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

Mijo Hwang[1], Courtney Harris MD[2], Alexandria Robbins MD[3], 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 frequency of interventions and characteristics of pediatric patients with a cancer diagnosis 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

- Retrospective review of the PHIS database, spanning January 2015 to 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 (AAP) definitions: infant/toddler, child, and adolescent
  - Utilized the complex chronic condition flags to identify patient co-morbidities.
- Conducted descriptive analysis of demographic variables and employed Chi-square and Fisher's exact tests to examine associations between categorical variables.

Results

Table 1 Demographic Characteristics of 5232 pediatric-aged patients with a cancer diagnosis who died in PHIS hosptials between 1/2015 and 12/2023

Characteristic	n	%
Sex		
Male	2846	54.4%
Female	2380	45.5%
Unknown	6	0.1%
Age, *years*		
Median [IQR]	11	[4-16]
Age Category		
Infant/Toddler	1042	19.9%
Child	1851	35.4%
Adolescent	2339	44.7%
Ethnicity		
Hispanic or Latino	1440	27.5%
Not Hispanic or Latino	3540	67.7%
Other	252	4.8%
Race		
White	2885	55.1%
Black	830	15.9%
Asian	307	5.9%
Pacific Islander	48	0.9%
American Indian	15	0.3%
Other	912	17.4%
Length of Stay, *days*		
Median [IQR]	17	[5-46]
Admission Category		
Emergent/Urgent	4084	78.1%
Elective	1005	19.2%
Other	143	2.7%
High-Intensity End of Life Factors		
ICU Stay	3813	72.9%
Mechanical Ventilation	3273	62.6%
ECMO	279	5.3%
TPN	2513	48.0%
Hospital Region		
Midwest	1284	24.5%
Northeast	846	16.2%
South	1772	33.9%
West	1330	25.4%
Hospital Location		
Urban	4476	85.6%
Not Urban	756	14.4%

Table 2 Complex Chronic Condition comparision for pediatric-aged patients with a cancer diagnosis who died in PHIS hospitals between 1/2015 and 12/2023 who underwent an operation at end of life (within 72 hours of death) and those who did not undergo and operation at end of life

Complex Chronic Conditions	Operation at End of Life		No Operation at End of Life		p-value
Cardiovascular Flag					*0.0033
Y	334	17.3%	1596	82.7%	
N	682	20.7%	2620	79.3%	
Gastrointestinal Flag					*<0.0001
Y	162	12.5%	1130	87.5%	
N	854	21.7%	3086	78.3%	
Hematologic/immunologic Flag					*<0.0001
Y	352	13.2%	2311	86.8%	
N	664	25.8%	1905	74.2%	
Metabolic Flag					*<0.0001
Y	339	14.8%	1953	85.2%	
N	677	23.0%	2263	77.0%	
Congenital/genetic defect Flag					0.2247
Y	64	9.4%	615	90.6%	
N	952	19.6%	3901	80.4%	
Renal/urologic Flag					*<0.0001
Y	171	11.2%	1353	88.8%	
N	845	22.8%	2863	77.2%	
Respiratory Flag					*<0.0001
Y	85	10.9%	693	89.1%	
N	931	20.9%	3523	79.1%	
Transplant Flag					*<0.0001
Y	153	10.6%	1290	89.4%	
N	863	22.8%	2926	77.2%	
Neurologic/neuromuscular Flag					*<0.0001
Y	431	23.6%	1392	76.4%	
N	585	17.2%	2824	82.8%	

- 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] (Table 1). 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 (ICU) admission (20.7% vs. 15.8%, p<0.0001), mechanical ventilation (23.1% vs. 13.2%, p<0.0001), and extracorporeal membrane oxygenation (ECMO) (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. Patients with a neurologic/neuromuscular flag were more likely to undergo surgery at EOL than those without (23.6% vs. 17.2%, p<0.0001) (Table 2).

Conclusions

- 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, such as ICU care, mechanical ventilation, and ECMO, 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.

References

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Disclosures

- None