

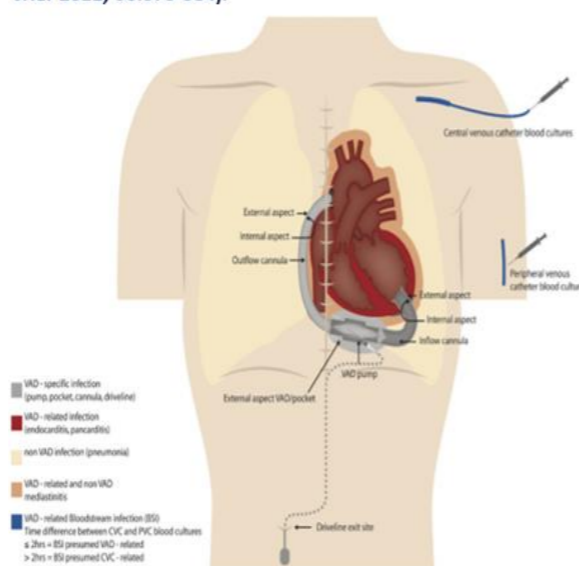
# INFECTIONS IN PATIENTS AFTER BERLIN HEART® LEFT VENTRICULAR ASSIST DEVICE IMPLANTATION

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## BACKGROUND AND PURPOSE

- Ventricular assist devices (VAD) are electromechanical circulatory pumps used to partially or completely replace the function of a failing heart. They can be used both as a **bridge to transplantation** and as a **destination therapy**. Yet, related infections can be a serious challenge and remain a major cause of death alongside with bleeding and thrombosis. **Fig. 1.**
- According to the definitions of the International Society of Heart and Lung Transplantation (ISHLT), infections in patients using VADs, can be classified as VAD-specific (VAD-S), VAD-related (VAD-R) and non-VAD infections (N-VAD). **Table 1.**
- Berlin Heart® EXCOR devices (BHED) are paracorporeal VADs used in patients of all age groups, from months up to 2 years; as a bridge to transplantation. Their cost is estimated in 20,000€/ventricle.
- The aim of our study** is to describe our experience on infections occurring after BHED implantation, in a tertiary care hospital in Madrid, Spain.

Fig 1. VAD structure and associated infections (Hannan M. JHLT 2011; 30:375-384).



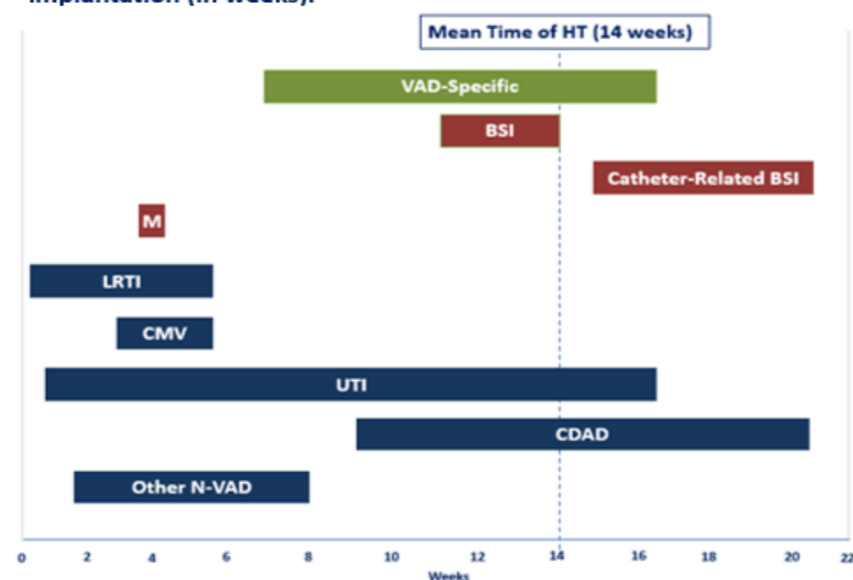
## MATERIAL AND METHODS

- A multidisciplinary team prospectively followed all patients who underwent a BHED implantation in our institution during a 2 year-period (2013-2015).
- The number of infectious episodes, time from implant to infection, relation to the VAD, etiology, treatment and final outcome were registered according to a pre-established protocol.
- Infectious episodes occurring during the first six months after heart transplantation (HT) were also registered, since some of them might be VAD-related as well.
- In all cases, perioperative prophylaxis with cefazolin was administered.

Table 1: Classification of VAD-associated Infections

	Infections included
<b>VAD-Specific (VAD-S) Infections</b>	<ul style="list-style-type: none"> <li>Pump and/or cannula Infections</li> <li>Pocket Infections</li> <li>Driveline Infections</li> </ul>
<b>VAD-Related (VAD-R) Infections</b>	<ul style="list-style-type: none"> <li>Mediastinitis</li> <li>Bloodstream Infections (BSI) (VAD-Related, CVC-Related)</li> <li>Infective Endocarditis (IE)</li> </ul>
<b>Non-VAD (N-VAD) Infections</b>	<ul style="list-style-type: none"> <li>Urinary Tract Infections (UTI), Lower Respiratory Tract Infections (LRTI), <i>C. difficile</i> associated diarrhea (CDAD), etc.</li> </ul>

Fig 3. Time of appearance of infectious syndromes after BHED implantation (in weeks).



Each box represents one infectious syndrome and time of appearance of first and last episode. M: Mediastinitis. Color code: VAD-S, VAD-R and N-VAD. N-VAD Infections were namely: 1 Skin and Soft Tissue Infection, 1 Surgical Wound infection and 1 Catheter-related infection.

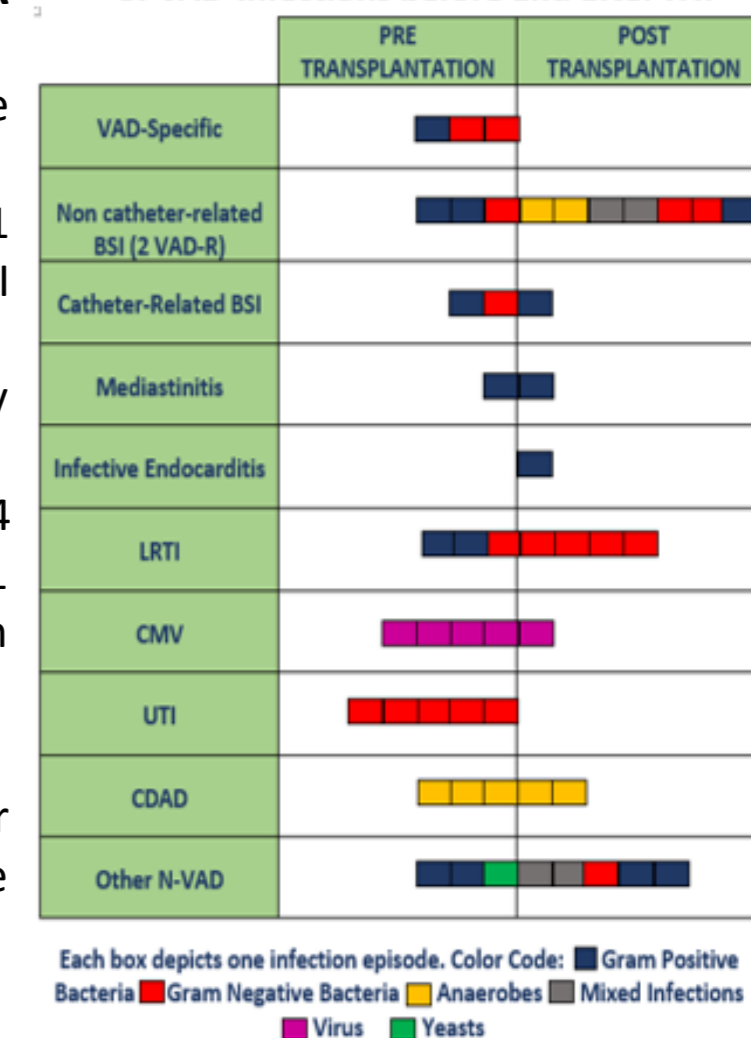
## RESULTS

- During the study period, 10 patients underwent BHED implantation (median age = 60.3 years) and eight of them could be transplanted. The 2 remaining patients died of bleeding complications. BHED were maintained for a mean of 14 weeks (min 7 – max 21 weeks).

**Pre transplantation infections:** 9 out of 10 patients developed a total of 27 infections before HT (3 VAD-S; 6 VAD-R and 18 N-VAD). Classification according to ISHLT, clinical syndrome, etiology and time of appearance are shown in **Fig 2** and **Fig. 3.**

- Five patients (50%) had at least one **VAD-S** or **VAD-R** infection (9 episodes).
  - VAD-S infections:** 3 episodes in 3 patients (1 driveline and 2 cannula Infections).
  - VAD-R Infections:** 6 episodes in 5 patients (1 mediastinitis, 2 VAD-related BSI, 2 catheter-related BSI and 1 primary BSI).
  - Gram-Positive bacteria were the most common etiology in this group of infections (55.5%).
- N-VAD infections:** 8 patients had 18 episodes (5 UTI, 4 CMV, 3 LRTI, 3 CDAD, 1 skin and soft tissue infection, 1 surgical wound infection and 1 catheter-related infection (CRI).
  - Gram negative bacteria prevailed in this group (61%).
- Generally, LRTI were the earliest infections to appear (median=16days), whilst catheter-related BSI had the latest onset (median= 129 days) **Fig. 3.**

Fig 2. Incidence, classification and etiology of VAD-Infections before and after HT.



- Post transplantation infections:** 8 patients had 22 episodes.
  - Non catheter-related BSI and LRTI were the most common syndromes.
  - Three of 5 patients who had suffered a VAD-S/VAD-R Infection, presented a post HT infection caused by the same microorganism (1 MRSA- IE, 1 CRI and 1 BSI).

**Overall mortality** was 40%. None of these deaths could be linked to a VAD Infection (2 bleeding complications, 1 intraabdominal infection and 1 late UTI sepsis).

## CONCLUSIONS

- Nine out of 10 patients receiving a Berlin Heart® EXCOR device developed at least one infectious complication. Yet, that did not preclude Heart Transplant, which was performed in 8 of them.
- Non-VAD were the most common type of infections. Nonetheless, half of the patients presented VAD-Specific or VAD-Related infections.
- Given the great complexity of infectious complications in this population, a multidisciplinary highly coordinated approach is needed before and after Heart Transplantation.