

Pediatric patients admitted with Implantable Cardioverter Defibrillator at increased risk of inpatient death

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BACKGROUND

Utilization of implantable cardioverter-defibrillators (ICD) in children has increased over time. While prior studies have evaluated complications associated with ICD implantation, there is no data regarding incidence of mortality or risk factors associated with death among patients admitted with ICDs.

PURPOSE

To test our hypothesis that inpatient death in admissions with ICDs was more likely to occur among patients with cardiomyopathy (CM) or heart failure (HF) compared to patients with primary arrhythmias (PA) or congenital heart disease (CHD).

METHODS

- The Kid Inpatient Database (KID) used to identify all children <21 years of age hospitalized with an existing ICD from 2000 through 2016.
- Diagnostic and procedural ICD9 and ICD10 codes were used to identify variables.
- Patients with new ICD implants were excluded.
- Underlying diagnosis was divided into the CHD, CM, PA and other groups. Presence of HF was evaluated. Procedure codes for cardiac surgeries or procedures were combined to look for admissions-with-cardiac-surgery-or-procedure.
- Patients with ICD and inpatient death were compared to patients with ICD who were discharged.
- Statistical analysis was performed using SAS. Fischer's exact test and Wilcoxon rank sum was used for categorical and continuous variables respectively. Multivariable analysis was performed using Logistic regression. A Bonferroni correction ($p < 0.01$) was applied to account for multiple comparisons.

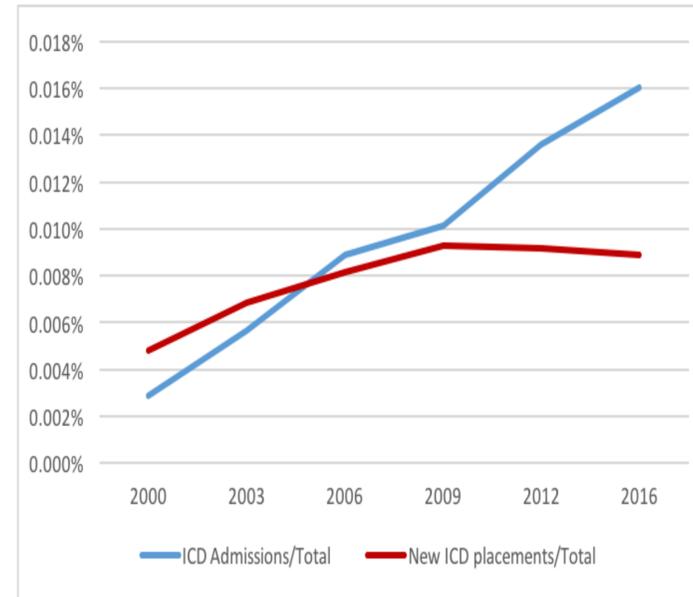


Fig 1: Comparison ICD admissions and New ICD placements/total patient discharge data over time. An overall increase in % of ICD admissions vs placements over the years.

Baseline Characteristics	Discharged (n=3966)	Died (n=55)	p value	
Age	18 (IQR 15-20) yrs.	17 (IQR 14-19) yrs.	0.24	
Female	1646 (42%)	15 (27%)	0.02	
Race	White	1775 (44%)	19 (35%)	0.11
	Black	776 (20%)	20 (36%)	
	Other	1415 (36%)	16 (29%)	
Insurance type	Medicaid/Medicare	1695 (43%)	28 (51%)	0.22
	Other*	2214 (56%)	27 (49%)	
Cardiac surgery/procedure	628 (15.8%)	16 (29%)	0.008	

Table 1: Baseline characteristics of admissions with ICDs that were discharged and those that died.

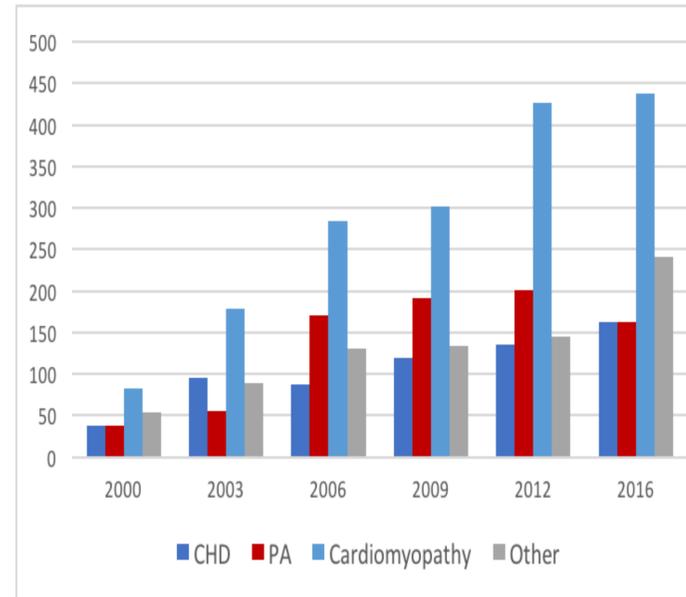


Fig 2: Trends in primary underlying diagnosis in all admissions with ICDs over time.

Variables	Discharged (n=3966)	Died (n=55)	p value	
Age (median, IQR) yrs.	18 (IQR 15-20)	17 (IQR 14-19)	0.59	
Underlying diagnosis	CHD	625 (16%)	13 (23.6%)	0.16
	CM	1676 (43%)	35 (63.6%)	
	PA	815 (20.6%)	-- ¹	
Heart failure	1123 (28%)	45 (82%)	0.0083*	

Table 2. Multivariable logistic regression analysis. ¹Unable to document data due to HCUP rules/restrictions. * $p < 0.001$ is significant.

RESULTS

- A total of 42,570,716 weighted pediatric hospital admissions were identified from KID 2000 through 2016.
- A total of 3966 weighted admits had ICDs present at the time of admission; 3330 new ICD placements were excluded.
- Fig 1 shows an increasing trend of ICD placements and admissions over the years.
- Of the ICD admissions, 55 (1.4%) died while 3911 (98.6%) were discharged. Table 1 shows baseline characteristics of these groups.
- Fig 2 shows an increasing trend in admissions with CHD and CM; PA increases at first but drops in 2016.
- When comparing pts that died to those discharged (median age 18 yrs., IQR 15-20 yrs. vs 17 yrs., IQR 14-19 yrs), on univariate analysis pts who died were less likely to be females (OR 0.5, 95% CI 0.28 – 0.92), more likely to have a diagnosis of cardiomyopathy (OR 2.3, 95% CI 1.3 – 4.0), heart failure (OR 10.9, 95% CI 5.5 – 21.6) and have a cardiac procedure or surgery during that admission (OR 2.1, 95% CI 1.2-3.9).
- On multiple logistic regression analysis, primary arrhythmia (OR 2.4, 95% CI 1.35 – 4.33, p value 0.0029) and heart failure (OR 9.7, 95% CI 4.5 – 20.6, p value < 0.0001) were significantly associated with mortality (Table 2).

CONCLUSION

The mortality rate among pediatric patients admitted with an ICD present is low (1.4%). Diagnosis of heart failure and primary arrhythmia are significantly associated with mortality in this group.

REFERENCES

1. Burns KM, Evans F, Kaltman JR. Pediatric ICD utilization in the United States from 1997 to 2006. *Heart Rhythm*. 2011;8(1):23–28. doi:10.1016/j.hrthm.2010.09.073