01.30.05 – Management of LVAD Patients

Purpose

To prevent surgical site infections in patients undergoing LVAD (left ventricular assist device) placement.

Elective Surgery Pre-Op Education & Care

All patients who will undergo LVAD placement surgery and their primary care giver shall attend preoperative educational classes 4-6 weeks prior to their surgery where they will be educated on skin and nasal decolonization and the care of their surgical wounds. The Pre-Heart Transplant Coordinator shall provide this education during the outpatient evaluation phase in the Heart Failure Clinic using the educational brochure developed by the Department of Infection Control and Healthcare Epidemiology titled *Keep Your LVAD Free of Infection* ***(See Attachment A.)***

a. **Education on Skin Decolonization with Hibiclens Prior to Surgery:** During the educational classes, patients shall be given bottles of Hibiclens (4% chlorhexidine gluconate) and instructed to shower or bathe with Hibiclens once daily for 7 days prior to their surgical procedure.

b. **Education on Skin Decolonization with Chlorhexidine Gluconate (CHG) Wipes Following Surgery:** Patients undergoing LVAD placement will be unable to shower until the driveline exit site is healed (about 6 weeks after surgery), so they shall be instructed on how to take sponge baths with CHG wipes during this time period. They shall be provided with the wipes at discharge from the hospital (6-week supply.)

c. **Education on Nasal Decolonization with Nozin:** Patients shall be instructed to apply Nozin twice daily per manufacturer's recommendations. Nasal decolonization shall begin 7 days prior to expected date of surgery. ***See Attachment B: Nozin Administration Instructions***.

Emergent Surgery Pre-Op Education & Care

Patients undergoing emergent surgery will not have the opportunity to undergo skin and nasal decolonization for 7 days prior to surgery. However, skin and nasal decolonization shall be performed in the unit the patient is housed prior to surgery as outlined below in item C.

1. Emergent surgery patients shall receive the same postoperative long-term education provided to elective surgery patients while admitted to the hospital.
2. The LVAD Coordinator shall provide this education while the patient is hospitalized.

Day Surgery Unit

1. Skin Decolonization with CHG Wipes: Patients arriving in the DSU for LVAD placement shall be provided with a package of CHG wipes and instructed to cleanse their body before changing into a hospital gown. Patients who cannot use the wipes independently shall be assisted by staff.

2. Pre-Op Nasal Decolonization with Nozin: Patients shall receive three separate applications of Nozin in the DSU prior to going to the OR.
    a. Applications shall be given within 2 hours prior to surgery. One application consists of six rotations clockwise and six rotations counterclockwise to each nostril plus a swab of the inside front pocket of each nostril. The first application will be done by staff for demonstration and subsequent applications may be by staff or the patient.
    b. Process:
        i. Provider places the Nozin order in EPIC.
        ii. Nurse retrieves 4-ounce multi-use bottle of Nozin from unit supply (MM Reference # 30030.)
        iii. Bottle labeled with patient's name and MRN.
        iv. Bottle placed with patient's belongings to be transferred to the inpatient floor with the patient after surgery.

Intraoperative Skin Preparation & Wound Care

1. Skin preparation for surgery shall be performed using ChloraPrep (2% chlorhexidine gluconate and 70% isopropyl alcohol) unless contraindicated due to allergy. Duraprep shall be used for patients with a CHG allergy.
2. Prior to suturing and closing, the mid-sternal site wound should be cleaned with betadine.
3. Apply Dermabond (in conjunction with conventional sutures) to the mid-sternal site wound (unless the chest is left open, or staples were used) and then cover the wound with gauze dressing. Apply chest tube site dressings separately from the sternal wound dressing to prevent disruption of the sternal dressing when the chest tubes are removed, or chest tube dressings are changed so that the sternal surgical incision will remain sterile for 48 hours.
4. Allow the Dermabond to dry completely prior to placing the dressing to prevent the dressing from sticking to the wound. This dressing shall remain in place for 48 hours unless the integrity of the dressing becomes compromised. If integrity is compromised, see item H-1 below.
5. The driveline exit site wound shall be dressed using gauze and tape.

Antimicrobial Prophylaxis

1. Prophylactic antibiotics shall be administered in the operating room by the Department of Anesthesiology.
2. Intravenous Cefazolin shall be used for prophylaxis. 2 grams of Cefazolin, and 3 grams of Cefazolin for patients weighing greater than 120 kg should be administered within 30 to 60 minutes before the skin incision and continued for no longer than 48 hours.
3. For patients with a history of allergy to beta-lactam agents or if a patient is known to have a recent MRSA infection, IV Vancomycin shall be used.

4. Re-dosing should occur for procedures lasting greater than 4 hours.

Glycemic Control

Implement glycemic control preoperatively, intraoperatively and postoperatively following the Cardiac Surgery Adult Protocol as follows:

- Optimize glycemic control before surgery by maintaining serum glucose levels <180 mg/dL for 2 weeks prior to surgery.
- Blood glucoses shall be monitored and treated intraoperatively by the Department of Anesthesiology.
- Postoperatively, proper diabetes education and glucose control shall be conducted through a multidisciplinary approach.

Inpatient Post-Op Skin & Nasal Decolonization

1. Skin Decolonization with CHG: Patients undergoing LVAD placement shall sponge bathe daily with CHG wipes. Patients who cannot use the wipes independently shall be bathed by the nursing staff.
2. Nasal Decolonization with Nozin: Nozin shall be applied intranasally per package instructions twice daily for the duration of the hospital stay by nursing staff or patient.
3. Process:
   a. Nozin ordered by provider in EPIC.
   b. Must use the correct order in EPIC for documentation to be available.
   c. Patients should arrive from surgery with the 4-ounce bottle in their belongings.
   d. If the bottle is missing or new one is needed, Nozin is available from Materials Management. Reference MM# 30030 for 4-ounce bottle.
   e. Ensure bottle is labeled with patient's name and MRN.
   f. Apply Nozin twice daily.
   g. Bottles may be stored in room.

Inpatient Post-Op Wound Care

1. Mid-sternal dressings shall remain on for 48 hours. If the dressing's integrity is compromised or heavily stained with blood, cleanse the sternal incision with ChloraPrep and redress the incision using sterile technique.
2. After 48 hours, sternal dressings are to be removed as follows:
   - If wound is sealed with Dermabond, leave the incision open to air unless drainage occurs.
   - If drainage occurs, reapply a dressing using clean technique and change as needed.
   - If wound is not sealed with Dermabond, clean the incision gently with ChloraPrep daily.
3. Except for wounds closed with Dermabond, all other sternal incision sites shall have a dressing change every 24 hours as follows:

- Clean the site with ChloraPrep.
- Apply a dry, sterile dressing with paper tape.
- Date, time and initials are required for every dressing.
- Dressing change is placed on the MAR when the patient is admitted to the unit.
- Dressing change is charted in nursing notes and on the MAR.

4. Clean chest tube sites and pacing wire sites daily with ChloraPrep. Redress the sites.
5. LVAD driveline exit site shall be cleaned daily (or more frequently if needed) with 10% povidone- iodine until it is healed and no longer draining by the nursing staff working in conjunction with the LVAD Coordinator. If contraindicated due to allergy, CHG shall be used. (***See Attachment C)***
6. Process:
    - Practice hand hygiene with alcohol-based hand rub, and wear masks and gloves.
    - Patients should preferably be supine with the door closed, no fans.
    - Clean surface of worktable with a Cavicide wipe.
    - Place supplies on the table.
    - Cleanse exit site using 10% povidone-iodine and sterile gauze dressing.
    - Apply drive- line anchor and secure drive- line with approximately 1 – 2 inches of slack in line.

Discharge **Skin and Nasal Decolonization**

1. Verify skin and nasal decolonization patient education with demonstration by patient and document in Epic.
2. Patients undergoing LVAD placement shall be instructed to sponge bathe daily with CHG wipes until the driveline exit site is healed (about 6 weeks). ***Patients shall NOT shower or take a regular bath until cleared by the VAD Team!***
3. After the exit site has healed, the patient shall continue CHG skin cleansing by bathing or showering with Hibiclens 3 times per week for as long as the device is present. Patients should choose a schedule of Mon/Wed/Fri ***or*** Tues/Thurs/Sat for consistency. On days between, patients may bathe or shower with their preferred soap and water.
4. Patients shall be instructed to continue Nozin twice daily until their follow-up appointment with the surgeon and until surgeon certifies all surgical wounds have healed.

5. Patients shall take currently used inpatient bottle of Nozin and remaining clean nasal swabs home with them to continue nasal decolonization.

Driveline Exit Site Care

1. Patients shall be instructed to clean the driveline exit site daily with 10% povidone- iodine (or more frequently if needed) and apply a 24-hour LVAD dressing until site has healed and is no longer draining.
2. After the driveline exit site has healed and is no longer draining, the LVAD Coordinator will instruct the patient to apply a 72-hour LVAD dressing. This dressing shall be changed every 72 hours and as needed when soiled using a Tegaderm with CHG dressing. (***See Attachment D)***
3. Patients shall monitor the driveline exit site for signs and symptoms of infection using the Driveline Exit Site Staging Guide ***(See Attachment E).*** If the site develops drainage or signs and symptoms of infection, the patient shall notify the LVAD Coordinator who will schedule a clinic appointment for the patient to evaluate the exit site. Exit site care for an infected driveline shall be initiated, with dressing change frequency increased to daily (or more frequently if indicated) (***See Attachment F).***

Sternal Wound Care

Leave sternal wound open to air. Do not apply lotions or creams. When skin is cleaned with CHG, the sternal wound will be cleaned during that process.

Home Health Monitoring

For patients undergoing LVAD placement, the patient's Home Health agency shall monitor the driveline exit site and the midline sternal wound for signs and symptoms of infection and notify the LVAD Coordinator if signs and symptoms of infection are present.

Post-Op Clinic Follow-Up

1. Patients undergoing LVAD placement shall follow-up in the LVAD Clinic the first Monday after discharge. After the initial follow-up LVAD clinic visit, patients shall be seen in the LVAD clinic weekly for at least 4-6 weeks, then every 2 weeks thereafter, then monthly thereafter. LVAD Coordinator will advise patient on frequency of clinic visits thereafter.
2. The patient shall be assessed for infection at each clinic visit.
3. If the patient presents at any UTMB-affiliated facility or non-UTMB affiliated facility with a suspected bacteremia or driveline infection, the LVAD Clinic and Department of Infection Control and Healthcare Epidemiology shall be notified by phone call or email, and an ID Consult should be placed with management as follows below. If patients are seen at any non-UTMB affiliated facility with signs of infection, they shall be educated to instruct the facility to notify the LVAD Coordinator. The LVAD Coordinator should subsequently notify the Department of Infection Control and Healthcare Epidemiology.

A. Management of Nontoxic Patients

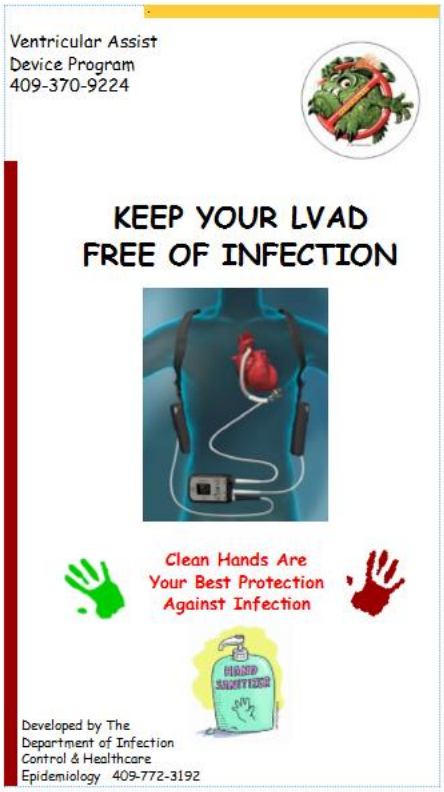
- A swab of any drainage should be carefully collected and sent to the lab for culture. When collecting the swab be sure not to touch the patient's skin - only touch the drainage. If the skin is touched, the swab should be discarded, and a new set should be collected.
- Make a STAT referral to ID clinic for erythema, heat, fluctuance, drainage, increasing pain at the site without fever or hypotension by emailing idclinicscheduling@utmb.edu with the title "STAT referral – suspected LVAD infection." Include the patient's full name, MRN and onset of symptoms.

B. Management of Toxic Patients

- If the patient has signs or symptoms of systemic illness (fever, hypotension, malaise) or the provider believes the patient should be admitted, the provider should call the UTMB operator (dial 0) and request the pager number for the on-call ID fellow. The provider will present the case for a consult and request assistance selecting empiric therapy.
- On arrival to the hospital, two sets of blood cultures from two separate sites should immediately be sent to the lab. Additionally, a swab of any drainage should be carefully collected and sent to the lab for culture. When collecting the swab, be sure not to touch the patient's skin (only touch the drainage.) If the skin is touched, the swab should be discarded, and a new set should be collected.

Attachment A

Education on Skin Decolonization with Hibiclens Prior to Surgery



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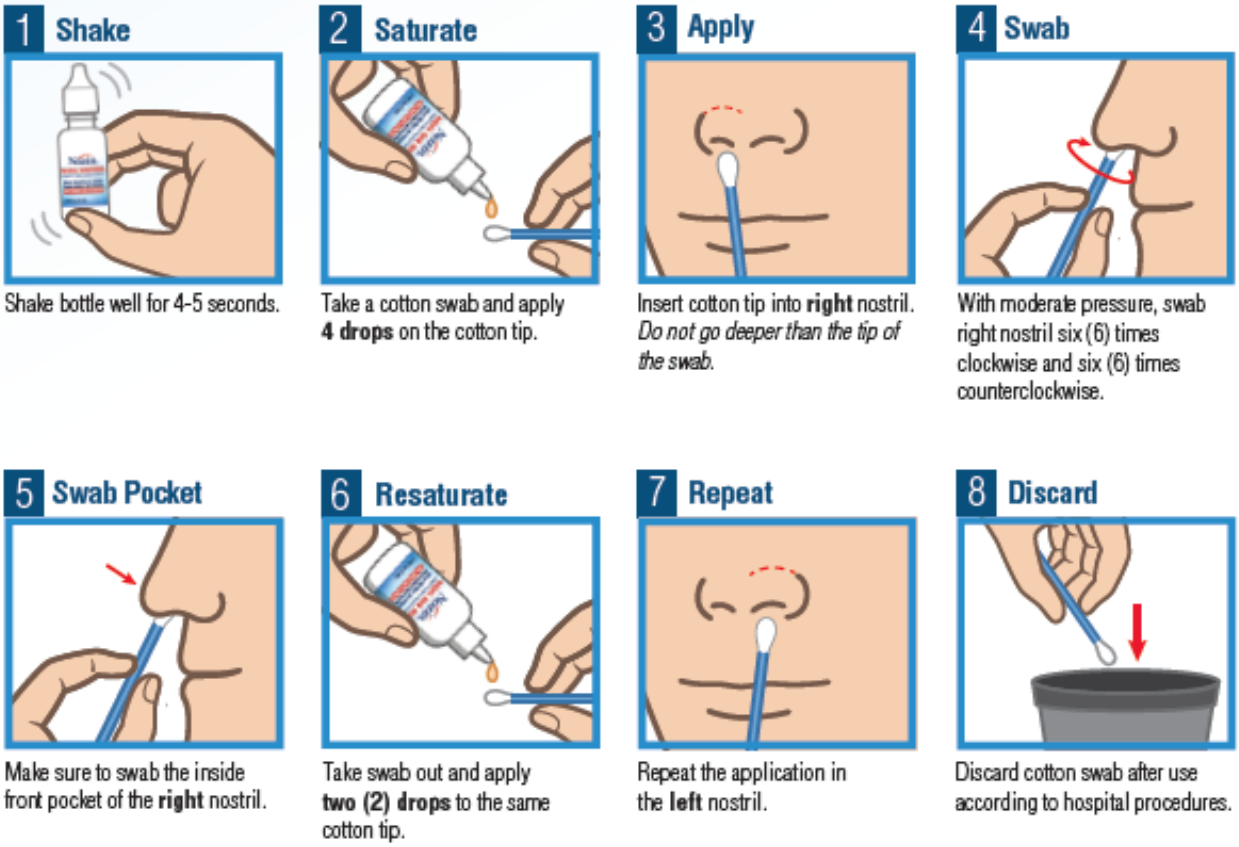
Attachment B

Nozin Administration Instructions

DAILY DECOLONIZATION: MULTIDOSE 12ML BOTTLE

INSTRUCTIONS FOR USE



REPEAT APPLICATION TWICE A DAY (EVERY 12 HOURS)

Secure cap on bottle. For best results, use within 45 days after opening.

Please read entire product package prior to use. Apply to skin only.

Caution: Do not use if you have a history of nasal bleeding or irritation, or if you have allergy to citrus or coconut oil.

Attachment C

24 Hour Driveline Exit Site Care

STEP 1: Clean hands with alcohol-based hand sanitizer.

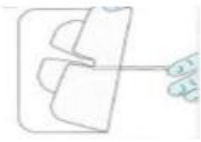
STEP 2: Clean work table.

STEP 3: Clean hands again.

STEP 4: Open dressing kit using aseptic technique.

STEP 5: Open pack of 4x4 gauze using aseptic technique & wet with betadine.

STEP 6: Put on face mask. Second mask is for caregiver if needed.



STEP 7: Loosen edges of old dressing. Put on non-sterile gloves and remove old dressing. Dispose of old dressing and remove gloves.

STEP 8: Use hand sanitizer pack on outside of blue drape.

STEP 9: Put on sterile gloves and clean exit site using betadine-moistened gauze. Wipe in a circular motion starting close to the exit site and moving outward. Then clean a small area of the driveline beginning close to the skin and cleaning away from the body. **Betadine must dry for 3 minutes to work!**

STEP 10: Place sterile gauze with split around exit site, then place gauze without slit directly on top of it and tape.

STEP 11: Apply driveline anchor and secure with 1-2 inches of slack in line.

STEP 12: Discard gloves, mask and packaging.

Attachment D

72-Hour LVAD Dressing Change Protocol for Clean Wounds – Outpatient	
University of Texas Medical Branch-Galveston **301 University Blvd** **Galveston, TX 77555**	
Dressing Protocol for LVADs	Every 72 hours or PRN. Dressing should be changed, preferably when the patient is supine with door closed, no fans.
Equipment/supplies (*recommended*)	On outside of blue drape: 2 face masks 1 pair non-sterile gloves Inside of blue drape: Hand sanitizer 1 pair of sterile gloves 1 large breathable adhesive dressing 1 adhesive strip to fit snuggly around adhesive dressing 2 chlorhexidine swab sticks or betadine 1 skin prep swab 2 4x4 split gauze 2 4x4 gauze Cavicide wipes / Antimicrobial surface cleaning agent (not included in kit) Disposal receptacle (not included in kit) Optional: Dakin's solution (either 0.25% or 0.025%) as determined by VAD team
Procedure	1. Wash hands for at least 15 seconds with antibacterial soap or use contained hand sanitizer pack on outside of blue drape. Dry. 2. Clean surface of worktable with cavicide wipe. 3. Open packaging using aseptic technique. Open packaging using aseptic technique. Squeeze some betadine into one open pack of gauze 4x4s. Do not touch gauze or inside of package with bare hands or dirty gloves. 4. Put on one face mask. Second mask is for caregiver (if needed). 5. Loosen edges of old VAD driveline site dressing. 6. Put on non-sterile gloves and gently remove old dressing. Dispose of old dressing and remove gloves. 7. Use hand sanitizer pack contained inside blue drape. Allow hands to dry. 8. Put on sterile gloves. 9. Holding one chlorhexidine swab stick, gently pinch wings together until you hear small "crack". Press swab against skin to begin releasing contents. Cleanse Driveline exit site using an up and down and side to side motion, from Driveline exit site to approximately 1 ½ inches outward. 10. Repeat step 9 with second swab. ***OR*** Use betadine coated gauze. 11. Wipe in a circular motion around the driveline, starting from closest to the exit site moving outward. Clean small area of driveline beginning from closest to skin and cleaning away from body. Allow site to air dry for at least 30 seconds

	12. Place Antimicrobial disk (Biopatch) around Driveline at exit site with writing facing up. 13. Use 1 skin prep swab to clean from Biopatch outward approximately 2-3 inches circumferentially. Allow 30 seconds to dry. 14. Remove backing from large breathable dressing and place over 4x4 gauze centered, allowing adhesive to adhere to skin on all edges around dressing, with Driveline lined up at notched part of dressing. 15. Remove backing from bottom adhesive strip and place under Driveline, with edges slightly over-lapping edge of large dressing. 16. Apply second skin prep to approximately 4-inch diameter area of skin about 1-1 ½ inches from edge of large breathable dressing. Allow to dry. 17. Remove backing of Driveline anchor device and place approximately 1-1 ½ inches from large dressing on prepped area. Secure Driveline in device and ensure that the line is not pinched or damaged when in place. For optimal protection, make sure to leave a small sagging area in Driveline between exit site and anchor. **Driveline anchor device is to be worn AT ALL TIMES** 1. Discard gloves, mask and packaging appropriately. 2. Document dressing change and notify MD/LVAD coordinator of any changes or signs and symptoms of infection. **Notify VAD Coordinator/Team immediately if any tenderness, redness, or discharge/drainage is noted at the percutaneous lead (driveline) exit site.**

Attachment E

Driveline Exit Site Staging Guide

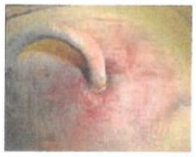
Report changes in driveline exit site appearance to the VAD team.

Stage 1

Appearance

- Pink, healthy tissue incorporating into the driveline
- Little or no erythema
- No tenderness
- No drainage

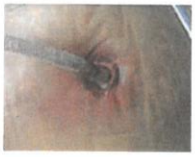
Stage 2



Appearance

- Persistent disruption of skin at exit site
- Some erythema
- Mild tenderness
- Small amount of drainage (note color, odor and amount) may be culture negative

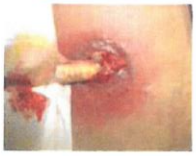
Stage 3



Appearance

- Systematic symptoms of infection, persistent skin disruption, granulation tissue may be forming, pulled away from the driveline, gap present
- Erythema
- Severe tenderness
- Moderate to copious amounts of drainage, culture positive

Stage 4



Appearance

- Systematic symptoms of infection, severe skin disruption, bleeding from granulation tissue, pulled away from the driveline, possible cellulitis or bleeding
- Erythema
- Severe tenderness with infection tracking along driveline tract
- Copious amounts of purulent drainage, culture positive

Stage 5

Appearance

- Systematic symptoms of infection, severe skin disruption, bleeding from granulation tissue, pulled away from the driveline, cellulitis or bleeding
- Erythema
- Severe tenderness with infection tracking along driveline, which may involve pump pocket
- Copious amounts of purulent drainage, site and blood culture positive

References: 1. Sharp Driveline Staging Chart. 2. System Overview and Theory Slide Deck. Slide 37.

6b

Attachment F

Daily LVAD Dressing Change Protocol for Infected wounds (draining/bleeding/etc.) – Outpatient	
University of Texas Medical Branch-Galveston **301 University Blvd** **Galveston, TX 77555**	
Dressing Protocol for LVADs with infected driveline exit site	Percutaneous (Driveline) lead exit sites should be cleaned Daily and PRN when soiled. (Unless otherwise ordered). Dressing should be changed, preferably when the patient is supine with door closed, no fans.
Equipment/supplies (*recommended*)	<u>On outside of blue drape:</u> 2 face masks 1 pair of non-sterile gloves <u>Inside of blue drape:</u> Hand sanitizer 1 pair sterile gloves 1 large breathable adhesive dressing 1 adhesive strip to fit snuggly around adhesive dressing 2 chlorhexidine swab sticks or betadine 1 skin prep swabs 2 4x4 split gauze 2 4x4 gauze Cavicide wipes / Antimicrobial surface cleaning agent (not included in kit) Disposal receptacle (not included in kit) Optional: Dakin's solution (either 0.25% or 0.025%) as determined by VAD team
Procedure	3. Wash hands for at least 15 seconds with antibacterial soap or use contained hand sanitizer pack on outside of blue drape. Dry. 4. Clean surface of worktable with cavicide wipe. 5. Open packaging using aseptic technique. Open packaging using aseptic technique. Squeeze some betadine into one open pack of gauze 4x4s. Do not touch gauze or inside of package with bare hands or dirty gloves. 6. Put on one face mask. Second mask is for caregiver (if needed). 7. Loosen edges of old VAD driveline site dressing. 8. Put on non-sterile gloves and gently remove old dressing. Dispose of old dressing and remove gloves. 9. Use hand sanitizer pack contained inside blue drape. Allow hands to dry. 10. Put on sterile gloves. 11. Holding one chlorhexidine swab stick, gently pinch wings together until you hear small "crack". Press swab against skin to begin releasing contents. Cleanse Driveline exit site using an up and down and side to side motion, from Driveline exit site to approximately 1 ½ inches outward. 12. Repeat step 9 with second swab ***OR*** Use betadine coated gauze. 13. Wipe in a circular motion around the driveline, starting from closest to the exit site moving outward. Clean small area of driveline beginning from

	closest to skin and cleaning away from body. Allow site to air dry for at least 3 minutes. **OR** Moisten 4x4 gauze with Dakin's solution, squeeze out excess moisture and pack in surgical wound as instructed by VAD team. 14. Place 4x4 split drain gauze around Driveline at exit site. 15. Place (1-2) 4x4 gauze directly on top of split gauze over exit site. 16. Remove backing from large breathable dressing and place over 4x4 gauze centered, allowing adhesive to adhere to skin on all edges around dressing, with Driveline lined up at notched part of dressing. 17. Remove backing from bottom adhesive strip and place under Driveline, with edges slightly over-lapping edge of large dressing. 18. Apply skin prep to approximately 4-inch diameter area of skin about 1-1 ½ inches from edge of large breathable dressing. Allow to dry. 19. Remove backing of Driveline anchor device and place approximately 1-1 ½ inches from large dressing on prepped area. Secure Driveline in device and ensure that the line is not pinched or damaged when in place. For optimal protection, make sure to leave a small sagging area in Driveline between exit site and anchor. **Driveline anchor device is to be worn AT ALL TIMES** 20. Discard gloves, mask and packaging appropriately. 21. Document dressing change and notify MD/LVAD coordinator of any changes or signs and symptoms of infection. **Notify VAD Coordinator/Team immediately if any tenderness, redness, or discharge/drainage is noted at the percutaneous lead (driveline) exit site.**