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Prediction of Mortality Circumstances in the Pediatric Intensive Care Unit

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Abstract: We aimed to describe mode of death and the circumstances surrounding dying a pediatric intensive care unit. A retrospective descriptive study all patients (<15 years) dying in the PICU of tertiary care hospital from April 2004 to Jun 2006 (n = 74). Information regarding sex, age, Length of Stay (LOS), primary and admission diagnosis and the way of death was determined. Deaths were classified in 5 groups: Do not resuscitate (DNR), Withdrawal or Limitation of Therapy (W/LT), failed cardiopulmonary resuscitation (Failed CPR), brain death (BD) and terminal organ failure (TOF). Among 1075 admission, 6.8% patients died. Afton admitted during evening (43%). 40.8% died in the first two days. Failed CPR was the most common mode of death (66.2%), BD was found in 14.9%, TOF in 12.2%, W/LT in 2.7% and DNR in 4.1%. We observed that failed CPR is the most common mod of death and active withdrawal is still not widely practiced in our PICU because pediatricians in developing countries have to consider socio cultural and religious factors when making such decisions.

Key words: Pediatric, intensive care unit, mortality

INTRODUCTION

In Pediatric ICUs (PICUs), retrospective studies done during the past decade indicate that 40-60% of all deaths follow limitation or withdrawal of life-sustaining treatment (LST) (Ryan *et al*., 1993; Pendergast and Luce, 1997; Levetown *et al*., 1994). Withdrawal of treatment and do not resuscitate orders ethically acceptable under certain circumstances. Mortality rates differ from 3.8-13% in PICUs in North and South America and Europe (Ten-Berye *et al*., 2006; Kipper *et al*., 2005; Althabe *et al*., 2003). The studies performed at adult ICUs indicate that mortality are affected by several factors, such as time, day and source of admission (Bell and Redelmeier, 2001; Combes *et al*., 2005).

There are few data available from Iranian Pediatric Intensive Care Units (PICU) regarding mode of death and their causes. The purpose of this study was not only to determine the mode of death in the PICU but also to describe the others circumstances surrounding dying in the PICU.

MATERIALS AND METHODS

Our PICU is a 8 combined medical and surgical (Excluding cardiac surgery) Intensive care unit. We carried out a retrospective chart review of all patients less than 15 years of age who died at the PICU between April 2004 and Jun 2006.

Demographic data including sex, age, length of stay, time of admission and death were recorded. The time of admission and death was classified as daytime (between 8Am and 2 Pm), evening (between 2 p.m. and 11 p.m.), or night (between 11 p.m. and 8 a.m.).

The reason for admission was categorized as follows: acute congenital disease, chronic congenital disease, exacerbation of a chronic disease, acute acquired disease, chronic acquired disease and post operative care following surgery. Chronic disease was defined as a condition persisting for more than 30 days (Garros *et al*., 2003).

We categorized admission diagnoses as follows: Respiratory, circulatory, metabolic, neurological and trauma. The source admission was categorized as: Emergency Room (ER), other hospital, pediatric ward of own hospital, and post operative. Deaths were classified in 5 groups: Brain Death (BD), BD was defined according to the Dutch criteria (Ten-Velden and Haffelen, 1997), failed cardiopulmonary resuscitation (failed CPR), do not resuscitation (DNR), withdrawal or limitation of therapy (W/LT), terminal organ failure (TOF).

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The statistical analysis was made using the SPSS 14/windows descriptive data are reported as means (SEM) or median and range. Differences of categorical variables among the mode of death were investigated by the Chi-Square test. The measured variables of age and length of stay were analyzed by non-parametric method. We considered a $p<0.05$ to be significant.

RESULTS AND DISCUSSION

During the study period 1075 patients were admitted at the PICU, among of whom 74(6.8%) died (Table 1). The male: female ratio was 53:21. The mean age of study group was 27.9(±4.13). About 62% of the deaths were aged<2 years. Most patients were admitted during evening and night, 43 and 32%, respectively. About 46% of patients were referred from the emergency room, 26 (35.1%) from the wards of our own hospital and 12 (16.2%) from another hospital. Only 2 (2.7%) were admitted from the operating room. The patients were admitted from the wards of our own hospital were older than other source of admission (mean: 41.46±13.62 months). The median length of stay in the PICU was 3 days [rage: 1-45 days]. The length of stay in the BD and W/LT groups was longer than the failed CPR group ($p<0.01$). But no significant difference was noted between source of admission and length of stay. The reason for admission in PICU was acute acquired disease, 39 patients (52.7%), followed by the chronic congenital disease 28.4%, progression of a chronic disease 8.1%, acquired congenital disease 5.4% and post operative care 2.1%, respectively.

The mode of death was failed CPR in 49(66.2%), BD in 11(14.9%), TOF in 9(12.2%), W/LT in 2(2.7%) and DNR in 3 (4.1%). The patients in the DNR group were younger (mean: 7.33±2.18), whereas patient in TOF group were older (mean: 50.25±18.30). There was no significant difference between age distribution and mode of death ($p = 0.175$). 40.5% of the deaths occurred in the first two days. The percentage of death increased to 62% within 4 days.

The primary PICU admitting diagnosis on the study population were acute respiratory failure in 37%, circulatory in 24.7%, neurological disorder in 27.4% and metabolic in 2.7%. The patients with respiratory disease often died due to failed CPR ($p<0.05$) and more often admitted from emergency ward ($p<0.05$).

In this study, the mortality rate is comparable with mortality rates reported at PICU s in America and Europe (Ten-Berye *et al*., 2006; Kipper *et al*., 2005; Althabe *et al*., 2003). We found that failed CPR was the most common mode of death in our PICU. In contrast to other studies, the frequency of withdrawal was lower than failed CPR (12.2% vs 56.8%) and BD (Ryan *et al*., 1993; Pendergast and Luce, 1997; Levetown *et al*., 1994). Discrepancies might be the results of difference in pediatrician ethical attitudes. For Islamic patients, withdrawal was difficult once life support was instituted, because they believe everything possible has been done. The incidence of DNR (4.1%) in our study was similar to study of Ten-Berge *et al*. (2006), but was lower compared to other studies (14-27%) (Garros *et al*., 2003; Ten-Velden and Haffelen, 1997; Ven Der Wal *et al*., 1999). The meaning of a DNR order is not always the same and furthermore a DNR order is usual the first step in a process of withdrawal (Kipper *et al*., 2005). In contrast to Arias *et al*. (2004) we did not observe association between mortality and time of admission. It remains to determine whether this observation results from difference in the structure of care, processes of care or both.

Table 1: Clinical charactristic and mod of death. (Faild CPR failed cardiopulmonary resuscitation, DNR do not resuscitate. W/LT withdrawal or limitation of therapy, BD brain death TOF terminal organ failure)

	Failed CPR (n = 49)	DNR (n = 3)	W/LT (n = 2)	BD (n = 11)	TOF (n =)	Total (n = 74)
Mean age (months)	25.67	7.33	14.22	36.27	50.25	27.9
Mean length of stay(days)	5	9	11**	11**	3.4	6.08
Reasons of admission (%)						
Acute congenital disease	2(50)	-	-	1(25)	1(25)	4
Acute acquired disease	24(61.5)	-	1(2.6)	8(20.5)	6(15.4)	39
Chronic congenital disease	16(76.2)	3(14.3)	-	1(4.8)	1(4.8)	21
Exaacerabation of a chronic disease	4(66.7)	-	1(16.7)	1(4.8)	1(16.7)	6
Post operative care	1(50)	-	-	1(50)	-	2
Source (%)						
Emergency room	27(79.4)*	2(5.9)	1(2.9)	3(8.8)	1(2.9)	34
Other hospital	8(66.7)	1(8.1)	-	-	3(25)	12
Pediatric ward	12(46.2)	-	1(3.8)	8(30.8)	5(19.2)	26
Post operative	2(100)	-	-	-	-	2
Admission diagnosis						
Respiratory	19((70.4)*	2(7.4)	1(3.7)	2(7.4)	3(11.1)	27
Circulatry	14(73.7)	1(5.3)	-	1(5.3)	3(15.8)	19
Metabolic	2(100)	-	-	-	-	2
Neurological	11(57.4)	-	1(4.8)	8(38.7)	1(4.8)	21

The median length of stay in our PICU is similar in other hospitals (3days) (Particia *et al*., 2005; Peter and Cox, 2003). We found that 40.8% of the patients died within the first two day of admission. These patients were admitted primarily from the ER. The percentage of death increased to 62% within four days. In 12 patients (16.2%) death occurred in the first 24 h of admission to PICU, and was lower than other study (Particia *et al*., 2005). In this study, the length of PICU stay in patients that admitted from the wards of our own hospital longer than other groups.

CONCLUSION

Finally we are aware that our study has several limitations. First it is retrospective study, which could lead to incomplete data. Second, the discussion between the physicians and the families about the end-of-life care were poorly documented in the chart record. This study might represent the reality in just east Azerbaijan in Iran and therefore, others studies are necessary to assess end-of-life situations at the PICU s all over the country.

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