a relatively low yield of confirmed HIT cases compared to the high volume of testing, suggesting that current diagnostic practices may lead to over-testing within the lung transplant population. Integrating 4Ts score calculations into the electronic health record may help standardize testing protocols to guide HIT testing in lung transplant recipients.

Nicole Unwin, PharmD

Nicole received her PharmD from the University of Arizona College of Pharmacy and completed her PGY1 pharmacy residency at St. Joseph's Hospital and Medical Center. Her professional interests include oncology and internal medicine. Following residency, Nicole will practice as a clinical specialist at Banner Health MD Anderson Cancer Center.

Mentors: Rhiannon Garcia, PharmD, BCCCP; Kellie Goodlet, PharmD, BCIDP, BCPS, BCTXP; Christine Pham, PharmD

Presented at ASHP Midyear (December 2024, New Orleans, LA) and AzPA Southwestern States Residency Conference (June 2025, Tucson, AZ)

Updates from Past Residents

Congratulations to our 2022-2024 PGY1 and PGY2 Critical Care resident Sydni Martinez, PharmD, BCCCP for being recognized nationally by the ASHP Foundation as the 2024 recipient of the Resident Research Literature Award for her PGY1 residency project assessing letermovir as CMV prophylaxis in lung transplant recipients! (*P.S.- Her research was cited in the 2025 CMV guidelines too!*)

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LITERATURE AWARDS

2024 Resident Research Award

RESIDENT RESEARCH AWARD

Sydni Martinez, PharmD

Evaluating the Efficacy and Safety of Letermovir Compared to Valganciclovir for the Prevention of Human Cytomegalovirus Disease in Adult Lung Transplant Recipients

Comparative Study

› Transpl Infect Dis. 2024 Jun;26(3):e14279. doi: 10.1111/tid.14279. Epub 2024 May 14.

Sydni Martinez [1], Devika Sindu [2], Michael D Nailor [1], Lauren Cherrier [1 2], Sofya Tokman [2], Rajat Walia [2], Kellie J Goodlet [3]

Podcast Alert

Research that Moves Pharmacy Forward: Conversations with the 2024 ASHP Foundation Literature Award Winners

SPEAKERS

- Jai N. Patel, PharmD
- Dave L. Dixon, PharmD
- Sydni Martinez, PharmD
- Dakota Sicignano, PharmD BS
- Kelly McCormick-Sullivan

Updates from Past Residents

John Drennan, PharmD (PGY1 Class of 2023-2024)

Congratulations to John! His residency project was published in the December 2024 issue of The Journal of Neuroscience Nursing:

Drennan JC, Sheehan TO, Schroeder T, Haller JT. Implementation of a Nurse-Initiated Protocol to Improve Enteral Medication Administration Documentation in Stroke Patients. J Neurosci Nurs. 2024 Dec 1;56(6):214-218. doi: 10.1097/JNN.0000000000000785. Epub 2024 Sep 2. PMID: 39231433.

Jules Fuentebella, PharmD, BCPS (PGY1 Class of 2023-2024)

Congratulations to Jules! His residency project was published in the June 2025 issue of Progress in Transplantation:

Fuentebella J, Lam EH, Garcia R, Arjuna A, Lam JC. Utility of Anti-Xa Levels in Lung Transplant Recipients on Apixaban. Prog Transplant. 2025 Jun;35(2):123-127. doi: 10.1177/15269248251343385. Epub 2025 Jun 10. PMID: 40491305..

Sandra Savaya, PharmD, BCOP (PGY1 Class of 2021-2022)

Congratulations to Sandra! Her residency project is currently in-press at the Journal of Hematology Oncology Pharmacy:

Savaya S, Mychajlonka C, Radosevich JJ. Retrospective analysis of an ideal body weight calcitonin dosing protocol for the treatment of hypercalcemia of malignancy. J Hematol Oncol Pharm 2025.

Acknowledgements

PGY1 Residency Program Director
Christian Eslinger, PharmD, MBA, MEng, BCPS

PGY1 Residency Program Coordinator
Jade Lam, PharmD, BCCP

PGY1 Residency Advisory Council (2024-2025)

Miranda Arzate	Christian Eslinger	Caroline Kim	Brian Palmer	Erin Rzeczkowski
Olivia Johns	Michelle Feider	Erwin Lam	Hiren Patel	Amanda Stetson
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Adam Brenner	Tyler Haller	Michael Nailor	Jason Rodriguez	
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For questions regarding the SJHMC PGY1 Research Fundamentals and Application longitudinal experience, please contact Kellie J. Goodlet, PharmD, BCIDP, BCPS, BCTXP (kellie.goodlet@commonspirit.org).