

Title: Surgery at the End of Life for Pediatric Patients Diagnosed with Cancer: A Review of the Pediatric Health Information System Database

Authors: Mijo Hwang¹, Courtney Harris MD², Alexandria Robbins MD³, Jonathan Roach MD^{3,4}, Anna Linton PA-C^{3,4}, Kristine Corkum MD^{3,4}

1-University of Colorado School of Medicine

2-Division of Pediatric Surgery, East Carolina University Brody School of Medicine

3-Division of Pediatric Surgery, University of Colorado Anschutz Medical Campus

4-Surgical Oncology Program, Children's Hospital Colorado

Background: End-of-life (EOL) care for pediatric oncology patients often involves complex decision-making, particularly regarding surgical interventions. There is limited data on the characteristics of pediatric oncology patients who undergo surgery near EOL. This study aimed to examine these aspects of EOL care using data from the Pediatric Health Information System (PHIS) database.

Methods: We conducted a retrospective review of the PHIS database, spanning January 2015-December 2023, focusing on pediatric patients (ages 0-21 years) with both a malignancy flag and a discharge mortality flag. EOL was defined as within 72 hours of date of death. Timing of surgery to death was identified using post-operative length of stay data. Age groups were categorized using American Academy of Pediatrics definitions: infant/toddler, child, and adolescent. We utilized the complex chronic condition flags to identify patient co-morbidities. We conducted descriptive analysis of demographic variables and used Chi-square and Fisher's exact tests to examine associations between categorical variables.

Results: Over the study period, 5,232 pediatric patients with cancer died in PHIS hospitals. The median age was 11 years [IQR 4-16], with 54.4% male, 67.7% non-Hispanic, 55.1% white, and the median hospital length of stay was 15 days [IQR 4-41]. Of the cohort, 1,016 patients (19.4%) underwent surgery within 72 hours of death. There were no significant differences between those who did and did not undergo surgery at EOL by sex, age category, race, or hospital geographic location. However, non-Hispanic patients were more likely to undergo surgery at EOL than Hispanic patients (20.2% vs. 17.1%, $p=0.0113$). Patients with higher-intensity medical interventions, such as intensive care unit admission (20.7% vs. 15.8%, $p<0.0001$), mechanical ventilation (23.1% vs. 13.2%, $p<0.0001$), and extracorporeal membrane oxygenation (30.4% vs. 18.8%, $p<0.0001$) were more likely to undergo surgery within 72 hours of death. Conversely, patients receiving total parenteral nutrition (TPN) were less likely to undergo surgery than those not receiving TPN (7.7% vs. 30.2%, $p<0.0001$). Patients with certain complex chronic condition flags were less likely to have surgery near EOL compared to those without these flags, except for patients with a neurologic/neuromuscular flag (23.6% vs. 17.2%, $p<0.0001$).

Conclusion: Nearly 20% of pediatric cancer patients who die in the hospital undergo surgery within 72 hours of death. The likelihood of surgery near EOL varies by co-morbid conditions, with those having complex chronic conditions generally less likely to undergo surgery, except for those with neurologic/neuromuscular conditions. Patients receiving high-intensity interventions are more likely to have surgery near EOL. This study highlights the significant role of surgery in the EOL management of pediatric cancer patients, indicating a need for further research to assess the benefits and burdens of these interventions in this population.