

Current Management of Cardiac Implantable Electronic Device Infections: Results of an Emerging Infections Network Survey



NATIONAL LEADERS IN MEDICINE

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ABSTRACT

Background: Infectious disease (ID) specialists are frequently involved in the care of patients with cardiac implantable electronic device (CIED) infections. While guidelines exist for managing these infections, supporting literature is largely based on expert opinion. We sought to better understand current CIED treatment practices of ID physicians.

Methods: A seven-question electronic survey of ID physician members of the Emerging Infections Network (EIN), a CDC-sponsored sentinel network, in late January 2015.

Results: 543/1,185 (46%) EIN members responded. We excluded 183/543 (34%) respondents who had not treated CIED infections in the past year. 166/360 (46%) reported having treated <5 CIED infections in the past year. Respondents predominantly favored complete device removal for patients with a pocket infection [293/359 (82%)] or lead-associated endocarditis [356/360 (99%)]. Complete removal was less frequently [164/358 (46%)] recommended for occult bacteremia, and few [40/355 (11%)] felt it necessary when bacteremia was attributable to a non-cardiovascular source. Isolation of *S. aureus* was a key reason for recommending complete device removal. Respondents were more likely to treat *S. aureus* bacteremia with antibiotics for >4 weeks compared to Gram-positive bacteremia other than *S. aureus* or Gram-negative bacteremia (64%, 31%, and 23%, respectively; p<0.0001). 306/355 (86%) treated lead-associated endocarditis for >4 weeks. 175/355 (49%) of respondents favored a brief device-free interval (2-6 days) until CIED reimplantation in patients with a pacemaker-dependent arrhythmia, but 260/356 (73%) favored waiting ≥1 week for patients requiring a CIED for primary prevention of sudden cardiac death and 246/353 (70%) for secondary prevention. For patients with lead-associated endocarditis where complete CIED removal was not possible, respondents favored chronic suppression with oral antibiotics after initial intravenous therapy [33/360 (93%)]; most recommended treatment for an indefinite period [239/329 (73%)].

Conclusions: In the setting of CIED infections, ID physicians favored a combination of complete device removal and prolonged antibiotic therapy, particularly in the setting of *S. aureus* infection.

INTRODUCTION

- Cardiac implantable electronic devices (CIED) including pacemakers, implantable cardioverter-defibrillators (ICD), and cardiac resynchronization therapy (CRT) devices have revolutionized the management of arrhythmias & heart failure
- In 2009, >235,000 new pacemakers & 130,000 ICDs were implanted in the U.S., while another 100,000 pacemakers & 73,000 ICDs were replaced [1]
- CIED infection rates range anywhere from <1% to 4% [1-3]
- It is not known how frequently infectious disease specialists encounter CIED infections in clinical practice
- Management guidelines are largely driven by expert opinion [4] and little is known of individual practice patterns

METHODS

- The questionnaire was first piloted by infectious disease physicians at 2 large, academic medical centers
- The final 7-question questionnaire was electronically distributed to EIN members between January 29, 2015 and February 22, 2015
- Descriptive statistics were calculated using SAS 9.4 (Carey, NC)

STUDY POPULATION

- **543/1,185 (46%)** EIN member physicians w/ an adult infectious diseases practice responded
- The study sample was diverse in terms of respondent geography, experience & employment (Table 1)
- **360/543 (66%)** had treated a pt(s) with a CIED infection in the past year (Table 2)

TABLE 1. Demographics

	n (%) (n=543)
U.S. Census Bureau Regions	
Northeast	130 (23.9)
Midwest	137 (25.2)
South	157 (28.9)
West	115 (21.2)
Canada	4 (0.7)
Years of Experience	
< 5	120 (22.1)
5-14	149 (27.4)
15-24	124 (22.8)
≥ 25	150 (27.6)
Employment	
Hospital/clinic	158 (29.1)
Private/group practice	167 (30.8)
University/medical school	181 (33.3)
VA and military	32 (5.9)
State government	5 (0.9)

TABLE 2. Experience w/ CIED infections

	n (%) (n=360)
Cases treated during past year	
< 5	166 (46.1)
5-10	125 (34.7)
11-25	55 (15.3)
≥ 25	14 (3.9)

RESULTS

- In pts w/ **occult bacteremia (no apparent focus)**:
 - 46% usually/almost always recommend complete device removal; 7% usually/almost always recommend partial device removal
- In pts w/ **bacteremia from a non-cardiovascular infection**:
 - 11% usually/almost always recommend complete device removal; 3% usually/almost always recommend partial device removal
- In pts w/ **pocket infection requiring I&D**:
 - 82% usually/almost always recommend complete device removal; 29% usually/almost always recommend partial device removal
- In pts w/ **lead-associated endocarditis**:
 - 99% usually/almost always recommend complete device removal; 20% usually/almost always recommend partial device removal
- 73% endorsed complete device removal in the setting of *S. aureus* bacteremia if the source is unknown; 47% recommend likewise even if a non-cardiovascular source is found. Most recommend complete device removal in the context of pocket infection or lead-associated endocarditis irrespective of organisms cultured (Figure 1)
- The preferred duration of therapy to treat *S. aureus* bacteremia is greater than that with other Gram-positive or Gram-negative organisms. Most treat pocket infections for up to 14d and lead-associated endocarditis for >4 wks (Figure 2)
- In pts w/ CIED infection who are pacemaker-dependent, a shorter device holiday acceptable compared to those needing a CIED for primary/secondary prevention (Table 3)
- For pts w/ lead-associated endocarditis, 334 (93%) treat with chronic suppressive oral antibiotics, w/ 73% recommending indefinitely

FIGURE 1. Device Removal by Organism

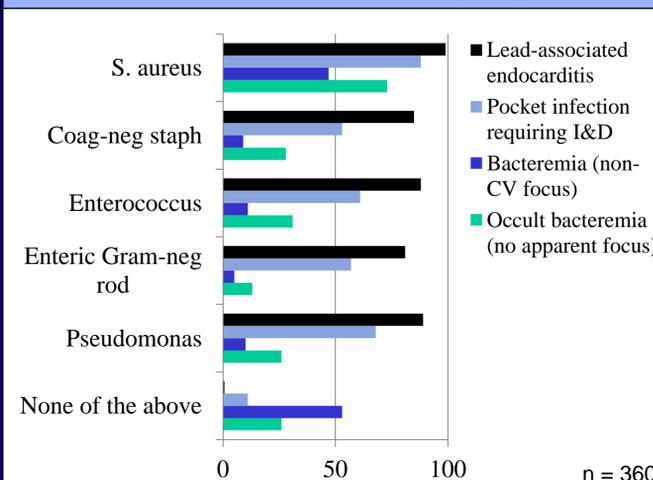


FIGURE 2. Duration of therapy for CIED infections

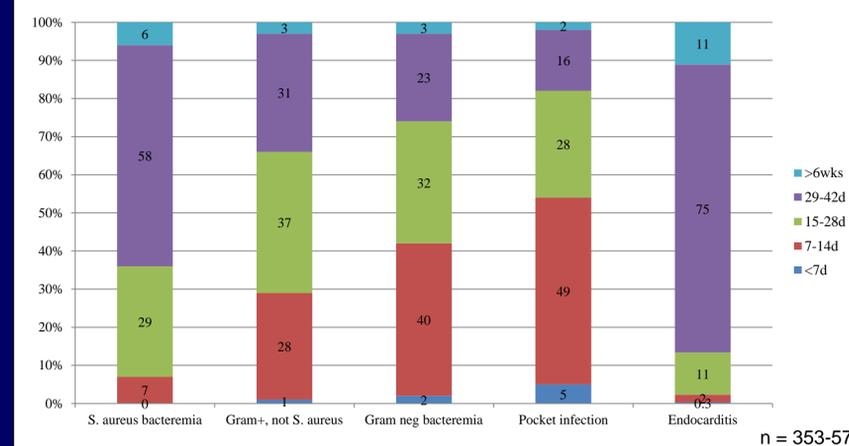


TABLE 3. When to reimplant a CIED after infection

Indication	≤ 48h	2-6d	1-2 wk	>2-4 wk	>4-6 wk	>6 wk
Pacemaker-dependent arrhythmia	31 (9%)	175 (49%)	100 (28%)	33 (9%)	15 (4%)	1 (0.3%)
Primary prevention (e.g., CM w/ ↓EF)	15 (4%)	81 (23%)	110 (31%)	78 (22%)	51 (14%)	21 (6%)
Secondary prevention (e.g., prior VT/VF)	16 (5%)	91 (26%)	125 (35%)	74 (21%)	36 (10%)	11 (3%)

CONCLUSIONS

- Despite widespread CIED use, complications requiring the care of an infectious disease specialist remain infrequent
- Most EIN members agree that complete device removal is warranted in the setting of *S. aureus* bacteremia, pocket infection & lead-associated endocarditis
- Most are more likely to treat CIED pts w/ *S. aureus* bacteremia for longer periods (28-42d) vs. other Gram-positive or Gram-negative organisms
- In the pacemaker-dependent pt w/ a CIED infection, a device holiday of 2-6d is generally preferred
- Long-term chronic suppressive oral antibiotics are commonly being used in lead-associated endocarditis when complete device removal is not possible

REFERENCES

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Funding: S.L. received support from the KM1 Comparative Effectiveness Research Career Development Award (KM1CA156708-01), the Clinical and Translational Science Award (CTSA) program (UL1RR024992) of the National Center for Advancing Translational Sciences (NCATS), and the Barnes-Jewish Patient Safety & Quality Career Development Program, funded by the Foundation for Barnes-Jewish Hospital. EIN is supported by the Grant or Cooperative Agreement FOA CK11-1102, funded by the Centers for Disease Control and Prevention.