RESEARCH ARTICLE / *Araştırma Makalesi*

Evaluation of the Demographic and Clinical Characteristics of Patients Followed up a Tertiary Pediatric Intensive Care Unit

Üçüncü Basamak Çocuk Yoğun Bakım Ünitesinde Takip Edilen Hastaların Demografik ve Klinik Özelliklerinin Değerlendirilmesi

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Abstract

Objective	To evaluate the demographic and clinical characteristics of the patients that presented to our pediatric intensive care unit (PICU) between January 1, 2016 and December 31, 2018 and were followed up for at least 24 hours.
Materials and Methods	This study was designed as a single-center retrospective, cross-sectional, descriptive study. A total of 876 admission files belonging to patients who were followed up at PICU between January 01, 2016 and December 31, 2018 were examined. The data of 751 admissions of 640 patients with complete archive records and patient information forms were included in the study.
Results	Forty-three percent of the 640 patients were female, and 32.4% of the total 751 admissions were referrals from hospitals in our city or region for advanced intensive care. Although all cases requiring intensive care, internal or surgical, were hospitalized, infectious diseases were the most common reason for admission. Parameters individually associated with mortality were the presence of chronic disease, need for mechanical ventilation, need for blood products, need for inotropic support, and need for renal replacement therapy. None of the patients who were followed up due to poisoning and airway obstruction died. The hematological-oncological patient group had the highest mortality rate, including end-stage cases.
Conclusion	Our PICU provides an important health service for all critically ill children in our region. The mortality rates were within the ranges reported for Turkey. To obtain better outcomes, it is necessary to strengthen medical staff in our clinic and develop the palliative care centers in our region.
Keywords	Pediatric intensive care units; demographic analysis; health status

Öz

Amaç	*Çocuk yoğun bakım (ÇYB) ünitemize 1 Ocak 2016-31 Aralık 2018 tarihleri arasında başvuran ve en az 24 saat izlenen hastaların demografik ve klinik özelliklerinin değerlendirilmesi amaçlanmıştır.*
Gereç ve Yöntemler	*Bu çalışma, tek merkezli, geriye dönük, kesitsel ve tanımlayıcı bir çalışma olarak tasarlandı. 01 Ocak 2016 ile 31 Aralık 2018 tarihleri arasında ÇYB ünitesinde izlenen hastaların 876 başvuru dosyası incelendi. Arşiv kayıtları ve hasta bilgi formları tam olan 640 hastaya ait 751 başvurunun verileri çalışmaya dahil edildi.*
Bulgular	*640 hastanın yüzde 43'ü kadındı ve toplam 751 başvurunun %32,4'ü ilimiz veya bölgemizdeki farklı hastanelerden ileri düzey yoğun bakım için sevk edildi. Dahili veya cerrahi yoğun bakım gerektiren tüm vakalar hastaneye yatırılsa da en sık başvuru nedeni bulaşıcı hastalıklardı. Mortalite ile bireysel olarak ilişkili parametreler; kronik hastalık varlığı, mekanik ventilasyon ihtiyacı, kan ürünleri ihtiyacı, inotropik destek ihtiyacı ve renal replasman tedavisi ihtiyacı idi. Zehirlenme ve hava yolu tıkanıklığı nedeniyle takip edilen hastaların hiçbiri ölmedi. En yüksek ölüm oranı, son dönem hematolojik-onkolojik hasta grubunda görüldü.*
Sonuç	*ÇYB ünitemiz, tüm kritik hastalığı olan çocuklar için bölgemizde önemli bir sağlık hizmeti sunmaktadır. Ölüm oranları Türkiye'den diğer çalışmalarda bildirilen aralıktadır. Daha iyi sonuçlar elde etmek için kliniğimizdeki sağlık personelinin güçlendirilmesi ve bölgemizdeki palyatif bakım merkezlerinin geliştirilmesi gerekmektedir.*
Anahtar Kelimeler	*Pediatrik yoğun bakım birimleri; demografik analiz; sağlık durumu*

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INTRODUCTION

Pediatric intensive care units (PICUs) are the places where the care and treatment of children aged one month to 18 years with life-threatening diseases are performed continuously with a multidisciplinary approach.[1] In Turkey, in order to achieve a desired level of this critical healthcare service, it has been considered to be necessary to both increase the number of PICUs and improve access to these units.[2] This developing health system and increasing interest in the PICU area has resulted in the extensive development of this critical healthcare service.

This study aimed to evaluate the demographic and clinical characteristics of the patients that presented to our PICU between January 1, 2016 and December 31, 2018 and followed up for at least 24 hours.

MATERIALS and METHODS

This study was designed as a single-center retrospective, cross-sectional, descriptive study (Atatürk University Faculty of Medicine, Division of PICU). Approval for the study was obtained from the local ethics committee (2019/07/53). The study was conducted in accordance with the principles of the Declaration of Helsinki.

For the study, a total of 876 admission files belonging to the patients who were followed up at PICU between January 01, 2016 and December 31, 2018 were examined. The data of 751 admissions of 640 patients with available archive records and complete patient information forms in the electronic environment were included in the study. The data belonging to 35 admissions whose archive records could not be fully accessed electronically, as well as those of 90 admissions with a follow-up duration of less than 24 hours in PICU were excluded from the study. From the medical records, data on age, gender, method and place of presentation at each admission, diagnosis at the time of admission, accompanying chronic diseases, presence of resuscitation before intensive care admission, need and duration of mechanical ventilation, tracheostomy, plasmapheresis, renal replacement therapy, need for positive inotropic support and need for blood products were recorded.

Statistical Analysis

The data obtained from the study were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows v. 22.0 (SPSS Inc. Chicago, IL, USA). Whether the data showed a normal distribution was evaluated with the Shapiro-Wilk normality test. Since the evaluated data did not show a normal distribution, median (minimum-maximum) values were obtained. Pearson's chi-square test was used for the frequency comparison of categorical parameters. The Mann-Whitney U test was used to compare the groups in terms of the mean values of continuous variables that did not show a normal distribution. Parameters considered to have an effect on mortality were tested with the chi-square analysis. The independent effects of the parameters with a significant effect on mortality were further evaluated using the binary logistic regression analysis. $P < 0.05$ was accepted as the statistical significance level.

RESULTS

Of the 640 patients in the study group, 276 were girls (43%) and 364 were boys (57%). At the time of admissions, the median age of the patients was 18.7 months. The distribution of the patients by age groups is shown in Table 1. Of the 751 admissions evaluated in the study, 171 (22.8%) belonged to emergency service presentations, 243 (32.4%) were referrals from other hospitals, and the remaining 337 (44.8%) were transferred from the pediatric services and other departments in our hospital. Of the 243 admissions accepted by referral from other hospitals, 147 (60%) were from surrounding provinces and districts, while 96 (40%) were from Erzurum city center and districts. The distribution of admissions by referral was as follows: Ağrı, 35 (23.8%); Erzincan, 26 (17.7%); Kars, 24 (16.4%); Iğdır, 15 (10.2%); Muş, 8 (5.4%); Van, 8 (5.4%); Ardahan, 7 (4.8%); Artvin, 4 (2.7%); Gümüşhane, 4 (2.7%); Bayburt, 3 (2%); Bingöl, 3 (2%); Bitlis, 3 (2%); Samsun, 2 (1.4%); Rize, 2 (1.4%); Ankara, 1 (0.7%); Batman, 1 (0.7%); and Giresun,

1 (0.7%).

Table 1. Distribution of the patients by age groups at the time of admission

Age group	n	%
≥1 month - <2 years	424	56.50
≥2 years - <5 years	107	14.20
≥5 years - <12 years	137	18.20
≥12 years - <18 years	83	11.10
TOTAL	**751**	**100.00**

It was determined that 547 of the admissions (72.9%) belonged to the patients that were admitted to the intensive care unit for the first time while the remaining 204 (27.1%) were those with a history of at least one intensive care admission. Among the cases with previous intensive care admissions, 111 (54%) had been hospitalized in our clinic and 93 (46%) in other clinics. The mortality rate was 25.5% among the patients with a history of previous intensive care admission and 15.4% for the remaining patients ($p < 0.05$). The incidence of chronic disease was 95.6% for the patients with recurrent admissions and 51.2% for those with a single admission ($p < 0.05$). The diagnoses of the patients at the time of admission to PICU are shown in Table 2.

Table 2. Reasons for admission to PICU

Diagnosis	n	%
Infectious diseases[Pneumonia (29%), sepsis (5.50%), CNS infection (3.90%)]	288	38.40
Post-operative care	104	13.80
Neurological disorder	84	11.20
General condition disorder	59	7.90
Cardiological diseases	42	5.60
Hematological-oncological diseases	41	5.50
Trauma	41	5.50
Hypovolemia-dehydration	26	3.50
Poisoning	23	3.10
Endocrinological diseases	9	1.20
Nephrological diseases	9	1.20
Liver failure	9	1.20
Gastrointestinal diseases	8	1.10
Interstitial lung disease	5	0.70
Other*	3	0.40
TOTAL	751	100.00

PICU, pediatric intensive care unit; CNS, central nervous system *Other: anaphylaxis, subglottic stenosis

When the recurrent admissions were excluded, 366 (57.2%) of the patients included in the study (n = 640) were found to have chronic diseases (Table 3). The median length of hospital stay was 4 (range 1-288) days for the patients with chronic diseases and 3 (range 1-221) days for those without chronic diseases ($p < 0.01$).

Table 3. Distribution of the chronic diseases of the patients without recurrent admissions

Chronic Disease	n	%
Neurological	117	32.00
Cardiological	61	16.70
Congenital	46	12.60
Hematological-oncological	42	11.50
Pulmonary	27	7.40
Metabolic-endocrinological	24	6.60
Nephrological	15	4.10
Genetic	12	3.30
Gastrointestinal	10	2.70
Infectious	1	0.30
Other*	11	3.00
TOTAL	366	100.00

*Other: Malnutrition, history of intestinal surgery, history of colostomy

There was a significant relationship between the presence of chronic disease and mortality ($p < 0.01$). Table 4 presents the relationship of different variables with mortality for a total of 751 admissions. The median length of stay on mechanical ventilation was 3 (range 1-288) days. A significant relationship was found between the duration of mechanical ventilation and mortality ($p < 0.01$). A central venous catheter was applied in a total of 190 (25.3%) admissions. The median length of catheter use was 9 (range 1-120) days. It was observed that the patients with a catheter had a significantly longer hospital stay than those without a catheter (median 12.5 and 2 days, respectively) ($p < 0.01$). The median length of stay in PICU was 3 (range 1-288) days for a total of 751 admissions. The number of patients hospitalized for 120 days or longer was 13. Tracheostomy was performed in 27 (3.6%) of all admissions. For the patients who underwent tracheostomy, the median length of PICU stay was 84 (range 19-262) days, which was significantly longer compared to those that did not require this procedure (3 days) ($p < 0.05$).

It was found that plasmapheresis was required in 1.7% (n = 13) of the 751 admissions and renal replacement therapy (RRT) in 3.3% (n = 25). There was no significant relationship between the need for plasmapheresis and mortality ($p < 0.05$). Of the patients evaluated, 4.8% (n = 36) had a history of cardiac arrest within the 24 hours before their admission. The mortality rate was 13.2% in those with a history of arrest and 2.9% among the remaining patients. A significant relationship was detected between the presence of a history of cardiac arrest and mortality ($p < 0.05$). The parameters that were determined to be individually associated with mortality (Table 4) were further evaluated with the logistic regression analysis (Table 5). According to the results, the presence of chronic disease, need for mechanical ventilation, need for any blood product, need for positive inotropic support, and need for RRT were independent variables affecting mortality while the need for a central venous catheter and the presence of a nosocomial infection were not identified as independent variables affecting mortality. The mortality rates in terms of the patients' admission diagnoses are given in Table 6. The highest mortality was observed in the patients with hematological-oncological diseases and those without any definite diagnoses at the time of admission.

The median value of the Pediatric Risk of Mortality (PRISM)-3 score for all admissions was calculated as 6 (range 0-66). The median PRISM-3 score of the mortality group was 15 (range 0-66), which was significantly higher compared to the surviving patients ($p < 0.05$). The mortality rate for the whole study period was calculated as 18.1% (136/751 admissions). However, when the admissions of the end-stage oncology patients (16 patients, 17 admissions) were excluded, this rate was lower (16.1%, 121/734 admissions).

Table 4. Parameters individually associated with mortality

Parameter	Mortality (n = 136) n (%)	Survival (n = 615) n (%)	Chi-square statistic	p
Chronic disease (n = 475)	112 (82.40)	363 (59)	26.075	<0.01
Need for mechanical ventilation (n = 369)	131 (96.30)	238 (38.70)	159.469	<0.01
Central catheter (n = 190)	72 (52.90)	118 (19)	67.142	<0.01
Need for any blood product (n = 328)	116 (85.30)	212 (34.50)	150.768	<0.01
Need for any vasopressor drug (n = 161)	91 (66.90)	70 (11.40)	203.904	<0.01
Need for RRT (n = 25)	14 (10.30)	11 (1.80)	25.037	<0.01
Hospital-acquired infection (n = 135)	60 (44.10)	75 (12.20)	76.972	<0.01

RRT, renal replacement therapy

Table 5. Binary logistic regression analysis results of the parameters independently associated with mortality

Parameter	p	OR	95% Confidence Interval	
			Upper	Lower
Presence of chronic disease	=0.01	3.14	1.559	6.304
Need for MV	<0.01	16.63	6.214	44.522
Presence of a central venous catheter	0.159	0.64	0.346	1.189
Hospital-acquired infection	0.746	1.10	0.611	1.988
Need for any blood product	<0.01	4.62	2.475	8.634
Need for positive inotropic support	<0.01	6.43	3.724	11.091
RRT	<0.01	3.55	1.166	10.802

OR, odds ratio; MV, mechanical ventilation; RRT, renal replacement treatment

Table 6. Relationship between admission diagnoses and mortality

Admission Diagnoses			Survival	Mortality	Total
Infectious diseases	Pneumonia	n	183	35	218
		%	83.90	16.10	100
	Sepsis	n	33	8	41
		%	80.50	19.50	100
	CNS infection	n	25	4	29
		%	86.20	13.80	100
Neurological disease		n	76	8	84
		%	90.50	9.50	100
Poisoning		n	23	0	23
		%	100	0	100
Cardiological disease		n	37	5	42
		%	88.10	11.90	100
Pulmonary disease		n	4	1	5
		%	80.0	20	100
Hypovolemia-dehydration		n	24	2	26
		%	92.30	7.70	100
Endocrinological diseases		n	7	2	9
		%	77.80	22.20	100
Hematological-oncological diseases		n	22	19	41
		%	53.70	46.30	100
Trauma		n	33	8	41
		%	80.50	19.50	100
Nephrological diseases		n	7	2	9
		%	77.80	22.20	100
Gastrointestinal diseases		n	7	1	8
		%	87.50	12.50	100
Postoperative care		n	91	13	103
		%	87.50	12.60	100
General condition disorder		n	34	25	59
		%	57.60	42.40	100
Liver failure		n	6	3	9
		%	66.70	33.30	100
Airway obstruction		n	3	0	4
		%	100.	0	100

CNS, central nervous system

DISCUSSION

This study was the first to present PICU data in our region, and therefore will make important contributions to the further development of PICU services in our region. The median age of the patients was 18.7 months. The age distribution of the patients was found that 56.5% were under two years old. In similar studies conducted in Turkey, the median age of the patients followed up in PICU has been reported to be 18-51 months.3,4 In line with these data, it can be stated that children that require intensive care in our country are often under the age of five.

Concerning the admission diagnoses of the patients, infections ranked first, followed by post-operative care requirement and neurological diseases (Table 2). Previous studies conducted in Turkey also showed that infectious diseases, respiratory system disorders, neurological system disorders and poisoning were the most common PICU admission diagnosis.[4-7] The data of these studies indicate that inpatient diagnoses varied according to the characteristics of the clinics. Although pneumonia ranked first in our study similar to other studies, there was a varying frequency of post-operative care that was observed as the second most common reason for PICU admission in our study. This is due to the lack of intensive care units in some of the surgical clinics in our hospital. We consider that in some clinics having their own intensive care units, pediatric patients are admitted to PICU due to staff inexperience in critical pediatric patient management. In addition, unlike other studies, we found the rate of poisoning (3.1%) to be low among all the admissions. As we suggested in a previous study,[8] this may have resulted from our approach in which we closely follow-up poisoning cases in the pediatric ward unless their clinical condition deteriorates.

The clinical characteristics of the followed-up patients and the spectrum of cases that can be followed up by a center affect the duration of PICU stay. The median length of the PICU stay of our patients was three days, which is similar to other studies conducted in Turkey.[4,9] In these studies, the duration of intensive care stay varied between two and three days.

PICUs serving as regional centers accept many patients from neighboring provinces,[10] while smaller centers mostly only accept patients from their own provinces.[11] Thirty-six percent of the patients admitted to our clinic had been referred from different provinces other than Erzurum and its districts. It was seen that Ağrı had referred the highest number of patients to our center. It was also determined that patients referred from a total of 15 provinces had been admitted to our clinic. This result indicates that being a large regional center serving a very wide area, our clinic needs to be supported in its development.

In our study, the rate of patients admitted to PICU from the emergency department (22.8%) was found to be lower compared to other studies (43-78%).[4,5,9] In recent years, developments in 112 Emergency Services have made it possible to transfer patients requiring PICU services from all clinics under appropriate conditions. Our clinic is a third-level healthcare center in a geographical region with a population of approximately 10-12 million. Therefore, any patient accepted into our clinic can be directly transferred to PICU without applying to the emergency service of our hospital through 112 Emergency Services after prior consultation with the referring center. This explains the relatively low number of patients admitted to our emergency department.

The rate of patients transferred from the pediatric wards and other departments in our hospital (44.9%) was also found to be higher than reported by other studies.[4,5] This suggests that many patients who may clinically require intensive care are admitted to inpatient services. There may be three reasons for this situation: First, some surgical departments do not have their own intensive care units or be inadequate in the management of the follow-up of critical patients who have undergone surgery. Second, our PICU is an arena-type intensive care unit, in which family mem-

bers cannot accompany their children. Third, although our clinic provides pediatric intensive care not only for our city but also for the whole region, the number of assisting healthcare personnel remains insufficient. Therefore, critical patients that can be followed up in inpatient services in terms of their clinical condition are primarily admitted to those clinics and only transferred to PICU if there is any deterioration in their condition.

In Turkey, for reasons such as the increasing level of education, decreasing infant mortality rates, increasing survival rate of premature babies with a very low birth weight, and increasing care support provided by the state for handicapped children, the life expectancy of handicapped children has extended. These children are prone to recurring, life-threatening health problems, which leads to recurrent intensive care admissions. In our study, the rate of recurrent admissions was 27%. While the prevalence of chronic disease was 95.6% for those with recurrent admissions, this rate was 51.2% among those with a single admission. This finding may be useful in predicting the need for PICU in the hospital admissions of children with chronic diseases.

Mechanical ventilation is a life-saving practice in critically ill children. It is required in cases such as acute respiratory failure, loss of respiratory tract protective reflexes, and loss of consciousness. In previous studies, the rate of PICU patients that required mechanical ventilation has been reported to vary between 20.7 and 67.3%.[9,12-14] Thus, the rate detected in our study (49.1%) is within the reported range. Differences in results can be related to the characteristics of patients admitted to these units. The duration of stay on a mechanical ventilator is directly related to the patient's clinical condition. For our patients, the median length of mechanical ventilation requirement was three days, which indicates that they generally had acute problems that improved rapidly.

In intensive care units, the reasons for the insertion of a central venous catheter include the use of multiple drugs, frequent need for blood and blood products, need for intensive fluid therapy, need for parenteral nutrition, increased inotropic support, impaired peripheral circulation in critically ill patients, and need for central venous pressure measurements. Therefore, central venous catheter placement is undertaken more frequently in PICUs. In a previous study, the frequency of central venous catheter insertion in PICUs was reported to be approximately 24%.[12] In our study, a central venous catheter was used at a similar rate (25.3%). The duration of catheter use can vary according to the needs of the patient. In our patients, the median duration of central venous catheter use was nine days. It was observed that the patients with a central venous catheter had a significantly longer PICU stay than those without catheter requirement ($p < 0.01$). This is because most patients that required these catheters had a critical condition.

Nosocomial infections are often more difficult to treat and result in higher mortality.[15] In addition to being an important problem for inpatients hospitalized for a long time, nosocomial infections can become a more serious problem in intensive care patients. Previously studies reported the rate of hospital-acquired infections to range from 14% to 23.6%.[12,13,16] Similarly, in our study, hospital-acquired infections constituted 18% of all admissions.

In patients admitted to PICU that have or are predicted to have a prolonged need for mechanical ventilation, tracheostomy may be required in the presence of conditions such as trauma in which upper airway integrity is impaired and chronic neurological diseases affecting respiratory muscles. The frequency of the need for tracheostomy in PICUs has been reported to vary between 2.05 and 5.1%.[9,17] In our study, tracheostomy was required in 3.6% of all admissions, which is in agreement with the literature. While the median length of PICU stay was 3 (1-288) days for all admissions, it was 84 (range 19-262) days for those involving a tracheostomy ($p < 0.01$). This reveals the importance of palliative care for these patients.

Patients followed up in PICUs with conditions such as trauma, sepsis, disseminated intravascular coagulation and multiorgan insufficiency frequently need blood and blood products.[18,19] While the use of these substances is life-saving, they may also lead to new problems and complicate patient follow-up. The frequency of blood and blood product use is directly related to the characteristics of patients admitted to PICU. In studies conducted in Turkey, this rate has been reported as 13.6-25.3%.[6,20] In our study, we determined this rate to be 43.7%. Although the need for blood and blood product transfusion varies according to the clinical condition of the patient, the higher rate in our study led us to consider that we should review the indications we use for a blood product transfusion.

Positive inotropic support is an important treatment method required to provide and maintain stable hemodynamics in very critically ill patients. In our study, positive inotropic support was needed in 21.4% of admissions, which is consistent with the rates reported in the literature (11.3-41.5%).[3,20]

Plasmapheresis is a treatment method used in PICUs in cases of intoxication, severe sepsis, metabolic diseases, some autoimmune diseases, and transition to liver transplantation.[21] In our clinic, plasmapheresis is routinely applied in patients with appropriate indications. In the current study, plasmapheresis was applied in 1.7% of the total admissions, which is in agreement with the literature data.[3]

The crude mortality rate in our study was calculated as 18.1%. However, when the admissions of end-stage oncology patients (16 patients, 17 admissions) were excluded, this rate was reduced to 16.1%. We consider that the lack of sufficient palliative care centers in our region significantly increased our mortality rate. According to the "Medical Audit Report of Pediatric Intensive Care Units" published by the Turkish Ministry of Health (TMH)[22] in 2013, the crude mortality rate was 13.9% for the hospitals affiliated with TMH and 18.6% for university hospitals. This situation suggests that more critical patients are followed up in the PICUs of university hospitals. In our clinic, we found a mortality rate close to the average in Turkey. Our data indicate that there is a need for further improvement in pediatric intensive care provided in our region, as well as the whole country.

CONCLUSION

Our PICU provides an important health service for critically ill patients in our region. It is a center where not only inpatients requiring non-surgical treatment but also many surgical patients including cases of trauma, cardiovascular surgery, and transplantation can be followed up. The mortality rate detected in our study was within the range reported for Turkey. However, the study results indicate that the mortality rates can be further reduced by supporting PICUs especially in terms of experienced staff, eliminating deficiencies, and improving palliative care services.

Limitations

We consider that the rates of disseminated intravascular coagulation and multiorgan insufficiency may have been higher than we reported due to the wrong use of the ICD-10 codes. Therefore, the evaluation of these parameters was not included in the study.

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Authorship Contributions

Surgical and Medical Practices - H.K.; Concept - H.K., N.C.; Design - H.K., N.C.; Analysis or Interpretation - H.K., N.C., K.Ç., F.L.; Literature Search - K.Ç., F.L.; Writing - H.K., N.C., K.Ç.

Conflict of interest

The authors declare that there is no conflict of interest.

Informed Consent

This is a retrospective study. All data were obtained from the patient records. The identity information of the patients was not disclosed; therefore, informed consent was not required for this study.

Ethical approval

The authors declare that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation in Turkey and with the 1975 Declaration of Helsinki, as revised in 2008. Ethical approval for the study was obtained from the Faculty of Medicine of Atatürk University (Ethics Committee Year/Number: 2019/07/53).

References

1. *Karaböcüoğlu M, Köroğlu T. Çocuk yoğun bakım esaslar ve uygulamalar. Türkiye, İstanbul Tip Yayınevi; 2008. p. 5.*
2. *Köroğlu TF, Bayrakçı B, Dursun O, Kendirli T, Yıldızdaş D, Karaböcüoğlu M. Çocuk yoğun bakım birimleri için kılavuz: çocuk acil tıp ve yoğun bakım derneği önerileri Derleme. Türk Pediatri Arşivi. 2006;41(3):139-145.*
3. *Ünal E. Çocuk Yoğun Bakım Ünitesinde İzlenen Hastaların Retrospektif Değerlendirilmesi: Dokuz Eylül Üniversitesi Tıp Fakültesi, Tıpta Uzmanlık Tezi, Danışman: Prof. Tolga Fikri KÖROĞLU; 2016.*
4. *Orhan MF, Yakut Hİ, İkiz MA. Çocuk Yoğun Bakım Ünitesinde 2 Yıl İçinde Yatan 938 Olgumuzun Değerlendirilmesi. Türkiye Çocuk Hastalıkları Dergisi. 2012;6(4):228-231.*
5. *Öz O, Bayraktar S, Elevli M, Duru HNS, Çivilibal M, Şahin K. The Evaluation of Patients Admitted to the Pediatric Intensive Care Unit of a Training and Research Hospital. 2015;2(2):65-70.*
6. *Kılıç FZ, Çoban Y, Davutoğlu M, Dalkıran T. A retrospective analysis of patients and investigation of affecting factors of mortality monitored in the pediatric intensive care unit. 2016;3(3):140-145.*
7. *Yeğin LN, Sancak Y, Aşut Ç, Gizem Z, Özdel E. Çocuk Yoğun Bakım Ünitesine Yatan Hastaların Değerlendirilmesi Evaluation Of The Patients Admitted To The Pediatric Intensive Care Unit. 2017;15(2):1-10.*
8. *Keskin H, Kara M, Akat H, Ceviz N. Pediatric Intoxication Cases Followed in the PICU; 2-year Experience: Cocuk Yogun Bakim Unitesinde Takip Edilen Zehirlenme Olgulari; 2 Yillik Deneyim. Journal of Pediatric Emergency and Intensive Care Medicine. 2019;6:150-155.*
9. *Tekerek NÜ, Akyıldız BN. Üçüncü basamak bir merkezde çocuk yoğun bakım hastalarının prognozunun değerlendirilmesi. Türkiye Çocuk Hastalıkları Dergisi.11(4):221-225.*
10. *Poyrazoğlu H, Dursun İ, Güneş T, ve ark. Çocuk Yoğun Bakım Ünitesine Yatan Olguların Değerlendirilmesi ve Sonuçları. Erciyes Medical Journal/Erciyes Tip Dergisi. 2008;30(4):232-237.*
11. *Konca Ç, Tekin M, Karakoç F, Turgut M. Çocuk yoğun bakım ünitesinde yatan 770 hastanın değerlendirilmesi: Tek merkez deneyimi. Türkiye Çocuk Hastalıkları Dergisi. 2015;9(2):90-95.*
12. *Aşıloğlu N, Kot H. Çocuk Yoğun Bakım Ünitesine Yatan Olguların Değerlendirilmesi ve Sonuçları. Turkiye Klinikleri Journal of Pediatrics. 2011;20(1):10-15.*
13. *Khilnani P, Sarma D, Singh R, et al. Demographic profile and outcome analysis of a tertiary level pediatric intensive care unit. Apollo Medicine. 2004;1(2):161-166.*
14. *Volakli E, Sdougka M, Tamiolaki M, Tsonidis C, Reizoglou M, Giala M. Demographic profile and outcome analysis of pediatric intensive care patients. Hippokratia. 2011;15(4):316-322.*
15. *Fridkin SK, Welbel SF, Weinstein RA. Magnitude and prevention of nosocomial infections in the intensive care unit. Infectious disease clinics of North America. 1997;11(2):479-496.*
16. *Raymond J, Aujard Y. Nosocomial infections in pediatric patients: a European, multicenter prospective study. European Study Group. Infection control and hospital epidemiology. 2000;21(4):260-263.*
17. *Wood D, McShane P, Davis P. Tracheostomy in children admitted to paediatric intensive care. 2012;97(10):866-869.*
18. *Armano R, Gauvin F, Ducruet T, Lacroix J. Determinants of red blood cell transfusions in a pediatric critical care unit: a prospective, descriptive epidemiological study. Critical care medicine. 2005;33(11):2637-2644.*
19. *Bateman ST, Lacroix J, Boven K, et al. Anemia, blood loss, and blood transfusions in North American children in the intensive care unit. 2008;178(1):26-33.*
20. *Ceyhan SM. SDÜ Tip Fakültesi Çocuk Yoğun Bakim Ünitesinde İzlenen Hastaların Retrospektif Değerlendirilmesi: Süleyman Demirel Üniversitesi Tip Fakültesi Tipta Uzmanlık Tezi, Danışman: Ahmet Rifat Örmeci; 2014.*
21. *Szczepiorkowski ZM, Winters JL, Bandarenko N, et al. Guidelines on the use of therapeutic apheresis in clinical practice—Evidence-based approach from the apheresis applications committee of the American Society for Apheresis. 2010;25(3):83-177.*
22. *Şencan İ, Bayrakçı B. Çocuk Yoğun Bakım Üniteleri Tibbi Denetim Raporu https://denetimshgm.saglik.gov.tr/. 2013.*