Dartmouth-Hitchcock Electrophysiologists at the Forefront of Lead Management Assessment, Research, and Emergency Removal

The number of people living with implantable electronic cardiac devices has increased in recent years, due in large part to longer life expectancy. Many people are living with these devices for decades, during which time they may develop other comorbidities.

As a result, clinicians are increasingly faced with complex lead management decisions regarding whether to extract and replace, or cap and abandon, leads — particularly when patients have dysfunctional leads or require a device upgrade. Due to the limited available research in this area, clinicians often have insufficient data to guide decision-making.

Additionally, although the lead-removal protocol in emergent situations (such as infection) is non-controversial, not all medical centers are equipped to perform these immediate device- and lead-removal procedures.

Dartmouth-Hitchcock Medical Center, based in Lebanon, NH, has taken a twofold approach to address lead management and extraction concerns. First, electrophysiologist Emily Zeitler, MD, MHS, has published groundbreaking research to assess the short- and long-term risks of capping and abandoning versus extracting leads.

Secondly, Dartmouth-Hitchcock now offers an emergency device- and lead-extraction service staffed 24/7 by three electrophysiologists with extensive experience in lead management.

Challenges in Risk Assessment

Little data are available to assist clinicians in comparing the risks and benefits of lead extraction versus capping and abandonment, and most available data focuses on short-term outcomes only. Long-term risks are not well quantified, making it difficult to estimate future health implications. Developing a lead management strategy for complex patients is particularly challenging.

In younger patients, the short-term risks of lead extraction — which are better supported by available data — are typically less concerning than the long-term risks related to lead abandonment. Older patients may have a lower risk of long-term complications related to lead abandonment due to their shorter life expectancy.

“In a 60-year-old patient, we would remove the leads because the patient will live longer,” said Dr. Zeitler. “The longer the lead is in, the more likely it is to cause complications, and the harder it will be to remove.”

Groundbreaking Research

Dr. Zeitler is one of only a few researchers who has studied and published research on the one-year and five-year outcomes of these two lead management approaches.

“We are among a small group of physicians exploring this research area,” said Dr. Zeitler. "It is exciting to work in a field where there is so little existing data.”

In an article published in *Circulation: Arrhythmia and Electrophysiology*, Dr. Zeitler and her co-authors reviewed data from the National Cardiovascular Data Registry's Implantable Cardioverter-Defibrillator (ICD) Registry and found that patients who underwent removal of an unused or malfunctioning ICD lead had a slightly higher rate of in-hospital procedure-related complications and death than those who opted for lead abandonment, but differences in long-term outcomes were not clear.

In another study, Dr. Zeitler and her co-authors found that elective lead extraction in cases when infection was not present resulted in long-term survival rates similar to capping and abandoning leads; however, extraction was associated with a lower risk of device infections at five years.

Dr. Zeitler and her team also have collaborated with Dartmouth-Hitchcock radiologists to develop a CT imaging protocol to better assess each patient's risks for lead extraction versus lead abandonment.

A Multidisciplinary Approach to Planned and Emergent Lead Extraction Surgery

Lead management evaluation and surgery – in both planned and emergency cases — is conducted by an interdisciplinary team that includes a radiologist, a cardiac surgeon, and an electrophysiologist. Cardiologists may be consulted if a patient has comorbidities, such as heart failure or heart valve disease.

"Not all hospitals offer emergency lead- and device-extraction services," said Dr. Zeitler. "Dartmouth-Hitchcock is staffed 24/7 with qualified electrophysiologists who can handle this type of emergency, and we also offer consultation services in both emergency and non-emergency cases."

Changing the Lead Management Paradigm

Through pioneering research, the development of new imaging protocols, and emergency lead extraction services, the electrophysiology team at Dartmouth-Hitchcock is at the forefront of lead management protocols and improved outcomes for patients with electronic implantable cardiac devices.

About Dartmouth-Hitchcock: Dartmouth-Hitchcock Health (D-HH), New Hampshire's only academic health system and the state's largest private employer, serves a population of 1.9 million across northern New England. D-HH provides access to more than 2400 providers in almost every area of medicine, delivering care at its flagship hospital, Dartmouth-Hitchcock Medical Center (DHMC) in Lebanon, NH. DHMC was named in 2019 as the #1 hospital in New Hampshire by U.S. News & World Report, and recognized for high performance in 13 clinical specialties and procedures. Dartmouth-Hitchcock also includes the Dartmouth-Hitchcock Norris Cotton Cancer Center, one of only 51 NCI-designated Comprehensive Cancer Centers in the nation; the Children's Hospital at Dartmouth-Hitchcock, the state's only children's hospital; affiliated member hospitals in Lebanon, Keene, and New London, NH, and Windsor, VT, and Visiting Nurse and Hospice for Vermont and New Hampshire; and 24 Dartmouth-Hitchcock clinics that provide ambulatory services across New Hampshire and Vermont. The D-HH system trains nearly 400 residents and fellows annually, and performs world-class research in partnership with the Geisel School of Medicine at Dartmouth and the White River Junction VA Medical Center in White River Junction, VT.