

Marcolino M^{1,2,3}, Antonini Ribeiro R³, Polanczyk CA^{1,2}

¹ National Institute of Science and Technology for Health Technology Assessment (IATS) - CNPq/Brazil (project: 465518/2014-1), Porto Alegre, Brazil; ² Graduate Program in Epidemiology, Universidade Federal do Rio Grande do Sul School of Medicine, Porto Alegre, RS, Brazil; ³ HTAnalyze Consulting and Training, Porto Alegre, RS, Brazil.

Objectives

Cardiac implantable electronic devices (CIED) implantation procedures, available in the Brazilian Public Health System (SUS) for more than 30 years, are performed only in tertiary care centers.

This research aims to explore CIED implantation centers' landscape in the Brazilian Public Healthcare System.

Methods

Open data of **approved hospital admissions reimbursed by SUS** were obtained from the Hospital Information System through the Informatic Department of SUS (DATASUS)

Selection criteria:

- Admission register for a **CIED implantation**, including:
 - Permanent pacemaker (PM)
 - Implantable cardioverter-defibrillator (ICD)
 - Cardiac resynchronization therapy (CRT)
- Procedures performed from **2008 to 2019**

Individual admissions registers were used to **identify and analyze the Centers' geographic distribution, characteristics, and activity related to CIED implantation.**

Results

SUS reimbursed **216,440 CIED implantations** performed in **260 centers (Table 1)**

- 40.4% located in capital cities
- 60.8% classified as philanthropic institutions

The number of active centers varied in the period

- **18.9%** increase from 2008 (190) to 2019 (226)
- Mean 213 (range 190 – 227)

Geographic distribution (Table 1, Figure 1)

- Most centers were in the Southeast region (n=151, 44.2%)
- States of São Paulo (n=52, 20%) and Minas Gerais (n=35, 13.5%) in the lead

Centers' activity

All centers performed pacemaker implants

- 151 (58.1%) implanted PM exclusively
- 87 (33.5%) implanted ICD
- 90 (34.6%) CRT
- 80 (30.8%) CRT with defibrillator.

Implants per center in the 12-year period, mean (range)

- Total: 832.5 (1 – 6,183)
- Annual: 75.1 (1 – 662)

North centers presented the lower mean total (671.4, range 15; 1876) and annual (37.9, range 1; 203) number of implants.

Table 1. Centers' characteristics and activity

Characteristic	North	Northeast	Southeast	South	Central-West	Total
Centers, N (% of total)	11 (4.2)	54 (20.8)	115 (44.2)	56 (21.5)	24 (9.2)	260
Centers located in capital cities, N (% of region)	8 (72.7)	38 (70.4)	28 (24.3)	13 (23.2)	18 (75.0)	105 (40.4)
N of centers (% of region) by CIED type						
CRT	5 (45.5)	19 (35.2)	35 (30.4)	20 (35.7)	11 (45.8)	90 (34.6)
CRT-D	7 (63.6)	18 (33.3)	26 (22.6)	19 (33.9)	10 (41.7)	80 (30.8)
ICD	5 (45.5)	20 (37.0)	32 (27.8)	20 (35.7)	10 (41.7)	87 (33.5)
PM	11 (100)	54 (100)	115 (100)	56 (100)	24 (100)	260 (100)
Annual count of centers, mean (range)	9.1 (8 – 10)	40.3 (35 – 45)	96.0 (86 – 105)	49.3 (43 – 54)	18.3 (16 – 21)	213.1 (190 – 227)
Type – N (% of region)						
Public	6 (54.5)	14 (25.9)	24 (20.9)	10 (17.9)	3 (12.5)	57 (21.9)
Philanthropic	5 (45.5)	21 (38.9)	80 (69.6)	42 (75.0)	10 (41.7)	158 (60.8)
Private	0	19 (35.2)	11 (9.6)	4 (7.1)	11 (45.8)	45 (17.3)
Implants per center						
Total*, mean (range)	671.4 (15 – 1,876)	826.7 (1 – 5,156)	840.9 (2 – 6,183)	846.8 (12 – 5,001)	845.2 (11 – 4,738)	832.5 (1 – 6,183)
Annual, mean (range)	68.0 (1 – 205)	92.4 (1 – 559)	84.1 (1-566)	79.6 (1 – 662)	92.7 (1 – 479)	75.1 (1 – 662)

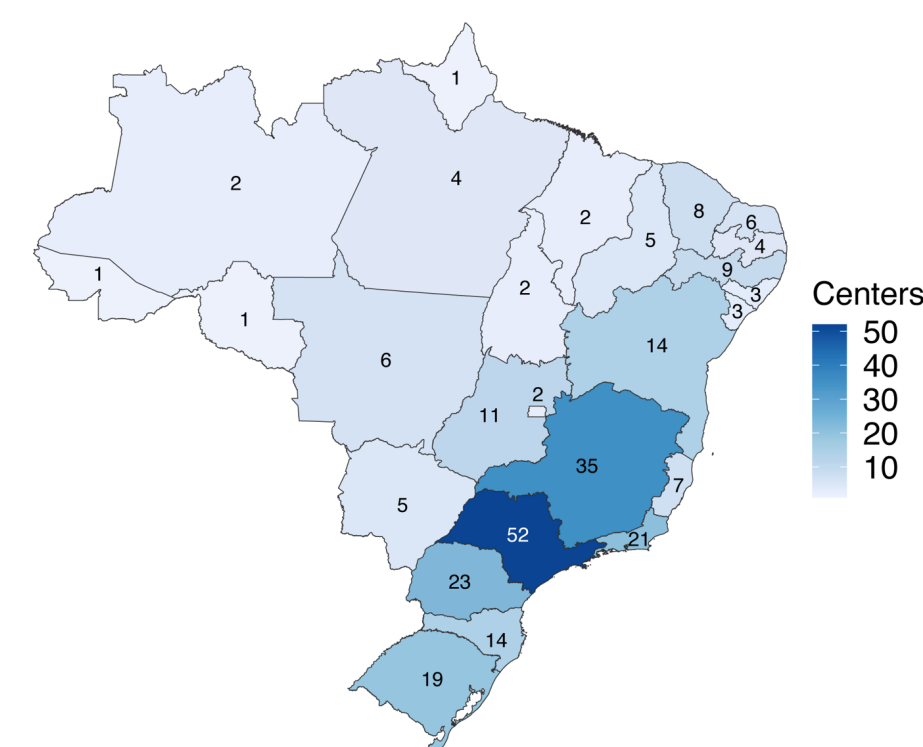


Figure 1. Geographic distribution of centers

Conclusions

Real World Evidence from the Brazilian Public Healthcare System indicates that **CIED implantation centers have a heterogeneous geographic distribution.**

An increase in the number of active centers per year was identified. Also, there is considerable variability in the number of procedures and types of device implants performed by each institution.