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Letter to Editor (Pages: 185-188)

Improving Treatment Outcomes in Pediatric Oncology Patients Admitted to Intensive Care Units: Current Challenges and Future Strategies in Iran

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Abstract,

Improvements in survival among children with cancer, together with increasingly complex treatment regimens, hematopoietic stem-cell transplantation, and targeted therapies, have increased the need for admission to pediatric intensive care units (PICUs). In Iran, overall survival among children with cancer has improved in recent years; however, mortality among children with cancer admitted to the PICU remains higher than that reported for the general PICU population. Sepsis, multi-organ dysfunction, central nervous system involvement, and high-risk hematologic malignancies are major contributors to mortality in this population. Delayed recognition of clinical deterioration, drug-resistant infections, late referral, and inequitable access to specialized services remain important challenges in the care of these patients in Iran. Effective strategies include the implementation of pediatric early warning systems, antimicrobial stewardship programs, strengthened collaboration between oncology and PICU teams, optimization of nutritional support, early integration of palliative care, and family-centered care. Developing local clinical guidelines, training healthcare personnel, and establishing multicenter databases may help reduce preventable mortality and improve the quality of care.

Key Words: Iranian health system, Multi-organ dysfunction, Pediatric intensive care, Pediatric oncology, Sepsis.

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Dear Editor,

Substantial advances in the treatment of childhood cancer—including multi-agent chemotherapy protocols, hematopoietic stem-cell transplantation, immunotherapy, and targeted therapies—have improved survival among children with malignancies worldwide. In Iran, national data also indicate that five-year survival among children with cancer has improved over recent decades. This progress reflects the development of pediatric oncology services, expanded referral pathways, and increased access to modern treatments; nevertheless, considerable differences persist across cancer types, age groups, and geographic regions of the country (1, 2).

Despite these advances, some children with cancer experience acute, life-threatening complications during the course of their illness and require intensive care. Severe infection during neutropenia, septic shock, respiratory failure, drug toxicity, tumor lysis syndrome, major hemorrhage, and multi-organ dysfunction are among the most common reasons for PICU admission in this population. Systematic reviews and meta-analyses have shown that a considerable proportion of children with cancer require intensive care at least once during their illness and that pooled PICU mortality in this group is substantially higher than that observed among the general PICU population, in both high-income and low- and middle-income countries (3, 4).

Evidence from specialized referral centers in Iran shows a broadly similar picture, although with differences in disease patterns, severity at admission, and referral pathways. Single-center studies conducted in specialized Iranian centers have reported considerable mortality among children with cancer admitted to the PICU, with higher mortality among patients with high-risk hematologic malignancies, central nervous system tumors, severe sepsis, and multi-organ dysfunction (5, 6). These findings suggest that some children with cancer are referred to the PICU at a stage when significant organ injury has already occurred, thereby reducing the potential effectiveness of resuscitative interventions.

Comparison of these findings with international evidence indicates that the main challenge is not merely a shortage of equipment. Rather, it reflects a combination of delayed recognition of deterioration, differences in referral patterns, geographic inequities in access to specialized services, and variation in the quality of data registration. In international meta-analyses, the need for mechanical ventilation, inotropic support, and renal replacement therapy has been associated with an increased risk of PICU mortality (3, 4). This highlights the importance of early recognition of clinical deterioration and timely referral of high-risk patients.

One of the most important challenges in Iran's critical care system is delayed recognition of gradually worsening clinical status. In children with cancer, warning signs may be atypical or masked by corticosteroid use, analgesics, chemotherapy, or immunosuppression. In many oncology wards, transfer to the PICU occurs only after overt respiratory failure, refractory hypotension, or altered consciousness has developed. Under such circumstances, the likelihood of admission with multi-organ dysfunction increases and the effectiveness of resuscitative interventions decreases. Implementation of pediatric early warning systems (PEWS) in oncology wards, emergency departments, and inpatient units can facilitate earlier recognition of deterioration and timely referral to the PICU through regular monitoring of vital signs, respiratory status, peripheral perfusion, level of consciousness, and concerns raised by nurses or parents. Validation of PEWS among children with cancer and hematopoietic stem-cell transplantation recipients has shown that these tools can help identify high-risk patients and facilitate early intervention (7).

Multidrug-resistant infections represent another major threat to pediatric oncology patients. Prolonged neutropenia, central venous catheters, repeated hospitalizations, extensive use of broad-spectrum antibiotics, and exposure to the hospital environment increase the risk of resistant bacterial and invasive fungal infections. In such settings, delayed initiation of appropriate antibiotics or limited access to effective antimicrobial agents may lead to septic shock and multi-organ dysfunction. International guidelines emphasize the importance of infection prevention in children with cancer and hematopoietic stem-cell transplantation recipients; however, effective implementation requires

adequate laboratory infrastructure, continuous surveillance of antimicrobial resistance patterns, and antimicrobial stewardship programs in each center (8).

Nutrition is another important but often underemphasized component of care for critically ill children with cancer. Nausea, vomiting, mucositis, pain, reduced appetite, and increased metabolic demands may contribute to malnutrition. Malnutrition is associated with impaired immune function, increased risk of infection, respiratory muscle weakness, prolonged mechanical ventilation, and delayed recovery. Regular assessment of nutritional status at admission, active involvement of clinical nutrition teams, and early initiation of nutritional support—including in patients requiring mechanical ventilation—may reduce complications and improve clinical outcomes (5, 6).

Strengthening collaboration between pediatric oncology teams and critical care specialists is also essential. In modern models of care, decisions regarding the continuation or modification of chemotherapy, timing of transplantation, management of treatment-related toxicity, and alignment of treatment goals should be made jointly and in a team-based manner. Fragmented or episodic consultations may result in delayed decision-making, inconsistency in treatment goals, and unnecessary interventions. Daily joint rounds, standardized referral pathways, and clearly defined roles for each team member can improve the quality of care.

Early integration of palliative care should also be an inseparable component of care for children with cancer. Palliative care does not mean withdrawal of treatment; rather, it includes pain and symptom control, psychosocial support, transparent communication with families, and alignment of treatment with the goals of the child and family. International evidence indicates that integrating palliative care into standard pediatric oncology care can improve quality of life and reduce burdensome or non-beneficial interventions at the end of life (9). In Iran, strengthening early referral to palliative care teams and improving coordination among palliative care, oncology, and PICU services are necessary.

Finally, family-centered care should have a central role in clinical decision-making. Parents of children with cancer often experience anxiety, depression, financial burden, and numerous questions regarding prognosis. Regular, empathetic, and transparent communication with families, their participation in decision-making, and the provision of information appropriate to the stage of illness can strengthen trust and help prevent conflict during sensitive treatment decisions (10).

CONCLUSION

Children with cancer who require transfer to the intensive care unit represent one of the most vulnerable patient groups within Iran’s health system. Experience from domestic centers indicates that mortality increases substantially in the presence of severe sepsis, multi-organ dysfunction, and high-risk hematologic malignancies. Improving treatment outcomes requires a shift from a reactive approach to a preventive, team-based, and family-centered model of care. Implementation of early warning systems, antimicrobial stewardship programs, improved nutritional support, strengthened collaboration between oncology and PICU teams, early integration of palliative care, and reduction of regional inequities may improve both survival and quality of life for children and their families. Developing local guidelines, providing continuous workforce training, and establishing multicenter databases are practical steps toward achieving these goals in Iran.

CONFLICT OF INTEREST: None.

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