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Pediatric Oncology Emergencies: Acute Complications and Management

Todorov Pedersen*

Department of Pediatric Hematology-Oncology & Autologous Hematopoietic Stem Cell Transplantation Unit, University of Crete, Heraklion, Greece

***Corresponding author:** Todorov Pedersen, Department of Pediatric Hematology-Oncology & Autologous Hematopoietic Stem Cell Transplantation Unit, University of Crete, Heraklion, Greece; **Email:** Pedersen.todorov@crete.gr

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Introduction

Pediatric oncology emergencies represent some of the most critical conditions encountered in children with cancer, requiring immediate recognition and intervention to prevent morbidity and mortality. Unlike adults, pediatric patients often present with unique physiological responses to both the malignancy and its treatment, complicating the course of management. These emergencies may arise from the underlying disease itself, such as tumor mass effects, or from treatment-related complications, including infection, metabolic derangements, or organ dysfunction. The management of such emergencies is particularly challenging as it requires a delicate balance between stabilizing the child's acute condition and continuing cancer-directed therapy. Delays in diagnosis or mismanagement can significantly impact survival outcomes. Therefore, awareness of the spectrum of pediatric oncology emergencies, along with evidence-based intervention strategies, is essential for clinicians, caregivers and emergency care providers to optimize patient safety and improve prognosis [1].

Description

Tumor-related emergencies occur when malignancies exert direct mechanical or physiological effects on vital organs. Superior vena cava syndrome (SVCS), often associated with mediastinal masses like lymphomas, can present with respiratory distress, facial edema and venous engorgement, necessitating prompt airway management and corticosteroids to reduce tumor burden. Spinal cord compression is another critical emergency caused by vertebral infiltration or paraspinal masses, leading to back pain, weakness, or paralysis. Immediate administration of corticosteroids and timely imaging are crucial, followed by radiotherapy or surgery to relieve compression. Management includes elevating the head of the bed, administering corticosteroids or osmotic agents and arranging neurosurgical evaluation. Tumor lysis syndrome (TLS), though often classified as a metabolic emergency, arises directly from rapid tumor breakdown and is most common in leukemias and lymphomas with high proliferative rates. Recognizing these emergencies early and initiating urgent interventions are vital to prevent irreversible damage and improve outcomes [2].

Cancer therapies, including chemotherapy, radiation and targeted therapies, predispose pediatric patients to several acute emergencies. Febrile neutropenia is one of the most frequent and life-threatening complications, caused by profound immunosuppression. It requires immediate initiation of broad-spectrum antibiotics even before culture results are available. Sepsis and septic shock can rapidly develop, necessitating fluid resuscitation, vasopressors and intensive care support. Hemorrhagic complications may also occur due to chemotherapy-induced thrombocytopenia, demanding prompt transfusion support. Another significant treatment-related complication is mucositis, leading to severe pain, dehydration and risk of infection. Management includes supportive care, analgesia and infection prophylaxis. Awareness of these potential toxicities allows for timely recognition and tailored management, ensuring the continuation of therapy while minimizing harm [3].

Metabolic emergencies are frequently encountered in pediatric oncology and require rapid correction to avoid fatal outcomes. Tumor Lysis Syndrome (TLS) is a hallmark emergency caused by the rapid release of intracellular contents such as potassium, phosphate and uric acid into the bloodstream, leading to hyperkalemia, hyperphosphatemia, hypocalcemia and acute kidney injury. Preventive strategies include aggressive hydration, allopurinol, or rasburicase, along with close electrolyte monitoring. Hyperleukocytosis, particularly in acute leukemias, increases the risk of leukostasis, which can cause respiratory distress, central nervous system symptoms and hemorrhage. Immediate cytoreductive therapy, hydration and leukapheresis may be necessary. Rapid transfusion and stabilization are critical in these situations. Effective management of metabolic and hematologic crises is essential to maintain treatment continuity and reduce the risk of long-term complications [4].

Managing pediatric oncology emergencies requires not only acute stabilization but also comprehensive supportive care to prevent recurrence. This includes infection control measures, nutritional support, psychosocial care and close monitoring of organ function. Families and caregivers should be educated to recognize early warning signs of emergencies such as fever, bleeding, or neurological changes, ensuring timely medical intervention. A multidisciplinary approach involving pediatric oncologists, emergency physicians, intensivists, nurses and allied health professionals is essential for optimal outcomes. Coordination of care across hospital departments ensures rapid diagnosis, stabilization and continuation of cancer treatment. Advances in supportive therapies, risk stratification and early warning systems are improving survival rates, but continued education, training and infrastructure development remain vital in addressing pediatric oncology emergencies effectively [5].

Conclusion

Pediatric oncology emergencies encompass a wide spectrum of acute complications arising from both malignancy and its treatment. Rapid recognition and evidence-based interventions are crucial to prevent life-threatening consequences and ensure treatment continuity. Tumor-related, treatment-related, metabolic and hematologic emergencies demand tailored strategies guided by multidisciplinary collaboration. Beyond acute care, supportive interventions and preventive measures enhance long-term outcomes and quality of life. Strengthening awareness, preparedness and clinical expertise remains the cornerstone in improving survival and reducing morbidity in children with cancer.

Acknowledgment

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Conflict of Interest

None.

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