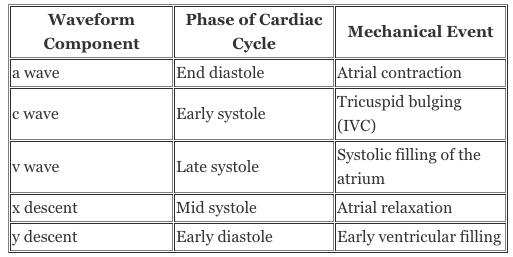
**Normal Hemodynamic and Blood Flow Parameters**

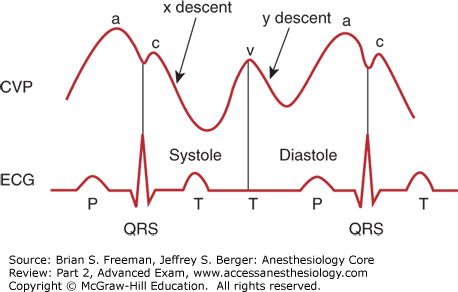
|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Abbreviation | Formula | Normal Range |
| Cardiac output | CO | Stroke volume (SV) x heart rate (HR) | 4-8 L/min |
| Cardiac index | CI | CO/BSA ÷ 1000 | 2.5-4.3 L/min/m2 |
| Mean arterial pressure | MAP | 2(DBP) + SBP ÷ 3 | 70-105 mmHg |
| Right arterial pressure | RAP | Cm H2O = mm HG x 1.34 | 2-8 mmHg |
| Pulmonary artery wedge pressure | PAOP |  | 8-12 mmHg |
| Pulmonary artery systolic | PAS |  | 15-35 mmHg |
| Pulmonary artery diastolic | PAD |  | 10-15 mmHg |
| Pulmonary vascular resistance | PVR | PAM-PAOP x 80 ÷ CO | 100-250 dynes/s/cm-5 |
| Pulmonary vascular resistance index | PVRI | PAM-PAOP x 80÷ CI | 25-285 dynes/s/cm-5/m2 |
| Pulmonary artery mean | PAM |  | 15-20 mmHg |
| Systemic vascular resistance | SVR | MAP-RAP x 80 ÷ CO | 800-1200 dynes/s/cm-5 |
| Systemic vascular resistance index | SVRI | MAP-RAP x 80 ÷ CI | 1970-2390 dynes/s/cm-5/m2 |
| Right ventricular stroke work index | RVSWI | (PAM-RAP)SVI x 0.0138 | 7-12 g/m/m2/beat |
| Left ventricular stroke work index | LVSWI | (MAP-PAOP)SVI x 0.0138 | 35-85 g/m/m2/beat |
| Oxygen delivery | DO2 | CaO2 x CO x 10 | 900-1100 mL/min |
| Oxygen delivery index | DO2I | CaO2 x CI x 10 | 360-600 mL/min/m2 |
| Oxygen consumption | VO2 | C(a-v)O2 x CO x 10 | 200-250mL/min |
| Oxygen consumption index | VO2I | C(a-v)O2 x CI x 10 | 108-165 mL/min/m2 |
| Stroke volume | SV | CO/HR x 1000 | 50-100 mL/beat |
| Stroke volume index | SVI | CI/HR x 1000 | 35-60 mL/beat/m2 |
| Ejection fraction | EF |  | >60% |
| Right ventricular end-diastolic volume | RVEDV | SV/EF | 100-160mL |
| Right ventricular end-diastolic volume index | RVEDVI | EDV/BSA | 600-100 mL/m2 |
| Right ventricular end-systolic volume | RVESV | EDV-SV | 50-100 mL |
| Right ventricular end-systolic volume index | RVESVI | ESV/BSA | 30-60 mLmm2 |
| Right ventricular ejection fraction | RVEF | SV/EDV | 40-60% |
| Mixed venous saturation | Svo2 |  | 60-80% |
| Oxygen extraction ratio | O2ER | (Cao2-Cvo2)/Cao2 x100 | 22-30% |

**Hemodynamic effects of Cardiovascular Agents:**

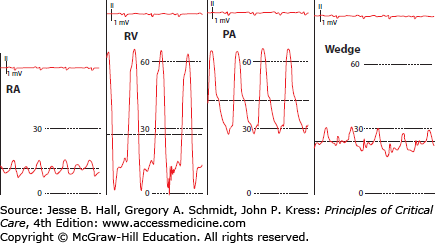
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Drug** | **CO** | **PAOP** | **SVR** | **MAP** | **HR** | **CVP** | **PVR** |
| Norepinephrine (Levophed) | **↑(slight)** | **↑** | **↑** | **↑** | **↔,↑** | **↑** | **↑** |
| Phenylephrine (Neosynephrine) | **↔, ↑** | **↑** | **↑** | **↑** | **↔, ↓** | **↑** | **↑** |
| Epinephrine | **↑** | **↑** | **↑** | **↑** | **↑** | **↑** | **↑** |
| Dobutamine  (Dobutrex) | **↑** | **↓** | **↓** | **↑**  **(with ↑ CO)** | **↔,↑**  **(slight)** | **↓** | **↓**  **↑** |
| Dopamine (Inotrope)  < 5 mcg/kg/min  >5 mcg/kg/min | **↑**  **↑** | **↑**  **↑↑** | **↑**  **(slight)**  **↑↑** | **↑**  **(slight)**  **↑↑** | **↑** | **↑↑** | **↔**  **↑** |
| Digoxin (Lanoxin) | **↑** | **↔** | **↔** | **↔** | **↓** | **↔** | **↔** |
| Isoproterenol (Isuprel) | **↑** | **↓** | **↓** | **↓** | **↑** | **↓** | **↓** |
| Levosimendan (Simdax) | **↔, ↓**  **(related to ↑ SVR)** | **↑** | **↑** | **↑** | **↔, ↓** | **↑** | **↑** |
| Vasopressin | **↔,↓**  **(related to ↑ SVR)** | **↑** | **↑** | **↑** | **↔, ↓** | **↑** | **↑** |
| Milrinone (Primacor) | **↑** | **↓** | **↓** | **↔ (↓ in preload sensitive people)** | **↔ (↑ in preload sensitive people)** | **↓** | **↓** |
| Nitroglycerin (Tridil)  20-40 mcg/min  50-250mcg/min | **↔**  **↑** | **↓**  **↓** | **↔**  **↓** | **↔**  **↓** | **↔**  **↑** | **↓**  **↓** | **↔**  **↓** |
| Nitroprusside (Nipride) | **↑** | **↓** | **↓** | **↓** | **↑** | **↓** | **↓** |

**CVP waveform information:**





**Normal looking waveforms when advancing Swan Ganz catheter**



**Arterial line square wave test:** 