

# User profile of implantable electronic cardiac devices in a university hospital

**RESUMO** | Objetivo: Identificar o perfil dos pacientes submetidos à inserção de dispositivos cardíacos eletrônicos implantáveis em um hospital de referência do Rio Grande do Norte. Método: Trata-se de um estudo descritivo, exploratório, retrospectivo dos últimos 03 anos com abordagem quantitativa. Amostragem foicelecionada por conveniência. A coleta de dados ocorreu entre outubro de 2017 a março de 2018. Resultados: A amostra foi composta por 215 prontuários, destes 182 foram analisados. Implantaram marca-passos 63,7% e 28% cardiodesfibriladores, corresponderam ao sexo masculino 69,3%, com média de idade 65 e 49. Entre as comorbidades, a Hipertensão Arterial Sistêmica abrangeu 87,4%. Evidenciaram-se os bloqueios atrioventriculares como principal causa para implantes (35%), seguidos das miocardiopatias (12%). Conclusão: Percebeu-se que, os indivíduos que implantaram marcapassos eram acometidos por bradiarritmias, enquanto cardiodesfibriladores por taquiarritmias. As complicações pós-operatórias e intercorrências durante o procedimento foram de baixo risco. Salienta-se, que no manejo desses usuários é fundamental a elaboração de um protocolo, visando aperfeiçoar o cuidado.

**Descritores:** Marcapasso cardíaco artificial; Desfibriladores implantáveis; Arritmias cardíacas; Procedimento cirúrgico; Cardiologia.

**ABSTRACT** | Objective: To identify the profile of patients undergoing insertion of implantable electronic cardiac devices in a reference hospital in Rio Grande do Norte. Method: This is a descriptive, exploratory, retrospective study of the last three years with a quantitative approach. Sampling was selected by convenience. Data collection occurred between October 2017 to March 2018. Results: Sample composed of 215 medical records, of these 182 were analyzed. Implanted pacemakers 63.7% and 28% cardiodesfibrillators, corresponded to the male gender 69.3%, with average age 65 and 49. Among the comorbidities, Systemic Arterial Hypertension covered 87.4%. The atrioventricular blocks were evidenced as the main cause for implantation (35%), followed by myocardial pathologies (12%). Conclusion: It was noticed that individuals who implanted pacemakers were affected by bradyarrhythmias, while cardioverter-defibrillators were affected by tachyarrhythmias. The postoperative complications and complications during the procedure were low risk. It is emphasized that in the management of these users it is essential to develop a protocol, aiming to improve care.

**Keywords:** Pacemaker, artificial heart; Defibrillators, implantable; Arrhythmias, cardiac; Surgical procedure; Cardiology

**RESUMEN** | Objetivo: identificar el perfil de los pacientes sometidos a la inserción de dispositivos cardíacos electrónicos implantables en el hospital de referencia de Rio Grande do Norte. Método: se trata de un estudio descriptivo, exploratorio, retrospectivo de los últimos 3 años con enfoque cuantitativo. El muestreo fue seleccionado por conveniencia. La recolección de datos se llevó a cabo entre octubre de 2017 y marzo de 2018. Resultados: muestra compuesta por 215 historias clínicas, de las cuales se analizaron 182. Marcapasos implantados 63,7% y desfibriladores cardioversores 28%, correspondieron al sexo masculino 69,3%, con una edad media de 65 y 49 años. Entre las comorbilidades, la Hipertensión Arterial Sistémica cubrió el 87,4%. Los bloqueos auriculoventriculares se evidenciaron como la principal causa de implantes (35%), seguida de las miocardiopatías (12%). Conclusión: se notó que, los portadores de marcapasos se vieron afectados por bradiarritmias, mientras que los desfibriladores cardioversores por taquiarritmias. Las complicaciones postoperatorias y las complicaciones durante el procedimiento fueron de bajo riesgo. Cabe señalar que en el manejo de estos usuarios es fundamental la elaboración de un protocolo, con el fin de mejorar la atención.

**Palabras claves:** Marcapasos cardíaco artificial; Desfibriladores implantables; Arritmia cardíaca; Procedimiento quirúrgico; Cardiología

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## INTRODUCTION

Implantable Electronic Cardiac Devices – (IECD) are pacemakers, re-synchronizers and cardioverter-defibrillators (ICD) and, within interventional cardiology, they are a primordial modality for health care, reducing the rates of fatal cardiac events, such as sudden death.<sup>1</sup>

Cardiovascular diseases are the leading cause of death in the world. It was estimated that 17.7 million people died from cardiovascular disease in 2015, representing 31% of all deaths globally, with 7.4 million due to cardiovascular disease. Low and middle income countries are responsible for 3/4 deaths. High-cost electronic medical devices are also used to treat cardiovascular diseases of arrhythmic origin.<sup>2</sup>

In this context, between the 1980s and 1990s, efforts were made to treat bradyarrhythmias and tachyarrhythmias through artificial atrial and ventricular stimulation. The development of these devices allowed the regulation of heart rhythm from the second half of the 20th century onwards.<sup>1,3</sup> Since then, the effectiveness of IECDs in reducing patient mortality and morbidity, as well as improving the quality of life of individuals, has been demonstrated.<sup>4</sup>

Thus, the main clinical indications for the implantation of the devices are: total atrioventricular blocks (TAVB), TAVB in the postoperative period of cardiac surgery, arrhythmogenic right ventricular dysplasia, CAVB due to congenital diseases, Mobitz II second-degree atrioventricular blocks (AVB), sick sinus syndrome, hypertrophic cardiomyopathy, long QT syndrome, Brugada syndrome, right bundle branch block, intraventricular conduction disorders, and prevention of sudden death from ventricular fibrillation.<sup>5</sup>

In a study carried out in the USA,

with 546,769 patients with kidney disease, 6.4% had IECD and 8.0% of them developed infection in the device itself. The main risk factors for device infection were black people, temporary dialysis catheter, and body mass index >25.<sup>6</sup>

According to data from the Ministry of Health, in Brazil, between January and June 2018 there were 14,694 implantation, replacement or reimplantation procedures for cardiac devices and generators across the country. The Southeast region had the highest number of procedures, with 6,647 followed by the South region with 3,398, Northeast (3,036), Midwest (1,185) and North (428). In Rio Grande do Norte (RN) in the same period, 236 procedures took place in the state.<sup>7</sup>

According to a study carried out in Goiânia, the mean age of individuals with pacemakers was 66.21 (minimum 39 and maximum 86 years), most were female, retired, married or widowed, with time of study  $\leq 9$  years.<sup>8</sup>

The implantation of devices can generate complications, having as risk factors: age, severity of heart disease, type of procedure performed and device implanted, as well as the degree of impairment and clinical condition of the user. The occurrence of death and hospital readmission was detected in previous studies and confirmed that serious events occur in older patients and in those with more advanced cardiomyopathies.<sup>9</sup>

Based on this scenario, the Unified Health System (SUS) ensures the implantation of the device as the most suitable treatment for arrhythmias. Ordinance No. 307, of March 29th, 2016, approves the protocol for the use of implantable cardiac devices and re-synchronizers at no cost to the user.<sup>3</sup>

Although treatments with implantation of the devices address a slight reduction in morbidity and mortality, the patient's quality of life can still be altered due to age and pre-existing comorbidities.<sup>10</sup>

It was decided to study patients who

had pacemakers, ICDs and re-synchronizers implanted, due to the lack of epidemiological research aimed at this population, which does not favor the definition of specific actions for the care of patients with IECD.

The objective of this study was to identify the profile of patients submitted to the insertion of implantable electronic cardiac devices in a University Hospital in Rio Grande do Norte, through the sociodemographic characteristics of the devices and to relate the aspects with the pathologies.

## METHOD

According to ethical and legal precepts of research involving human beings, the study was based on Resolution No. 466, of December 12th, 2012, of the National Health Council.<sup>11</sup>

It should be noted that prior authorization from the institution was requested for data collection, as well as users were contacted to sign the Free and Informed Consent Term (ICF) to access the medical records.

The research was submitted to the Ethics Committee under number 2.314.274 and Certificate of Presentation for Ethical Assessment (CAAE) 76671717.2.0000.5292.

This is a descriptive study, with a quantitative approach with analysis and retrospective data collection, based on the review of the medical records of patients who underwent insertion of implantable electronic cardiac devices at the University Hospital, in the last 03 years.

Data were collected from October 2017 to March 2018, after releasing the files (computerized and printed) by the Medical Archive and Statistics Service (SAME) and made available in the Hemodynamics sector.

The hospital is a state reference in the cardiology service, being the only public hospital responsible for IECD implants. In addition, it is the largest tea-

ching hospital in RN and is dedicated to the training of professionals in medicine, dentistry, nutrition, pharmacy, nursing, among other areas.<sup>12</sup>

The medical records of patients who were admitted to hemodynamics for IECB implantation in the period from 2015 to 2017 were included in this study, by means of convenience sampling, observing a total of 215 patients.

After excluding users who implanted temporary devices, medical records with insufficient information and even those who were not able to be contacted to sign the ICF, it was possible to show a sample of 182 documents for review.

The collection was carried out through the structured form, used to order the information from the medical records, which contained data related to the socioeconomic, clinical and surgical aspects of the patients.

Data were collected through computerized and printed medical records, being recorded in a previously prepared instrument. The spreadsheet of records of the Hemodynamics laboratory (place of implantation of the pacemakers) was analyzed, followed by the medical records, where the names of the patients were obtained, containing information for their location and contact.

After this data, a maximum of three attempts were made to make contact with the device holders, through the telephone number that appeared in the institution's register, with the purpose of requesting authorization with the signature of the ICF. There was a sample loss of 33 patients, due to difficult telephone contact or lack of information that contemplated the objective of this study.

Patients who could be contacted were clarified about the purpose of the research and requested to schedule an authorization for the collection. This was developed through the signature of the informed consent form by the patient and his/her guardian, as followed by consultations for device review, exchange of the DCEI or medical consultation.

Data were categorized in an Excel spreadsheet and imported into the Statistical Package for the Social Sciences (SPSS) program (version 22.0 for Windows), in which they were tabulated and analyzed using descriptive and inferential statistics, and presented in the form of tables and graphs.

Descriptive analysis of the data was carried out to outline the profile of patients who had implanted IECBs, using measures of central tendency (mean) and dispersion (standard deviation) for numerical variables, while categorical variables were measured by the frequency of occurrences.

## RESULTS

Between 2015 and 2017, 215 patients were treated for implantation of pacemakers, re-synchronizers and ICDs

at the hospital, with the following distribution over the years: 50 in 2015 (27.5%), 50 in 2016 (27.5%) and 82 in 2017 (45.0%). Depending on the research and data collection using the eligible criteria, it was possible to analyze a total of 182 samples.

Regarding gender, there was a prevalence of males, with a mean age of 65 years and residing and/or coming from the city of Natal and greater Natal. The epidemiological profile of users is described in table 1.

Regarding schooling, 63% of users were literate, they said they had at least basic education in the initial grades. Professions such as domestic and self-employed services that could not be classified into a single category corresponded to 71.4%. Regarding the housing of patients with heart disease with cardiac devices, 3.3% are domiciled in

**Table 1 - Epidemiological characteristics of patients undergoing IECB implantation, Natal, RN, Brazil, 2018.**

Variables	N(%) 2015	N(%) 2016	N(%) 2017	TOTAL (n = 182+%)
Age (years)				Média ± DP 65,49±14,92 65,49±14,92 65,49±14,92 65,49±14,92
Age group				
< 40 years, n (%)	0	0	7 (8,5)	7 (3,84)
41 - 49 years, n (%)	4(8)	8(16)	8(9,8)	20(10,96)
50 - 59 years, n (%)	6(12)	6(12)	18(22)	30 (16,5)
60 - 69 years, n (%)	8(16)	19(38)	16(19,5)	43(23,6)
70 - 79 years, n (%)	20(40)	10(20)	19(23,2)	49 (27)
≥ 80 years, n (%)	12(24)	7(14)	14(17,1)	33 (18,1)
Gender				
Male	24(48)	30(60) 5%	54(65,9)	108 (59,3)
Female	26(52)	20(40)	28(34,1)	74 (40,7)
Ethnicity				
White, n (%)	3 (6)	6(12)	10(12,2)	19 (10,4)
Brown or Black, n (%)	47(94)	44(88)	72(87,8)	163(89,6)
Education				
Illiterate	13(26)	12(24)	15(18,3)	40(22)
Literate	31(62)	32(64)	51(62,2)	114(62,6)
Not informed	6(12)	6(12)	16(19,5)	28(15,4)

wattle and daub houses, and the geographic region of the state that has the largest number of dwellings is not defined.

Table 2 has data on implants and users' comorbidities, which is an important aspect for the characterization of chronic non-communicable diseases and the procedure with the clinical and surgical history of these patients.

Systemic Arterial Hypertension (SAH) was the most evident comorbidity since 87.4% of the patients are hypertensive and are using antihypertensive drugs. The implanted devices were pacemakers (63.7%) and defibrillators (28%) as described in table 02. The ventricular pacing mode had a greater number of programming in the VVI devices that represented (39.6%) of the sample.

Regarding the predominance of the sample regarding its diagnosis, they were divided into 10 categories and the main disease that triggered the symptoms for the implant was identified and are listed in Figure 1. The IECD for the prevention of sudden death from Ventricular Tachycardia (VT) and Ventricular Fibrillation (VF) was representative in 10.4% of the surveyed medical records.

The diagnoses were also distributed by device, as shown in table 03.

Blockages had the highest rate of pacemaker implantation, corresponding to 72.2% of users, and also represented the highest number of ICD and ICD + Re-synchronizer implants (11%).

In table 4, data regarding antiarrhythmic therapy are available, corresponding to 53.8%. The drugs used were Amiodarone and Caverdilol as adjuvant therapy to the treatment, with beta-blockers being the most prevalent.

An important characteristic is that 61% of the 182 surveyed used prophylactic antibiotic therapy. This study had a low rate of complications (1.6%) in the perioperative period (pre, intra, post) and complications in the immediate postoperative period (14.8%). The complications presented were:

Marital status				
Without partner	22(44)	14(28)	31(37,8)	67(36,8)
With partner	27(54)	36(72)	46(56,1)	109(59,9)
Not informed	1(2)	0	5(6,1)	6(3,3)
Profession				
ADM, industries, agriculture, education, commerce, transport and communications.	8(16)	2(4)	12(14,6)	22 (12,1)
Domestic services, retirees, self-employed	36(72)	42(84)	52(63,4)	130 (71,4)
Unemployed	1(2)	0	4(4,9)	5 (2,74)
Not informed	5(10)	6(12)	14(17,1)	25 (13,7)
Housing Type				
Masonry	44(88)	50(100,0)	82(100)	176 (96,7)
Taipa	6(12)	0	0	6(3,3)
Provenance				
Home - Natal / Grande Natal	24(48)	21(42)	51(62,2)	96 (52,7)
Home – Interior	13(26)	16(32)	20(24,4)	49 (27)
Emergency Care Units and Hospitals	11(22)	3(6)	6(7,3)	20 (11)
Uninformed	2(4)	10(20)	5(6,1)	17 (9,3)

Source: Own Research; SD: Standard Deviation; ADM: Administration, 2018.

**Table 2 - Characterization of patients regarding comorbidities and electronic cardiac device implantation procedures performed at HUOL from 2015 to 2017, Natal, RN, Brazil, 2018**

Variables	Sample (n=182)	%
Comorbidities		
Systemic arterial hypertension	118	64,8
Absence of disease or not informed	64	35,2
Diabetes Mellitus	39	21,4
Absence of disease or not informed	143	78,6
Dyslipidemias	32	17,6
Absence of disease or not informed	150	82,4
Service mode		
Elective	151	81,9
Urgency	30	16,5
Uninformed	1	0,5
Clinical indication		
Tachycardia	41	22,5
Bradycardia	73	40,1
Uninformed	68	37,4
Type of IECD		
Pacemaker	116	63,7

convulsion, cardiorespiratory arrest, hemorrhage and ventricular tachycardia and complications: pain in the surgical pocket, detachment of electrodes, presence of exudate, bleeding, infective endocarditis, hematoma, hyperkalemia, local ischemia and pneumothorax, respectively.

Only 15.4% of patients required assistance in Intensive Care Units (ICU). During the entire data collection, no medical records of patients under 18 years of age with or without congenital heart disease who needed the implant were identified.

**DISCUSSION**

In this analysis, the similarity of the results regarding the predominance of heart disease in males was evident.<sup>13,14</sup>

A comparison survey with cases of arrhythmias in men and women shows that most cases occur in patients between 65 and 85 years of age, a period in which, proportionally, more women are alive. It is noteworthy that due to women seeking care more frequently in health services and having healthier lifestyles, it is possible to identify early injuries in the onset of cardiovascular diseases, with females being the least representative public, corroborating this analysis.<sup>15,16</sup>

The age of implant ranged from 50-80 years, corresponding to 82.79% of the entire population. Research carried out in Goiânia identified that users between 45 and 75 years old were affected by cardiovascular diseases, which agrees with this study, since heart diseases are considered indicators for implantation.<sup>14</sup>

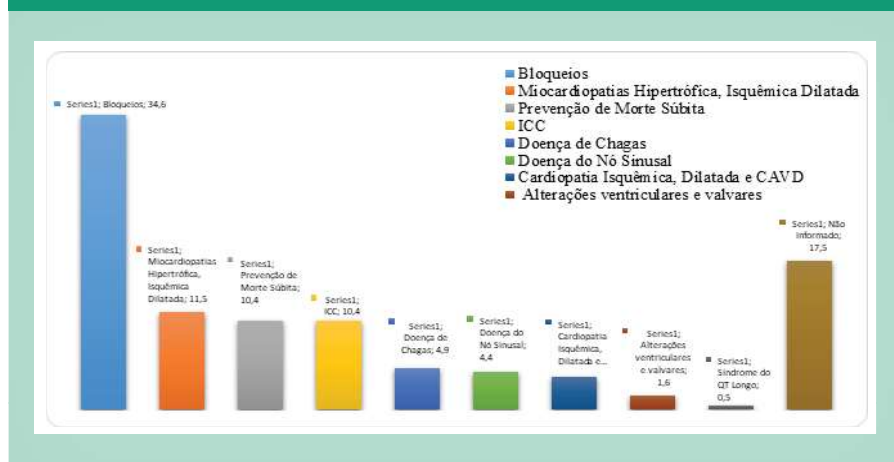
Regarding comorbidities, systemic arterial hypertension, as reported in national and international studies, is a comorbidity of great relevance to public health and a global health problem, causing 9.4 million deaths each year worldwide.<sup>17</sup>

In the public health notebook

ICD	51	28,0
ICD and Resynchronizer	10	5,5
Uninformed	5	2,8
DCEI mode		
VVI	72	39,6
DDD	61	33,5
VVIR	4	2,2
AAI	0	0,0
Uninformed	45	24,7

Source: Own research; ICD: Implantable cardioverter-defibrillator; V: Ventricle; I: Inhibited; A: Atrium; D: Double stimulation, 2018.

**Figure 1 – Distribution of the main pathologies for implantation of IECD in HUOL from 2014 to 2017, Natal, RN, Brazil, 2018**



Source: Own research. ARVD Arrhythmogenic right ventricular dysplasia, 2018.

**Table 3 - Characterization of diagnoses by type of electronic cardiac device performed at HUOL from 2015 to 2017, Natal, RN, Brazil, 2018.**

DIAGNOSTIC	IECD TYPE (N/%)		
	Pacemaker	ICD	ICD + Re-synchronizer
ICC	12(52,2)	7 (30,4)	4 (17,4)
heart diseases	6 (60)	4 (40)	0
Sudden Death Prevention	12 (50)	11 (45,8)	1 (4,2)
Chagas disease	4(40)	6 (60)	0
Ventricular and valvular changes	3 (60)	2 (40)	0
Blockages	52 (72,2)	15 (20,8)	5 (7)
Sinus Node Disease	6(67)	3(33)	0
Hypertrophic, ischemic and dilated cardiomyopathies	15(71,4)	6(28,6)	0
not informed	21(64)	8(24,2)	4(12,1)

Source: Own research; IECD: Implantable Electronic Cardiac Device; CHF: Congestive heart failure, 2018.

(2017), a higher prevalence of arterial hypertension was found in people with less education, regardless of the years studied and gender, presenting a similar result in this study.<sup>18</sup>

Regarding Chagas heart disease, the predominance of triatomine bugs (*T. Cruzei*) in suitable homes (pau a pique) was reported in a study evaluating western RN with 215 patients. Complex ventricular arrhythmia was reported in 32.7% of patients considered low risk of death and in 100% of high risk patients.<sup>19</sup>

There has been a significant reduction in the number of CIED implants in children and adolescents with Chagas disease in Brazil, which suggests a more effective control of all forms of disease transmission in the country (blood transfusion and vector control) in the last 20 years and reduction of vertical transmission of the parasite.<sup>20</sup>

It is worth noting that in NB epidemiological studies related to Chagas' heart disease are still insufficient. A report of 1/3 of the patients in the western region of the NB had the chagasic cardiac form, with different types and degrees of atrioventricular blocks, simple and complex arrhythmias, as well as alterations in contractility that justify the appearance of serious outcomes.<sup>19</sup>

In the European population, especially the German population, approximately 105 thousand DCEI are implanted annually, being the largest country with an implantation rate in relation to the population of any other European country.<sup>21</sup>

Tachycardias and bradycardias are arrhythmias that define the essential characteristics for the choice of devices. As shown in table 02, bradycardia was prevalent in (40%) and associated with the highest number of pacemaker implants. Tachycardia, on the other hand, is related to ICD implantation, which aims to prevent sudden death and/or control sustained arrhythmias such as Ventricular, Atrial and Supra-

**Table 4 – Characterization of antiarrhythmic therapy, prophylactic antibiotic therapy, outcome and complications after IECED implantation at HUOL from 2014 to 2017, Natal, RN, Brazil, 2018**

Variables	Sample (N=182)	%
Antiarrhythmic therapy	N	%
No	40	22,0
Yes	98	53,8
Uninformedo	44	24,2
Use of ATB		
No	71	39,0
Yes	111	61,0
Complications		
No	162	89,0
Yes	3	1,6
Uninformed	17	9,6
Complications		
No	139	76,4
Yes	27	14,8
Uninformed	16	8,8
Outcome		
ICU	28	15,4
Nursery	152	83,5
Death	2	1,1

Source: Own research. ATB – Antibiotic Therapy; ICU – Intensive Care Unit, 2018.

ventricular Tachycardia. Ventricular pacing devices are the most used (VVI).<sup>22</sup>

Regarding antiarrhythmic drugs, such as beta-blockers or amiodarone, in more severe cases, the indicated therapy is ICD implantation, since the drugs cannot prevent the occurrence of ventricular arrhythmias.<sup>23</sup>

A study carried out with an African-American patient showed that the TAVB, widely known as third-degree heart block or complete heart block (CHB), includes the presence of complete atrioventricular dissociation, in addition to permanent pacemaker implantation being a class I indication for all congenital or acquired symptomatic patients.<sup>24</sup>

The ICD may be useful in patients with unexplained syncope, indication for permanent pacing, patients with

moderately impaired left ventricular function (36% to 49%) or compromised right ventricular function (<40%). In addition, it would be ideal for patients with difficult endovascular access, in young people, as a form of primary prevention in electrical disorders such as: Brugada syndrome or congenital prolonged QT syndrome, short QT syndrome, some cases of arrhythmogenic right ventricular dysplasia and sudden death.<sup>25-26</sup>

Other pathologies such as aortic stenosis with percutaneous correction (TAVI) predispose conduction disorders and require implantation of IECEDs. It becomes a safe and valid attempt for the treatment of aortic stenosis, but with limitations due to the potential for complicating the conduction system. In the researched institution, there were only 03 cases that were conside-

red as valve alterations due to percutaneous and surgical interventions.<sup>27</sup>

In the United Kingdom, a survey carried out with 90 patients who underwent the TAVI procedure (3.3%) had TAVB that required the device to be implanted. Cardiac tamponade is also considered a serious complication of implants (2.2%).<sup>28</sup>

The need for an Intensive Care Unit for complications was not reported, but cardiac monitoring of rhythm and frequency is essential in the first hours after the procedure, which corresponds to the immediate postoperative period (IPO). The team must be available for immediate care, in addition to the availability of emergency and antiarrhythmic drugs (in the case of ICDs), as well as equipment (cardiac defibrillators) must also be available.<sup>29</sup>

The use of antibiotics as drug prophylaxis is indicated, along with shaving and local antiseptics. The choice of anesthetic technique (sedation, local or general anesthesia) depending on the general condition, as well as the patient's hemodynamics and the surgical approach to be performed.<sup>30</sup>

According to this research, only 0.5% of the medical records reported an infectious process, with Infectious Endocarditis being the acquired pathology. The international literature cor-

roborates this study, as the incidence of infection after implantation is 0.5% to 1% in the first 6 to 12 months and increases with the complexity of the implanted device.<sup>21</sup>

This study had limitations due to the review of medical records, which depends on all professionals recording information relevant to patients, as it is unicentric and does not present some gaps in the documentary information.

It is understood that articles of this nature can contribute to the creation of specific care routines for the follow-up of patients who have CIED implants, as well as the elaboration of protocols, in order to collaborate in the improvement of the service, as well as in the formulation of health policies that aim to improve the quality of care provided to users.

## CONCLUSION

The findings of the present study corroborate the literature, which infers the predominance of males, already elderly, who were or are in marital relationships. The low level of education of the population was identified, and the origin prevailed in the metropolitan region of the capital, this phenomenon is understood because this region concentrates the large hospital institutions.

Regarding the use of medication at home and comorbidities, there was a predominance of Hypertension, being an important predictor for cardiovascular events.

It was observed that after the associations, individuals who implanted pacemakers were affected by bradyarrhythmias, while those with tachyarrhythmias opted for ICD. The most used mode was ventricular stimulation and antiarrhythmic therapy with beta-blockers and amiodarone was also used. TAVB is the classic indication for IECD and it reached the highest percentage in the population studied. It is observed that there were no complications, for the most part, as well as interurrences. The use of antibiotic prophylaxis together with perioperative care may have influenced this result.

With the result obtained, it was possible to map the reality of patients and base the construction of a protocol for the care of patients with arrhythmias that require CIED in this institution, as well as developing primary guidelines, aiming to contribute to better care for the device carrier. It is essential to adopt strategies for public policies that can reduce future events, minimize adverse outcomes and improve treatment management. 🌱

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