Normal Hemodynamic Parameters and Laboratory Values

Normal hemodynamic parameters – adult

Parameter	Equation	Normal range
Arterial Oxygen Saturation (SaO_2)		95-100%
Mixed Venous Saturation (SvO_2)		60-80%
Central Venous Oxygen Saturation ($ScvO_2$)		60-70%
Arterial Blood Pressure (BP)	Systolic (SBP) Diastolic (DBP)	90-140 mmHg 60-90 mmHg
Mean Arterial Pressure (MAP)	SBP + (2 x DBP)/3	70-105 mmHg
Right Atrial Pressure (RAP) Central Venous Pressure (CVP)		2-6 mmHg
Right Ventricular Pressure (RVP)	Systolic (RVSP) Diastolic (RVDP)	15-25 mmHg 0-8 mmHg
Pulmonary Artery Pressure (PAP)	Systolic (PASP) Diastolic (PADP)	15-25 mmHg 8-15 mmHg
Mean Pulmonary Artery Pressure (MPAP)	PASP + (2 x PADP)/3	10-20 mmHg
Pulmonary Artery Occlusion Pressure (PAOP)		6-12 mmHg
Left Atrial Pressure (LAP)		6-12 mmHg
Cardiac Output (CO)	HR x SV/1000	4.0-8.0 L/min
Cardiac Index (CI)	CO/BSA	2.5-4.0 L/min/m^2
Stroke Volume (SV)	CO/HR x 1000	60-100 mL/beat
Stroke Volume Index (SVI)	CI/HR x 1000	33-47 mL/m^2/beat
Stroke Volume Variation (SVV)	(SVmax - SVmin)/SVmean x 100	10-15%
Systemic Vascular Resistance (SVR)	80 x (MAP - RAP)/CO	800-1200 dynes-sec/cm^{-5}
Systemic Vascular Resistance Index (SVRI)	80 x (MAP - RAP)/CI	1970-2390 dynes-sec/cm^{-5}/m^2
Pulmonary Vascular Resistance (PVR)	80 x (MPAP - PAOP)/CO	<250 dynes-sec/cm^{-5}
Pulmonary Vascular Resistance Index (PVRI)	80 x (MPAP - PAOP)/CI	255-285 dynes-sec/cm^{-5}/m^2
Left Ventricular Stroke Work Index (LVSWI)	SVI x (MAP - PAOP) x 0.0136	50-62 mmHg x ml/m^2
Right Ventricular Stroke Work Index (RVSWI)	SVI x (MPAP - CVP) x 0.0136	5-10 mmHg x ml/m^2

Edwards

Normal hemodynamic parameters – adult

Parameter	Equation	Normal range
Coronary Artery Perfusion Pressure (CPP)	Diastolic BP-PAOP	60-80 mmHg
Right Ventricular End-Diastolic Volume (RVEDV)	SV/EF	100-160 mL
Right Ventricular End-Diastolic Volume Index (RVEDVI)	RVEDV/BSA	59-94 mL/m^2
Right Ventricular End-Systolic Volume (RVESV)	EDV-SV	50-100 mL
Right Ventricular Ejection Fraction (RVEF)	SV/EDV x 100	40-60%
Arterial Oxygen Content (CaO_2)	(0.0138 x Hgb x SaO_2) + 0.0031 x PaO_2	17-20 mL/dL
Venous Oxygen Content (CvO_2)	(0.0138 x Hgb x SvO_2) + 0.0031 x PvO_2	12-15 mL/dL
A- V Oxygen Content Difference ($C(a\text{-}v)O_2$)	CaO_2 - CvO_2	4-6 mL/dL
Oxygen Delivery (DO_2)	CaO_2 x CO x 10	950-1150 mL/min
Oxygen Delivery Index (DO_2I)	CaO_2 x CI x 10	500-600 mL/min/m^2
Oxygen Consumption (VO_2)	$C(a\text{-}v)O_2$ x CO x 10	200-250 mL/min
Oxygen Consumption Index (VO_2I)	$C(a\text{-}v)O_2$ x CI x 10	120-160 mL/min/m^2
Oxygen Extraction Ratio (O_2ER)	(CaO_2 - CvO_2)/CaO_2 x 100	22-30%
Oxygen Extraction Index (O_2EI)	(SaO_2 - SvO_2)/SaO_2 x 100	20-25%

Normal blood laboratory values

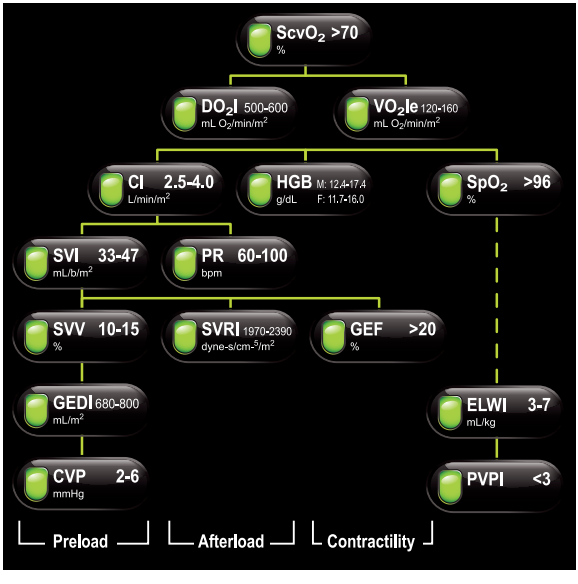
Test	Convention units (reference values*)	SI units
Hematocrit (Hct)	Males: 42-52% Females: 36-48%	0.42-0.52 0.36-0.48
Hemoglobin (Hgb)	Males: 12.4-17.4 g/dL Females: 11.7-16 g/dL	124-174 g/L 117-160 g/L
Lactate	0.93-1.65 mEq/L	0.93-1.65 mmol/L

SI Units = International Units
****Reference Values vary by regional laboratory techniques and methods.***

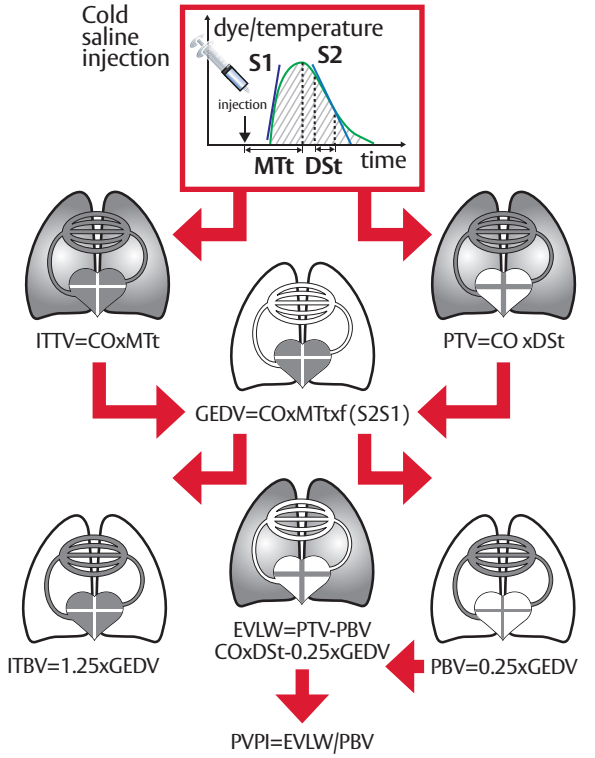
Normal hemodynamic parameters – adult

Parameter	Equation	Normal range
Extra Vascular Lung Water (EVLW)	CO x DSt - 0.25xGEDV	
Extra Vascular Lung Water Index (ELWI)	EVLW/PBW Predicted Body Weight (PBW): Female: 45.5 + 0.91 x (Height-152.4) Male : 50 + 0.91 x (Height-152.4)	0-7 mL/kg
Global End Diastolic Volume (GEDV)	CO x MTt x f(S1/S2)	
Global End Diastolic Volume Index (GEDI)	CI x MTt x f(S1/S2)	650-800 mL/kg
Global Ejection Fraction (GEF)	SV x 4 / GEDV	>20%
Cardiac Function Index (CFI)	1000 x CO / GEDV	4.5-6.5 1/min
Intra Thoracic Blood Volume (ITBV)	ITBV = 1.25 x GEDV	
Intra Thoracic Blood Volume Index (ITBI)	ITBI = 1.25 x GEDI	850-1000 mL/m^2
Pulmonary Vascular Permeability Index (PVPI)	EVLW/0.25 x GEDV	<3
Cardiac Power (CPO)	CO x MAP x K	
Cardiac Power Index (CPI)	CI x MAP x K	0.5-0.7 W/m^2

Physio-relationship



Transpulmonary thermodilution TPTD



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