Strengthening Your VAD Program

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I have no financial conflicts of interest.
Why VADs?

Key Ingredients for a Strong VAD Program

1. People
2. Protocols and Processes
3. The Devices – keep it simple
Mayo Clinic

• First and Largest integrated not-for-profit group practice in the world
• 3,300 physicians
• 46,000 allied health staff
• 3 sites (MCR, MCJ, MCA)
• Treat > 500,000 patient’s each year
• Dedicated to “Providing the Best Care to Every Patient Every Day.”
Mission:

• To improve survival and the quality of life for patients with advanced heart failure through an evidence-based & integrated/multi-disciplinary approach
It takes a village to manage a VAD patient

1. Start with Good People
Mechanical Circulatory Support Team

Cardiothoracic Surgery

Heart Failure Cardiology

VAD Coordinators and Nurses

Perfusionists
Make it about the Patient and Surround them by Compassionate Dedicated Experts

Nursing
Cardiac Surgery

Palliative Care
Cardiology

Laboratory Medicine
Perfusion Services

Administration and Finance
Infectious Diseases

Anesthesia
Gastroenterology

Psychiatry
Hematology

Neurosurgery
Social Work

Neurology

PATIENT
People People People

1. Palliative Care
   • Personal Preparedness Plan
   • Multiple meetings with patients (examples)

2. Perfusion

3. Gastroenterology
   • Cardio-Gastroenterology Clinic
   • Ambulatory Infusion Center (AIC)
     Iron, Blood

4. Infectious Diseases
   • AIC
   • Suppressive Antibiotics

5. VAD Coordinators (NP/PAs) and RNs
   • Manage the in-patient and out-patient service
   • Hold us to task to follow our protocols and policies
   • Prepare for Joint Commission
   • Teaching

6. Laboratory Medicine
   • Use of anti-Xa levels
   • Use of Lovenox for outpatients
Palliative Care

- Comprehensive symptom assessment
- Spiritual assessment
- Psychosocial evaluation
- Assessment of patient’s understanding of their condition
- Discussion of Goals of Care
- Prognosis sharing
- Advanced care planning, medical decision making
- Community referrals (i.e. Home Health, Hospice)
Palliative Care Engagement

Pre-implantation consultation
3 month post-implantation visit
Quarterly outpatient visits
Visits increase to every 4-8 weeks in “Transitional Phase”
Collaboration with home hospice team for patients approaching end-of-life
Patient care in inpatient hospice
Perfusion

- Our designated VAD experts
- Setup the LVADs in the operating room
- Round with us in the hospital including weekends and see patients in clinic
- Take emergency call with our VAD coordinators
- Keep a database of log files for every patient
- Help manage FDA recalls and action items
- Keep track of our outcomes and JCAHO metrics
Perfusion Log-file Interrogation
Detection of Pump Thrombosis

- Clinical evidence of hemolysis
  - Clinical Status – is patient in heart failure
  - Ramp Study
  - Laboratory Values
    » LDH
    » HgB
    » Urine
    » Plasma Free Hg
- VAD log files
Heartmate II Left Ventricular Assist Device
Heartware Left Ventricular Assist device

Suspected Thrombus
Pump Exchanged
2. Clinical Protocols and Processes

- Development of a straightforward surgical approach to cardiogenic shock
- Minimize the need for RVAD
- Diagnosing and Treating GI Bleed
- Treating Driveline Infection
- Diagnosing Pump Thrombosis
- Treating Pump Thrombosis
- Addressing the Progression of life
Clinical Practice Guidelines

Clinical Practice Guidelines: Guidelines established by multidisciplinary teams that outline the Destination Therapy program's inclusion criteria/selection criteria, evaluation process of Destination Therapy patients, including testing required, preoperative/nursing considerations, discharge planning & preparing the community, follow-up testing & care, and end-of-life management of patients in hospital and at home.

Performance Improvement Plan: The VAD for DT Performance Improvement (PI) Program is designed to improve the 1) VAD for DT program, 2) VAD for DT outcomes related to the following 1) Deaths, 2) Length, 3) One-year, and 4) Right.

Plan of Care: desire and other.

Destination Therapy Evaluation and Testing Includes:

- Complete History and Physical Examination
  - If patient has not been determined by the treating physician and excluded from Destination Therapy
  - If patient can not Transplant Strategies
  - Full heart transplant conference

- Laboratory Tests Evaluated
  - ABO, CBC with DVT, CMEP, PRAB, CHOL, PT, TPT, CRP, PCAO, PRA, LDD, ACL, PHT, BNP, TEG
  - Echo w Doppler
  - Intermus entry

Destination Therapy Follow-up Schedule

- 1 Week:
  - Labs: CBC w DVT, CMEP, PRAB, CHOL, PT, TPT, CRP, PCAO, PRAS, LDD, ACL, PIH, BNP, TEG
  - Echo w Doppler
  - 6 min walk
  - Minnesota Living
  - Intermus entry

- 1 Month Office Visit:
  - Labs: CBC w DVT, PRAB, CHOL, PT, TPT, CRP, PCAO, PRAS, LDD, ACL, PIH, BNP, TEG
  - Echo w Doppler
  - 6 min walk
  - Minnesota Living
  - Intermus entry

Mechanical Circulatory Assist Device: Termination of Support In Hospital

- Patient with mechanical circulatory assist device unlikely to survive 24 hours: if patient has a relative contraindication for continuing mechanical assist device support as evidenced by:
  - Embolic/hemorrhagic
  - Massive uncontrolled
  - Severe infection
  - Device failure
  - Other medical conditions determined by Cardiologist

Mechanical Circulatory Assist Device: End of Life Care Hospice

- Patient with mechanical circulatory assist device likely to survive greater than 24 hours but with poor prognosis and restricted quality of life: if patient has a medical condition as determined by the Cardiac Surgeon, Heart Failure, Cardiologist, and patient and/or medical power of attorney that limits life expectancy and/or quality of life, patient may be discharged home to hospice for end of life care and support may be withdrawn after thorough evaluation process completed.

Evaluation Process for discharge home with hospice and possible withdrawal of Mechanical Circulatory Assist Device:

- May consider consults/evaluations from:
  - Psychiatrist
  - Chaplain
  - Ethics Committee
  - Palliative Care
Surgical Treatment of Acute Cardiogenic Shock:

Development of an efficient algorithm for surgical intervention
  Inotropes, Pressors → IABP → ECMO → Impella

Use of the Impella 5.0 for ventricular decompression

Altered cannulation technique for peripheral ECMO

Do not cannulate femoral artery directly (use of 8mm side graft)
  minimizes risk of accidental de-cannulation
  minimizes risk of limb ischemia
Acute Temporary Support
Durable Support
Strategies to Prevent the Need for RV Mechanical Support

Protect against RV distension and Protect the Lungs
A. During CPB, ensure adequate decompression of RV with either double cannulation technique or vacuum assisted venous drainage.

B. Minimize volume administration

C. Minimize blood product administration
   1. Maintain patient normothermic—36-37°C to minimize coagulopathy after CPB
   2. No automatic FFP or blood in the pump.
   3. No administration of blood products until at least 30 minutes after protamine administration is complete and compulsive surgical techniques in hemostasis has been attempted. (Usually this is enough to create a dry field.)
   4. Don’t treat abnormal coagulation values in a non-bleeding patient (e.g. don’t correct INR, anemia or thrombocytopenia if patient is not bleeding after step 3.)
   5. When decision is made to administer blood products-minimize the quantity (e.g. give only 1U PRBC or 1U FFP or 1U Platelets by using labs to guide selection.)

D. Ultrafiltration during and after CPB
E. Meticulous de-airing technique to prevent acute RV ischemia
   1. De-air the aortic root
   2. Wean the CPB to 2-3 lpm with LVAD off and outflow graft clamped, thus, allowing the LV to eject and minimizing the amount of air that gets suctioned into the LVAD from the LV cavity.
   3. When echo confirms LV cavity de-airing is complete, start the LVAD at low rpms and intermittently release the outflow graft clamp
   4. When no more air is seen in aortic root, then completely release clamp on outflow and continue weaning CPB.
F. Slow wean from CPB
   1. Allow index of slightly <2.0 initially (this generally resolves before sternal closure)
   2. Observe in OR until inotropes and vasopressors stable
   3. Be patient!
G. Inhaled NO (20-40ppm) in all patients on arrival to operating room
H. Low tidal volume ventilation throughout CPB (~200ml)
Outcomes after Implementation of an RV Protection Strategy

- Need for Biventricular Support: 40-50% vs 1-2%
- Median ICU LOS: 14 days vs 7
- Median Hospital LOS: 18.5 days vs 13.5
- Blood Utilization: Saved 2 million dollars in first two months
- Essentially eliminated delayed sternal closure (dependent on need for biventricular support)
Summary

1. People
   - Most Important Asset
   - Leadership is overrated –
     - Collaboration is the secret to success
     - A multidisciplinary team is vital

2. Protocols and Processes
   Always important but in VAD therapy it is essential to have a plan for
   - Acute cardiogenic shock
   - Preventing “RV Failure”
   - Diagnosing and Treating Pump Thrombosis
   - Dealing with the progression of end of life in DT patients

3. Devices -- keep it simple