



Contents lists available at ScienceDirect

Indian Pacing and Electrophysiology Journal

journal homepage: www.elsevier.com/locate/IPEJ

A survey on patient preferences towards CIED implantation

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ARTICLE INFO

Article history:

Received 25 December 2020

Received in revised form

15 February 2021

Accepted 15 April 2021

Available online 19 April 2021

Keywords:

CIED implantation

Defibrillator

Pacemaker

Outpatient

Survey

ABSTRACT

Background: Cardiac implantable electronic device (CIED) implantation is increasingly performed worldwide with improving safety. Outpatient CIED implantation has similar complication rates compared to those implants which are hospitalized. Here, we analyze patient preferences on discharge timing after CIED implantation.

Objective: To identify and understand the factors contributing to patient preferences towards same-day or next-day discharge after CIED implantation.

Methods: One hundred and two patients undergoing new CIED implants were included in the study at two separate hospitals in CT (CT group) and FL (FL group) from 2018–2019. A 7-question survey was administered to the patients after the procedure. Survey responses and demographic data were statistically analyzed.

Results: Seventy-four percent of CT group and 58% of the FL group responded with a 10 score (0–10) that they were ready to be discharged home the same day ($p=0.09$). Both groups reported a low number of patients feeling safer by having a remote monitor provided at the time of discharge (44% CT group, 28% FL group; $p=0.123$). The mean distance of patients living from the hospital in CT group (21.6 miles) was significantly lower than that for the FL group (35.5 miles); $p=0.01$. Hypertension (86% vs 52%; $p=0.0002$) and Diabetes mellitus (44% vs 21%; $p=0.013$) were more prevalent in the FL group compared to the CT group.

Conclusion: Despite the influence of local practices, the majority of patients preferred same-day discharge after CIED implantation. Improved patient education regarding the ability of remote monitors to provide real-time response to acute events is needed.

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1. Introduction

Cardiac device implantation has evolved in recent times as a safer and more standardized procedure. Worldwide, the US has the highest number of Implantable Cardioverter Defibrillators (ICDs) and Permanent Pacemaker (PPM) implants per year [1]. More than 10,000 ICDs and 18,000 PPMs are implanted each month in the US

alone [1]. PPM implantation has also risen by about 56% in the last two decades. This trend can be attributed to improved implant techniques, increased operator experience, and low complication rates. Outpatient ICD and PPM implantation are also increasingly performed at some centers with complication rates similar to those implants which are observed in the hospital overnight [2–8]. Given the need to reduce cost, more centers are evaluating the potential for same-day discharge of patients who are implanted with a cardiovascular implantable electronic device (CIED). Also, recent healthcare legislation has emphasized patient experience and made patient preferences and satisfaction a quality indicator. To date, no published study has evaluated patient preferences and understanding of the CIED implant towards same-day or next-day discharge. Here we present the results of a survey to better

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Peer review under responsibility of Indian Heart Rhythm Society.

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understand patient preferences for outpatient CIED implantation and the various factors that may influence their preferences.

2. Methods

2.1. Patient population

The study was conducted from 2018 to 2019. Patients were screened for eligibility if they were undergoing a new CIED implantation such as a single or dual chamber PPM or an ICD or Cardiac Resynchronization Therapy with defibrillator or pacemaker function (CRT-D and CRT-P respectively). The survey was administered at two different sites in the US. The two centers included St. Francis Hospital (SFH) in Hartford, CT (CT group), and St. Vincent's Hospital (SVH) in Jacksonville, FL (FL group). Prior to the start of the study, most patients in the CT group were already being discharged same day, whereas most at SVH were being discharged on the following morning. IRB approval was obtained at both centers. Exclusion criteria included patients younger than 18 years of age, older than or of 100 years, those undergoing device generator exchange or upgrade, and those unable to complete the survey independently.

A total of 115 consecutively identified patients were enrolled in the study (Fig. 1). Fifty-four patients underwent CIED implant and completed a survey in the CT group, and 61 patients underwent CIED implant and completed a survey in the FL group. Two patients in the CT group had an unplanned stay overnight, and 11 patients in the FL group stayed for more than one night due to reasons not related to device implantation and hence were excluded from the survey analysis. Survey responses of the remaining 102 patients (52 in the CT group and 50 in the FL group) were included for analysis, and their baseline demographic data is listed in Table 1.

2.2. Procedure and survey questionnaire

All the implants were performed by cardiac electrophysiologists at both sites. As per local institutional practice, the CT-group patients expected to go home same day whereas the FL-group patients expected to stay overnight after the device implant. All the implants being elective cases in both centers, were scheduled in the day from 7:30 a.m. to 2 p.m. For patients on chronic anticoagulation, warfarin was continued peri-op but for those on Novel Oral Anticoagulants (NOAC), 1 or 2 doses of NOAC were held pre-op, at the discretion of the operator. Anesthesia protocol was determined by the Anesthesiologist and the Electrophysiologist and frequently included moderate sedation, with some patients requiring general anesthesia. The standard antibiotic protocol at the CT hospital included one dose of intravenous Cefazolin within 1 hour of incision time. Intravenous Vancomycin was used instead in-case of contraindication to Cefazolin use. One dose of intravenous Vancomycin and Vancomycin pocket irrigation was frequently used as standard prophylactic therapy at the FL hospital. Decision regarding antibiotics at discharge was at the discretion of the operator. Post-procedure chest x-ray was performed on all the patients in both groups as a standard of practice. Patients were provided with the survey after the device implantation while recovering in the hospital prior to discharge. The post-procedure timing of the survey enabled the patients to answer the questions such as pain rating and readiness to go home appropriately. The survey included 7 questions to be answered by the patient after device implantation, as listed in Table 2. Patient discharge timing was determined by the implanting electrophysiologist and the team caring for the patient. The attending Electrophysiologist and the device representative reviewed with the patients, the utility and instructions of the telemonitor which was set up on the day of

implant, prior to discharge. Data collection sheets were stored in a locked file cabinet in a locked room, with access only to study personnel. The electronic database was password protected and stored on an encrypted hospital network. Neither the hard copy data forms nor the electronic database contained patient identifiers. Duration of hospital stay for patients in the CT group ranged from 4 to 6 hours post-procedure and all patients were discharged home. Patients in both groups followed up in the Electrophysiology office for wound assessment 3–4 weeks post implantation.

2.3. Statistical methods

Data was evaluated and analyzed using SAS version 9.4. Values of $p < 0.05$ were considered statistically significant. Chi-square analyses compared categorical survey responses by study group; t-tests compared continuous variables (age, ejection fraction, readiness to go home, distance, pain) by study group.

3. Results

One hundred two patients who received de novo CIED implants at both hospitals from 2018 to 2019 were included for the analysis of their survey responses. A comparison of patient demographics and prevalence of comorbid conditions between the two groups is listed in Table 1. The mean ages of patients in the CT group ($n = 52$) and the FL group ($n = 50$) were 66.8 and 66.7 years respectively. Majority of patients were male in both the CT group ($n = 37$; 71%) and the FL group ($n = 28$; 56%). Mean Ejection Fraction (EF) for patients in CT group and FL group was 35.4% ($n = 51$) and 35.6% ($n = 48$) respectively. Mean distance of patients living from the hospital in CT group (21.6 miles) was significantly lower than that for the FL group (35.5 miles); $p = 0.01$. Compared to 13% of CT group patients, 32% of FL group patients lived >40 miles from the hospital, $p = 0.025$. Hypertension (86% vs 52%; $p = 0.0002$), Diabetes mellitus (44% vs 21%; $p = 0.0137$) and Chronic Kidney Disease (18% vs 13%; $p = 0.52$) were more prevalent in the FL group when compared to the CT group. Out of the 102 CIED implants, 38 were ICDs (22 in CT group and 16 in FL group), 36 were CRT-Ds (20 in CT group and 16 in FL group), one CRT-P in the FL group, and 27 were PPMs (10 in CT group and 17 in FL group). Comparison of ICD indications and the prevalence of ischemic versus non-ischemic cardiomyopathy between the CT group and the FL group are detailed in Table 3.

When asked whether patients felt ready to be discharged home on the day of implant, 37/50 (74%) patients in the CT group responded with the highest score of 10 (scale 0–10) while 29/50 (58%) patients in the FL group responded with a score of 10 that they were ready to be discharged home same-day ($p = 0.09$) (Table 4). Also, patients indicated a high likelihood of having someone at home to care for them overnight (48/52, 92% CT group, and 45/50, 90% FL group; $p = 0.68$). The majority of patients in both groups, 48/52 (92%) in the CT group and 38/50 (76%) in the FL group preferred to sleep in their own bed, though significantly more patients in the CT group indicated a preference of sleeping in their own bed as compared to the FL group ($p = 0.01$).

Concerning cost savings, more patients from the CT group 33/45 (73%) preferred to be discharged home the same day if it saved money, as compared to the FL group 22/50 (44%); $p < 0.003$. Amongst patients who preferred same day discharge if it saved money, there was no significant influence by the insurance type comparing Medicare vs Private insurance ($p = 0.26$). Similarly, if patients were told that complications were the same regardless of whether they stayed overnight or went home the same day, more patients in the CT group indicated a preference to be discharged home the same day (40/51, 78%) vs. FL group (21/50, 42%); $p < 0.0002$.

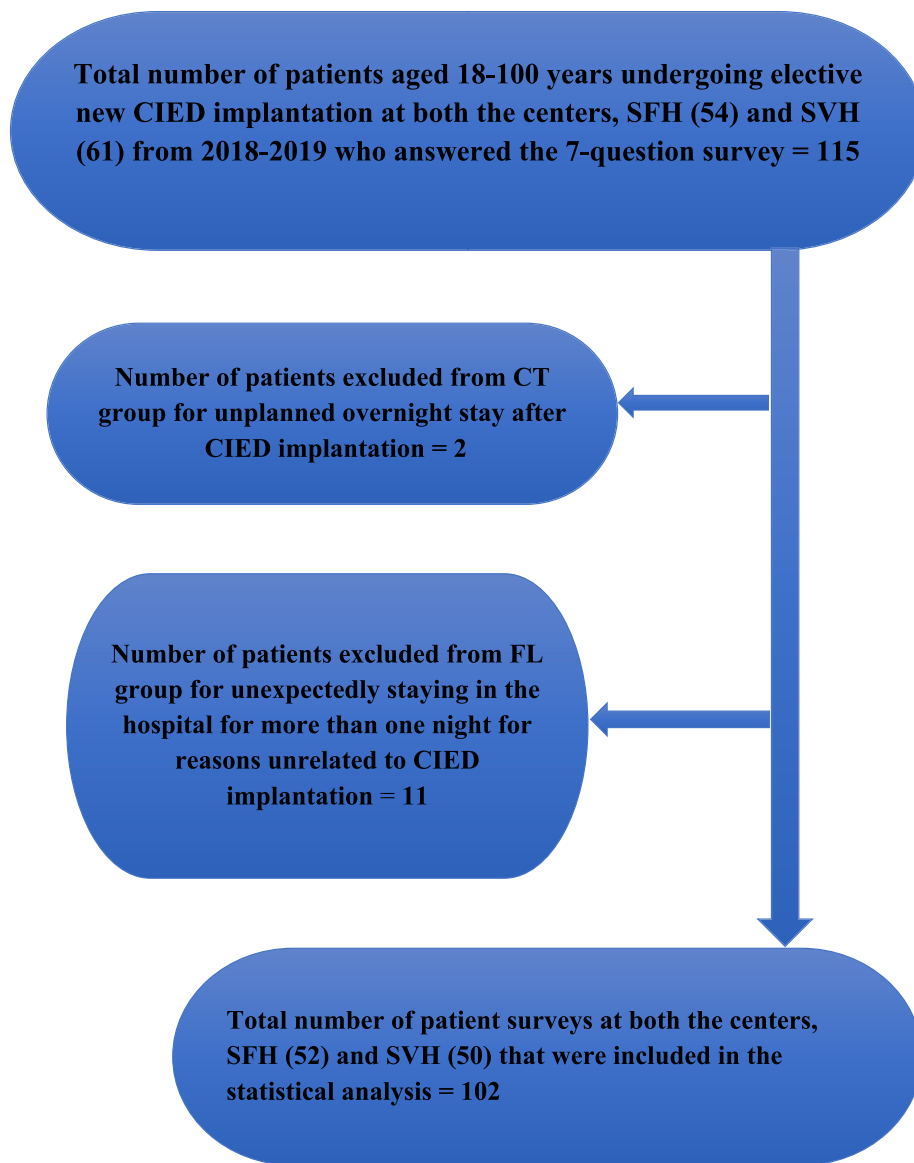


Fig. 1. Patient selection and exclusion criteria leading up to survey analysis.

CIED = Cardiac Implantable Electronic Devices

SFH = Saint Francis Hospital (CT group)

SVH = Saint Vincent’s Hospital (FL group).

Table 1

Comparison of baseline patient demographics and prevalence of co-morbidities between CT group and FL group along with respective p-values. LVEF = Left Ventricular Ejection Fraction.

Patient Characteristic	CT Group (N = 52)	FL Group (N = 50)	P value
Age in years, mean	66.8	66.7	0.98
Male sex, N (%)	37 (71)	28 (56)	0.11
LVEF in percentage, Mean (range)	35.4 (15–70)	35.6 (7.5–67)	0.94
Distance from hospital in miles, Mean (range)	21.6 (3–110)	35.6 (0.25–120)	0.01
Caucasian race, N (%)	37 (71)	35 (70)	0.89
Hypertension, N (%)	27 (52)	43 (86)	0.0002
Diabetes Mellitus, N (%)	11 (21)	22 (44)	0.0137
Chronic Kidney Disease, N (%)	7 (13)	9 (18)	0.52
Education level > High School, N (%)	31 (63)	28 (56)	0.46
Married, N (%)	32 (61)	21 (44)	0.07
Insurance, private only, N (%)	20 (38)	13 (26)	0.17
Distance from Hospital, >40 miles (Mean)	7 (13)	16 (32)	0.025

Table 2

The 7-question survey answered by the patients after de novo CIED implantation and prior to discharge home.

Survey Questionnaire
On a scale of 0–10, how ready are you to go home?
Is there someone at home to stay with you overnight?
On a scale of 0–10, how would you rate your pain or discomfort?
Do you think you would sleep better in the hospital or at home?
Would you feel safer going home with a heart monitor?
If it cost you less money, would you choose to go home the same day?
If the risk of complications is the same, would you choose to go home the same day?

Table 3

Comparison of indications for ICD and CRT-D devices and the prevalence of Cardiomyopathy type in the CT group and the FL group amongst patients who received ICD or CRT-D implants.

ICM = Ischemic Cardiomyopathy, NICM = Non-Ischemic Cardiomyopathy.

GROUP (N)	ICM, N (%)	NICM, N (%)	Primary prevention N (%)	Secondary prevention, N (%)
CT group (42)	18 (43)	24 (57)	39 (93)	3 (7)
FL group (32)	14 (44)	18 (56)	26 (81)	6 (19)

Table 4

Comparison of the 7-question survey results between CT group and FL group along with respective p-values.

Survey Response	CT group, N (%)	FL Group, N (%)	P value
Responded 10/10 on a scale on 0–10 for readiness to go home the same day.	37 (74)	29 (58)	0.09
Someone present at home to stay overnight.	48 (92)	45 (90)	0.68
Rated >6 on a 0–10 pain or discomfort scale.	18 (35)	16 (32)	0.88
Sleep better at home than in the hospital.	48 (92)	38 (76)	0.01
*Feel safer going home with a heart monitor.	23 (44)	14 (28)	0.12
Choose to go home the same day if it costs less money.	33 (73)	22 (44)	0.003
Choose to go home the same day if the risk of complications is the same.	40 (78)	21 (42)	0.0002

Finally, when evaluating the role of remote monitoring on discharge from the hospital, both groups reported a low number of patients feeling safer by having a remote monitor provided at the time of discharge (23/52, 44% CT group, 14/50, 28% FL group; $p = 0.123$).

4. Discussion

Several recent studies have concluded that same-day discharge after CIED implantation is safe compared to hospitalization after elective CIED implantation for monitoring [2–8]. These studies acknowledge a lack of statistically significant difference in the complication rates such as wound infection, hematoma formation, pacing lead dislodgement [7] and even mortality rates [5,6] between the two patient groups. Suri and Choudhury et al. [3] reported a prospective, randomized trial comparing early discharge to hospitalization after elective ICD implantation and did not find a statistical difference in Quality of Life scores reported by patients between both groups. In contrast to inpatient hospitalization, same-day discharge after elective CIED implantation is cost-effective with cost savings up to thousands of dollars per patient [2–4,6,8].

In the present study, we attempted to understand which factors and attitudes on the patient side may be playing a role in the wide variation in practice seen with CIED implantation. To our knowledge, this is the first study addressing patient preferences on defibrillator implantation. Interestingly, the majority of patients in both the CT group and FL group felt ready to be discharged home the same day, even though the FL group were more traditionally kept overnight as per local practice. This finding provides further indication that patients are indeed ready to be discharged home the same day, whether they are planning to be discharged the same day or be kept in hospital overnight. Given the increasing amount of

data on the safety of outpatient CIED implantation [2–8] and the importance of reducing hospital length of stay to address the rapidly rising global healthcare expenditure [10], it appears that decisions to stay in hospital are likely to be more provider-based than patient-based.

We also found that 73% of patients in the CT group were interested in same-day discharge if it saved the patient money, while in the FL group, only 44% of patients were interested in saving money by going home the same day. There may be several possible explanations for this finding, including proximity to the hospital, and comorbid conditions that might influence and weigh on patients who are considering early discharge from the hospital. Similarly, we also found that in the CT group, 78% were more likely to favor discharge home, as long as complication rates were the same as compared to 42% in the FL group. Of course, influence of the prevailing local practice of an overnight stay in the FL group along with the pre-procedure counseling patients may have received from their physicians or staff could have played an important role in being somewhat less comfortable in same-day discharge. Another important difference is that more patients in the FL group lived significantly farther from the medical center, suggesting that patients who live in remote locations may have a stronger preference for an overnight stay.

Logistic regression analysis predicted that only two variables are significant in influencing a patient's choice to select 10/10 when asked to rate on a scale of 1–10, their readiness to go home. These are the level of pain reported, and if someone was at home when discharged.

Patients with someone at home were 10 times as likely to select 10/10. Patients with higher pain scores (rated >6/10) were 0.71 times less likely to select 10/10.

Haugaa et al. [9] report a recent multinational patient survey regarding living with CIED, and they note patients were generally

well informed about their cardiac devices, but they did observe that patient understanding of device functioning is suboptimal. One of the more significant findings of our study was that regardless of the location of implantation, patients in the CT group and FL group did not feel safer by having a remote monitoring device provided at the time of implant and discharge from the hospital. In our study, only 44% of patients in the CT group, and 28% of patients in the FL group felt safer by having a remote monitor. This observation outlines a vital knowledge gap between providers/industry and patients regarding the ability of remote monitors to provide increased safety and real-time response to act when acute events occur.

5. Limitations

This study has several limitations that should be mentioned. First, the influence of the local standard practice of overnight or same-day discharge on patient preferences cannot be overlooked. Although the survey was conducted at two centers with different local practices, the total number of patients included in the survey analysis is small. Patient comorbidities and many non-medical factors such as distance from the hospital, and socioeconomic status may have also potentially influenced patient preferences.

Declaration of competing interest

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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