

Original Article  
Pediatrics



# End-of-Life Care of Hospitalized Children with Advanced Heart Disease

Joowon Lee , Gi Beom Kim , Mi Kyoung Song , Sang Yun Lee ,  
Min Sun Kim , and Eun Jung Bae

Department of Pediatrics, Seoul National University Children's Hospital, Seoul National University School of Medicine, Seoul, Korea



Received: Sep 11, 2019

Accepted: Feb 20, 2020

**Address for Correspondence:**

Gi Beom Kim, MD, PhD

Department of Pediatrics, Seoul National University Children's Hospital, Seoul National University School of Medicine, 101 Daehak-ro, Jongno-gu, Seoul 03080, Korea.  
E-mail: ped9526@snu.ac.kr

© 2020 The Korean Academy of Medical Sciences.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**ORCID iDs**

Joowon Lee   
<https://orcid.org/0000-0001-5089-6093>  
Gi Beom Kim   
<https://orcid.org/0000-0002-7880-280X>  
Mi Kyoung Song   
<https://orcid.org/0000-0002-0529-869X>  
Sang Yun Lee   
<https://orcid.org/0000-0002-3071-2661>  
Min Sun Kim   
<https://orcid.org/0000-0001-5323-9857>  
Eun Jung Bae   
<https://orcid.org/0000-0003-2134-151X>

**Disclosure**

The authors have no potential conflicts of interest to disclose.

## ABSTRACT

**Background:** Despite improvements in palliative care for critically ill children, the characteristics of end-of-life care for pediatric patients with advanced heart disease are not well-known. We investigated these characteristics among hospitalized children with advanced heart disease in a tertiary referral center in Korea.

**Methods:** We retrospectively reviewed the records of 136 patients with advanced heart disease who died in our pediatric department from January 2006 through December 2013.

**Results:** The median age of patients at death was 10.0 months (range 1 day–28.3 years). The median duration of the final hospitalization was 16.5 days (range 1–690 days). Most patients (94.1%) died in the intensive care unit and had received mechanical ventilation (89.7%) and inotropic agents (91.2%) within 24 hours of death. The parents of 74 patients (54.4%) had an end-of-life care discussion with their physician, and the length of stay of these patients in the intensive care unit and in hospital was longer. Of the 90 patients who had been hospitalized for 7 days or more, the parents of 54 patients (60%) had a documented end-of-life care discussion. The time interval from the end-of-life care discussion to death was 3 days or less for 25 patients.

**Conclusion:** Children dying of advanced heart disease receive intensive treatment at the end of life. Discussions regarding end-of-life issues are often postponed until immediately prior to death. A pediatric palliative care program must be implemented to improve the quality of death in pediatric patients with heart disease.

**Keywords:** Terminal Care; Palliative Care; Palliative Medicine; Heart Diseases; Child

## INTRODUCTION

Heart disease is one of the leading causes of death among children despite the fact that the mortality rate for pediatric patients with advanced heart disease has declined significantly owing to improvements in medical care and cardiac surgeries.<sup>1-3</sup> In addition, heart disease is a major cause of pediatric death due to complex chronic conditions, which account for a significant proportion of pediatric patients who die during hospitalization.<sup>4,5</sup> Children who died from advanced heart disease in hospitals usually received highly aggressive and technical treatment in intensive care units at their end-of-life.<sup>6-8</sup>

**Author Contributions**

Conceptualization: Lee J, Kim GB, Kim MS, Bae EJ. Data curation: Lee J, Kim GB, Kim MS. Formal analysis: Lee J. Methodology: Kim GB, Song MK, Lee SY. Investigation: Lee J. Writing - original draft: Lee J, Kim GB, Kim MS. Writing - review & editing: Song MK, Lee SY, Bae EJ.

Pediatric end-of-life care, an important component of palliative care, aims to satisfy the physical, emotional, social, and spiritual needs of children with life-threatening diseases at their end of life.<sup>9</sup> Appropriate end-of-life care helps mitigate children's suffering, increases parents' preparedness for their child's death, facilitates advanced care planning, and helps the child die in a preferred location.<sup>10,11</sup> Thus, palliative care programs for pediatric patients with life-limiting disease and their families have been steadily evolving worldwide; however, children with heart disease have rarely received palliative care program.<sup>12-14</sup>

Recent research has assessed the pattern of end-of-life care in pediatric patients with advanced heart disease; however, there remains a lack of studies of end-of-life care for patients with heart disease outside western countries.<sup>7,8</sup> Therefore, the purpose of this study was to investigate the current situation of end-of-life care for hospitalized patients with advanced heart disease in a tertiary referral center in Korea.

## METHODS

### Study population

We conducted a retrospective chart review of patients who died in the pediatrics department of our hospital between January 2006 and December 2013. Pediatric patients who were diagnosed with advanced heart disease were included in the study. Young adults between the ages of 18 and 35 years were also included to consider end-of-life care for young adults with complex congenital heart disease. To investigate the characteristics of patients with advanced heart disease with sufficient medical records and to minimize the confounding factors, patients who met the following criteria were excluded from the study: 1) patients who died outside the hospital or in the emergency department, 2) patients who died within 1 month after cardiac surgery, and 3) patients who had an extremely low birth weight, congenital diaphragmatic hernia, persistent pulmonary hypertension of the neonate, malignancy, or an immunodeficiency disorder.

### Data collection

The following patient characteristics at the final hospitalization were recorded: age, sex, diagnosis of primary heart disease, comorbid genetic disease, length of intensive care unit treatment, and duration of hospitalization. Furthermore, we collected data on parent' education level, residence type, and national health insurance status to identify the socioeconomic status of each patient's family.

The mode of death was categorized as follows: 1) death after withdrawal or withholding of life-sustaining support, 2) death during cardiopulmonary resuscitation, and 3) brain death. The location at the time of death and the cause of death were also recorded. Furthermore, we investigated whether cardiopulmonary resuscitation had previously been performed during the final admission. The total length of the final cardiopulmonary resuscitation was analyzed in the group of patients who died during resuscitation.

We also reviewed the interventions performed within the 24 hours prior to death. These data included the presence and type of mechanical ventilation and the use of inhaled nitrogen oxide, dialysis, and parenteral nutrition support. The use of extracorporeal membrane oxygenation support, left ventricular assist device, pacemaker, implantable cardioverter-defibrillator, and cardiac resynchronization therapy device were also recorded. The presence of central

and arterial lines and tracheostomy and gastrostomy tubes was evaluated, as well as the administration of inotropes, antibiotics, analgesics, sedatives, and neuromuscular blockers.

End-of-life care discussion between physician and patients/guardians were identified by searching for documented end-of-life discussions in medical records and the presence of written consent regarding a do-not-resuscitate order. End-of-life care discussions included explanations regarding life expectancy, withdrawal or withholding of certain life-sustaining support, and preferences regarding resuscitation or palliative care. Written consent regarding a do-not-resuscitate order that had been signed by the parents during the final cardiopulmonary resuscitation was not included. We analyzed the relationship between documented end-of-life care discussions and patients' characteristics and the socioeconomic status of their family. Finally, we determined the time interval between the end-of-life care discussion and death for the patients who had been hospitalized for 7 days or more and had documented end-of-life care discussions.

### Statistical analysis

Descriptive data are presented as medians and ranges or means and standard deviations, whereas categorical variables are presented as numbers and percentages. The Mann-Whitney U test and Pearson's  $\chi^2$  test/Fisher's exact test were performed for continuous and categorical variables, respectively. A *P* value less than 0.05 was considered statistically significant. Data manipulation and statistical analyses were performed using SPSS 23.0 for Windows (IBM SPSS, Inc., Chicago, IL, USA) and Microsoft Office Excel 2013 (Microsoft Inc., Redmond, WA, USA).

### Ethics statement

The present study protocol was approved by the Institutional Review Board of Seoul National University Hospital (approval No. 1510-050-710), and patient consent was waived because of the study's retrospective design.

## RESULTS

### Patient characteristics

Of the 652 patients who had died in the pediatric department from all causes of death during the study period, 136 patients with primary heart diseases were included in the current study. Their median age at death was 10.0 months (range, 1 day–28.3 years) (Table 1). More than half of the patients (72, 52.9%) died within a year after their birth, and 24 patients of them died during the neonatal period. The median duration of the final hospitalization was 16.5 days (range, 1–690 days), and 90 patients (66.2%) were hospitalized for 7 days or more. One-quarter of the patients (33, 24.3%) were confirmed or suspected of having comorbid genetic disease. The majority of patients (130, 95.6%) received treatment in an intensive care unit at least once during the final hospitalization, and 74 patients (54.4%) received treatment in an intensive care unit for 7 days or more. Three-fourths of the patients (97, 71.3%) had congenital heart disease, and 36 patients of them had a single ventricle physiology. Most parents (118, 86.8%) had Korean national health insurance. One-third of the patients (46, 33.8%) lived in the capital where the hospital was situated.

### Circumstances of in-hospital death of children with advanced heart disease

Seventy patients (51.5%) died following the withholding or withdrawal of life-sustaining treatment, whereas 66 patients (48.5%) died during cardiopulmonary resuscitation (Table 2).

**Table 1.** Patient characteristics

Characteristics	Values
Age at death, yr	
< 1	72 (52.9)
1–6	34 (25.0)
6–18	19 (14.0)
≥ 18	11 (8.1)
Sex	
Male	78 (57.4)
Female	58 (42.6)
Length of hospital stay, day	16.5 (1–690)
Length of ICU stay, day (n = 130)	12.5 (1–517)
Primary cardiac diagnosis	
Congenital heart disease	97 (71.3)
Single ventricle	
Single ventricle with heterotaxy	16
Hypoplastic left heart syndrome	13
Pulmonary atresia with intact ventricular septum	2
Other single ventricle	5
Pulmonary atresia with ventricular septal defect	13
Tetralogy of Fallot/double outlet of right ventricle	10
Pulmonary vein stenosis/total anomalous pulmonary venous return	8
Ventricular septal defect	6
Complete atrioventricular septal defect	5
Other congenital heart diseases	19
Cardiomyopathy/myocarditis	31 (22.8)
Others <sup>a</sup>	8 (5.9)
Residence	
Capital	46 (33.8)
Non-capital	90 (66.2)
Insurance	
National health insurance	118 (86.8)
Medical aid	18 (13.2)

Data are presented as number (%) or median (range).

ICU = intensive care unit.

<sup>a</sup>Two heart transplantation, 3 primary pulmonary hypertension, 1 mycotic aneurysm, 1 infective endocarditis, and 1 cardiac tumor.

**Table 2.** Circumstances of in-hospital deaths of pediatric patients with heart disease

Variables	Values
Mode of death	
Withholding or withdrawal of life sustaining treatment	70 (51.5)
Withholding of life sustaining treatment	62
Withdrawal of life sustaining treatment	8
Failed resuscitation	66 (48.5)
Brain death	0
Cause of death	
Multi-organ failure	71 (52.2)
Cardiac failure	50 (29.4)
Respiratory failure	8 (5.9)
Sepsis	2 (1.5)
Hemoptysis	3 (2.2)
Arrhythmia	3 (2.2)
Sudden death	9 (6.6)
Location of death	
Ward	8 (5.9)
Pediatric ICU	91 (66.9)
Neonatal ICU	37 (27.2)

Data are presented as number (%).

ICU = intensive care unit.

**Table 3.** Interventions performed within 24 hours of death

Variables	Values
Respiration	
Mechanical ventilation	122 (89.7)
Noninvasive ventilation	2 (1.5)
Nasal prong or facial mask	10 (7.4)
None	2 (1.5)
Inhaled nitric oxide	34 (25.0)
Extracorporeal membrane oxygenation	6 (4.4)
Cardiac devices <sup>a</sup>	12 (8.8)
Dialysis	15 (11.0)
Parenteral nutrition support	56 (41.2)
Central line	109 (80.1)
Arterial line	62 (45.6)
Tracheostomy	19 (14.0)
Gastrostomy	2 (1.5)
Inotropes	124 (91.2)
Antibiotics	95 (69.9)
Analgesics	42 (30.9)
Sedatives	76 (55.9)
Neuromuscular blockers	31 (22.8)

Data are presented as number (%).

<sup>a</sup>Ten pacemaker, 1 implantable cardioverter defibrillator, 1 cardiac resynchronization therapy device.

Among the patients who died during cardiopulmonary resuscitation, the median duration of the cardiopulmonary resuscitation was 51.5 minutes (range, 4–257 minutes), and 25 of 66 patients received cardiopulmonary resuscitation for 1 hour or more. More than half of the patients (71, 52.2%) died from multi-organ failure. Most patients (128, 94.1%) died during care in the intensive care unit, and only 6 patients died in the general ward.

### Interventions performed within 24 hours of death

Most patients (122, 89.7%) had received mechanical ventilation, and 14 patients (10.3%) had received high-frequency oscillatory ventilation within 24 hours of death (Table 3). Extracorporeal membrane oxygenation was applied to 6 patients (4.4%). Of the 12 patients (8.8%) with cardiac devices, 10 patients had a pacemaker, 1 had an implantable cardioverter defibrillator, and 1 had a cardiac resynchronization therapy device. Of the 15 patients (11.0%) who had received renal replacement therapy for acute renal failure, 12 patients received continuous renal replacement therapy and 3 received peritoneal dialysis. Fifty-six patients (41.2%) had received parenteral nutrition support prior to death. Most patients (124, 91.2%) had required inotropic support. More than half of the patients (76, 55.9%) received sedatives, and one-third of the patients (42, 30.9%) received analgesics.

### End-of-life care discussions for children with advanced heart disease

Seventy-four patients (54.4%) had documented end-of-life care discussions; of these, the discussions of 19 patients (19/74, 25.7%) occurred on the date of the patient's death. Seventy patients (70/74, 94.6%) died following the withholding or withdrawal of life-sustaining treatment and consent to a do-not-resuscitate order was written in 59 patients (59/74, 79.7%). The patient's age, sex, and comorbid genetic disease were irrelevant to the documented end-of-life care discussion (Table 4). The patients who had documented end-of-life care discussions were hospitalized longer than those who did not (23 days [range, 1–366] vs. 12 days [range, 1–690];  $P = 0.042$ ). The former patients had also remained for longer in the intensive care unit (15.5 days [range, 1–300] vs. 6 days [range, 1–517];  $P = 0.020$ ). Parents' education level, residence type, and national health insurance status were not related

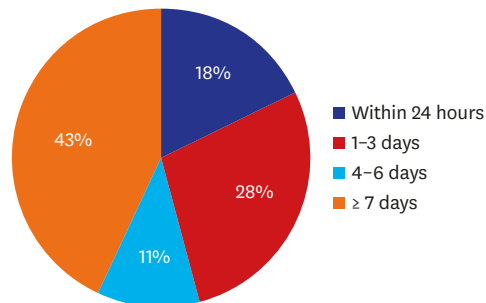
**Table 4.** Demographic and clinical characteristics according to the presence of end-of-life care discussion

Variables	Patients with end-of-life care discussion (n = 74)	Patients without end-of-life care discussion (n = 62)	P value
Age at death	8.5 mon (1 day–28.3 yr)	10.6 mon (1 day–24.1 yr)	0.570
Sex, female	30 (40.5)	28 (45.2)	0.587
Comorbid genetic disease	14 (18.9)	8 (12.9)	0.343
Length of hospital stay, day	23.0 (1–366)	12.0 (1–690)	0.042
Length of hospital stay, ≥ 7 day	54 (73.0)	36 (58.1)	0.067
Length of ICU stay, day (n = 130)	15.5 (1–300)	6.0 (1–517)	0.020
Primary cardiac diagnosis			0.029
Congenital heart disease	48 (64.9)	49 (79.0)	
Cardiomyopathy/myocarditis	23 (31.1)	8 (12.9)	
Other	3 (4.1)	5 (8.1)	
Residence type, capital	27 (36.5)	19 (30.6)	0.473
Insurance, national health insurance	63 (85.1)	55 (88.7)	0.540
Father's education level, bachelor's degree or higher (n = 119)	36 (59.0)	39 (67.2)	0.353
Mother's education level, bachelor's degree or higher (n = 121)	33 (52.4)	30 (51.7)	0.942
Mode of death			< 0.001
Withholding or withdrawal of life sustaining treatment	70 (94.6)	0 (0.0)	
Failed resuscitation	4 (5.4)	62 (100.0)	
Location of death			0.008
Ward	8 (10.8)	0 (0.0)	
PICU/NICU	66 (89.2)	62 (100.0)	
Consent to a do-not-resuscitate order	59 (79.7)	0 (0.0)	< 0.001
Interventions in 24 hr before death			
Mechanical ventilation	60 (81.1)	62 (100.0)	< 0.001
Extracorporeal membrane oxygenation	6 (8.1)	0 (0.0)	0.031
Dialysis	10 (13.5)	5 (8.1)	0.312
Central line	64 (86.5)	45 (72.6)	0.043
Inotropes	62 (83.8)	62 (100.0)	0.001

Data are presented as number (%) or median (range).

ICU = intensive care unit, PICU = pediatric intensive care unit, NICU = neonatal intensive care unit.

to the discussion regarding patients' end-of-life care. All discussions regarding end-of-life care occurred between the physicians and patients' parents or guardians; thus, no patients participated in the discussion of their end-of-life care. Of the 90 patients who were hospitalized for 7 days or more, the parents or guardians of 54 patients (54/90, 60%) had end-of-life care discussions. The time interval from the end-of-life care discussion to death was 3 days or less for 25 patients (25/54, 46.3%) (Fig. 1).



**Fig. 1.** Time interval from the end-of-life care discussion to death in patients who hospitalized for ≥ 7 days (n = 90). Fifty-four patients (54/90, 60%) had end-of-life care discussions, and the time interval from the end-of-life care discussion to death was three days or less for 25 patients (25/54, 46.3%).

## DISCUSSION

This study explored the recent trends in the end-of-life care for pediatric patients with advanced heart disease in a tertiary center in Korea. First, most patients (128, 94.1%) received highly intensive treatment and died in the intensive care unit. Second, half of the patients (66, 48.5%) died following an unsuccessful cardiopulmonary resuscitation, and the duration of some cardiopulmonary resuscitations was prolonged. Third, discussions regarding end-of-life care were often deferred until the day of the patient's death, despite the patient being hospitalized for 7 days or more. Finally, all discussions regarding end-of-life care occurred between the physicians and parents or guardians; the patients did not have the opportunity to confer with physicians about their end-of-life care and might not have been prepared for their death.

Most patients with heart disease were intubated, received highly advanced treatment, or died in the intensive care unit in our study. These findings are consistent with previous studies.<sup>6-8</sup> Some patients (25/66, 37.9%) died after prolonged cardiopulmonary resuscitation, despite the fact that survival rates are lower and neurological outcomes are poorer with longer cardiopulmonary resuscitation duration.<sup>15</sup> The frequencies of sedative drug and analgesic use at the end-of-life were lower than those reported in previous studies, including studies of general pediatric patients. This finding may reflect the invasiveness of the treatment for pediatric patients with heart disease in the current study.<sup>6,16</sup>

There were 3 possible reasons for this reported high invasiveness of treatment. First, with the advancement of technology for surgery and medical treatment, pediatric cardiologists can use advanced medical equipment, such as extracorporeal membrane oxygenation and ventricular assist devices, to save the lives of pediatric patients. In some cases, cardiac transplantation is an option for pediatric patients with heart disease that is intractable to medical treatment or surgery.<sup>17</sup> Therefore, pediatric cardiologists are likely to be unfamiliar with the decision-making process of shifting from attempting to cure patients to performing palliative care.<sup>18</sup> Second, parents are more likely to prolong the lives of their children via invasive treatments, even when there is no chance that the child's life will be extended. They may believe that there are remaining treatment options or that their child will survive, or they may have a more positive view regarding the quality of life of their child despite physician opinions.<sup>19</sup> Third, parents might not have known that their child had little possibility of survival until death was near.<sup>7</sup>

For more than half of the patients with documented discussions regarding end-of-life care, this discussion occurred immediately prior to death. This finding is consistent with that of a previous study.<sup>7</sup> Several studies have demonstrated that early integration of palliative care including end-of-life issues into the treatment plan is necessary to improve patients' quality of life and help patients prepare for their deaths.<sup>20,21</sup> However, there are several obstacles to early discussions regarding end-of-life care. First, some patients exhibit unpredictable courses and variable progression, which make it difficult for the physician to know when these patients will die and therefore, when the physician should start discussing the poor prognosis with the patient's family.<sup>22</sup> Second, a lack of in-depth conversation regarding the prognosis of heart disease can result in different understandings of the prognosis between patients or parents and physicians. Parents who care for pediatric patients with heart disease are likely to have more optimistic expectations regarding the prognosis of their children than physicians.<sup>8,18</sup> Third, physicians may worry that some patients or parents misunderstand the



concept of palliative and end-of-life care and believe palliative care is akin to abandonment of their children.<sup>23</sup> Finally, insufficient education regarding palliative care among pediatricians can make it difficult for them to understand when to initiate discussions regarding end-of-life care.<sup>24</sup>

None of the patients in the present study had the chance to participate in a discussion regarding end-of-life care with their doctors, although some patients were adolescents and young adults. Most discussions regarding end-of-life care occurred between physicians and parents. Patients may have been too sick to participate in discussions regarding their end-of-life care at this point. Physicians or parents may not have wanted to disclose the terminal illness to patients. In Asia, a child is considered a family member for whom the parents are responsible, and parents want to protect their child from highly negative information rather than considering the patient's autonomy.<sup>25,26</sup> However, adolescents and young adults can understand the concept of death, and some of these patients may be competent to make decisions regarding their lives.<sup>27</sup> More than half of adolescents with life threatening disease were reported being comfortable talking about their end-of-life issues. Indeed, not all decisions made by parents and physicians completely accord with the decisions of adolescent and young adult patients.<sup>28</sup> Adolescents and young adult patients should be given opportunities to participate in discussions of end-of-life care and express their wishes via early involvement of palliative care. To ensure optimal communication with adolescents and young adults regarding end-of-life care, physicians should take a gradual approach along with family support, considering the spiritual and cultural factors of the patient.<sup>29</sup> Educational programs, such as communication skills training, have been helpful for physicians to learn the skills required to deal with a challenging situation, including transitioning to palliative care and end of life.<sup>30</sup>

Pediatric palliative care programs must be established to provide appropriate end-of-life care for pediatric patients with advanced heart disease.<sup>9</sup> Pediatric palliative care has evolved over the previous 2 decades such that more than half of the hospitals in the United States have pediatric palliative care programs; historically, pediatric patients with heart disease infrequently used palliative programs.<sup>12,14</sup> Pediatric palliative care teams can assist patients with complex congenital heart disease and their families by providing help with medical decision-making, advance care planning, and bereavement management.<sup>31</sup> A recent single-center study reported that pediatric palliative care teams are primarily involved in the goals of care, psychosocial support, symptom management, and advance care planning for patients with advanced heart disease and their families.<sup>32</sup>

The present study had several limitations. First, as a retrospective study, only documented discussions regarding end-of-life care were collected; thus, discussions that had not been documented could not be identified. Second, this study included a small number of patients who died at a single tertiary referral hospital; thus, we could not identify patterns of end-of-life care among patients who died at home. Third, the subjective symptoms of the patients and the parents' preparedness for end-of-life were not explored; such factors could provide different perspectives of the death process in pediatric patients.

In conclusion, the present study is the first to explore the current status of end-of-life care pediatric patients with advanced heart disease outside of western countries. Our findings demonstrate that among most pediatric patients with advanced heart disease who died in our hospital, discussions with these patients regarding end-of-life care were postponed



until immediately prior to death. Pediatric palliative care programs must be implemented to improve the quality of death of pediatric patients with heart disease.

## REFERENCES

1. Boneva RS, Botto LD, Moore CA, Yang Q, Correa A, Erickson JD. Mortality associated with congenital heart defects in the United States: trends and racial disparities, 1979–1997. *Circulation* 2001;103(19):2376-81.  
[PUBMED](#) | [CROSSREF](#)
2. Gilboa SM, Salemi JL, Nembhard WN, Fixler DE, Correa A. Mortality resulting from congenital heart disease among children and adults in the United States, 1999 to 2006. *Circulation* 2010;122(22):2254-63.  
[PUBMED](#) | [CROSSREF](#)
3. Murphy SL, Mathews TJ, Martin JA, Minkovitz CS, Strobino DM. Annual summary of vital statistics: 2013–2014. *Pediatrics* 2017;139(6):e20163239.  
[PUBMED](#) | [CROSSREF](#)
4. Feudtner C, Hays RM, Haynes G, Geyer JR, Neff JM, Koepsell TD. Deaths attributed to pediatric complex chronic conditions: national trends and implications for supportive care services. *Pediatrics* 2001;107(6):E99.  
[PUBMED](#) | [CROSSREF](#)
5. Kim MS, Lim NG, Kim HJ, Kim C, Lee JY. Pediatric deaths attributed to complex chronic conditions over 10 Years in Korea: evidence for the need to provide pediatric palliative care. *J Korean Med Sci* 2018;33(1):e1.  
[PUBMED](#) | [CROSSREF](#)
6. Morell E, Wolfe J, Scheurer M, Thiagarajan R, Morin C, Beke DM, et al. Patterns of care at end of life in children with advanced heart disease. *Arch Pediatr Adolesc Med* 2012;166(8):745-8.  
[PUBMED](#) | [CROSSREF](#)
7. Blume ED, Balkin EM, Aiyagari R, Ziniel S, Beke DM, Thiagarajan R, et al. Parental perspectives on suffering and quality of life at end-of-life in children with advanced heart disease: an exploratory study. *Pediatr Crit Care Med* 2014;15(4):336-42.  
[PUBMED](#) | [CROSSREF](#)
8. Balkin EM, Wolfe J, Ziniel SI, Lang P, Thiagarajan R, Dillis S, et al. Physician and parent perceptions of prognosis and end-of-life experience in children with advanced heart disease. *J Palliat Med* 2015;18(4):318-23.  
[PUBMED](#) | [CROSSREF](#)
9. Liben S, Papadatou D, Wolfe J. Paediatric palliative care: challenges and emerging ideas. *Lancet* 2008;371(9615):852-64.  
[PUBMED](#) | [CROSSREF](#)
10. Kassam A, Skiadaresis J, Alexander S, Wolfe J. Parent and clinician preferences for location of end-of-life care: home, hospital or freestanding hospice? *Pediatr Blood Cancer* 2014;61(5):859-64.  
[PUBMED](#) | [CROSSREF](#)
11. Wolfe J, Hammel JF, Edwards KE, Duncan J, Comeau M, Breyer J, et al. Easing of suffering in children with cancer at the end of life: is care changing? *J Clin Oncol* 2008;26(10):1717-23.  
[PUBMED](#) | [CROSSREF](#)
12. Beringer AJ, Heckford EJ. Was there a plan? End-of-life care for children with life-limiting conditions: a review of multi-service healthcare records. *Child Care Health Dev* 2014;40(2):176-83.  
[PUBMED](#) | [CROSSREF](#)
13. Feudtner C, Kang TI, Hexem KR, Friedrichsdorf SJ, Osenga K, Siden H, et al. Pediatric palliative care patients: a prospective multicenter cohort study. *Pediatrics* 2011;127(6):1094-101.  
[PUBMED](#) | [CROSSREF](#)
14. Feudtner C, Womer J, Augustin R, Remke S, Wolfe J, Friebert S, et al. Pediatric palliative care programs in children's hospitals: a cross-sectional national survey. *Pediatrics* 2013;132(6):1063-70.  
[PUBMED](#) | [CROSSREF](#)
15. Matos RI, Watson RS, Nadkarni VM, Huang HH, Berg RA, Meaney PA, et al. Duration of cardiopulmonary resuscitation and illness category impact survival and neurologic outcomes for in-hospital pediatric cardiac arrests. *Circulation* 2013;127(4):442-51.  
[PUBMED](#) | [CROSSREF](#)
16. Ragsdale L, Zhong W, Morrison W, Munson D, Kang TI, Dai D, et al. Pediatric exposure to opioid and sedation medications during terminal hospitalizations in the United States, 2007–2011. *J Pediatr* 2015;166(3):587-593.e1.  
[PUBMED](#) | [CROSSREF](#)

17. Rossano JW, Dipchand AI, Edwards LB, Goldfarb S, Kucheryavaya AY, Levvey Rn BJ, et al. The registry of the International Society for Heart and Lung Transplantation: nineteenth pediatric heart transplantation report-2016; focus theme: primary diagnostic indications for transplant. *J Heart Lung Transplant* 2016;35(10):1185-95.  
[PUBMED](#) | [CROSSREF](#)
18. Durall A, Zurakowski D, Wolfe J. Barriers to conducting advance care discussions for children with life-threatening conditions. *Pediatrics* 2012;129(4):e975-82.  
[PUBMED](#) | [CROSSREF](#)
19. de Vos MA, van der Heide A, Maurice-Stam H, Brouwer OF, Plötz FB, Schouten-van Meeteren AY, et al. The process of end-of-life decision-making in pediatrics: a national survey in the Netherlands. *Pediatrics* 2011;127(4):e1004-12.  
[PUBMED](#) | [CROSSREF](#)
20. American Academy of Pediatrics. Committee on Bioethics and Committee on Hospital Care. Palliative care for children. *Pediatrics* 2000;106(2 Pt 1):351-7.  
[PUBMED](#)
21. Mack JW, Wolfe J. Early integration of pediatric palliative care: for some children, palliative care starts at diagnosis. *Curr Opin Pediatr* 2006;18(1):10-4.  
[PUBMED](#) | [CROSSREF](#)
22. Davies B, Sehring SA, Partridge JC, Cooper BA, Hughes A, Philp JC, et al. Barriers to palliative care for children: perceptions of pediatric health care providers. *Pediatrics* 2008;121(2):282-8.  
[PUBMED](#) | [CROSSREF](#)
23. Balkin EM, Kirkpatrick JN, Kaufman B, Swetz KM, Sleeper LA, Wolfe J, et al. Pediatric cardiology provider attitudes about palliative care: a multicenter survey study. *Pediatr Cardiol* 2017;38(7):1324-31.  
[PUBMED](#) | [CROSSREF](#)
24. McCabe ME, Hunt EA, Serwint JR. Pediatric residents' clinical and educational experiences with end-of-life care. *Pediatrics* 2008;121(4):e731-7.  
[PUBMED](#) | [CROSSREF](#)
25. Hatano Y, Yamada M, Fukui K. Shades of truth: cultural and psychological factors affecting communication in pediatric palliative care. *J Pain Symptom Manage* 2011;41(2):491-5.  
[PUBMED](#) | [CROSSREF](#)
26. Wiener L, McConnell DG, Latella L, Ludi E. Cultural and religious considerations in pediatric palliative care. *Palliat Support Care* 2013;11(1):47-67.  
[PUBMED](#) | [CROSSREF](#)
27. Doig C, Burgess E. Withholding life-sustaining treatment: are adolescents competent to make these decisions? *CMAJ* 2000;162(11):1585-8.  
[PUBMED](#)
28. Jacobs S, Perez J, Cheng YI, Sill A, Wang J, Lyon ME. Adolescent end of life preferences and congruence with their parents' preferences: results of a survey of adolescents with cancer. *Pediatr Blood Cancer* 2015;62(4):710-4.  
[PUBMED](#) | [CROSSREF](#)
29. Lyon ME, Jacobs S, Briggs L, Cheng YI, Wang J. Family-centered advance care planning for teens with cancer. *JAMA Pediatr* 2013;167(5):460-7.  
[PUBMED](#) | [CROSSREF](#)
30. Kissane DW, Bylund CL, Banerjee SC, Bialer PA, Levin TT, Maloney EK, et al. Communication skills training for oncology professionals. *J Clin Oncol* 2012;30(11):1242-7.  
[PUBMED](#) | [CROSSREF](#)
31. May R, Thompson J. The role of pediatric palliative care in complex congenital heart disease: three illustrative cases. *J Palliat Med* 2017;20(11):1300-3.  
[PUBMED](#) | [CROSSREF](#)
32. Marcus KL, Balkin EM, Al-Sayegh H, Guslits E, Blume ED, Ma C, et al. Patterns and outcomes of care in children with advanced heart disease receiving palliative care consultation. *J Pain Symptom Manage* 2018;55(2):351-8.  
[PUBMED](#) | [CROSSREF](#)