

Pulmonary Artery Catheters- how to perform and interpret cardiac output studies in CICU with Drager Monitoring

For insertion guide see One Heart- Pulmonary Artery Catheter Insertion

How to perform cardiac output studies

Ensure the bedside monitor is displaying a pulmonary artery catheter trace and measurement.



You will first need to wedge the pulmonary artery catheter.

1. Inflate the balloon (red port) with up to 1.5ml of air and lock it.





2. Slowly advance the catheter using the sterile sheath until a wedge trace is achieved on the screen. This is usually 2-10 mmHg at 40-50 cm distance if SCV/ IJ insertion.





3. Press 'Wedge' on the bedside console to start the process.



4. A box will appear on the monitor indicating it is ready to perform a wedge pressure. The monitor will then prompt you to press 'Wedge' to start using the rotary knob.

SpO2 Weak Signal	Internal 50 % 🗂	4-Jan 18:11	
Pacer OFF Filter	All Alarms OFF 0:07 HR ESU Adult	123 18	Alarm Silence
"~~~~~		A 54 A	Ann Proc
100	PA	mmHg &	
	8 CM	& & Panelo 94	Al NBP Alarma Off Start/Stop
Inflate Balloon, Press 'We	dae' to State Wester Se	0	Code Fast
Scale 100 mmHg	Sweep Spe. 6.25 mm/s	&	
	STI	• •• •	Discharge < Mark
	c.c	6.4 36.8 A	Main Source Menu
FT F		CO2 MPa 5.5 47	
0		24 25 1002 0.0 0.0	
1 Battery charger			01
			\smile

5. The computer will record the wedge pressure and then prompt you to deflate the balloon and save.

Internal 50 % 💼		Jan 18:11	
Adult	HR	123 148	Alarm Silence
mm	ART mmHg	23 160	17.
	PA	34 4	±/ * Alarm Limits
	mmHg		-
	CVP		All Alarms Of
	mmHg		
/e. Wedge	SpO2	* * * 100	Code
Cursor Quit	PLS	2	
The second second	STII mm	4	Discharge
	C.O.	6.4	Heir
		368 8	Main
	17:21 11 26.9		Screen
	etCO2 kPa	5.3 35	Screen
	Internal 50 % C	Internal 50 % cs 4	Internal 50 % 63 4-Jan 18:11 Adult Hn 123 160 Adult ATT Ministry 93 160 PA ministry 93 160 160 160 PA ministry 93 160

 Ensure you deflate the balloon, lock the syringe, and pull back the pulmonary artery catheter 1-2 centimetres to prevent inadvertent wedging. Note the change from wedge to PA trace on the monitor. Leaving the catheter wedged can cause arterial rupture.



You are now ready to perform cardiac output studies.

1. You will need an ice bucket to cool the sterile water used to perform the studies.



2. Ensure the transducer is level with patients left atrium and the line is zeroed. Press C.O. on the bedside console.



3. A box on the monitor screen will appear indicating it is ready for you to perform thermodilution cardiac output studies.

Bueve avear	ignal		-	Internal 50 %	6	4-	Jan 18:12
Pacer	OFF	-A-A-Filter: ES	mh-h	mhuh	Adult	R	12318
150 100 100				18:12	PWP 7	RT mmHg	93 160
						8 A)	53 a
AA	AΛ	1A	ΛΛ	ΛΛΛ	A /P	A mmHg	28 🏘
		VV		1 V V	JV 2	1 🐴	13 🕰
LNLM	W/W	NW	ww	mm	MM°	WP mmHg	98
					S	pO2	× × × ¹⁰⁰ / ₉₃
					S PL	pO2 S	× × × ¹⁰⁰ &
c.o.		READ)Y		PU S	pO2 S	* * * ¹⁰⁰ * • • • \$3 • • • \$3
C.O.		READ)Y	-	S PL	pO2 \$	* * * ¹⁰⁰ &
c.o.		REAL	DA		S P C B 17	002 5 711 mm 0. 7 °C 21 17 26.8	* * * ¹⁰⁰ *** × ¹⁰⁰ &
C.O. #1 #2		REAL	2¥ 45	50VP AV410/0	S Pl C B T T T	0. 111 mm 0. 11268 11268	* * * ¹⁰⁰ *** & & & 6.4 36.8 & 5.5 \$3



4. Draw back 10ml of ice-cold water, remove bubbles and rapidly inject (usually via the blue port, but you can also use the white port) watching the monitor to ensure a cardiac output thermodilution curve and figure are obtained. Ideally perform at end expiration so there is the least effect of pleural pressure on intracardiac pressures.



5. If one result seems erroneous this can be discarded by using the rotary knob to highlight the box and clicking on it to remove it from the final average value.



6. Save the average value using the rotary knob.





Now you can use the values obtained from your thermodilution studies to calculate various parameters to provide an indication of the patient's clinical status.

1. Press 'menu' on the patient's monitor, then use the rotary knob to scroll to 'calculations', then 'hemo' and confirm by pressing down on the rotary knob.



2. Scroll down to input the patient's height and weight then press 'Capture Values'.

SpO2 Weak Signal -50min HB 0 0 0	Pacer OFF Calculations	Filter: ESU	50 % 💼 A Adult		Jan 18:17 122 ¹⁴⁰
Capture Values	Calculate	Results	0	68 4	93 8 53 a
Hemodynamics				21 A	28 ≏ 14 ⇒
HR ART S				CVP mmHg	4 &
ART M ART D				SpO2	* * * 100
CVP PA M				PLS	43
PWP 18:12				mm	4
Height				C.O. BT %	7.8 36.7 &
Update displayed parameter v	alues.			etCO2 kPa RBc do 24 Z icO2	5.5 ^{6.7} 0.0 ^{0.6}

3. Once the values from your thermodilution studies appear on screen you can then press 'Calculate' to obtain your results.





•	The results are display	ycu	you winneed			
			Pacer OFF	Filter: ESU	Adult	
			Calculations		- TOLET	
					and the second se	

4. The results are displayed- you will need to scroll down to view them all.

			Supplementary of the local division of the l		Manual D
	4-Jan	4-Jan	4-Jan	4-Jan	Normal Kan
	17:23	17:26	18:01	18:17	
HR	124	124	124	122	60 - 90
ART M	63	62	62	68	70 - 100
PAM	31	29	21	21	10 - 20
PWP	14	14	4	7	4 - 12
CVP	115	13	77	4	2-6
C.O.	6.4	6.4	6.4	7.8	4.0 - 8.0
SV	51.6	51.6	51.6	63.9	60.0 - 120.0
SVR		612		656	900 - 1400
PVR	212	187	212	144	70 - 180
LVSW	34.4	33.7	40.7	53.0	60.0 - 80.0
RVSW		11.2		14.8	10.0 - 15.0
CI	3.4	3.4	3.4	4.2	2.5 - 4.0
614	27.6	27.6	27.6	34.2	30.0 - 60.0



How to interpret results

Key values obtained:

Value	Reference range	Clinical Relevance				
Measured values						
PWP (Pulmonary Wedge Pressure)	4-12 mmHg	Used to determine LV function; correlates LVEDP, LV preload				
CVP (Central Venous Pressure)	2-6 mmHg	Used to determine volume status and RV) function; correlates with RVEDP				
CO (Cardiac Output)	4-8 L/min	Describes blood flow through tissues; reflects adequacy of overall cardiac function				
CI (Cardiac Index)	2.5-4 L/min/m ²	CO adjusted for patient's BSA				
Derived values						
SV (Stroke Volume)	60-120 ml/beat	Amount of blood ejected during systole; decreased SV indicates ventricular dysfunction				
SVI (Stroke Volume Index)	30-60 ml/beat/m ²	SV adjusted for patient's BSA				
SVR (Systemic Vascular Resistance)	900-1400 dynes/sec/cm ⁵	Describes state of resistance in systemic vasculature, afterload				
SVRI (Systemic Vascular Resistance Index)	1700-2600	SVR adjusted for patient's BSA				
PVR (Pulmonary Vascular Resistance)	70-180 dynes/sec/cm ⁵	Describes state of resistance in pulmonary vasculature				
PVRI (Pulmonary Vascular Resistance Index)	150-250	PVR adjusted for patient's BSA				

Very simplified flow diagram to help aid in interpretation:





Troubleshooting:

There is a separate guide on how to attach the PA catheter – often the nursing staff will know.

If a temperature does not appear when the 'wedge' button is pressed, the unit or cable is likely defective. Replace and try again.

Ensure the transducer is correctly positioned or it will not give an accurate result.

Check the water is well cooled by the ice bucket.