Research Letter

Ventricular Assist Device Driveline Dressing-Change Protocols: A Need for Standardization. *A Report from the SimVAD Investigators*

Ventricular assist devices (VADs) are a well-established surgical therapy for patients with advanced heart failure. VAD-associated complications, including driveline infections, are relatively common but are potentially preventable.[1,2] The International Society for Heart and Lung Transplant recently published a consensus document for the prevention and management of VAD infections.[3] However, this document does not offer a rigorous standard of care for driveline site management. Therefore, each VAD-implanting center uses its own site-specific driveline-management protocols. The purpose of this study was to examine driveline dressing-change protocols from high-volume VAD centers across the U.S. so as to identify similarities and differences.

We performed content analysis[4] of inpatient driveline dressing-change protocols from 15 academic advanced heart failure/heart transplant centers that implant a high number of VADs. Each center provided the dressing-change protocol used for clean, dry driveline exit sites in nonallergic patients for maintenance dressing changes. The Northwestern University Institutional Review Board approved this study as being exempt.

We collected demographic data from each center, including number of VADs implanted between January 1, 2017, and December 31, 2018, VAD types and implant strategies. A deductive approach was used to create a codebook relevant to VAD site dressing changes by a subset of authors (JEW, KAC, RSH, KBS KLG, ERC, JHB). Two authors (JHB, JEW) coded all 15 protocols while blinded to center; disagreements were resolved by consensus. We calculated inter-rater reliability on initial coding using the Cohen kappa and report frequencies for each code identified after consensus had been achieved.

A total of 1388 VADs were implanted at the 15 centers, with a median of 95 (IQR 72, 107) at each center during the study period. VAD type was evenly split between HeartMate and HeartWare, and slightly more VADs were implanted as destination therapy rather than as bridges to transplant. The inter-rater reliability between the 2 reviewers was high (κ = 0.80). They identified 10 VAD dressing-change codes; the frequency of the use of each of them is reported in Table 1.

Each center had a protocol for driveline exit-site dressing change, but only 80% stated explicitly how often the dressing should be changed, and there was a wide range of time frames for how often dressing changes should occur. Utilization of sterile technique was required in 100% of programs. Although sterile technique includes hand-washing before donning sterile gloves, only 80% of programs stated the performer must wash hands before putting on gloves, only 27% specified duration (eg, $\geq$ 20 seconds) of hand-washing, and 67% specified the solution.

All 15 protocols stated the need to clean the skin around the driveline exit site using chlorhexidine gluconate (CHG). However, there were differences regarding the specific motion used for cleaning, and 20% of protocols did not even state specifically how to clean the skin around the exit site. The vast majority of protocols did not specify the length of time to scrub using CHG (73%) or the length of drying time (60%). Over half of the protocols (67%, 10/15) referenced a dressing-change kit as well as an antimicrobial covering, such as a Biopatch 70% (7/10) or silver-based covering 30% (3/10).

Although we found commonalities in all 15 protocols, including the use of sterile technique and CHG to clean the area around the driveline exit site, several differences were identified. Only 67% of protocols included use of a kit and/or Biopatch/silver-impregnated dressing, despite the use of a kit with an antimicrobial skin covering having been shown to reduce driveline exit-site infections.[5] Additionally, customized VAD procedure kits that contain all of the supplies needed for a dressing change may facilitate accuracy in following protocols[6] and also may save both time and money.[7]

Other important findings included the lack of specificity in terms of 1) describing explicitly how to perform sterile techniques; 2) detailed instructions regarding CHG use; and 3) timing and duration of hand-washing. Current best practices for CHG use on a dry skin site include using a back-and-forth scrubbing motion for at least 30 seconds, and then allowing the CHG to dry completely for at least 30 seconds.[8,9] Despite these best practices, many sites used a circular outward motion for CHG cleaning. Additionally, several protocols did not specify timing or techniques for hand-washing. Data clearly demonstrate that 20 to 30 seconds of proper hand-washing with soap and water eradicate the most skin flora.[10]

Table 1. Items Identified Using the Codebooks of 15 Institutional Dressing-Change Protocols

Item, n (% of 15)	N = 15† Institutional dressing-change protocols
1. The protocol states how often the dressing should be changed for a dry, nondraining wound.*	12 (80)
a. Once a week (7 days)	5 (33)
b. Two times a week	5 (33)
c. Three times a week	3 (20)
d. One to 3 times a week	1 (7)
2. Patient positioning: The protocol states the appropriate/allowable position(s) for the patient to be in while the dressing change is being performed.*	2 (13)
a. Lying down	2 (13)
3. Set-up	
a. The protocol states that the surface being used must be clean.	12 (80)
i. Disinfectant (alcohol, bleach, ammonia)	9 (60)
ii. Does not specify how to clean surface	3 (20)
b. Protocol lists all needed supplies.	14 (93)
c. Protocol says to collect all supplies before starting the dressing change (or before putting on sterile gloves).	11 (73)
d. Use a dressing-change kit.	10 (67)
e. Everyone in room dons masks.	6 (40)
f. Only the procedure performer dons a mask	1 (7)
g. The patient and procedure performer wear masks.	8 (53)
4. Sterile technique	15 (100)
a. Protocol includes reminders on how to maintain sterile technique correctly.	8 (53)
b. Hand-washing: protocol states that hands must be washed at some point.	14 (93)
i. Specifies duration of hand-washing:	6 (40)
1. > or = 15 seconds < 20 seconds	2 (13)
2. > or = 20 seconds < 30 seconds	2 (13)
3. > or = to 30 seconds	2 (13)
ii. Specifies solution*	10 (67)
1. Soap and water	8 (53)
2. Alcohol-based solution	6 (40)
3. Hand wipe	1 (7)
4. Packet provided	1 (7)
ii. Timing of hand-washing specified*	14 (93)
1. Before starting the entire procedure	14 (93)
2. Before getting sterile	12 (80)
3. After completing the procedure	3 (20)
c. Protocol states to wear gloves when removing old dressing.	15 (100)
d. Protocol states to put on sterile gloves prior to placing new dressing.	15 (100)
e. Protocol states to clean skin around driveline exit site.	15 (100)
i. Solution types specified*	15 (100)
1. Chlorhexidine gluconate	15 (100)
a. Specifies motion used for cleaning as being back and forth	5 (33)
b. Specifies motion used for cleaning as being outward circles	7 (47)
c. Does not specify motion for cleaning	3 (20)
d. Specifies must scrub for 30 seconds or more	4 (27)
e. Does not specify length of scrub	11 (73)
f. Specifies must let dry for at least 30 seconds (for this part)	6 (40)
g. Specifies must let dry	13 (87)
h. Does not specify drying time	9 (60)
2. Saline and gauze	1 (7)
a. Specifies motion used for cleaning as outward circles	1 (7)
b. Does not specify length of scrub	1 (7)
c. Does not specify drying time	1 (7)
f. Protocol states to clean driveline itself	5 (33)
i. Specifies solution type	5 (33)
1. Chlorhexidine gluconate	5 (33)
a. Does not specify length of scrub	5 (33)
b. Specifies must let dry for 15 seconds or more (for this part)	3 (20)
c. States must dry completely	5 (33)
d. Does not specify time	2 (13)
g. Protocol describes placing antimicrobial or antiseptic covering.	10 (67)
i. Biopatch	7 (47)
ii. Silver	3 (20)
5. Protocol states type of dressing to use.*	15 (100)
a. Sorbaview	10 (67)
b. Tegaderm (clear dressing)	5 (33)
c. Mepilex	2 (13)
d. Gauze/sponge	3 (20)
e. Medipore	1 (7)
6. Protocol discusses how to manage the driveline during dressing changes.	10 (67)
a. Hold driveline sterilely while cleaning	6 (40)
b. Avoid pulling on driveline/driveline trauma	6 (40)
7. Protocol specifies the use of a skin anchor.*	15 (100)
a. Centurion Foley anchor	13 (87)
b. Securement device	2 (13)
c. Hollister	1 (7)
d. Clear dressing	1 (7)
8. Protocol specifies when to change the anchor.*	2 (13)
a. When the anchor looks dirty or compromised in some way	1 (7)
b. Between 4 and 7 days	1 (7)
c. Greater than or equal to 7 days	1 (7)
9. Protocol describes the method for attaching the anchor.	8 (53)
10. Protocol mentions discarding used materials.	10 (67)

*A single protocol may indicate multiple responses.

†Sites included in study: Advocate Christ Medical Center, Columbia University Medical Center, Mayo Clinic-Arizona, Northwestern Memorial Hospital, NYU Langone Health, Spectrum Health, The Ohio State University Wexner Medical Center, Tufts Medical Center, University of California- San Diego Medical Center, University of Kansas Health System, University of Michigan Medical Center, University of Minnesota Health, University of Nebraska Medical Center, University of Washington Medical Center, Vanderbilt University Medical Center. *Note:* Only items present in 1 or more of the protocols are listed.

In conclusion, we found substantial heterogeneity in VAD driveline dressing protocols among 15 high-volume VAD centers. This wide variability in care highlights the lack of a standard against which current practices can be assessed. Inclusion of existing best practices may reduce driveline-associated infections.

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