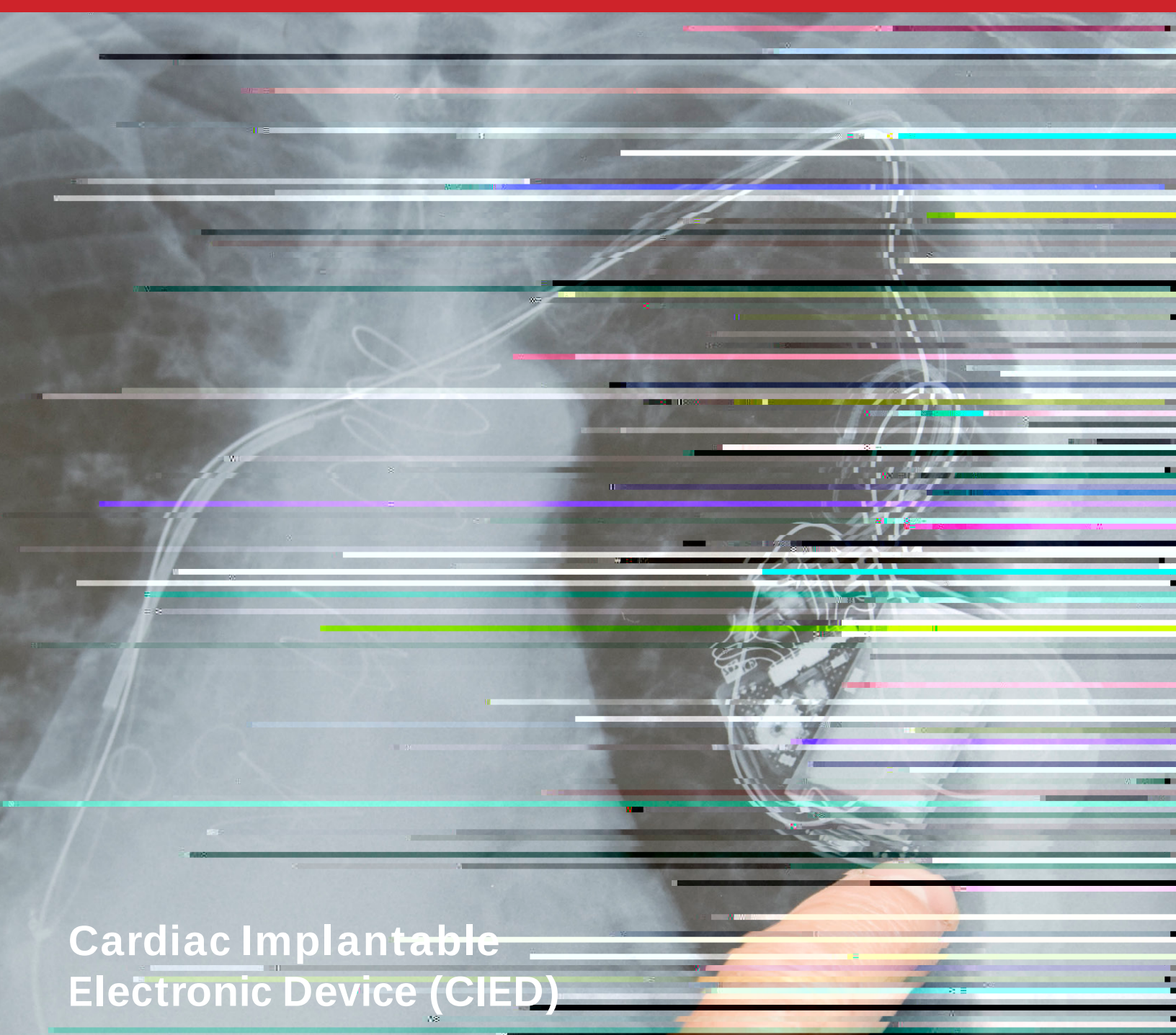




Cardiac Implantable
Electronic Device (CIED)

INFECTION SUMMIT



Bridging Gaps in Awareness, Detection and
Appropriate Treatment of CIED Infections

INTRODUCTION

The use of cardiac implantable electronic devices is becoming more and more common. Between es

In March 2022, the AHA led by a nine-member planning committee convened multidisciplinary stakeholders at the in-person [CIED Infection Summit](#) and identified three major problems to solve and three preliminary actionable solutions:

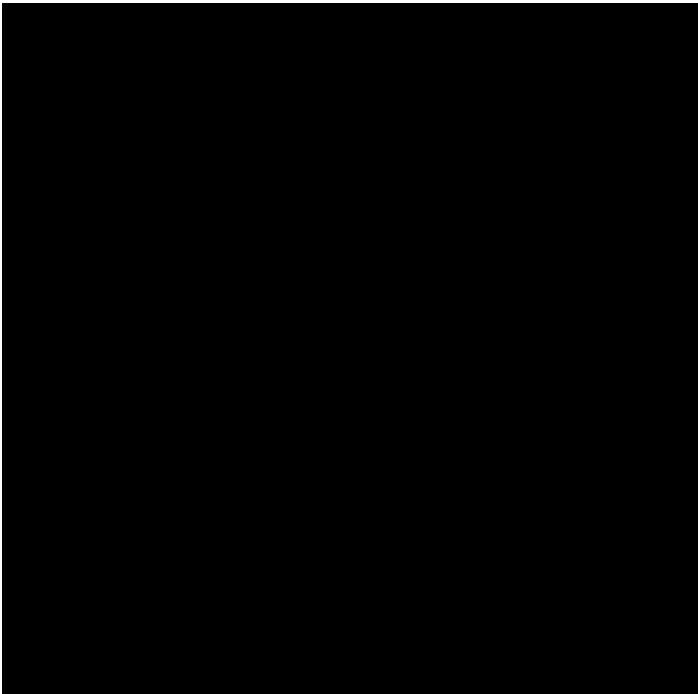
PROBLEMS TO SOLVE

CIED infections are rising, despite advances in our understanding of their clinical elements.² CIED infections result in substantial morbidity and mortality that can be reduced if optimally treated.^{3,4}

Patient and procedural factors and physician experience combine to optimize care of CIED infections, but coordinated systematic approaches are lacking. Patients and physicians play a role in CIED infection care, and communication between these stakeholders is critical.

Health care burdens related to CIED infection are substantial,⁵ thus health systems could provide higher-value care by address

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But others can occur years later, even more than 15 years after the initial procedure.⁹

The clinical presentation of lead associated endocarditis is influenced by the time from the most recent CIED procedure. Among patients with lead-associated endocarditis, those who presented less than six months after their most recent CIED procedure were more likely to also have local pocket infections. Conversely, those who presented six months or more after their most recent procedure were more likely to have a systemic infection—suggesting that lead-associated endocarditis should be suspected in any CIED patient who presents with a systemic infection.¹⁰

The Direct, Indirect and Intangible Costs of CIED Infections

Patients and their families bear the greatest cost when CIED infections reduce the quality and length of the patients' lives. Patients with infections also require additional procedures, and if best-practice management guidelines are not followed, they may experience morbidity and/or mortality as a result.

Some costs are direct: Average annual medical costs were 2.4 times higher for CIED patients with an infection, compared to those without an infection.¹¹ An analysis of claims through commercial insurers and Medicare supplement insurance estimated that infections increase the per-patient cost of care from \$62,256 to \$110,141 for initial implants and from \$64,810 to \$110,332 for replacement implants.⁵ Indirect costs include lost productivity for the patient and family caregivers, and intangibles such as pain, disruption and lost time due to illness, disability and treatment.

Patient, Procedural and Physician Factors

The number of CIED implantations is increasing. One study found that the incidence of CIED implantation increased by 96% from 1993 to 2008.¹ At the same time, the devices being implanted have become more complex: Between 1998 and 2008, the number of permanent pacemakers and implantable cardioverter-defibrillators (ICDs) being inserted decreased, while the number of cardiac resynchronization therapy devices (CRTs) increased.¹² In addition, the age of patients receiving implants has been increasing, and the patients have more cardiovascular and other co-morbidities such as diabetes and chronic kidney disease.¹

The risk of infection increases with age, co-morbidities and complexity of the devices.¹³ Younger patients, including those with certain forms of inherited arrhythmia syndromes, are receiving these devices and can expect to undergo several pulse generator replacements over their lifetime. Device recipients

after first implantation for ICDs and pacemakers decreased to less than 1% from 1997 to 2010, among patients who had undergone first CIED procedures, the infection rate rose to almost 9% for ICDs and 14% for pacemakers.¹³



Another barrier is ov v r Jr 0 J r ã i m

The American Heart Association's Mission:
Lifeline® initiative is another successful example.
The program's goals are to bring stakeholders
together in a collaborative manner and to reduce
mortality and morbidity while improving overall

to better understand the problems and solutions. The good news is that experience from other diseases offers a road map to improving awareness and education on CIED infections.

The [Hypertrophic Cardiomyopathy Association](#) (HCMA) is the preeminent organization improving the lives of those with hypertrophic cardiomyopathy (HCM), preventing untimely deaths and advancing understanding. A recent collaboration between the AHA and the HCMA illustrates some of the best practices in designing an education, awareness and engagement initiative.

The Building Blocks



Key Summit Takeaways

Call to Action

The insights and data presented at the CIED Infection Summit highlighted a clear but complex problem to address. As a result, the call to action is multi-layered and relies on improving healthcare professional evaluation of how patients are being treated, driving adherence to gx

Key stakeholders Resources needed		
	Digital app, patient education materials	

Proposed solution(s)	Short Term	Long Term
	Establish criteria for center of excellence for CIED infections Care pathway development – including patient transfer infrastructure for non-extracting centers Improve extraction safety	Make center of excellence model the standard of care Identify CIED infection management quality measure Work with CMS to make it a quality measure to align performance with payment Measure the care pathway

ACTION ITEMS: Raising Awareness and Advancing Education for Patients

	Short Term	Long Term
Proposed solution(s)	Develop patient education toolkit to target people living with a device and their caregivers: Develop a standard, simple protocol or checklist for device checks, with templates for patients and providers, including capture of infection photographs Device makers to include information on risks in instructions for use. Collaborate with Association for Advancement of Medical Instrumentation (AAMI) to update information Include infection in the shared-decision document during informed consent process (leverage existing AHA and HRS materials) Identify opportunities for patients to inform clinicians that they have a device	

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References

Greenspon AJ, Prutkin JM, Sohail MR, et al. Timing of the most recent device procedure influences the clinical presentation of lead associated endocarditis. *J Am Coll Cardiol*