

## Introduction to Swan-Ganz Catheterization

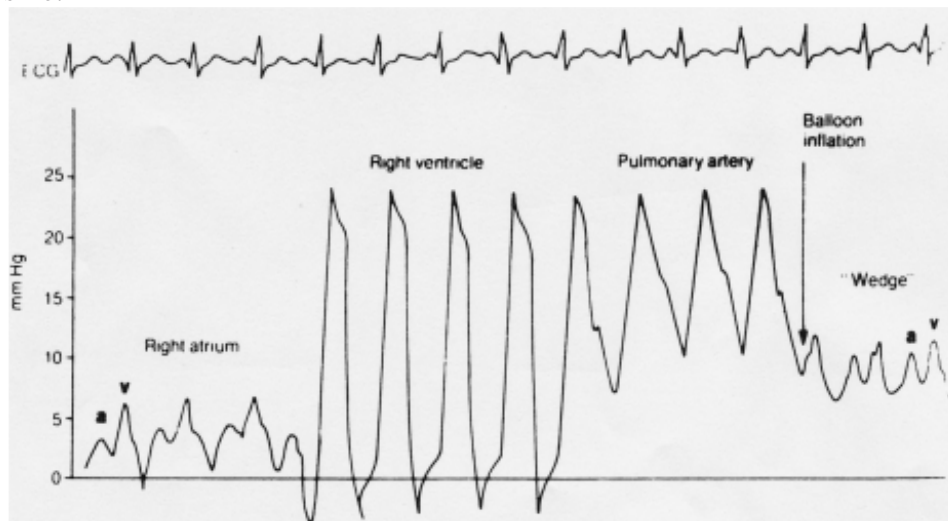
A Swan Ganz (aka Pulmonary Artery Catheter, “Right Heart Cath”) is a long flexible catheter inserted through an introducer (aka Cordis) that “floats” through the right heart to lodge in a pulmonary artery branch. It offers several ports for meds in addition to hemodynamic data.

**Indications:** Often inserted to gauge fluid status and cardiac output/index. Some scenarios:

- 1) Hypotension following adequate fluid resuscitation
- 2) Pulmonary edema not responding to diuresis
- 3) Pulmonary edema with hypotension or pulmonary hypertension
- 4) Respiratory failure with high PEEP settings

### Floating a Swan

- 1) Obtain an introducer site. For Swan purposes, the most favorable position in the R IJ, followed by the L subclavian. Next is R subclavian, and the least conducive position is L IJ. Swans can be introduced femorally. Hold on to “swandom” from cordis kit.
- 2) Maintaining sterile field, unwrap Swan, check balloon for function and leaks.
- 3) Place “swandom” on Swan. The tip of the Swan goes through the rubber septum first. Push the swandom back toward the ports without unrolling it.
- 4) Hand off the port hub to a RN so that the ports can be flushed.
- 5) Insert the Swan into the cordis. Advance about 15cm, then call for Balloon up.
- 6) Note: When advancing Swan, Balloon **UP**; when withdrawing, Balloon **DOWN**.
- 7) Advance through RA, RV, PA, and then to wedge (see diagram). A “wedged” waveform is fairly flat; when balloon is deflated, the waveform will become more sine.



**Data:**

- CVP (Central Venous Pressure) – normally **1-6**
- PCWP (aka LV filling pressure) – approximates LV pressure in diastole (except in mitral stenosis). Normal range around **12**. Increased in fluid overload.
- CO (cardiac output) – calculated by thermodilution
- CI (cardiac index) – cardiac output divided by body surface area; normal **2.4 - 4.0**
- SVR (systemic vascular resistance) – decreased in setting of sepsis; normal **1600-2400**
- PVR (pulmonary vascular resistance); normal **200-400**

**Data Interpretation:**

- Right heart failure – low CI, high PVR
- Left heart failure – high PCWP, low CI, high SVR
- Tamponade – high PCWP, high SVR, low CI; CVP = PCWP
- Hypotension:
  - Hypovolemia – low CVP, low PCWP, low CI, high SVR
  - Cardiogenic – high CVP, high PCWP, low CI, high SVR
  - Sepsis (Vasogenic) – low CVP, low PCWP, high CI, low SVR

<p style="text-align: center;"><b>SUBSET I</b> Normal CI, low to normal PAWP</p> <hr/> <p>Monitor regularly Administer O<sub>2</sub> Offer prn pain medication Sedation as ordered (These interventions are usually necessary since most patients aren't problem-free; they may just have normal readings.)</p>	<p style="text-align: center;"><b>SUBSET III</b> Normal CI, high PAWP</p> <hr/> <p>Administer O<sub>2</sub> Decrease preload Offer prn pain medication Sedation as ordered Optimize heart rate Enhance contractility</p>		
<p style="text-align: center;"><b>SUBSET II</b> Low CI, low to normal PAWP</p> <hr/> <p>Administer IV fluids Administer O<sub>2</sub> Enhance contractility Decrease afterload IABP Optimize heart rate Surgical intervention for a correctable cardiac problem</p>	<p style="text-align: center;"><b>SUBSET IV</b> Low CI, high PAWP</p> <hr/> <p>Administer O<sub>2</sub> Decrease preload Decrease afterload Enhance contractility Optimize heart rate IABP Surgical intervention for a correctable cardiac problem</p>		
<p style="text-align: center;"><b>PRELOAD</b></p> <p><b>To increase:</b> Fluids Vasopressors</p> <p><b>To decrease:</b> Diuretics Fluid restriction Low-salt diet Positive-end expiratory pressure (PEEP) Venous vasodilators</p>	<p style="text-align: center;"><b>AFTERLOAD</b></p> <p><b>To increase:</b> Dopamine (Inotropin) Norepinephrine (Levophed)</p> <p><b>To decrease:</b> ACE inhibitors Alpha blockers Amrinone (Inacor) Arterial vasodilators Beta blockers Calcium channel blockers IABP Milrinone (Primacor) Morphine Nitrates Nitroprusside (Nipride, Nitropress)</p>	<p style="text-align: center;"><b>CONTRACTILITY</b></p> <p><b>To increase/enhance:</b> Amrinone (Inacor) Dobutamine (Dobutrex) Dopamine (Inotropin) Calcium Digoxin (Lanoxin) Epinephrine (Adrenalin) Isoproterenol (Isuprel) Milrinone (Primacor) Norepinephrine (Levophed)</p> <p><b>To decrease:</b> Beta blockers Calcium channel blockers</p>	<p style="text-align: center;"><b>HEART RATE</b></p> <p><b>To increase:</b> Atropine Cardiac pacing Epinephrine (Adrenalin) Isoproterenol (Isuprel)</p> <p><b>To decrease:</b> Antiarrhythmics Beta blockers Calcium channel blockers Cardiac pacing Digoxin (Lanoxin)</p>