Original Research

Critical Care Pathways for Pediatric Hematology-Oncology Patients in Italy: A National Survey of Organizational Models and Escalation of Care

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Abstract

Introduction. The management of critically ill pediatric hematology-oncology patients represents a major organizational and clinical challenge due to the high risk of rapid clinical deterioration related to both disease and treatment. Early recognition of deterioration and timely transfer to intensive care units (ICUs) are essential to improve outcomes. However, organizational models and emergency management pathways may vary significantly among centers. The aim of this study is to describe organizational models for the management and transfer of critically ill pediatric oncohematology patients across Italian centers, with particular focus on access to

pediatric intensive care, escalation of care processes, use of clinical deterioration scores, multidisciplinary collaboration, and transfer procedures.

Methods. A multicenter cross-sectional descriptive survey was conducted among the 47 pediatric hematology-oncology centers belonging to the Italian Association of Pediatric Hematology and Oncology (AIEOP) network. Data were collected between May and September 2024 through an ad hoc questionnaire developed by the Nursing Working Group after literature review and expert content validation. The questionnaire explored intensive care availability, transfer logistics, emergency response organization, clinical deterioration assessment systems, transfer documentation, and communication practices.

Results. Thirty-one centers participated (response rate 66%). Most centers were exclusively pediatric (80.6%), while 61.3% had an on-site pediatric intensive care unit (PICU). Among centers without a PICU, patients were transferred either to adult ICUs within the same hospital or to external pediatric ICUs. Transport modalities included stretcher transfer (51.6%), ambulance (25.8%), and helicopter emergency services. Clinical deterioration scores were used in 52% of centers, with Pediatric Early Warning Score (PEWS) being the most frequently adopted tool (69%). Critically ill patients were mainly managed within pediatric hematology-oncology wards or dedicated high-dependency areas (65%). ICU transfer decisions were multidisciplinary in 71% of centers. Most centers (84%) did not have a dedicated Medical Emergency Team or Transfer Rapid Response Team. Standardized nursing handover tools were used in only 32% of centers. Dedicated ICU rooms for pediatric hematology-oncology patients were available in 52% of centers.

Discussion. Despite organizational heterogeneity among Italian pediatric hematology-oncology centers, timely access to intensivecareandmultidisciplinarymanagementaregenerally ensured. However, variability persists regarding emergency response structures, use of clinical deterioration scores, and standardized handover procedures. Strengthening shared organizational models, promoting structured communication tools, and implementing multidisciplinary training programs may further improve the management and safety of critically ill pediatric hematology-oncology patients.

Keywords: Pediatric Hematology-Oncology, Clinical Deterioration, Escalation of Care, Pediatric Intensive Care Unit, Nursing

Introduction

The management of emergencies in pediatric hematology-oncology patients represents a complex clinical challenge. The vulnerability of these patients, resulting both from the

underlying oncological disease and from intensive treatments, exposes them to severe complications such as sepsis, respiratory failure, and hemorrhagic shock (Jagt, 2013). Appropriate and timely intervention is essential; indeed, the literature highlights how a rapid and high-quality response can significantly reduce mortality and improve prognosis (Jones et al., 2015, Hayes et al., 2012).

In Italy, the Italian Association of Pediatric Hematology and Oncology (AIEOP) coordinates a network of specialized centers aimed at providing advanced care and support to children and adolescents affected by oncohematological diseases.

Organizational and logistical differences exist among centers, including the proximity to intensive care services. The aim of this study was to evaluate the availability and distance of intensive care units from AIEOP centers through a cross-sectional observational survey, in order to identify organizational models across different care settings.

Materials and Methods

Study Design, Sample, and Setting

A multicenter cross-sectional descriptive study was conducted involving the 47 pediatric hematology-oncology centers affiliated with AIEOP. The study was carried out by the AIEOP Nursing Working Group. A formal email invitation was sent to the nursing coordinators of each center, requesting that they complete the questionnaire once during the period from May 2024 to September 2024. Completion of the questionnaire was considered implied informed consent for the anonymous processing and dissemination of data for study purposes.

Instrument

A comprehensive literature review was conducted to identify a validated questionnaire investigating organizational models in the management of emergencies in pediatric hematology-oncology. As no suitable validated instrument was identified, an ad hoc questionnaire was developed. Once created, the questionnaire was assessed for clarity and content validity by four members of the AIEOP Nursing Working Group.

The questionnaire consisted of five sections, for a total of 24 questions:

1. Respondent demographics and affiliated center
2. Type of center (pediatric or mixed) and availability of a pediatric intensive care unit (PICU)
3. Distance, transfer time, and mode of transportation
4. Team responsible for identifying clinical deterioration, use of clinical assessment scales, transfer team, and handover procedures
5. Location of dedicated rooms within intensive and sub-intensive care units and isolation measures for pediatric hematology-oncology patients

Ethical Considerations

Ethical committee approval was not required for this study, as it involved an anonymous survey of healthcare professionals and did not collect sensitive personal data. Participation was voluntary, and completion of the questionnaire implied informed consent. Confidentiality and anonymity were ensured throughout the study in accordance with the principles of the Declaration of Helsinki.

Results

This study provides an overview of the characteristics of AIEOP centers regarding the management of emergencies in pediatric hematology-oncology.

All 47 centers belonging to the AIEOP network were contacted; the response rate was 66% (31 centers). Among respondents, 20 were Hub centers, 6 were Spoke centers, while the status of the remaining centers was unknown.

Twenty-five centers (80.6%) were exclusively pediatric, whereas six (19.4%) were mixed pediatric-adult centers.

Detailed analysis of the collected data showed that 19 centers (61.3%) had an in-house pediatric intensive care unit, while 12 centers (38.7%) relied on external intensive care services.

Specifically, among centers with a pediatric intensive care unit, the survey evaluated whether

the PICU was located within the same building or in a different hospital building. In 11 centers (58%), the PICU was located within the same building, whereas in eight centers (42%) it was situated in a different building. In the latter case, transfer times ranged from 5 to 20 minutes.

Regarding the management of oncohematological emergencies in the 13 centers without an on-site PICU, 43% reported transferring patients to general or specialized adult intensive care units within the same hospital, whereas 57% transferred patients to an external pediatric intensive care unit, with transport times ranging from 10–15 minutes to longer durations.

Concerning transport modalities, in 51.6% of cases patients were transferred by stretcher, followed by 25.8% by ambulance, and 9.7% by helicopter emergency medical service or by a combination of these modalities (see Figure 1).

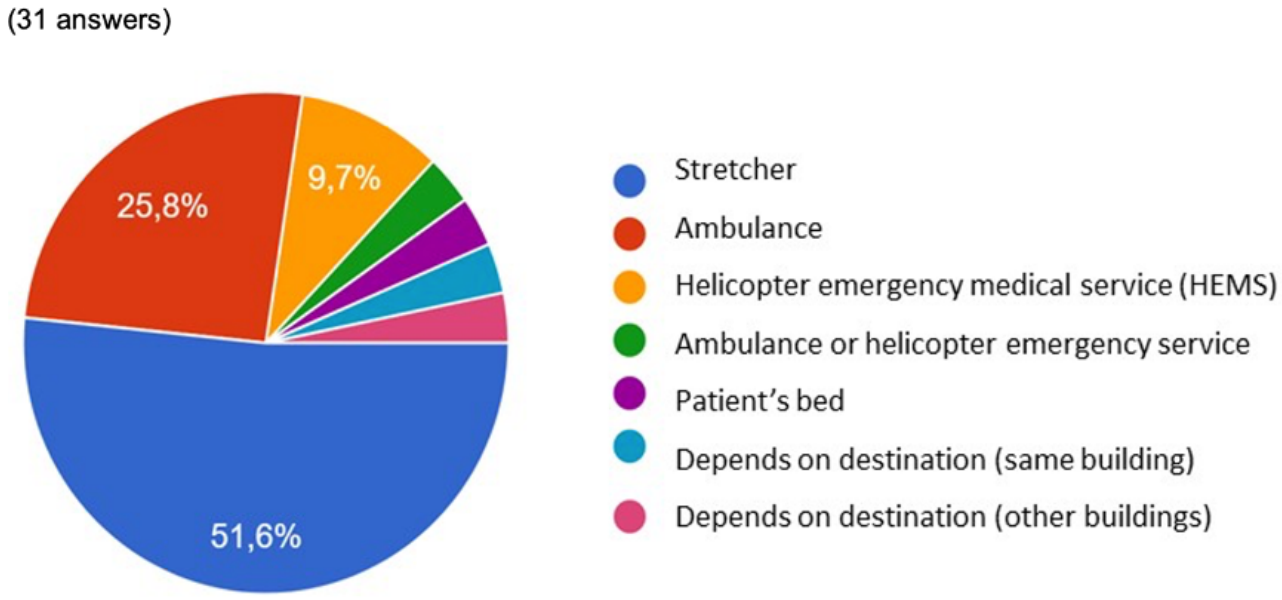


Figure 1. Distribution of transport modalities for critically ill pediatric oncohematology patients transferred to intensive care settings.

The collected results regarding the use of a clinical score for the assessment of deterioration in critically ill pediatric hematology-oncology patients showed that 16 centers (52%) adopted such a tool, whereas the remaining 15 centers (48%) did not use any scoring system (see Figure 2).

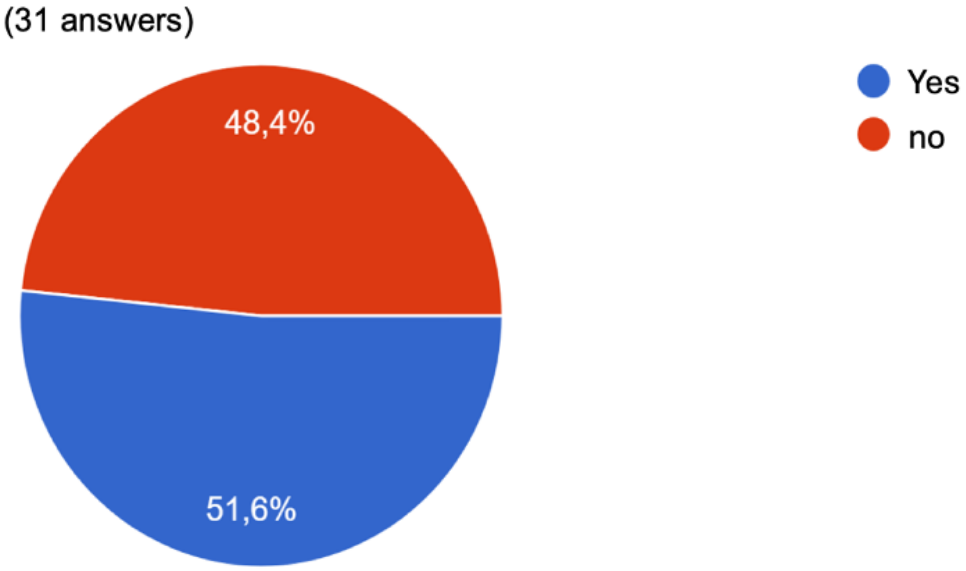


Figure 2. Use of pediatric early warning and clinical deterioration scoring systems across participating centers.

Sixty-nine percent of centers reported using the PEWS score, while the remaining centers used PALARM, PRIMAP, or MEWS scoring systems.

In 22% of cases, critically ill patients were transferred directly to an intensive care unit or a high-dependency care unit.

In 65% of cases, patients were managed within the standard pediatric hematology-oncology ward or in a dedicated high-dependency care area belonging to the same hematology-oncology department (see Figure 3).

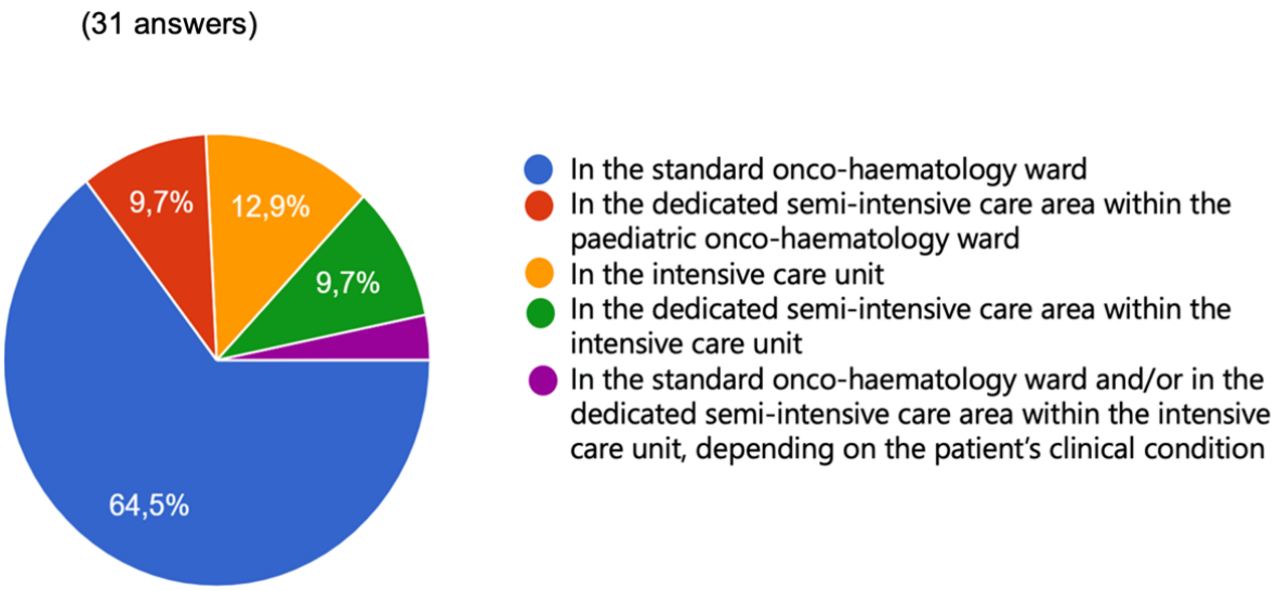


Figure 3. Clinical management of pediatric oncohematology patients requiring semi-intensive care.

When the patient is transferred to the intensive care unit, the decision is made by a multidisciplinary medical and nursing ward team in collaboration with the intensive care team in 71% of cases (see Figure 4).

With regard to patient transfer management, in 26 centers, corresponding to 84% of those surveyed, there was no dedicated team available, such as a TRR or MET (Medical Emergency Team). In the remaining five centers (16%), a

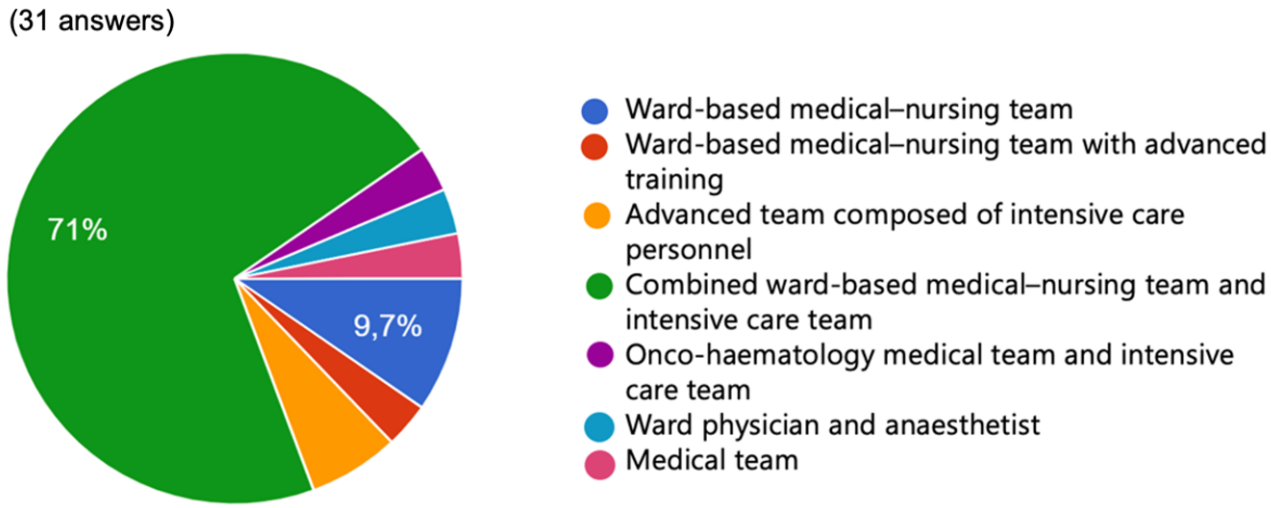


Figure 4. Collaborative decision-making for transfer of critically ill pediatric oncohematology patients to intensive careing centers.

well-structured team was available, composed of various healthcare professionals including an anesthesiologist, an intensive care nurse, and, in some cases, a pediatric hematology-oncology nurse.

In centers where no dedicated structured team was available, additional healthcare professionals were involved alongside those previously mentioned, such as ward pediatricians or healthcare assistants, depending on the patient's level of clinical severity (see Figure 5).

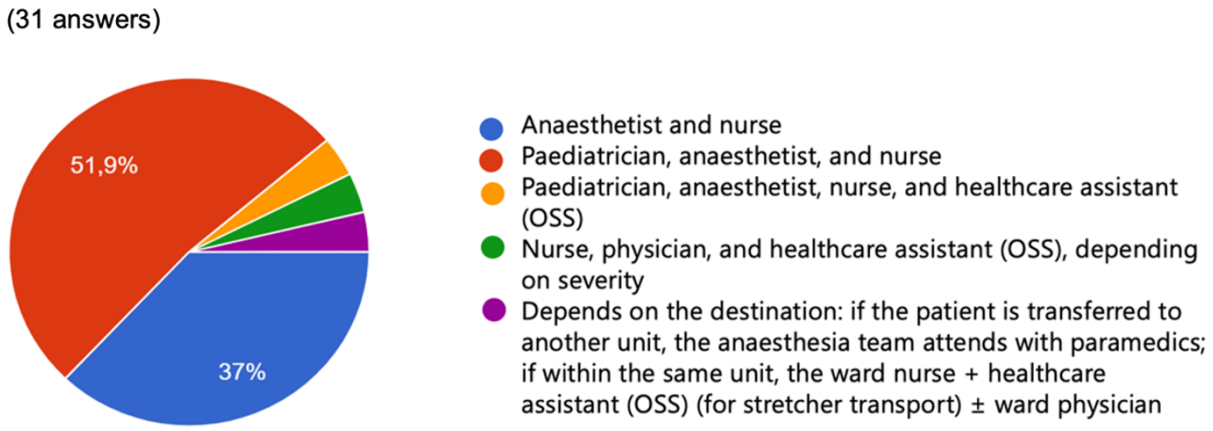


Figure 5. Presence of structured Medical Emergency Teams across participating centers.

Thirty-two percent of centers used a nursing transfer form to facilitate handover communication for critically ill patients (e.g., SBAR, structured handover tools, or integrated electronic medical records), whereas 68% did not use any standardized transfer documentation.

Twelve centers (39%) documented the patient's clinical condition during transfer.

Furthermore, the study investigated whether, following transfer, a dedicated room for critically ill pediatric hematology-oncology patients was available within the intensive care unit, considering the particular vulnerability of these patients.

A dedicated room was available in 16 centers (52%), whereas 10 centers (32%) did not provide a dedicated room; in the remaining cases, availability depended on bed capacity and the patient's infectious status (see Figure 6).

Twenty-five centers included in the study (81%) did not use objective assessment criteria to define the clinical situations in which patients should be transferred to the intensive care unit.

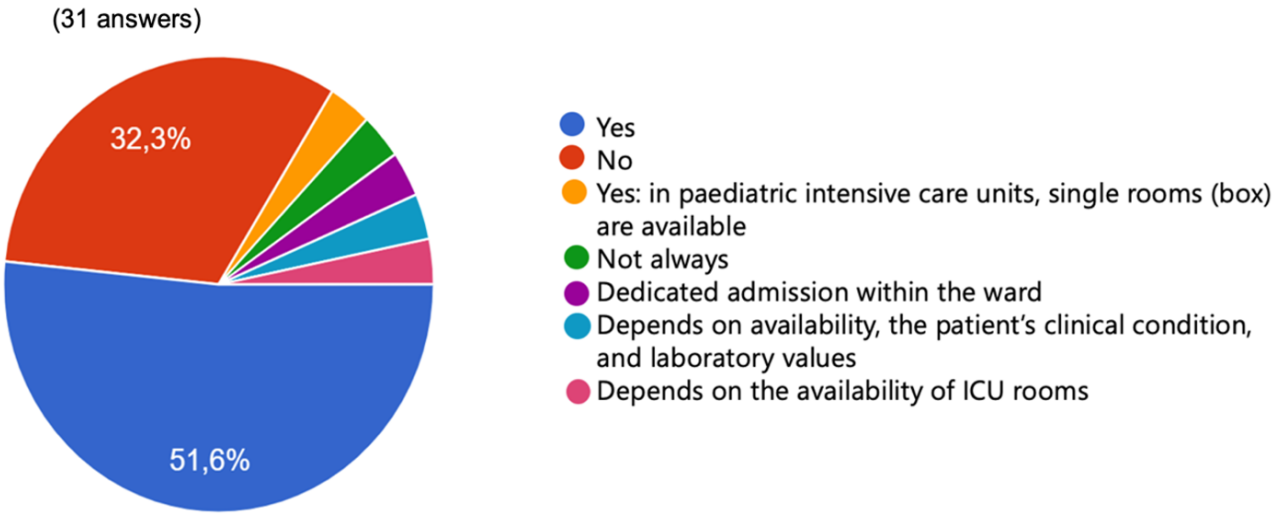


Figure 6. Availability of dedicated ICU rooms for critically ill pediatric oncohematology patients.

Discussion

The logistical and organizational heterogeneity among AIEOP centers allows, in all cases, timely transfer to intensive care units, supported by specialized multidisciplinary teams managing critically ill patients.

The literature highlights that early access to the PICU is significantly associated with improved outcomes during critical illness. In a study conducted at St. Jude Children's Research Hospital, mortality among pediatric oncology patients admitted to intensive care was 17%, with a 6-month survival rate of 69% among patients who had not undergone bone marrow transplantation (Fiser et al., 2005). These findings emphasize how adequate intensive care support may allow approximately two-thirds of patients to survive severe events such as sepsis. Broadening the perspective, a meta-analysis including approximately 17,000 PICU admissions of pediatric oncology patients estimated an average mortality rate of 27.8% (Wösten-van Asperen et al., 2019). Despite slight improvements in recent years, mortality rate remains significantly higher than that observed in the general pediatric population, highlighting the fragility of patients undergoing oncological treatment.

A crucial issue concerns delays in PICU admission: a French multicenter study involving 224 children with cancer demonstrated that non-survivors had waited an average of 24 hours for PICU admission, compared with 12 hours among survivors (Wösten-van Asperen et al., 2019). One-month mortality was influenced by disease severity at admission, with an increased risk (odds ratio 2.3) among patients presenting grade 4 toxicity prior to admission (Fausser et al., 2019). These findings strongly suggest that early recognition of clinical deterioration followed by timely access to intensive care improves survival.

Additional data from a pediatric oncology center in Mexico reported a mortality rate of 9.1% for unplanned PICU admissions, consistent with rates reported in high-income countries (ranging from 6.8% to 17.5%) (Cardenas-Aguirre et al., 2022). This result demonstrates that, even in resource-limited settings, effective organization including critical response teams, Early Warning Scores, and protocols such as the "Golden Hour" can achieve comparable outcomes.

Finally, a large European study highlighted that nighttime or weekend admissions were not associated with increased PICU mortality (Wösten-van Asperen et al., 2019), suggesting that the timing of admission itself is not a determining factor.

The familiarity of intensive care teams with the complexity of pediatric oncology patients, together with the availability of early recognition systems for clinical deterioration such as Pediatric Early Warning Scores (PEWS), is crucial to ensure timely escalation of care. The BedsidePEWS, for example, has been associated with a significant reduction in critical events and has proven to be a useful tool in guiding the intensification of care proportionally to clinical risk (Gawronski et al., 2022). However, as highlighted by a qualitative study conducted in the same setting, the effectiveness of these systems is closely linked to staff training, interprofessional communication, and the organizational context in which care is delivered (Gawronski et al., 2018).

Furthermore, the concept of "critical deterioration", defined as transfer to intensive care followed by the need for ventilation, intubation, or vasopressor support within 12 hours, has been proposed as a pragmatic and early metric to evaluate the effectiveness of rapid response systems in pediatric settings. This indicator was found to occur eight times more frequently than cardiac arrest and was strongly associated with in-hospital mortality, making it a valuable measure for monitoring and optimizing clinical response in high-risk patients (Bonafide et al., 2012). International literature confirms that the effective implementation of rapid response systems, well integrated with early assessment tools and supported by organizational structures capable of sustaining timely decision-making, can significantly improve outcomes even in emergency settings, as demonstrated in Australian pediatric emergency departments (Considine et al., 2018).

The organizational structure of AIEOP centers allows compliance with the fundamental principles recommended by the literature, namely management by specialized personnel and rapid transfer to intensive care units.

The analysis showed that centers without a dedicated emergency team structure (MET or TRR) still consistently involve pediatricians, anesthesiologists, nurses, and healthcare assistants in the management of pediatric oncohematological emergencies.

The development of a multidisciplinary training program promoted by AIEOP, based on high-fidelity simulation for the management of pediatric oncohematological emergencies, could become a cornerstone in fostering staff specialization throughout Italy.

Most centers reported the use of a specific clinical deterioration score for early recognition of patient worsening, a key element in ensuring timely intervention and avoiding delays in ICU transfer.

The literature recommends the adoption and implementation of a generic early warning system such as the Pediatric Early Warning Score (PEWS) (Lambert et al., 2017). Compared with a disease-specific tool such as the Oncology Pediatric Early Warning Score (OPEWS), PEWS reflects a balance between clinical effectiveness, operational simplicity, and interdepartmental standardization. PEWS has become a validated and widely used pediatric tool for clinical monitoring and early identification of deterioration due to its simple structure, rapid applicability, and adaptability across different healthcare settings.

Its broad use promotes a common language among professionals working in heterogeneous environments, facilitating clinical communication and coordination between departments. However, this universality also represents a limitation in highly complex settings such as pediatric hematology-oncology, where patients present specific pathophysiological characteristics that may reduce the sensitivity and specificity of PEWS in identifying early clinical deterioration.

OPEWS was developed to address this need by proposing an assessment system specifically designed for pediatric hematology-oncology patients, including targeted parameters such as heart rate, respiratory rate, and hourly urine output, while reducing subjectivity in clinical domains where PEWS may be less effective (Maccarana et al., 2024). Nevertheless, widespread adoption of a specialist score presents operational barriers, including the need for dedicated staff training, updating internal protocols, and the risk of fragmentation of assessment criteria among different units, all of which may hinder systemic implementation.

Furthermore, the limited availability of multicenter evidence and the lack of large-scale external validation raise concerns regarding the reliability and reproducibility of the score in settings different from those in which it was originally developed. In this context, PEWS continues to represent the preferred option in many institutions because of its well-established operational effectiveness, despite the limitations observed in specific clinical subgroups.

This study demonstrates that most AIEOP centers use clinical deterioration scores in accordance with the gold standard promoted by the scientific literature.

Future perspectives require intelligent integration between generic and specialist tools, moving toward risk-stratification models and personalized medicine approaches implemented across all centers. The adoption of a hybrid system, in which OPEWS is reserved for patients with known oncohematological conditions while PEWS remains the reference tool for the general pediatric population, could represent an effective strategy.

The literature also highlights the importance of an adequate handover system for patient-related information, with communication perceived as an integral component of interfacility transfers (Rosenthal et al., 2016).

Structured and validated handover tools specifically developed for interfacility communication are recommended (Thirnbeck et al., 2024). The use of SBAR forms, for example, has proven to be an effective methodology for improving communication and the quality of information exchange (Shahid et al., 2022).

The use of nursing transfer forms is partially widespread among AIEOP centers; therefore, it is essential that communication strategies be designed and shared in order to streamline the process, improve the quality of information transfer and bidirectional communication, and facilitate positive relationships among healthcare professionals from different institutions.

Despite the large body of scientific literature dedicated to the analysis of treatments in pediatric oncology patients admitted to intensive care units, there are currently no studies directly comparing mortality — the most frequently analyzed outcome — between these patients and clinically comparable patients managed in standard pediatric wards, whether oncological or non-oncological. This gap may be explained by the marked clinical differences between patients admitted to PICU and those remaining in standard wards, as PICU admission is generally

reserved for critically ill patients and therefore does not represent a treatment arm comparable to standard hospitalization. Additionally, most retrospective studies adopt a predominantly descriptive approach.

Although of significant clinical interest, data regarding mortality in standard pediatric oncology wards remain limited. The high heterogeneity of patients and the substantial differences among malignancies make aggregation and comparative analysis of outcomes particularly difficult. Furthermore, many deaths occurring in these settings happen during advanced stages of disease and are not systematically investigated, unlike deaths occurring in intensive care settings.

Among patients admitted to PICU, mortality ranges between 18% and 45%, with peaks exceeding 60% in the most complex cases or in settings with limited resources and less developed healthcare systems (Bhosale et al., 2021, Pechlaner et al., 2022).

It should also be emphasized that differences in PICU admission criteria for pediatric hematology-oncology patients, likely heterogeneous among centers, may significantly contribute to the variability in survival rates reported in the literature.

The higher mortality observed among pediatric oncology patients admitted to PICU, compared with those managed in standard wards, mainly reflects the severity of illness among patients selected for intensive care admission. The principal determinants of poor outcome are therefore not attributable to the care setting itself, but rather to the burden of organ dysfunction present at admission (Dalton et al., 2003, Turner et al., 2016).

The literature focuses particularly on several recurring themes, including the identification of mortality predictors among pediatric oncology patients admitted to PICU, such as the need for mechanical ventilation, inotropic support, or high-intensity treatments, all associated with significantly worse outcomes, especially in patients with hematological malignancies. Several studies have compared mortality between oncological and non-oncological patients treated within the same intensive care unit, generally demonstrating an increased risk for oncology patients even after adjustment for age, severity, and treatment.

Another key area concerns the impact of early intensive care admission, which has been associated with a significant reduction in mortality (Hourmant et al., 2021, El Halal et al., 2012). Finally, some evidence suggests that the care environment itself, particularly the difference between pediatric and adult intensive care units, may influence outcomes in favor of specialized pediatric units (Flerlage et al., 2023, Peltoniemi et al., 2016).

Conclusions

In light of the results obtained through this observational study, it emerges that, despite the organizational heterogeneity across centers within the AIEOP network, the criteria for optimal management of critically ill pediatric hematology-oncology patients are generally respected.

In all participating centers, patients can be transferred to intensive care units within appropriate timeframes, and the management of critically ill patients is entrusted to specialized multidisciplinary teams, either through dedicated Emergency Medical Teams or collaboration between ward-based hematology-oncology staff and anesthesia and intensive care specialists.

The scientific literature suggests the need for continuous organizational reassessment in order to guarantee access to intensive care as rapidly as possible.

The use of clinical deterioration assessment scales is recommended and, in the future, it would be desirable for all centers to adopt them uniformly.

Effective communication and information transfer represent key elements in patient transfer management. One of the future developments of this study will be the creation of a structured and validated nursing transfer form.

The literature does not clearly indicate which setting — standard ward versus intensive care unit — is most appropriate for managing pediatric hematology-oncology patients requiring high-dependency care. Most centers currently manage these patients within hematology-oncology wards. Further studies are needed to define the most appropriate care setting.

This study presents several limitations typical of survey-based and bibliographic research. The

survey design entails potential heterogeneity in the quality and completeness of collected information, with possible bias related to voluntary participation and data availability. Furthermore, the information gathered from

AIEOP centers reflects diverse organizational and operational realities, whereas data from the international literature derive from individual hospitals belonging to healthcare systems structured differently from the Italian system.

Terminology, procedures, and team roles may vary across contexts, making it difficult to consistently attribute a uniform meaning to specific practices. Nevertheless, the results provide valuable insight into pediatric intensive care practices, allowing comparison of organizational approaches and identification of potential areas for improvement and harmonization of clinical practice.

In particular, the findings emphasize the importance of early recognition of critically ill pediatric hematology-oncology patients and their timely transfer to intensive care units, factors that may significantly influence clinical outcomes and guide optimization of care pathways across different clinical settings.

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References

- Bhosale, S. J., Joshi, M., Patil, V. P., Kothekar, A. T., Myatra, S. N., Divatia, J. V., & Kulkarni, A. P. (2021). Epidemiology and Predictors of Hospital Outcomes of Critically Ill Pediatric Oncology Patients: A Retrospective Study. *Indian journal of critical care medicine : peer-reviewed, official publication of Indian Society of Critical Care Medicine*, 25(10), 1183–1188. https://doi.org/10.5005/jp-journals-10071-23984
- Bonafide, C. P., Roberts, K. E., Priestley, M. A., Tibbetts, K. M., Huang, E., Nadkarni, V. M., & Keren, R. (2012). Development of a pragmatic measure for evaluating and optimizing rapid response systems. *Pediatrics,* 129(4), e874–e881. https://doi.org/10.1542/peds.2011-2784
- Cardenas-Aguirre, A., Hernandez-Garcia, M., Lira-De-Leon, B., Munoz-Brugal, Y. L., Wang, H., Villanueva-Diaz, I., Ruiz-Perez, E., Mijares-Tobias, J. M., Giles-Gonzalez, A. O., McArthur, J., Escamilla-Aisan, G., Arias, A., Devidas, M., & Agulnik, A. (2022). Outcomes for critical illness in children with cancer: Analysis of risk factors for adverse outcome and resource utilization from a specialized center in Mexico. *Frontiers in oncology*, 12, 1038879. https://doi.org/10.3389/fonc.2022.1038879
- Considine, J., Rhodes, K., Jones, D., & Currey, J. (2018). Systems for recognition and response to clinical deterioration in Victorian emergency departments. *Australasian emergency care*, 21(1), 3–7. https://doi.org/10.1016/j.auec.2017.12.003
- Dalton, H. J., Slonim, A. D., & Pollack, M. M. (2003). MultiCenter outcome of pediatric oncology patients requiring intensive care. *Pediatric hematology and oncology*, 20(8), 643–649.
- El Halal, M. G., Barbieri, E., Filho, R. M., Trotta, E.deA., & Carvalho, P. R. (2012). Admission source and mortality in a pediatric intensive care unit. *Indian journal of critical care medicine : peer-reviewed, official publication of Indian Society of Critical Care Medicine*, 16(2), 81–86. https://doi.org/10.4103/0972-5229.99114
- Fausser, J. L., Tavenard, A., Rialland, F., Le Moine, P., Minckes, O., Jourdain, A., Tirel, O., Pellier, I., & Gandemer, V. (2017). Should We Pay Attention to the Delay Before Admission to a Pediatric Intensive Care Unit for Children With Cancer? Impact on 1-Month Mortality. A Report From the French Children's Oncology Study Group, GOCE. *Journal of pediatric hematology/oncology*, 39(5), e244–e248. https://doi.org/10.1097/MPH.0000000000000816
- Fiser, R. T., West, N. K., Bush, A. J., Sillos, E. M., Schmidt, J. E., & Tamburro, R. F. (2005). Outcome of severe sepsis in pediatric oncology patients. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, 6(5), 531–536. https://doi.org/10.1097/01.pcc.0000165560.90814.59
- Flerlage, T., Fan, K., Qin, Y., Agulnik, A., Arias, A. V., Cheng, C., Elbahlawan, L., Ghafoor, S., Hurley, C., McArthur, J., Morrison, R. R., Zhou, Y., Park, H. J., Carcillo, J. A., & Hines, M. R. (2023). Mortality Risk Factors in Pediatric Onco-Critical Care Patients and Machine Learning Derived Early Onco-Critical Care Phenotypes in a Retrospective Cohort. *Critical care explorations*, 5(10), e0976. https://doi.org/10.1097/CCE.0000000000000976
- Gawronski, O., Latour, J. M., Cecchetti, C., Iula, A., Ravà, L., Ciofi Degli Atti, M. L., Dall'Oglio, I., Tiozzo, E., Raponi, M., & Parshuram, C. S. (2022). Escalation of care in children at high risk of clinical deterioration in a tertiary care children's hospital using the Bedside Pediatric Early Warning System. *BMC pediatrics*, 22(1), 530. https://doi.org/10.1186/s12887-022-03555-0
- Gawronski, O., Parshuram, C., Cecchetti, C., Tiozzo, E., Ciofi Degli Atti, M. L., Dall'Oglio, I., Scarselletta, G., Offidani, C., Raponi, M., & Latour, J. M. (2018). Qualitative study exploring factors influencing escalation of care of deteriorating children in a children's hospital. *BMJ paediatrics open*, 2(1), e000241. https://doi.org/10.1136/bmjpo-2017-000241
- Hayes, L. W., Dobyns, E. L., DiGiovine, B., Brown, A. M., Jacobson, S., Randall, K. H., Wathen, B., Richard, H., Schwab, C., Duncan, K. D., Thrasher, J., Logsdon, T. R., Hall, M., & Markovitz, B. (2012). A multicenter collaborative approach to reducing pediatric codes outside the ICU. *Pediatrics*, 129(3), e785–e791. https://doi.org/10.1542/peds.2011-0227
- Hourmant, Y., Mailloux, A., Valade, S., Lemiale, V., Azoulay, E., & Darmon, M. (2021). Impact of early ICU admission on outcome of critically ill and critically ill cancer patients: A systematic review and meta-analysis. *Journal of critical care*, 61, 82–88. https://doi.org/10.1016/j.jcrc.2020.10.008
- Jagt E. W. (2013). Improving Pediatric Survival from Resuscitation Events: The Role and Organization of Hospital-based Rapid Response Systems and Code Teams. *Current pediatric reviews*, 9(2), 158–174. https://doi.org/10.2174/1573396311309020009
- Jones, G. L., Will, A., Jackson, G. H., Webb, N. J., Rule, S., & British Committee for Standards in Haematology (2015). Guidelines for the management of tumour lysis syndrome in adults and children with haematological malignancies on behalf of the British Committee for Standards in Haematology. *British journal of haematology,* 169(5), 661–671. https://doi.org/10.1111/bjh.13403
- Lambert, V., Matthews, A., MacDonell, R., & Fitzsimons, J. (2017). Paediatric early warning systems for

detecting and responding to clinical deterioration in children: a systematic review. *BMJ open*, 7(3), e014497. https://doi.org/10.1136/bmjopen-2016-014497

- Maccarana, T., Pillon, M., Bertozzi, V., Carraro, E., Cavallaro, E., Bonardi, C. M., Marchetto, L., Reggiani, G., Tondo, A., Rosa, C., Comoretto, R. I., Amigoni, A., & Biffi, A. (2024). Oncological pediatric early warning score: a dedicated tool to predict patient's clinical deterioration and need for pediatric intensive care treatment. *Pediatric hematology and oncology*, 41(6), 422–431. https://doi.org/10.1080/08880018.2024.2355543
- Pechlaner, A., Kropshofer, G., Crazzolara, R., Hetzer, B., Pechlaner, R., & Cortina, G. (2022). Mortality of Hemato-Oncologic Patients Admitted to a Pediatric Intensive Care Unit: A Single-Center Experience. *Frontiers in pediatrics*, 10, 795158. https://doi.org/10.3389/fped.2022.795158
- Peltoniemi, O. M., Rautiainen, P., Kataja, J., & Ala-Kokko, T. (2016). Pediatric Intensive Care in PICUs and Adult ICUs: A 2-Year Cohort Study in Finland. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, 17(2), e43–e49. https://doi.org/10.1097/PCC.0000000000000587
- Rosenthal, J. L., Okumura, M. J., Hernandez, L., Li, S. T., & Rehm, R. S. (2016). Interfacility Transfers to General Pediatric Floors: A Qualitative Study Exploring the Role of Communication. *Academic pediatrics*, 16(7), 692–699. https://doi.org/10.1016/j.acap.2016.04.003
- Shahid, S., Thabane, L., Marrin, M., Schattauer, K., Silenzi, L., Borhan, S., Singh, B., Thomas, C., & Thomas, S. (2022). Evaluation of a Modified SBAR Report to Physician Tool to Standardize Communication on Neonatal Transport. *American journal of perinatology*, 39(2), 216–224. https://doi.org/10.1055/s-0040-1715524
- Thirnbeck, C. K., Espinoza, E. T., Beaman, E. A., Rozen, A. L., Dukes, K. C., Singh, H., Herwaldt, L. A., Landrigan, C. P., Reisinger, H. S., & Cifra, C. L. (2024). Interfacility Referral Communication for PICU Transfer. *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, 25(6), 499–511. https://doi.org/10.1097/PCC.0000000000003479
- Turner, E. L., Nielsen, K. R., Jamal, S. M., von Saint André-von Arnim, A., & Musa, N. L. (2016). A Review of Pediatric Critical Care in Resource-Limited Settings: A Look at Past, Present, and Future Directions. *Frontiers in pediatrics*, 4, 5. https://doi.org/10.3389/fped.2016.00005
- Wösten-van Asperen, R. M., van Gestel, J. P. J., van Grotel, M., Tschiedel, E., Dohna-Schwake, C., Valla, F. V., Willems, J., Angaard Nielsen, J. S., Krause, M. F., Potratz, J., van den Heuvel-Eibrink, M. M., Brierley, J., & POKER (PICU Oncology Kids in Europe Research group) research consortium (2019). PICU mortality of children with cancer admitted to pediatric intensive care unit a systematic review and meta-analysis. *Critical reviews in oncology/hematology*, 142, 153–163. https://doi.org/10.1016/j.critrevonc.2019.07.014