## So your patient has an LVAD…

**Goals:**

* Don’t trip on the wall plug…the patient needs that thing to live!
* Maintain volume status
* Protect right ventricle
* Know the renin-angiotensin system because it escalates secondary to non-pulsatile flow a few months after LVAD placement (the patient will be on insane doses of ACEI)

**Set-up:**

* +/- Arterial line depending on surgery 🡪 need strict aseptic method when placing
  + If you place one, a Vigileo might not be a bad idea
  + Does the patient have a palpable pulse? Do you need ultrasound for placement?
* +/- Central venous catheter to measure CVP, depending on surgery
* Hand-held NIBP with Doppler
  + Place a BP cuff on each arm
  + Use gel to place the Doppler on the radial or brachial artery of one hand, turn on Doppler, adjust sound volume, inflate cuff manually then deflate slowly, make sure you can detect a Korotkoff sound (meaning the volume is loud enough and the Doppler is placed over the radial artery) 🡪 that’s your MAP
  + The NIBP on the other arm will be connected to the Draeger monitor (like for every other patient) and will give you your MAP too
* Have TEE available
* Magnet because it’s not uncommon for these people to have an AICD since their EF sucks
  + The nurse should be placing external defibrillator pads on the patient
* Albumin
* Phenylphrine gtt in line
* Whatever you would use for this type of case if it was a normal patient

**Pre-op**

* Check CBC, especially hemoglobin and platelets
* What is the patient’s most recent INR? Anticoagulation status? Heparin bridge?
  + Discuss the anticoagulation regimen with the surgeon who placed the VAD
  + Don’t discontinue aspirin ever, but the patient should discontinue anti-platelet drugs
* When was the LVAD placed?
  + If it was placed recently, the patient might have some hemodynamic instability and/or may require increased inotropic support
  + If it has been more than 2 months, the patients should have excellent hemodynamic instability
* Does the patient have acquired vonWillebrand disease?
* What dose of ACE-inhibitor is the patient on?
* Does the patient have a palpable pulse? Can you get a MAP with a NIBP (SBP and DBP will be inaccurate)? Does the pulse oximeter work with a decent waveform?
  + If the pulse oximeter doesn’t work, you’ll need an arterial line to get serial ABGs
* Did the patient bring the battery back-up and wall plug?
* Is the patient type and crossed? Blood ready?

**Intra-op**

* You need good hydration pre-induction
* Place all lines pre-induction
* Always do a rapid-sequence induction because the patient is considered full-stomach due to the LVAD (giant thing sitting in your belly)
* Don’t forget the magnet!
  + It doesn’t hurt to add a note on Epic that you placed a magnet on the patient
* Keep SBP > 80 and pump flow should remain constant throughout the case
* Treat hypotension with volume first (unless the patient has signs of volume overload or the monitors show volume overload) 🡪 alpha-agonists are second line
* Have phenylephrine gtt in line
* Avoid hypoxia and hypercarbia 🡪 increase pulmonary vascular resistance 🡪 bad for right ventricle
* In Epic, you should be documenting MAP by Doppler, pump flow (lpm), pulse index, and pump power (rpm)

**Pump**

* Continuous flow VADs (Heartmate II) are preload dependent and afterload sensitive!!
* Pump flow is in liters per minute
  + If it shows +++, it means it is unable to calculate the flow 🡪 give volume
  + If MAP/afterload is increased 🡪 give a vasodilator
* Pulse index is an indicator of LV pulsatility 🡪 the higher the number, the more contractile the LV is
  + If > 6 🡪 increase the pump speed
  + If < 4 🡪 you have decreased preload or the pump speed is too high 🡪 give volume and consider decreasing rpm’s
* Pump power: that number should stay constant the whole time, it’s pre-set
  + If it increases > 10 acutely along with an increase in rpm’s and pulse index 🡪 you may have a VAD thrombus 🡪 not good!
* A suction event can happen if the patient becomes hypovolemic
  + Hypovolemia 🡪 heart gets sucked into the inflow line of VAD 🡪 decreased cardiac output!!
  + Tx: fill up the heart and restart pump at normal settings

**Things to think about**

* Normal CVP is 10-12, normal pulse index is 4-5
* If CVP < 10 and PI < 3 🡪 hypovolemia
* If CVP < 10 and PI > 5.5 🡪 systemic HTN
* If CVP > 12 and PI < 3 🡪 bad things are happening 🡪 RV dysfunction with poor LV filling
* Your ETCO2 curve might look funky with multiple dips 🡪 that is due to cardiac oscillations, especially if the patient is thin 🡪 it does not mean that the patient is too light and overbreathing the ventilator