

ABIOMED BVS 5000

Post- op Patient Care Guidelines For Abiomed BVS 5000

I. Cardiac Rhythms:

The Abiomed 5000 functions independently of the patient's rhythm so changes in cardiac rhythm should not affect flow rates.

Patients on univentricular support will require intervention more urgently than patients with bi-ventricular support

No CPR or Precordial Thumps – pressure may cause a disruption of the cannula sites in the heart cause bleeding.

1. Atrial arrhythmias:

- Attempts should be made to chemically convert atrial fibrillation
- Atrial flutter may require rapid atrial pacing
- Electrical Cardioversion may be necessary
- If Atrial arrhythmias persist, increase the target ACT level to 200

2. Ventricular Arrhythmias:

- Amiodarone for VT
- Defibrillation for VF

II. Hemodynamic Monitoring:

Patients on the Abiomed BVS 5000 are monitored with arterial and central lines in the same way as standard post-op patients.

Cardiac Output by thermodilution method is inaccurate if on RV or bi-ventricular support.

1. The Abiomed BVS 5000 is capable flows of 5liters/min.
BVS flow rate, BVS beat rate are recorded:

- q 15mins until stable
- q 30mins x 2
- q1h & prn

If flow rates are adjusted, allow 2 minutes for stabilization of flow rates before recording values.

2. Intra Aortic Balloon Pump:

With BIVAD or LVAD support, use arterial trigger.

$$SVR = \frac{MAP - CVP}{C.O} \times 80 \quad PVR = \frac{mPAP - PCWP}{C.O} \times 80$$

3. BP, PAP, CVP, LAP and oxygen saturation is documented hourly.
- For LVAD support – CI, SVR & PVR should be calculated using both the PA catheter values (right sided pressures) and the left pump flow rate as the cardiac output (left sided pressures).
 - For BIVAD support – CI, SVR & PVR should be calculated using the left pump flow rate as the cardiac output.

Document all calculated values on the flow sheet.

III. Temperature/Warming:

1. Most heat loss from the pump is dissipated from the tubing. Use Abiomed pump tubing insulators (sleeves) to minimize heat loss.
2. Use Bair Hugger system to maintain normothermia.
3. IV fluids and blood products may be warmed via usual methods.
4. Heat should never be applied externally to the blood tubing or cannula as it can lead to accelerated thrombus formation.

IV. Volume Management:

The Abiomed BVS 5000 is preload dependent. To optimize preload ensure adequate circulating volume and adjust height of pump to position of patient's atrium.

1. Hourly intake & outputs
2. Foley catheter to hourly outputs
3. Chest tubes to $-20\text{cmH}_2\text{O}$ – hourly outputs. NG to gravity drainage.
4. Target CVP/LAP/PCWP of 12-18mmHg unless noted otherwise by VAD team
5. Daily weights.

V. Bleeding:

Bleeding is the most common complication with this device.

Notify Blood Bank when it is known that a VAD is being implanted.
Call Blood Bank q shift to discuss anticipated blood transfusions as well as the need for possible blood products.

Heparin should be reversed in the OR according to standard protamine administration for CV Surgery.

1. Do not autotransfuse.
2. Obtain baseline coagulation studies.
3. Monitor chest tube outputs q1h – notify MD if outputs > 100cc/hr.
4. Post-op monitor CBC, PTT/INR as per current CVICU protocol

VI. Anticoagulation:

When CT drainage decreases to 75cc/hr and bleeding stops, initiate anticoagulation. Once Heparin has been started, do not discontinue unless ordered by the surgeon.

Do not exceed 24 hours without anticoagulation.

ACT q hourly until therapeutic level reached then q2h.

First 24 hrs - Titrate Heparin to maintain an ACT between 180-200 sec.

36-48hrs - Increase target ACT to 200-250 sec.

Arrhythmias – with sustained arrhythmias increase the target ACT to 250-300 sec.

When weaning: increase target ACT to 300 sec until device is removed.

VI. Pharmacologic Management:

1. Inotropes:

The amount of inotropic support required to maintain adequate hemodynamics should be significantly reduced with bi-ventricular support

In uni-ventricular support it may be necessary to continue inotropes to maintain bloodflow through the unassisted ventricle.

2. Vasopressors:

Vasopressors may be administered as necessary to maintain adequate resistance when SVR is low.

3. Vasodilators:

Vasodilators may be necessary to reduce SVR./PVR .

VII. Ventilation and Oxygenation:

Wean ventilator and extubate as per CVICU protocol.

Pulse oximetry with vital signs.

If a patient on BIVAD develops pulmonary congestion, the flows on the RVAD can be decreased to 0.5l/min **below** LVAD flow.

Mixed venous gases and arterial blood gases are obtained on admission to CVICU and every am. A decrease in MVO₂ may be indicative of heart/circulatory failure.

VIII. Nutrition/GI:

1. NPO post-op with NG tube in situ.
2. Dietician to assess nutritional status via calorie counts/biochemical parameters and advise dietary needs.
3. Assess need for IV Pepcid on POD #2 if remains intubated.
4. Assess need for GI feeds POD #3 if remains intubated.
Clear fluids to full fluid diet when extubated.

VIII. Activity:

1. Positioning:

The HOB should be elevated at $\leq 30^{\circ}$ for all hemodynamic measurements.

IX. Dressing Changes:

No petroleum jelly or ointment-based products are to be used on the incision/cannula sites

Dressings are changed q day and prn using aseptic technique. The cannula sites are cleaned with normal saline and painted with 0.5% Chlorhexidine solution and the area is covered with a dry dressing.

X. Weaning from Abiomed BVS 5000:

Note the presence of ventricular ejection peaks on the arterial pressure tracings (small peaks interspersed with large BVS pulsatile peaks)

TEE is used to assess ventricular wall motion prior to weaning.

Weaning Protocol:

- Decrease BVS flows in increments of 0.5L/min while performing TEE to assess native heart function.
- If ready to wean, set flow rates at 0.5L/min less than previous settings. Remember if weaning a bi-ventricular support patient, always reduce flows on RVAD first.
- Reduce flows by 0.5L/min every 30-60mins. Monitor hemodynamics q 15mins during weaning. If signs of failure are evident, increase the flow settings to previous rate and call VAD team.

- Increase target ACT to 300 sec when flows reach 3L/min or less.
- Wean to 2L/min flow rate within 4 hours of initiating weaning.
- IABP support is not usually necessary but may be beneficial in some patients.
- Plan for explantation when patient achieves hemodynamic stability with flow rates ≤ 2 L/min.

Abiomed BVS 5000 Emergency Safety Systems

1. Internal Safety System

If the control system fails, a fixed-rate (35 beats/min) control system will take over console function.

When the back-up system is engaged, “ **Emergency System on**” will be displayed in addition and a pulsatile audible alarm will sound.

To reset the system, turn the power switch **OFF then ON** again.

If the system cannot be reset while the emergency system is engaged, call the Abiomed emergency service number located on the console.

2. Clamps

Four large tubing clamps are taped to the console at all times if the tubing disconnects or air is detected in the system.

3. Battery Power

The BVS 5000 should be plugged in at all times except during patient transport.

A fully charged battery will operate the console for 1 hour.

In the event of a power failure, battery power is automatically activated.

A foot pump is the back-up system when the battery is exhausted.

Using the Abiomed BVS 5000 Foot Pump

The foot pump is located in the rear compartment of the BVS 5000 console

Turn the pump control OFF (push buttons twice at close intervals) or turn the main power switch OFF

Open rear compartment and move the lever up to the horizontal position.

Grasp the foot pedal, squeeze the pedal and remove it from the compartment.

Place foot pedal on the floor and start pumping.

When power is restored and the foot pedal is no longer needed, return the pump to the compartment and return lever to horizontal position.

Do not restart the console with foot pump still engaged – Self-test failure will occur

Changing the Abiomed BVS 5000 Console

1. Continue patient support with the foot pump or emergency back-up system.
2. Obtain back-up console from storage room.
3. Plug in back-up console and turn power "on." Allow the back-up console to complete the self-test.
4. Transfer the driveline from the failed console to the back-up console. Support will be temporarily interrupted.
5. Press the "on" keys for the appropriate blood pump(s) on the front panel of the back-up console.
6. Notify the VAD coordinator of console failure.