

Epidemiologic Burden of Hospitalization for Cardiac Arrhythmias Requiring Implantable Cardioverter-Defibrillator Among Adult Filipinos

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Abstract

BACKGROUND: Implantable cardioverter-defibrillator (ICD) is the therapy of choice in the prevention of SCD. The ICD has been proven to improve survival among survivors of cardiac arrest, patients who are at risk of having one because of myocardial scarring and low left ventricular ejection fraction, and those with primary inherited arrhythmia syndromes. The insertion of an ICD is indicated for survivors of cardiac arrest due to ventricular fibrillation or hemodynamically unstable sustained ventricular tachycardia after the exclusion of any reversible cause. At present, there are no nationwide data regarding the prevalence of ventricular tachyarrhythmias requiring an ICD.

OBJECTIVES: The aim of this study was to determine the (1) total hospitalization claims per year (2017 and 2018) for arrhythmias requiring an ICD, (2) total number of cardioverter-defibrillator insertions done for patients mentioned in (1), (3) prevalence of hospitalization for cardiac arrhythmias requiring insertion of ICD among patients admitted for medical conditions for 2017 and 2018, (4) the demographic profile of patients who were hospitalized for cardiac arrhythmias requiring insertion of ICD, (5) type of facilities (primary, secondary, or tertiary; government or private) where the patients were confined, and (6) duration of hospitalization and mortality rate of patients admitted for the above conditions.

METHODS: This is a descriptive study using the database of Philippine Health Insurance Corporation (PhilHealth) on hospital claims of admitted patients 19 years or older in PhilHealth-accredited hospitals from January 1, 2017, to December 31, 2018. Anonymized records were reviewed using the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) of the World Health Organization. The codes relevant to the study question were chosen and used. The PhilHealth Relative Value Scale (RVS) codes were used to determine the procedures that the patients underwent for their cardiac arrhythmias. Patients' demographic profile, diagnosis, region, hospitalization stay and status on discharge, and type of facility of admission were collected. Descriptive statistics using median value and interquartile range for quantitative data and frequency and percentage for categorical data were reported.

RESULTS: In 2017 and 2018, among patients 19 years or older, there were 1282 and 1480 claims of cases of cardiac arrhythmias requiring an ICD (based on ICD-10 codes), whereas those who underwent placement of an ICD (based on RVS codes) numbered 50 and 45, respectively. The prevalence of hospitalization for cardiac arrhythmias related to ICD among patients who were admitted for medical conditions was 0.05% and 0.06%, for the same years. The overall in-hospital mortality rates were 10.84% and 9.46% in each year for those who were admitted for cardiac arrhythmias that required an ICD; however, there were no recorded mortalities for those who underwent implantation of a cardioverter-defibrillator. For patients with arrhythmias requiring an ICD (based on ICD-10 and RVS codes), the median (first quartile [Q1], third quartile [Q3]) age was 59 (43, 72) years. In 2018, the median (Q1, Q3) age was 57 (38, 71) years. There were similar proportions of males (53%) and females (47%) in both years. The majority of cases based on ICD-10 codes of cardiac arrhythmias requiring an ICD were confined in government hospitals, whereas most of the claims for procedures based on RVS codes were in private hospitals. Most of the procedures were done in the National Capital Region. The duration of hospitalization was 3 to 4 days.

CONCLUSION: Based on PhilHealth claims, the admission due to cardiac arrhythmias requiring ICD is common in both private and government hospitals. Cardioverter-defibrillator implantation is being done mostly in the National Capital Region and private hospitals. There is a wide gap between the prevalence of cardiac arrhythmias requiring an ICD and the frequency of implantation of the lifesaving device.

KEYWORDS: implantable cardioverter-defibrillator, sudden cardiac death, Brugada syndrome, PhilHealth

INTRODUCTION

The incidence of sudden cardiac death ranges from 50 to 100 per 100,000 in the general population¹ and parallels the incidence of coronary artery disease. In the younger population, sudden cardiac death is caused by nonischemic fatal ventricular arrhythmias, and the incidence ranges from 1.3 to 8.5 per 100,000 patient-years.²

The most common etiologies of SCD in this age group are hypertrophic cardiomyopathy, right ventricular dysplasia, and primary inherited arrhythmia syndromes such as the Brugada syndrome (BrS) and congenital long QT syndrome. Locally, there are no epidemiologic data on ventricular arrhythmias and sudden death. In 2007, Gervacio et al³ performed a nationwide survey regarding the incidence of sudden unexplained death during sleep (SUDS), a disease allelic to BrS. The study found that 43 per 100,000 young Filipinos were affected by SUDS. In the National Nutrition Survey of 2008, Gervacio et al⁴ found that 0.2% (7/3,907) of the survey participants had Brugada type 1 pattern in their electrocardiogram.

The implantable cardioverter-defibrillator (ICD) remains to be the therapy of choice in both primary and secondary prevention of SCD. The ICD has been proven to improve survival in patients who survived cardiac arrest and patients who are at risk of having one because of myocardial scarring and low left ventricular ejection fraction and those with primary inherited arrhythmia syndromes. The insertion of a cardioverter-defibrillator is a class I indication for survivors of cardiac arrest due to ventricular fibrillation or hemodynamically unstable sustained ventricular tachycardia (VT) after evaluation to define the cause of the event and to exclude any completely reversible cause.⁵ Included are patients with primary inherited arrhythmia

syndromes, for example, BrS, who survived sudden cardiac arrest. For patients with BrS who have had syncope or those who have had documented VT not resulting in sudden cardiac arrest, placement of ICD is a class IIa recommendation.

At present, there are no nationwide data regarding the prevalence of ventricular tachyarrhythmias requiring an ICD. Given these, this study was conducted to determine the

- (1) total hospitalization claims per year (first admissions and readmissions) from 2017 to 2018 for cardiac arrhythmias requiring placement of ICD and their regional distribution;
- (2) number of cardioverter-defibrillator implantation among the patients hospitalized for cardiac arrhythmias mentioned in (1) and their regional distribution;
- (3) prevalence of hospitalization for cardiac arrhythmias related to ICD among patients admitted for medical conditions in 2017 and 2018;
- (4) demographic profile of the patients who were hospitalized for cardiac arrhythmias requiring placement of ICD and those who underwent implantation of a cardioverter-defibrillator;
- (5) type of facilities (primary, secondary, or tertiary; government or private) where the patients mentioned in (1) and (2) were confined; and
- (6) duration of hospitalization and mortality rate of the patients admitted for the above conditions.

METHODOLOGY

Study Design and Source of Data

A retrospective descriptive study was done by reviewing anonymized records of hospital claims of admitted patients 19 years or older from Philippine Health Insurance Corporation (PhilHealth)-accredited hospitals from January 1, 2017, to December 31, 2018.

The data were gathered using the database of PhilHealth using the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) of the World Health Organization derived from the latest PhilHealth Medical Case Rates table. The ICD-10 codes were reviewed, and the codes relevant to the study question were chosen and used. Data on the procedures that the patients underwent were collated using the latest PhilHealth Relative Value Scale (RVS) codes.

The collected PhilHealth data included the patient's demographic profile, diagnosis, region, hospitalization stay and status on discharge, and type of facility of admission. Readmissions were likewise determined by checking any claims for the same patient with multiple admissions for the same condition.

Ethical Consideration

All data were anonymized, and the results were reported as group data. The protocol was reviewed and approved by the Independent Ethics Committee of De La Salle Medical and Health Sciences Institute in Dasmariñas, Cavite.

Data Analysis

Data encoding and analysis used Microsoft Excel 2016 (Microsoft Corp, Redmond, Washington). Because of the nonnormal distribution of data, quantitative data were presented as median value and interquartile range. Categorical data were presented as frequency and percentage.

RESULTS

Cardiac Arrhythmias That Required Cardioverter-Defibrillator Implantation

Table 1 shows the distribution of the different cardiac arrhythmias with their corresponding ICD-10 codes that require an ICD. There were 1282 and 1480 hospitalization claims of these cardiac arrhythmias in 2017 and 2018, respectively. In 2017, there were 666 males (52%) and 628 females (48%). The median age (interquartile ranges: first quartile [Q1], third quartile

[Q3]) was 59 (42, 72) years. For 2018, there were 1480 claims with similar proportions of males and females (53% and 47%). The median age (Q1, Q3) was 56 (38, 71) years. The overall in-hospital mortality rates were 10.84% in 2017 and 9.46% in 2018.

Number of ICD-Related Procedures

The frequencies of procedures related to cardiac arrhythmias that required an ICD are shown in Table 2. Based on RVS codes, there were 50 and 45 claims for these procedures in 2017 and 2018, respectively. In 2017, the median age (Q1, Q3) for 2017 was 65.5 (54, 74.5) years. There were 38 males (76%) and 12 females (24%). For 2018, the median age (Q1, Q3) was 61 (47, 71) years. Males again outnumbered females (71% vs 39%). There was no in-hospital mortality for these admissions.

Combining both ICD-10 and RVS codes, the median ages (Q1, Q3) for 2017 and 2018 were 59 (43, 72) years and 57 (38, 71) years, respectively.

Hospitalization claims for medical conditions numbered 2,675,097 and 2,715,491 in 2017 and 2018, respectively. Based on the number of hospitalizations for the ICD-related arrhythmias and procedures for the same years, their overall annual prevalence rates were 0.05% and 0.06%, respectively. This meant that there were five or six patients hospitalized per year for ICD-related arrhythmias per 10,000 patients confined for medical conditions for the said years.

Distribution of Hospitalization (First Admission and Readmissions) for Arrhythmias Requiring an ICD in the Philippines by Regions

The regional distribution is shown in Table 3. Most of the cases are in the National Capital Region (NCR), 25% and 32%, in 2017 and 2018, respectively, followed by Davao region and then Western and Central Visayas regions.

Distribution of Cardioverter-Defibrillator Implantation in the Philippines by Region

The majority of the ICD implantations were done in NCR, 76%

Table 1. Number of Hospitalization Claims for Cardiac Arrhythmias That Require Cardioverter-Defibrillator Implantation

ICD-10 Codes	Description	Total Claims, 2017	Mortality, 2017 n (%)	Total Claims, 2018	Mortality, 2018 n (%)
I47.0	Re-entry ventricular arrhythmia	112	18 (16.07)	67	17 (25.37)
I47.2	Ventricular tachycardia	219	36 (16.44)	194	36 (18.56)
I49.0	Ventricular fibrillation and flutter	154	42 (27.27)	149	35 (23.49)
I49.8	Other specified cardiac arrhythmias, Brugada syndrome, long QT syndrome, coronary sinus rhythm disorder, ectopic rhythm disorder, nodal rhythm disorder	797	43 (5.39)	1070	52 (4.86)
	Total claims	1282	139 (10.84)	1480	140 (9.46)

ICD-10=International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.

in 2017 and 93% in 2018 Table 4 shows the distribution of cardioverter-defibrillator implantation by region.

Duration of Hospitalization

The median durations of hospitalization with corresponding interquartile ranges (Q1, Q3) were 3 (2, 5) days and 4.5 (3, 8) days for hospitalization claims for cardiac arrhythmias requiring an ICD and for those who underwent implantation of the cardioverter-defibrillator, respectively, in 2017. For 2018, the median durations (Q1, Q3) for the hospitalization claims for the cardiac arrhythmias were 3 (2, 5) days and 4 (3, 9) days for those who underwent implantation.

Types of Facilities Where the Patients With Cardiac Arrhythmias Requiring an ICD Were Confined

The majority of hospitalization claims of cardiac arrhythmia cases that require an ICD were confined in government hospitals, whereas most of the hospitalization claims for ICD-related procedures were in private hospitals, as shown in Table 5.

DISCUSSION

Most cases of sudden death are caused by VT or fibrillation most commonly due to myocardial scarring due to ischemic

heart disease and previous myocardial infarction. In adults older than 35 years, the incidence of SCD is in the range of 1 per 1000 persons per year, with an age-related increase in risk over time as the prevalence of coronary artery disease increases in parallel to advancing age.⁶ However, in the transition age range between adolescence and young adulthood (to 25 years), although coronary heart disease remains to be a dominant cause, disorders, such as hypertrophic cardiomyopathy, BrS, long QT syndrome, and arrhythmogenic right ventricular dysplasia (cardiomyopathy), are significant contributors to the causes of SCD in this age group.

The incidence of sudden death in the Philippines is not known despite the particular interest in one type of sudden death that occurs in sleep (SUDS). In the country, this was attributed to “bangungut” and was first described in the Philippine medical literature in 1917.⁷ This syndrome, which affects previously healthy males aged 25 to 44 years without the known cardiac disease, has been initially attributed to acute hemorrhagic pancreatitis.⁸ In 1998, Munger and Booton⁹ reviewed 722 autopsy reports filed from 1948 to 1982 to determine the epidemiology of SUDS in the Philippines. The reported rate for men aged 25 to 44 years was 10.8% to 26.3% per 100,000 person-years with an increasing trend from 1948

Table 2. Number of ICD-Related Procedures

RVS Codes	Description	Total Claims, 2017	Mortality, 2017 n (%)	Total Claims, 2018	Mortality, 2018 n (%)
93640	Electrophysiologic evaluation of single or dual pacing cardioverter-defibrillator leads including defibrillation threshold evaluation (induction of an arrhythmia, evaluation of sensing and pacing for arrhythmia termination) at time of initial implantation or replacement	1	0	0	0
93641	Electrophysiologic evaluation of single or dual-chamber pacing cardioverter-defibrillator leads including defibrillation threshold evaluation (induction of an arrhythmia, evaluation of sensing and pacing for arrhythmia termination) at time of initial implantation or replacement; with testing of single or dual-chamber pacing cardioverter-defibrillator pulse generator	1	0	0	0
93642	Electrophysiologic evaluation of single or dual-chamber pacing cardioverter-defibrillator (Includes defibrillation threshold evaluation, induction of arrhythmia, evaluation of sensing and pacing for arrhythmia termination, and programming or reprogramming)	2	0	0	0
33240	Insertion or replacement of implantable cardioverter-defibrillator pulse generator	46	0	45	0
Total claims		50	0	45	0

ICD=implantable cardioverter-defibrillator; RVS=Relative Value Scale.

Table 3. Regional Distribution of Hospitalization (First Admission and Readmissions) for Arrhythmias Requiring an Implantable Cardioverter-Defibrillator in the Philippines

Region	n (%) 2017	n (%) 2018
Philippines	1282	1480
Ilocos Region (Region I)	87	93
Cagayan Valley (Region II)	36	30
CAR	28	37
Central Luzon (Region III)	96	84
NCR	315	477
Calabarzon (Region IV-A)	47	52
MIMAROPA (Region IV-B) ^a	48	29
Bicol Region (Region V)	53	69
Western Visayas (Region VI)	84	140
Central Visayas (Region VII)	124	95
Eastern Visayas (Region VIII)	46	45
Zamboanga Peninsula (Region IX)	30	40
Northern Mindanao (Region X)	46	42
Davao Region (Region XI)	138	156
SOCCSKSARGEN (Region XII)	57	57
Caraga (Region XIII)	45	32
ARMM	2	2

CAR=Cordillera Administrative Region; NCR=National Capital Region; CALABARZON=Cavite, Laguna, Rizal, Quezon; MIMAROPA=Mindoro, Marinduque, Romblon, Palawan (*Batangas, included in IV-B as per PhilHealth office location); SOCCSKSARGEN=South Cotabato, Cotabato, Sultan Kudarat, Sarangani, General Santos; ARMM=Autonomous Region of Muslim Mindanao.

Table 4. Regional Distribution of Cardioverter-Defibrillator Implantation in the Philippines

Region	n (%) 2017	n (%) 2018
Philippines	50	45
Ilocos Region (Region I)	0	0
Cagayan Valley (Region II)	0	0
CAR	5	0
Central Luzon (Region III)	0	0
NCR	38	42
Calabarzon (Region IV-A)	0	0
MIMAROPA (Region IV-B) ^a	4	0
Bicol Region (Region V)	0	0
Western Visayas (Region VI)	0	1
Central Visayas (Region VII)	3	1
Eastern Visayas (Region VIII)	0	0
Zamboanga Peninsula (Region IX)	0	1
Northern Mindanao (Region X)	0	0
Davao Region (Region XI)	0	0
SOCCSKSARGEN (Region XII)	0	0
Caraga (Region XIII)	0	0
ARMM	0	0

CAR=Cordillera Administrative Region; NCR=National Capital Region; CALABARZON=Cavite, Laguna, Rizal, Quezon; MIMAROPA=Mindoro, Marinduque, Romblon, Palawan (*Batangas, included in IV-B as per PhilHealth office location); SOCCSKSARGEN=South Cotabato, Cotabato, Sultan Kudarat, Sarangani, General Santos; ARMM=Autonomous Region of Muslim Mindanao.

Table 5. Types of Facilities Where Patients Were Confined

Codes	2017			2018	
	Government Hospitals n (%)	Private Hospitals n (%)	Not Mentioned n (%)	Government Hospitals n (%)	Private Hospitals n (%)
Cardiac arrhythmias requiring an ICD	661 (51.56)	619 (48.28)	2 (0.16)	846 (57.16)	634 (42.84)
ICD-related procedures	10 (20)	39 (78)	1 (2)	17 (37.78)	28 (62.22)

ICD=implantable cardioverter-defibrillator.

to 1982. Interestingly, they did not find evidence of acute hemorrhagic pancreatitis in the autopsy reports.⁹ The only recent study on the incidence of SUDS in Filipinos was done by Gervacio et al,³ who found that 43 per 100,000 young Filipinos were affected by SUDS. The phenotypic presentation of sudden death in sleep in the Philippines is identical to the BrS initially

described in 1982.¹⁰ Although no study was done to determine if sudden death in sleep in the Philippines is BrS, the similarities in the patient characteristics are undeniably striking.

Although antiarrhythmic medications suppress ventricular arrhythmias, except for β -blockers, these medications have not

been proven to prevent sudden cardiac death. Unfortunately, in BrS, even β -blockers do not confer mortality benefit, and an ICD remains to be the only effective therapy in decreasing mortality risk. Given the dearth of medications that prevent sudden death in ventricular arrhythmias from various causes, implantation of a cardioverter-defibrillator is a fundamental armamentarium both for primary and secondary prevention of sudden cardiac death for these conditions.

Unfortunately, in a country where the cost of medical care is through out-of-pocket expenses, implantation of this device is expensive and may thus limit its utilization. In this study, 1282 patients in 2017 and 1480 patients in 2018 were hospitalized for ventricular arrhythmias that most probably will require an ICD. Although the exact etiologies cannot be determined in the database because of a lack of specific diagnosis, it can be assumed that at least 90% of these patients have malignant ventricular arrhythmias based on population-based registries in other countries.³ Furthermore, the high mortality rate noted in these patients may support this assumption.

Of the patients hospitalized for VT, only 95 patients have undergone cardioverter-defibrillator implantation in 2 years (2017 and 2018) corresponding to approximately 4% of the total number of hospitalizations for arrhythmias requiring ICD in the Philippines. The majority of these procedures were done in NCR and private hospitals. This observed disparity may be caused by different factors such as better socioeconomic status of patients in this region compared with elsewhere and, possibly, because the implanters and heart rhythm specialists are in NCR, where most of these private hospitals are located. Considering that the indication is for secondary prevention where the benefit is demonstrated to be higher compared with primary prevention, this number of cardioverter-defibrillator implantation is dismal. The magnitude of lives lost in these patients could be staggering, especially in younger individuals with cardiomyopathy and primary inherited arrhythmia syndromes (those with structurally normal hearts) where ICD has been proven to be a lifesaving therapy.

This situation can be addressed by improving the capacity of the different tertiary hospitals in the country for ICD insertion. As this lifesaving intervention needs resources, funding support is much needed for patients who have a clear indication for implantation of the much-needed cardioverter-defibrillator.

LIMITATIONS

The data were based only on PhilHealth claims. Admissions due to cardiac arrhythmias and procedures related to ICD not reflected in the claims will underestimate the prevalence and frequency of procedures.

CONCLUSION

Admission due to cardiac arrhythmias requiring ICD is common in both private and government hospitals. Cardioverter-defibrillator implantation is being done mostly in NCR and

private hospitals. There is a wide gap between the prevalence of cardiac arrhythmias requiring ICD and the frequency of the insertion of the device.

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