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Implementation of Infection Prevention and Antimicrobial Stewardship in Cardiac Electrophysiology Laboratories: Results from the SHEA Research Network

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Abstract

Infection prevention in electrophysiology (EP) laboratories is poorly characterized; thus, we conducted a cross-sectional survey using the SHEA Research Network. We found limited uptake of basic interventions, such as surveillance and appropriate peri-procedural antimicrobial use. Further study is needed to identify ways to improve infection prevention in this setting.

Infections complicate 2%–5% of all cardiovascular implantable electronic device (CIED) procedures, which include pacemakers and implantable cardioverter-defibrillators.^{1,2} With use of CIEDs growing to 245,000 new implants in 2007, the incidence of CIED infections is also increasing.² Deep infections cost more than \$50,000 per event and have an absolute mortality of 18%.^{3,4} The rising use of CIED devices, particularly due to a growing geriatric population coupled with the devastating nature of CIED infections, creates a critical need for effective infection prevention strategies in the cardiac electrophysiology (EP) laboratory.

The need to improve infection prevention strategies is underscored by recent studies demonstrating high rates of inappropriate antimicrobial prophylaxis following CIED procedures.⁵ Accordingly, it is important to understand the current landscape of infection prevention and antimicrobial stewardship practices in the EP laboratory, a patient-care area

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often outside of traditional inpatient surveillance programs. To address this gap, we conducted a cross-sectional survey of institutions participating in the Society for Healthcare Epidemiology in America Research Network (SHEA-RN).

METHODS

A qualitative survey to ascertain information related to current infection prevention and antimicrobial stewardship practices in the EP laboratory was developed and sent to institutions participating in the SHEA-RN. The 45-item questionnaire had 2 major domains, the first relating to infection prevention and the second to antimicrobial stewardship. Survey items also collected institutional demographic information, including procedural volume and number of practicing electrophysiologists. Basic institutional data about participating facilities, such as number of beds and type of clinical setting, are also available from SHEA-RN databases. Data were analyzed using descriptive statistics.

RESULTS

Of 109 institutions actively participating in the SHEA-RN, 41 institutions (38%) responded. Among the responders, 17 (41%) provided complete data, 5 (12%) were eligible but provided incomplete data, and 19 (46%) were ineligible for the study due to the absence of an EP laboratory. Among responding facilities, 5 of 17 (29%) identified themselves as high-volume CIED centers (>100 procedures per year), and 13 of 17 (76%) institutions were in the United States. The number of EP providers ranged from 2 to 14. In addition, 4 institutions (24%) had EP laboratories where 26%–50% of procedures were identified as revisions. Of 17 institutions, 16 have an infectious diseases consultation services available; 3 of these 16 institutions mandate infectious diseases consultation for management of CIED infections. Of 17 institutions, 7 (41%) reported that patients are discharged home on the same day as the EP procedure.

Infection prevention interventions directed toward the EP laboratory were limited. Most institutions reported having basic infection prevention practices in place, but more targeted interventions were rare (Table 1). Among 17 institutions, 7 (41%) indicated that they have a surveillance program for identifying CIED infections. However, only 6 of 7 institutions report identified CIED infections to their infection prevention division, and only 3 of 7 were able to identify a mechanism for reporting infections to infection prevention. Infection prevention receipt of denominator data was also limited; 3 of 17 institutions were able to provide an approximate 6-month incidence of CIED infection following device procedures (range of reported CIED infection rates, 0 to 1.4%).

In total, 15 institutions (88%) indicated that they used preprocedural antibiotics, and 6 institutions used intraoperative antibiotics (35.3%). In addition, 7 institutions reported that prolonged postprocedural antibiotics are commonly prescribed; among them, 6 reported prolonged utilization 76%–100% of the time following both initial implantation procedures and device revision procedures. Factors identified as affecting use of prolonged postprocedural antibiotics included perceived high-risk patient,⁴ break in sterility,²

intraoperative complications such as bleeding,² electrophysiologist preference,¹ and repeat procedure.¹ The most common regimen reported was cephalexin for 5–7 days.

DISCUSSION

This cross-sectional survey demonstrates the limited penetration of infection prevention and antimicrobial stewardship measures in the EP laboratory setting. Although the study was limited by a small number of participating institutions, facilities that responded tended to be moderate-to-high-volume procedural centers that may be more likely to have formalized infection prevention and stewardship activities than smaller, nonteaching facilities.

Notably, of the 17 institutions providing complete responses, 41% self-identified as having a formal surveillance program in place for targeting CIED infections. However, only 18% of infection prevention programs received denominator data, and many programs that reported having a surveillance system (4 of 7; 57%) were not able to characterize a reporting mechanism. These data may suggest that systematic and active surveillance programs—effective measures for reducing other types of healthcare associated infections—are rare. Reportage of passive surveillance programming may also be overestimated, as only 3 of 7 institutions mandate ID consultation for CIED infection—a commonly used mechanism for passive surveillance activity.

Marked variability around infection prevention and stewardship programs exists. While most institutions reported delaying procedures in the presence of a fever, responses regarding procedural delay in the setting of an elevated INR were variable, despite studies demonstrating an increased risk of CIED infections in patients with elevated INRs and postprocedural hematomas.⁶ Preprocedural antimicrobial prophylaxis is a highly effective and established measure for reducing CIED infections,^{6,7} yet even among SHEA-RN facilities, implementation of this practice is not universal, and this finding has been substantiated in other studies.^{1,5} Responding facilities also reported variable postprocedural antibiotic practices, with 35% (6 of 17) of institutions stating that postprocedural antimicrobials were prescribed by EP providers the vast majority of the time, despite the lack of supporting evidence.

Limitations include small sample size, though our cohort was geographically distributed and included both high and low volume labs. Our response rate was low. Moreover, survey responders may self-select for higher performing or larger institutions.

Results from our survey suggest that the EP laboratory may benefit from increased infection prevention interventions and attention to large-scale quality improvement initiatives around antimicrobial stewardship.

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TABLE 1

Infection Control Practices in Electrophysiology Laboratories Among Survey Respondents

Electrophysiology Laboratory Intervention	Responders, No. (%) (n =17)
Passive surveillance	7 (41)
Active surveillance	4 (23)
Denominator reporting	3 (18)
Hand hygiene program	17 (100)
Chlorhexidine use	10 (59)
Use of full drape	16 (94)
Use of antimicrobial pocket	2 (12)
Use of shaving	4 (23)
<i>Staphylococcus aureus</i> screening program	3 (18)
<i>Staphylococcus aureus</i> decolonization program	2 (12)
Use of fever cutoff for procedural delay (temperature >37.7°C [100°F])	12 (70)
Use of <i>any</i> INR cutoff for procedural delay	8 (47)
Use of INR cutoff >1.5	2 (12)

NOTE. INR, international normalized ratio.