

Deaths In a Non-Trauma Center Pediatric Emergency Department: A Ten-Year Experience

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Abstract

Background: Although trauma is the leading cause of death in children, there are many pediatric emergency departments that are not trauma centers. To facilitate preparedness for the spectrum of presentations of children who die in non-trauma center PED, we described deaths in such a center over a 10-year period.

Methods: Through a retrospective case series, medical records of deaths that occurred in non-trauma center PED from July 1988 to July 1999 were reviewed. Patients were identified by a hospital database and information was extracted from the medical record using a prospectively designed data sheet.

Results: Thirty-nine deaths occurred over a ten-year period for an incidence of 1.7 deaths per 10,000 patient visits. The median age of death was 10 months (range: 1 day-22 yrs) with 17 (44%) of the patients being less than 3 months of age. Sudden Infant Death Syndrome (SIDS), confirmed by autopsy, accounted for 12 (31%) of the deaths. Twenty-one (54%) had an underlying chronic medical illness. Median estimated time intervals of onset of arrest to initiation of CPR were 30 minutes (range: 0 mins-7 hrs). Median resuscitative time intervals in the non-trauma center PED were 22 minutes (range: 4 mins-2 hrs 5 mins). Over half (22, 56%) of the patients were resuscitated for greater than 20 minutes. Only one child who presented without vital signs had them briefly restored.

Conclusion: When an underlying chronic medical condition did not exist, SIDS was the most common cause of death. We propose that educational programs for the staff of non-trauma center PED directed at the acute counseling of families of SIDS victims would be beneficial.

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INTRODUCTION

Trauma is a threat to the health of American children and is the leading cause of death in children after the first year of life.¹ In an attempt to optimize the care of pediatric trauma victims, regionalization of care centers has occurred. One benefit of regionalization is not only the multidisciplinary approach to care of the patient but also the support and counseling that is offered to the family of the victim. Although not documented in the literature, one would assume that members of these teams (dedicated and specially trained nurses, social workers, pastoral care staff) would have specific expertise in dealing with the social, spiritual and grieving components of these unique and difficult situations.

Across the United States, there are many pediatric emergency departments (PED) that are not regional trauma centers. Even though the majority of these centers probably are proficient in addressing the spiritual, social and grieving needs of these families whose children have died in the PED, a systematic approach is generally missing and 24-hour-a-day in house support personnel (social worker, pastoral care, etc.) are lacking. In order to facilitate preparedness of non-trauma centers in dealing with families of children who will die in the PED, we sought to identify and describe pediatric deaths that occurred in a non-trauma center PED over a ten-year period.

METHODS

Through a retrospective case series, medical records of deaths that occurred in a mid-Atlantic urban non-trauma center PED, which treated approximately 23,000 patients per

year from July 1988-July 1999 were reviewed. Subjects were identified by a hospital disposition database and information was extracted from the medical record using a prospectively designed data sheet by a single investigator (AM). Data collected is summarized on the following data sheet:

Figure 1

Data Sheet

Demographics	Age, sex, race	
Chronic medical condition	Yes	No
Resuscitation times	ED	EMS
Method of transport	Private vehicle	EMS
Vital signs on presentation	Yes	No
Pupils fixed and dilated	Yes	No
VS Restored	Yes	No
Approximate "down" times	Minutes	Minutes
Autopsy performed	Yes/ results	No
Diagnosis	Cause of Death	

Results were tallied and descriptive data reported. The protocol was approved by our Institutional Review Board.

RESULTS

Thirty-nine deaths occurred over a ten-year period for an incidence of 1.7 deaths per 10,000 patient visits. The Results are summarized on the following table:

Figure 2

Table 1: Summary of Results

Sex	22 males (56%), 17 females (44%)
Race	24 AA (62%), 13 C (33%), 1 Asian
Age of death	Median 10 months (range: 1d-22yrs)
Chronic medical conditions	21 (54%)
Autopsy confirmed SIDS	12 (31%); 11 < 6 months of age
Transport	32 (82%) EMS
Onset to CPR	Median 30 min (range: 0min-7hrs)
Approximate "down" times	0min-3hrs
Vital signs in ED	26 absent (67%); 27(69%) fixed & dilated pupils
Mean ED resuscitation times	22 min (range: 4min-2hrs 5min)
Mean resuscitation times of patients transported via EMS	26 min (81%) >20min
Mean resuscitation times of patients transported via private vehicle	6 min (100%) >20min
Mean resuscitation times of patients with vital signs absent in ED	11 min (42%) >20min
Mean resuscitation times of patients with vital signs present in ED	11 min (92%) >20min
VS Restored	1 (briefly)

Figure 3

Table 2: Diagnosis at Autopsy

Cause of Death	Number of Patients	Age
SIDS	12	0-11mo
Cardiac	4	3 mo, 4yr, 11yr, 15yr
Asphyxiation	2	2mo, 10mo
Aspiration	1	16mo
Chronic encephalopathy	1	22mo
Sepsis	2	9mo, 10yr
Small bowel obstruction	1	2yr
Drowning	1	2yr

DISCUSSION

The cause of death of children under 6 months of age in this study was sudden infant death syndrome (SIDS) accounting for approximately one third of the cases. The cause of death in children older than 6 months of age were more varied and included respiratory failure, sepsis, small bowel obstruction, and drowning. Similar results were noted in previous studies which reviewed the etiology of non-traumatic cardiopulmonary arrests in children.^{2,3,4,5,6} Among the most common causes of pediatric and adolescent deaths described in these studies were cardiac diseases (hypertrophic cardiomyopathy, myocarditis), airway diseases (pneumonia, epiglottitis, asthma), epilepsy, hemorrhage (gastrointestinal bleeding, ectopic pregnancy), and drug toxicity (tricyclic antidepressants, cocaine). Respiratory failure is the primary factor in deaths of young children and infants as opposed to cardiac failure in adults.²

Thirteen percent of patients in our study had pre-existing cardiac conditions including hypertrophic right heart syndrome, tetralogy of Fallot, Marfan syndrome, left coronary artery, and hypertrophic cardiomyopathy. The rates of sudden cardiac death in children with known cardiac abnormalities varies widely.⁷ Acquired causes of heart disease that may increase the risk of sudden cardiac death in children include Kawasaki syndrome and dilated cardiomyopathy. In addition, sudden cardiac death may result from previously unrecognized congenital heart disease such as hypertrophic cardiomyopathy, congenital coronary artery abnormalities and arrhythmogenic right ventricular dysplasia.

Our study (done in a pediatric emergency department) did not show intra-abdominal hemorrhage as a cause of death however other studies in adolescents and young adults have shown that intra-abdominal bleeding to be a common cause of nontraumatic deaths, specifically from a ruptured ectopic pregnancy.⁸ They concluded that early detection by culdocentesis or paracentesis in female patients of reproductive age could lead to more vigorous fluid resuscitation and early surgical intervention in abdominal hemorrhage.

Fifty-four percent of children in our study had an underlying chronic condition including cerebral palsy, mental retardation, and developmental delay. This is similar to a previous study in which 24 of 32 children (75%) with chronic medical conditions succumbed to cardiopulmonary arrest in the emergency department.⁹ Through a retrospective

review, they described a population of patients who arrived in the PED with pulse and respirations but then sustained cardiopulmonary or respiratory arrest while in the ED. Thirty-two cases of cardiopulmonary ($n = 18$) or respiratory arrest ($n = 14$) were identified, for an incidence of 1.2 arrests per 10,000 patient visits. Causes of arrest varied widely. In addition, it was concluded that the rate of survival of such an arrest in the ED is superior to that in outpatient arrests but inferior to that in inpatient arrests.

SIDS is defined as: “the sudden death of an infant under 1 year of age, which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history.”¹¹ Many factors including prone sleeping position, maternal smoking during pregnancy, prematurity and/or low birth weight, overheating, late or no prenatal care, sleeping on a soft surface, co-sleeping, and male sex, have been implicated in the cause of SIDS.^{12,13,14,15} Gausche reviewed cases of pediatric cardiopulmonary resuscitation in the out-of-hospital setting and found that very few patients presenting as suspected SIDS were successfully resuscitated (0.2%).¹⁶ SIDS remains a common cause of pediatric death in the US with an incidence of 1.5 per 1000 live births, with 88% occurring under 6 months of age.¹³ Since SIDS accounted for one-third of all deaths in our study it would be beneficial to have a team knowledgeable in the acute counseling of families of SIDS victims available for these families.

Studies have identified factors that make ED death notification particularly difficult.¹⁹ Often the ED physician has had no prior relationship with the patient's family. Physicians may also find it particularly difficult in dealing with deaths of pediatric patients since these deaths are often sudden and unexpected. Others have noted that the infrequency of pediatric deaths is a barrier to physician comfort in dealing with the families and their responses to the deaths.¹⁸ Also, physicians may view death as a failure of competency since pediatric deaths are not very common. Ahrens surveyed 122 adult ED physicians on their experiences with pediatric deaths and found that 66% felt that “communication with the family of a child who had died was much more difficult than communication with the family of an adult who had died.”¹⁷

Although physicians are usually responsible for informing the families of the child's death, specialized teams can assist in supporting the families. The teams may include clergy or

social support staff, child life specialists, and nurses to help explain all aspects of the care the child received and to prepare them as to what to expect when viewing the deceased body. These teams would also be critical in monitoring the family's understanding of the events and providing support in such a difficult moment. Care must be taken when communicating information to families using non-technical language and gearing to the family's vocabulary and level of sophistication.²⁰ The death-telling interview can have profound negative consequences for grieving parents if mishandled.¹⁷

In addition, many factors probably contribute to the finding that 56% of the patients in this study had resuscitative efforts greater than 20 minutes in the PED, and why 81% of the patients brought in by EMS had total resuscitation times greater than 20 minutes. These prolonged resuscitation times occurred despite the fact that 42% of these patients had approximate down times ranging up to 3 hours, and 55% (12/22) patients presented with fixed and dilated pupils. Furthermore, 92% of patients presenting to the PED without vital signs had resuscitative efforts for greater than 20 minutes. It has been previously shown that performing CPR for greater than 20-30 minutes in normothermic patients does not improve survival rates.²²

The limitations of this retrospective study include its small number of deaths. However, this is not unique to this report given the relative rare occurrence of pediatric deaths in emergency departments. Additionally, we did not review patients who survived cardiac arrest in the emergency department and therefore did not attempt to draw conclusions about survival rates. In addition, although one patient had vital signs briefly restored in the ED we cannot make conclusions about spontaneous return of circulation based on the results of this study.

CONCLUSION

In this study, SIDS was shown to be the most common cause of death in a PED population of otherwise healthy pediatric patients. We propose that specialized teams (social worker, pastoral care, etc.) can assist in supporting the families whose child has died in the PED. These specialized teams should have expertise in the grief counseling of SIDS victims.

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