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Patient Safety and Quality of Emergency Care for Children with Hematologic Malignancies and Cancer: Challenges and Solutions in Iran and Globally

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Abstract,

Children with hematologic malignancies and other cancers are highly vulnerable to serious, rapidly progressive complications—including fever and neutropenia, bloodstream infection, bleeding, and metabolic disturbances—due to immunosuppression from the underlying disease or chemotherapy. The emergency department (ED) is often the first point of care for these children. Consequently, the quality of triage, timeliness of treatment initiation, medication and blood product safety, management of central venous catheters, and effective communication with the oncology team can decisively influence patient outcomes. In Iran, despite therapeutic advances, important challenges persist, including disparities in access to and quality of services across centers, delays in referral, and weaknesses in adverse event reporting systems. Establishing a dedicated triage pathway, ensuring timely administration of antibiotics for febrile neutropenia, implementing safe medication management, providing targeted staff training, strengthening error-reporting culture, and enabling rapid communication between EDs and referral centers can reduce preventable complications and improve the quality of care.

Key Words: Childhood cancer, Emergency care, Fever and neutropenia, Hematologic malignancies Patient safety, Quality of care.

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Dear Editor,

Scientific advances in the treatment of childhood cancer and hematologic disorders have substantially improved prospects for cure and long-term survival worldwide (1). Nevertheless, a child's outcome can be jeopardized by an acute complication, delayed diagnosis, or delayed intervention in the emergency department (ED). In such situations, the ED is the first point of contact and one of the most critical links in the continuum of care. Any deficiency in clinical, medication-related, or communication processes can have irreversible consequences for the child and family. Patient safety in this high-pressure environment depends not only on the vigilance of individual physicians and nurses, but also on well-designed care systems, clear protocols, and an organizational culture that supports error reporting (2).

Children with cancer and hematologic disorders are exposed to multiple clinical risks due to immunosuppression related to the underlying disease, chemotherapy, radiotherapy, hematopoietic stem cell transplantation, prolonged corticosteroid use, and the presence of central venous catheters. Fever and neutropenia is one of the most urgent and dangerous conditions in these children and may be the first sign of severe infection or sepsis. The 2023 international clinical practice guideline for the management of fever and neutropenia in pediatric patients with cancer and hematopoietic cell transplantation recipients recommends rapid risk assessment, blood cultures, and timely initiation of empirical antibiotics, particularly in clinically unstable patients (3). Multicenter studies have also shown that no risk-stratification tool alone can identify all high-risk children with complete certainty; therefore, maintaining a high level of clinical vigilance and taking precautionary measures in the ED is essential (4).

In leading hospitals, dedicated triage pathways, rapid alert systems, and prioritization of febrile children with cancer have helped reduce time to treatment initiation. However, in general EDs, particularly centers with less familiarity with this patient population, triage based on general criteria may not adequately reflect the clinical severity of a febrile child with cancer. In Iran, challenges such as differences in the quality of services between academic centers and general hospitals, geographical distance from referral centers, and limited access to pediatric hematology and oncology specialists may prolong evaluation and treatment times. Iran's health system provides hospital services through university-affiliated hospitals, but the quality and availability of services are not uniform across regions (5). Delayed diagnosis and treatment of childhood cancer is also a recognized problem. For example, in a study of Iranian children with retinoblastoma, the mean diagnostic delay was reported to be approximately 3.4 months (6). The World Health Organization has also identified delay in cancer treatment as an important contributor to increased mortality (7). Therefore, the ED can play an important role in reducing hospital-related delays through early recognition of warning signs, rapid assessment, and timely referral.

From a global perspective, survival of children with cancer has improved considerably in high-income countries. However, in many resource-limited settings, disparities in access to early diagnosis, specialized treatment, supportive care, and complication management still result in substantial survival gaps. The IRANCANSURV study in Iran showed that the five-year net survival was approximately 67.85% for children with leukemia and 48.63% for those with central nervous system tumors (8). Although these figures reflect progress in Iran's cancer treatment system, a gap remains compared with leading international centers. Improving the quality of acute care, particularly in emergency situations, could help narrow this gap.

Another challenge is the changing pattern of infectious agents and increasing antimicrobial resistance in healthcare settings. International guidelines generally determine initial empirical treatment based on illness severity, local resistance patterns, and the patient's clinical condition (3). In Iran, studies from cancer centers have reported a considerable burden of multidrug-resistant Gram-negative bacteria, including ESBL-producing Enterobacteriaceae and carbapenem-resistant organisms, among hospitalized and pediatric oncology patients, underscoring the importance of rational, evidence-based antibiotic selection (9). Emergency physicians must balance the need for rapid, effective treatment with the need to avoid unnecessary use of broad-spectrum antibiotics. Practical solutions include

developing regional guidelines based on local resistance patterns, providing rapid access to infectious disease or pediatric oncology consultation, and accurately documenting previously administered antibiotics (10).

Medication prescribing in children is another high-risk aspect of emergency care. The doses of many medications are calculated according to the child's weight, age, or body surface area, and even a small error in dose calculation, unit conversion, or dilution can lead to drug toxicity. This risk is greater with chemotherapeutic agents, broad-spectrum antibiotics, cardiovascular drugs, and potent analgesics. The World Health Organization defines a medication error as a preventable event that may lead to inappropriate medication use or patient harm (11). Electronic prescribing systems with dose alerts, dose-verification checklists, accurate labeling of high-alert medications, separation of look-alike and sound-alike drugs, and the involvement of clinical pharmacists in medication-related decisions are among the most important preventive measures (2, 11). In settings where these resources are limited, regular training of nurses and physicians in dose calculation, maintaining a list of high-alert medications, and establishing independent double-checking mechanisms can improve safety.

Bleeding and the need for blood product transfusion are also important challenges for children with hematologic disorders and cancer in the ED. Blood transfusion is a high-risk process requiring accurate identification of the patient and blood product, compatibility checking, assessment for allergic and hemolytic reactions, vital sign monitoring, and precise documentation. A study conducted at Ghaem Educational Hospital in Mashhad examined proactive risk assessment of the blood transfusion process in a pediatric ED and emphasized standardized procedures, patient identification bands, staff training, and root cause analysis of adverse events (12). These findings indicate that ED safety is not merely the result of individual staff vigilance; it is also the product of safe process design, organizational culture, and monitoring systems.

Many children with cancer have central venous catheters or other long-term vascular access devices. These devices reduce the need for repeated venipuncture, but incorrect use can lead to catheter damage, occlusion, bloodstream infection, or bleeding. Emergency staff should be familiar with catheter types, access techniques, maintenance requirements, and warning signs of infection. Hand hygiene, aseptic technique, confirmation of catheter position, and avoidance of excessive pressure during injection or blood withdrawal are essential measures. In referral centers, targeted training of ED staff on central venous catheter care in children with cancer can help prevent avoidable complications.

The quality of emergency care for children with cancer is not limited to technical and pharmacological interventions. Parental anxiety, children's pain, fear of injections and invasive procedures, unfamiliarity with the treatment process, and insufficient information can reduce the quality of the care experience. The World Health Organization emphasizes the participation of parents and children in care, clear and timely communication, age-appropriate information, parental presence, and rapid responses to family concerns (2). This is particularly important in children with cancer, because families often possess valuable information about the child's previous condition, warning signs, treatment plan, medications, most recent neutrophil count, infection history, and type of central venous catheter.

Structured communication among the ED, pediatric oncology, nursing, pharmacy, and laboratory services is another key element of high-quality care. The ISBAR framework—Introduction, Situation, Background, Assessment, and Recommendation—can standardize the transfer of essential clinical information during patient handovers, telephone consultations, interdepartmental transfers, and escalation of care, thereby reducing the risk of incomplete or lost information (13). In children with cancer, a "neutropenic emergency card" or rapid-access record containing the diagnosis, chemotherapy regimen, current medications, most recent absolute neutrophil count, infection history, type of central venous catheter, and contact information for the oncology team can facilitate faster and more accurate decision-making.

A major barrier to improving patient safety is a weak culture of reporting errors and adverse events. In many centers, fear of blame, lack of constructive feedback, weak root cause analysis, and absence of

clear corrective actions cause errors to remain unreported or prevent organizations from learning from them. A study in Iran found that pediatric oncology wards accounted for a considerable proportion of nursing treatment errors and emphasized that creating conditions for honest error reporting by nurses is an important step toward reducing them (14). Iranian studies on patient safety culture have also highlighted infrastructural weaknesses, limited leadership support, gaps with national and international standards, and insufficient emphasis on teamwork (15).

CONCLUSION

In conclusion, children with hematologic malignancies and cancer are a highly vulnerable population, and the ED can play a decisive role in preventing avoidable complications, reducing treatment delays, and improving survival. Global experience shows that rapid triage, fever and neutropenia protocols, safe medication and blood product management, structured interprofessional communication, family participation, and a strong error-reporting culture can significantly improve the quality and safety of care. In Iran, despite considerable capacity in childhood cancer treatment, national standards for emergency care of children with cancer should be developed and implemented in referral hospitals. Adverse event reporting systems should be strengthened, specialized training for ED staff on the unique needs of these children should be expanded, and quality indicators should be monitored continuously. Simultaneous attention to clinical safety, human dimensions of care, and family experience can not only reduce preventable harm but also strengthen families' trust in the health system.

CONFLICT OF INTEREST: None.

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