

An Overview of Cardiac Pacing in Jamaica. Part I: Demographic Factors

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ABSTRACT

Objective: To present a report of the demographics of cardiac pacing in Jamaica.

Methods: Demographic data are extracted from patients attending the Pacemaker clinic between 2001 and 2012. A range of variables, minimum maximum, mean, standard deviations, etc., are computed for all the patients enrolled in the clinic. The demographics of pacing are examined in the context of pacing practice worldwide.

Results: There are several significant findings from the analysis of the 531 patients that visit the clinic. Close to 50 % of pacemaker patients in the clinic are over the age of 80, a figure that compares favourably with those from developed countries. Almost twice as many women as men had pacemakers implanted; whereas worldwide, the majority of pacemaker users are men. The majority of pacemakers were implanted in patients from the south of the island.

Conclusion: This paper highlights significant trends in the demographics of pacing practice in Jamaica and lays the foundation for the undertaking of future surveys as the practice continues to evolve in Jamaica. Multiple peculiarities of this small population have been suggested and further studies are warranted.

Keywords: Clinic, Demographics, ICD, Jamaica, Pacemaker

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INTRODUCTION

Pacemakers were first implanted at the Karolinska Institute in Solna, Sweden, in 1958 by Ake Senning and Rune Elmqvist (1). Since then pacemaker implantation has become a common modality of management of cardiac rhythm abnormalities resulting in a slow ventricular rate (Bradycardias), especially if symptomatic (2). In 2003, over 900,000 pacemakers were implanted worldwide with an increase of 5 – 6 % per year (3). More recent estimates suggest that there are more than 3 million pacemakers implanted worldwide (4).

Jamaica is an island in the Caribbean with a population of 2.7 million people, spread (unevenly) over 14 parishes (see Figure 3) with the Kingston and St. Andrew region having the largest population density. The commercial district of Kingston and St Andrew provides employment for the majority of its residents as well as a significant percentage of those from the adjoining parish of St. Catherine, most living in the municipality of Portmore.

Pacemaker implantation began in Jamaica in the early 1970's. Prior to this, patients would go to the United Kingdom or the United States for implantation and replacement of their devices as well as any follow-up that may have been necessary. Once implantation began on the Island, devices were acquired by purchasing them from suppliers or, for the indigent, through donations by the Rotary International Heart Beat International program. Subsequently, the Heart Beat International program was abandoned and patients either purchased their pacemakers directly from suppliers with or without help from private or public donors. Some obtained them from donations directly from the pacemaker manufacturers.

The first pacemaker clinic in Jamaica was opened at the University Hospital of the West Indies (UHWI) in Kingston in 2001. It was conceived so that all patients with pacemakers could be seen in a specialised clinic where pacemaker related issues could be quickly identified and dealt with by a specialised staff. In addition, data regarding pacemaker

use and patient demographics as well as disease characteristics could be collected. As such, clinic and follow-up data was input on a specially designed data sheet so that the information obtained on all patients was standardised for later analysis. At the time of inception, the majority of the issues seen were related to pacemaker syndrome, presumably as a result of the predominant reliance on basic single chamber (ventricular) pacemakers that were used to treat all patients requiring a pacemaker, regardless of the diagnosis.

All of the patients seen in the clinic initially had pacemakers, which were either manufactured by Medtronic Inc. or CCC Uruguay, reflecting the implant practice at the time. As the number of patients seen in the pacemaker clinic grew, and other pacemaker suppliers (for example, Boston Scientific) penetrated the market, patients with Implantable Defibrillators as well as patients with pacemakers of different brands began to consult the clinic for routine follow-up.

The clinic remains the only such public clinic in Jamaica and therefore serves the entire Island. Although the main infrastructure of the clinic is at the University Hospital of the West Indies, it soon became necessary to begin outreach clinics, primarily to reach more people in the rural areas and decrease the size of the UHWI clinic. For the purpose of the clinic outreach, the Island was divided into four districts (including the parent clinic) and a clinic is held, on average, twice per month at UHWI and once every three months in the other districts. All public patients who receive pacemakers at the UHWI are referred to the pacemaker clinic. Patients receiving pacemakers from overseas or other institutions also attended the clinic.

This report is the first to focus on pacemaker use in Jamaica. It documents the pacemaker implantation practice in Jamaica, highlighting demographics, device type and age.

SUBJECTS AND METHODS

All pacemaker clinic files of active patients were analysed. It included all patients from the inception of the clinic until the time of data extraction, which was July to September 2012. Active patients were those who were registered with the clinic and not known to be deceased. The data extracted from the files included, age, gender, address, date of implant, date of last visit, diagnosis, type and make of device; mode of pacing, presence and type of atrial arrhythmias and presence of ventricular arrhythmias, All data were analysed anonymously, after address data were extracted. The results of this analysis are presented below.

RESULTS

At the time of this study 531 patients were actively enrolled in the pacemaker clinic. Of this number, 382 patients were seen within the previous 24 months of the date of data extraction. Many of the patients enrolled in the clinic had their devices implanted before the clinic began operations, and for some patients, data forms were incomplete. For each of the variables analysed, the number of records included is stated.

Type of Pacing Device

Table 1 shows the percentage of patients with particular pacing devices. Of the 426 patients with information on type of pacing device, 92.3% had a pacemaker (Implantable pulse Generator - IPG) while 7.5% had an Implantable Cardioverter Defibrillator (ICD). Implantable loop recorders account for 0.2% of the clinic population at the time of the study.

Age Distribution

The 531 patients ranged from 5 to 112 years of age (mean 76.6 years) - see Figure 1. Most patients were within the 80 – 89 year age-group. Forty-six percent (46 %) of patients were older than 80 years, which compares quite favourably with developed countries (5).

Prior to age 50, utilization of the clinic was limited across age groups, increasing with age. After age 55, the numbers steeply increased and declined after 90 years of age. Notably, the number of patients in the modal age group (85 – 89 years), which represented 18.5% of the clinic population, exceeded the number of cases in the 0 – 69 year groups combined (18%).

Gender Distribution

Complete gender records were available for 530 patients. It was found that 35.5% of the patients were male and the remainder, 64.5% were female. Analysis of the data for each parish revealed the same ratio across the Island and within all age groups. Similar patterns emerged when corrections were made for the population-based male to female ratio per age.

Figure 2 shows the similarity of the age-related distributions of implantation for males and females, despite the 2:1 ratio of females to males, with means and standard deviations (s.d.) 75.9 (s.d. 16.5) years and 76.8 (s.d. 16.6) years respectively.

Geographical Distribution

Jamaica is divided into 14 parishes (see Table 2 and Figure 3). In 1923 the parishes of Kingston and Saint Andrew were combined into the Corporate Area and have, since then, been administered as a single parochial unit. Thus, for the purpose of the study, Kingston and Saint Andrew are combined and analysed as one. Patients who resided in Kingston and St. Andrew visited the clinic most commonly and represented 38.8 % of the clinic population. St Catherine was next at 20 %, followed by Manchester with 8.1 % of the clinic population. Trelawny was the least represented parish, making up only 1.5% of the clinic population.

Evaluation of the pacemaker implantation as a function of the population of the parish of residence of the patients revealed that Kingston and St. Andrew remained the best represented per member of the population with 36.4 patients per 100,000 population followed by Manchester (22.7) and St. Catherine (20.5). Trelawny was the least represented per parish population with an incidence of 10.6 patients per 100,000 population, though it was closely followed by St. James (10.9), Portland (11.0) and St. Ann (11.6). The average incidence for the population of Jamaica was 19.6 per 100,000 population, slightly less than half the rate for Kingston and a third of the average for the United States (using 2009 figures) (6). It was noted that the south coast parishes were far better represented in the clinic, accounting for more than 84.1 % of total implants. The incidence per 100, 000 persons for south coast parishes was approximately 14, compared to 11.3 for those on the north coast. A full analysis of this trend is beyond the scope of the report.

Cardiovascular diseases are often found to be associated with certain physiochemical characteristics of the environment. These characteristics have a clear geographical pattern across the island. Comparison of pacemaker distribution map in Figure 3 with the geochemical soil maps of Jamaica (7) did not show a clear relationship with geochemical distribution of elements, including magnesium - an essential transmembrane and intracellular modulator of the electrical activity of cardiac cells.

Implant Age

At the time of data collection, the oldest device of the 490 records analysed was implanted 242 months (approximately 20 years) prior, though fewer than 3 % of devices were older than 160 months (see Figure 4). The most recent was done one month prior to data collection, while the mean time since implant was approximately 80 months. Attendance at the clinic showed a steep decline after the first 8 months of implantation and showed a gradual decline

towards zero as the pacemaker became older.

DISCUSSION

This study yielded some intriguing results and opens the door for further research into implantation numbers and compliance with the facilities of the public clinic. The data are likely to be representative of the population of pacemaker patients in Jamaica as the University Hospital was - and remains - the largest implantation facility on the Island at the time of the study with only minor contributions from private implanters. Additionally, the compliance rate of follow-up initially was almost 100%. The rate of implantation per 100,000 is 19.6, with maximum utilization within the Kingston and St. Andrew region at 36.4/100,000. This compares with an average implantation rate of 61.6 per 100,000 for the United States in 2009 (6). It is noted that the rate of implantation and/or, utilization of the clinic is higher for patients from the south coast parishes as well as St. Mary, which could be a function of access to the University Hospital, both for the initial referral for implantation as well as follow-up. It is worth noting that the main urban centres are on the south coast and close to 60 % of the population reside there. The second city (Montego Bay) demonstrates a low rate of utilization of the clinic despite the presence of the satellite clinic there.

Perhaps one of the more intriguing findings of the study is the fact that the average age of the clinic (76.6 years) closely matches the average life expectancy for Jamaica (average 76.2 years (8)) and nearly 50 % of pacemaker patients in the clinic are over the age of 80 years old. This figure surpasses most developed countries with more sophisticated healthcare systems and refutes the perception of a correlation with early mortality. This as well as the lack of male predilection may imply a completely different behavior of conduction disease when compared to other acquired heart disease.

The data showed that almost twice as many women as men had pacemakers implanted; this differs from the situation worldwide (5, 9). Of the 61 countries surveyed in the most recent world survey of pacing and ICDs only the Philippines had a similar ratio of men to women (5). It was particularly interesting that this ratio persisted across all age groups (from the very young to the elderly). More research is required to investigate this unusual phenomenon.

CONCLUSION

The demographic data of pacemaker implantation in Jamaica has been presented. This initial report provides a snapshot of practice in a developing country transitioning to developed world practices in Cardiac Implantable Electronic Device (CIED) implantation. It has highlighted significant trends in the demographics of pacing practice in Jamaica laying the foundation for future surveys as the practice continues to evolve in Jamaica. Multiple peculiarities of this small population have been suggested and further studies are warranted.

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AUTHORS' NOTE

R Irvine and A Coy participated in data collection and analysis. All three authors wrote sections of the paper and participated in revisions.

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Table 1: Types of implanted devices - Types of pacing devices implanted in patients attending the clinic

Type of Pacing Device	Percentage Implanted (%)
Implantable Pulse Generator	92.3
Implantable Cardioverter Defibrillator	7.5
Implantable loop recorders	0.2

Table 2: Implantations by parish - A list of parishes showing the number of implantations, the percentage of the country total found in each parish and the incidence per 100, 000.

Parish	Frequency	% of Total	/100,000 Pop
Portland	9	1.7	11.0
Saint Thomas	13	2.5	13.8
Kingston & Saint Andrew	206	38.8	36.4
Saint Catherine	106	20	20.5
Clarendon	32	6.0	13.1
Manchester	43	8.1	22.7
Saint Elizabeth	26	4.9	13.7
Westmoreland	20	3.8	13.9
Hanover	10	1.9	14.4
Saint James	20	3.8	10.9
Trelawny	8	1.5	10.6
Saint Ann	20	3.8	11.6
Saint Mary	17	3.2	15.0

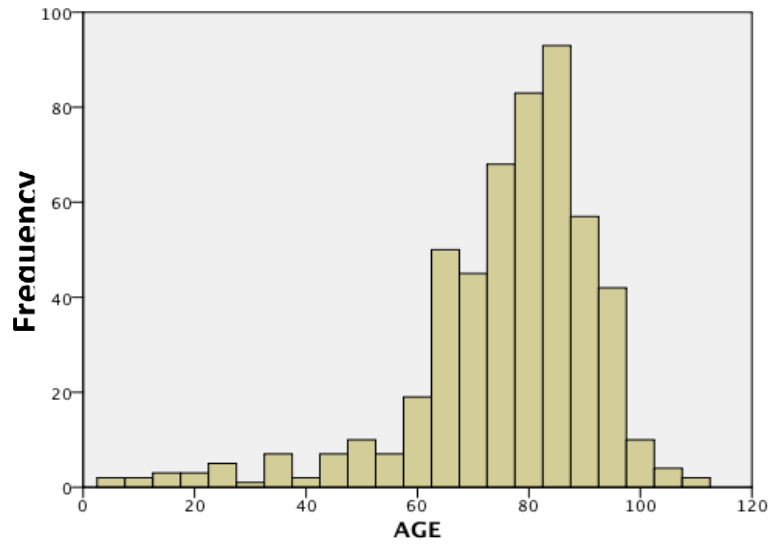


Fig. 1: Implantation by age - Distribution of pacemaker implantation by age group.

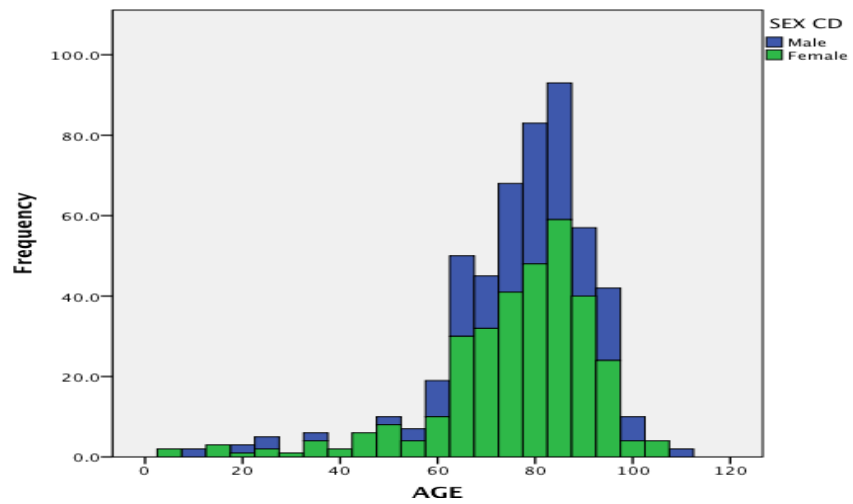


Fig. 2: Implantation by age, gender separated - Distributions of pacemaker implantation by age group, shown separately for males and females.

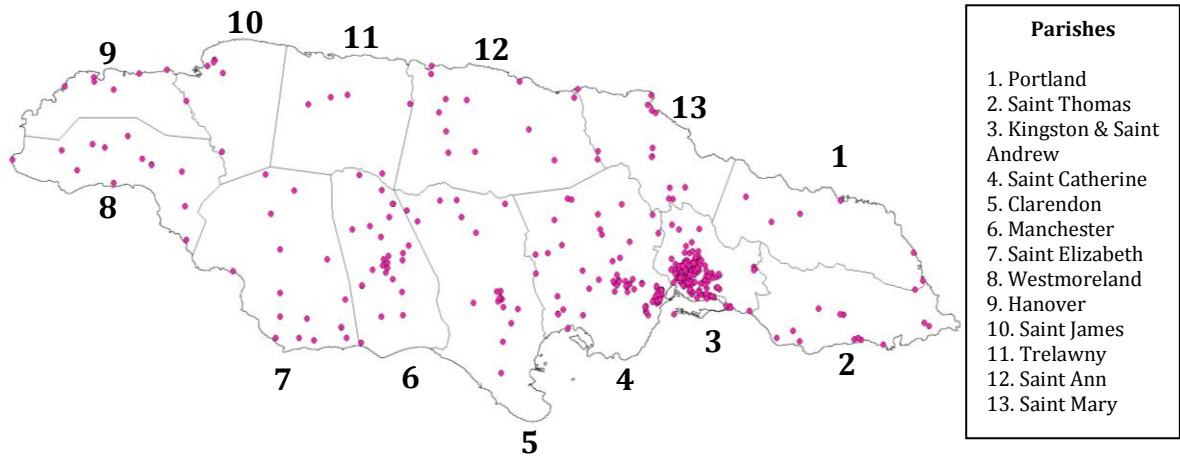


Fig. 3: Geographical distribution of pacemakers - A map of the island showing the parish distribution of pacemakers. Parish numbers correspond to those in Table 2.

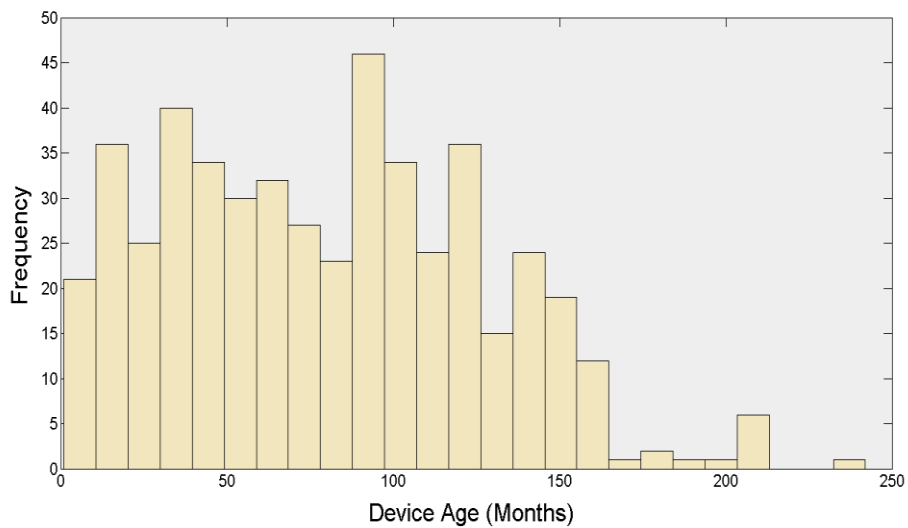


Fig. 4: Device age - Frequency of device age in months.