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EDITORIAL

Infections of cardiac implantable electronic devices: still a cause of high mortality

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Cardiac implantable electronic devices (CIEDs) are increasingly used around the globe (*Figure 1*).[1] However, CIEDs may carry a risk of adverse events, which are classifiable as access-related, lead-related, generator-related, and infections. Thus, CIED infections may require system removal, whereas superficial or incisional infections at the pocket site might be handled conservatively. Studies reported an infection rateup to 4.9% over 5 years of follow-up.[2] Serious device infections defined as requiring lead extraction or lifelong antibiotic treatment or causing death occurred in 2.7%.[2]

Worryingly, the number of CIED infections appears to increase in the last decade: an analysis of national healthcare administrative databases in the USA reported increased cardiac device implantation (CDI) procedures from 1.45% in 2000 to 3.41% in 2012.[3] Furthermore, hospital mortality was significantly higher in patients with CIED infection.[3,4] One-year mortality of CIED infection was about 16.9%. In addition to medical problems, therapy of CIED infections is very costly. A retrospective analysis of 4699 patients implanted with implantable cardioverter-defibrillator and cardiac

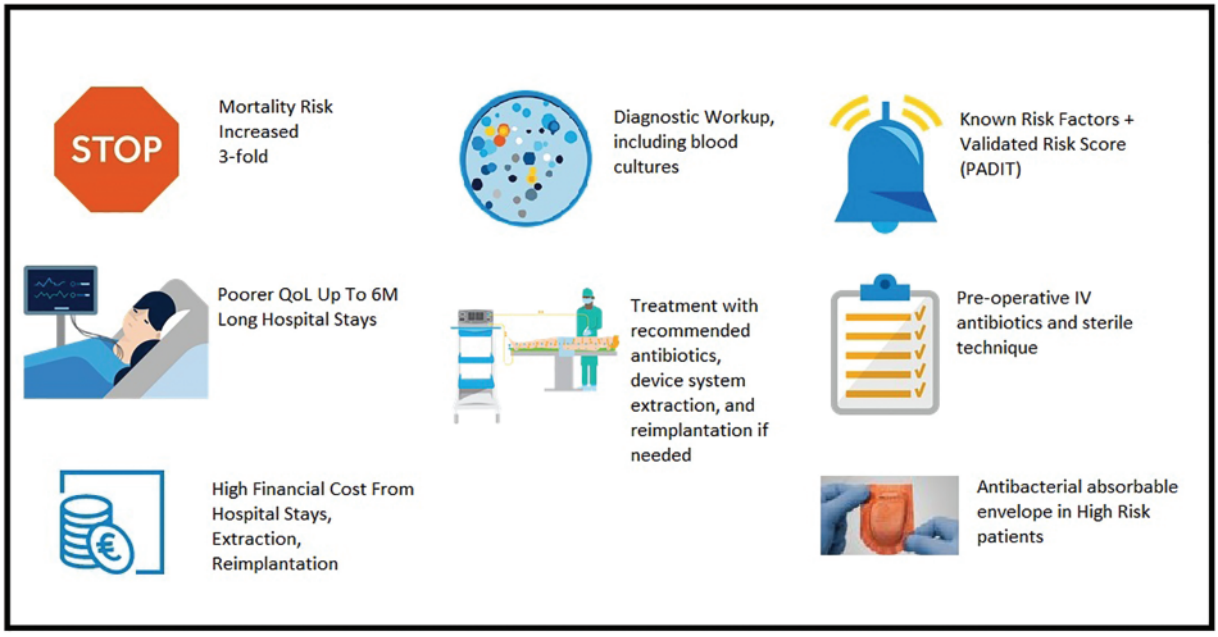

Figure 1 The problem of CIED infections. CIED, cardiac implantable electronic device.

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resynchronization therapy with defibrillator (CRT-D) devices using German health claims data found an overall rate of CIED infections of 3.4% in the first year. For major CIED infections (documented device-related procedure), the cumulative 3-year cost was estimated to be €99 706.[5] Thus, adequate prevention of CIED infection is of upmost importance for patients' safety and healthcare providers.

Recently, two very large trials define a new standard for prevention of CIED infection: PADIT (NCT01628666) and WRAP-IT (NCT02277990). The Prevention of Arrhythmia Device Infection Trial (PADIT) included 12 800 patients to compare an existing preprocedural antibiotic regimen vs. a novel dosing regimen.[6] The World-wide Randomized Antibiotic Envelope Infection Prevention Trial (WRAP-IT) was a randomized, single-blinded clinical study in up to 7764 patients, to evaluate the ability of the TYRX™ Absorbable Antibacterial Envelope to reduce major CIED infections following CIED generator replacement, upgrade, revision, or *de novo* CRT-D implant.[7] In particular, the introduction of the absorbable antibacterial envelope technology provides an important step towards risk reduction for CIED infections. The TYRX™ Absorbable Antibacterial Envelope (Medtronic, Inc., Minneapolis, MN, USA) is a sterile, single-use surgical mesh envelope designed to provide stabilization of an electronic implantable device, that contains the antibiotics rifampicin and minocycline.[7] Antimicrobial-impregnated CIED envelopes have been developed to hold devices securely in place and to lower rates of infections.[8] Therefore, the envelopes deliver a high concentration of antibiotics for a prolonged period of time effective against common CIED pathogens. Of note, CIED contaminations are thought to occur at the time of implantation procedure, and therefore, antibiotic envelopes appear as effective method for CIED infection prophylaxis.

An earlier version of the TYRX™ device (AEGIS) consisted of non-absorbable polypropylene, which was associated with substantial pocket fibrosis.[8] Thus, the latest envelope version TYRX™ is fully absorbed within weeks after implantation without induction of extensive pocket fibrosis. Beneficial effects of antibiotic envelopes were first reported by small prospective trials and validated by the WRAP IT study.[7,8]

The present supplement of *EP Europace* summarizes the current knowledge about epidemiology, preventive means of CIED infections, as well as summary of absorbable antibacterial envelope study results.[9–11] Furthermore, current guidelines and consensus statements on CIED infections are presented as well as recent cost analysis for the use of the absorbable antibacterial envelope.[12,13] Thus, the current volume of *EP Europace* provides a comprehensive overview about the current standard of care in patients who are at risk for CIED infections.

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