

**JOHN HUNTER HOSPITAL INTENSIVE CARE UNIT  
PRACTICE AND PROCEDURES MANUAL**

**SUBJECT: PiCCO Performing Thermodilution Measurements**

**PROCEDURE SECTION: P  
DATE TO BE REVIEWED: 2011**

**OUTCOMES: -**

- 1. Accurate performance of thermodilution measurements**
- 2. Correct use of equipment involved in thermodilution measurements**
- 3. Minimise complications associated with performing thermodilution measurements**

**S.W.P.**

**SAFE WORK PRACTICES**

**RISKS:**

- **Exposure to body fluids**
- **Muscular strain from awkward posture**
- **Manual handling risks associated with patient positioning.**

**CONTROLS:**

- **Wear personal protective equipment**
- **Adjust bed to the appropriate height**
- **Refer to HAHS Manual Handling Policy**

**SPECIAL CONSIDERATIONS:**

**Indication for performing thermodilution studies**

- **Change in central venous pressure**
- **Evaluation of changes in inotrope or intravenous fluid therapy**

**Number of Thermodilution Studies to be Performed**

**Initial calibration of the PiCCO requires three thermodilution studies. For subsequent studies two thermodilution curves are usually sufficient**

**Keeping Saline Injectate at Less than 8 degrees Celsius**

By keeping normal saline polyamps in a medications fridge the desired temperature can be achieved, however placing polyamps in a container with ice slush can also be performed. It is important to use syringes of saline as quickly as possible as they will warm rapidly due the large surface area and small volume. This will lead to inaccurate measurements.






**EQUIPMENT:**

- **20 mL syringe (one for each output curve performed)**
- **15mL of normal saline chilled to less than 8 degrees Celsius (for each output curve performed)**


## PROCEDURE:

### Calibration



If the PiCCO Plus has just been connected the main display page shows an arterial waveform and pressure reading however none of the cardiac indices appear, this will not occur until calibration has been performed. To perform this

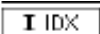

1. Press the “input menu”  key and enter the current central venous pressure. Use the arrow keys to change the parameter you wish to review and the plus and minus key to adjust the number
2. Change to the “thermodilution display page” by touching the  symbol.
3. Connect 20 mL syringe with 15 mL of normal saline that is at a temperature of less than 8 degrees Celsius to the injectate temperature sensor housing. The syringe connection must be directly to the three way tap and not through an interlink injection site (“bung”) or syringe cannula.
4. Press “start measurement key” .
5. Wait until the blood temperature status displayed on the bottom left of screen states “stable”
6. Inject the bolus as fast and steady as possible (<7 seconds).
7. A cardiac output curve will appear on screen with numerical indices also displayed
8. This process is repeated for subsequent measures (starting from press ‘start measurement key’). **Initial calibration of the PiCCO requires three thermodilution studies.**
9. Select the information key  at the bottom of this screen. The numerical information for these curves and averaged information for these curves will now be displayed and the right side of the screen will display the continuous indices that are generated.
10. This information can be recorded on the PiCCO studies chart. To return to the standard monitoring page select the enter key and then the pulse contour display key .

### Subsequent Thermodilution Studies

The above steps need to be performed remembering to enter the current CVP in the “input menu”  section. **When performing subsequent studies two thermodilution curves are usually sufficient**

### Further Display of Patient Indices

From the pulse contour display page, select the info key  then the patient profile button  and a grouped and graphic display of the patient’s most recent indices is displayed. The cross hatched square represents normal range and the solid line the patient’s most recent reading.

Also on the pulse contour page both the  indexed values (based on body surface area) and  absolute values touch keys can be selected giving access to further cardiac

indices.

### **PiCCO Normal Values**

The following table indicates the Parameters measured by PiCCO there abbreviation and normal values. Most of these can all be found on the patient profile page as described above.

<b>CARDIAC INDICE</b>	<b>ABBREVIATION</b>	<b>NORMAL VALUE</b>	<b>UNITS OF MEASURE</b>
<b>Output Measurements</b>			
Cardiac output	<b>CO</b>	4.0 - 8.0	L/min
Cardiac Index	<b>CI</b>	3.0-5.0	L/min/m <sup>2</sup>
Stroke Volume Index	<b>SVI</b>	40 - 60	mLs / m <sup>2</sup>
<b>Afterload Measurements</b>			
Mean Arterial Pressure	<b>MAP</b>	70 - 90	mmHg
Systemic Vascular Resistance	<b>SVR</b>	770 - 1500	dynes/sec/cm <sup>5</sup>
Systemic Vascular Resistance Index	<b>SVRI</b>	1200 - 2000	dyn sec cm <sup>5</sup> m <sup>2</sup>
<b>Contractility Measurements</b>			
Cardiac Function Index	<b>CFI</b>	4.5 – 6.5	L/min
Global Ejection Function	<b>GEF</b>	25-35	%
Index of Left Ventricular Contractility	<b>dPMx</b>	1200 - 2000	mmHg/s
<b>Volume Management Measurements</b>			
Global End Diastolic Volume Index	<b>GEDI</b>	680 - 800	mL/m <sup>2</sup>
Intrathroacic Blood Volume Index	<b>ITBI</b>	850 - 1000	mL/m <sup>2</sup>
Stroke Volume Variation	<b>SVV</b>	< 10	%
Pulse Pressure Variation	<b>PPV</b>	< 10	%
<b>Lung Measurements</b>			
Extravascular Lung Water Index	<b>ELWI</b>	3 - 7	mL / kg
Pulmonary vascular Permeability Index	<b>PVPI</b>	1 -3	

### **REFERENCES:**

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2. McLean, A and McCartin, V. (2002) Pulsion PiCCO. Wentworth Area Health Service. Retrieved 11<sup>th</sup> July, 2008 from [http://intensivecare.hsnet.nsw.gov.au/five/doc/pulse\\_contour\\_cardiac\\_output\\_PiCCO\\_HM\\_napean.pdf](http://intensivecare.hsnet.nsw.gov.au/five/doc/pulse_contour_cardiac_output_PiCCO_HM_napean.pdf)
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4. Richards, C. (2003) Pulse Contour Cardiac Output (PiCCO). Intensive Care Services Nursing Policy and Procedures, Royal Prince Alfred Hospital. Retrieved 11<sup>th</sup> July, 2008 from [http://intensivecare.hsnet.nsw.gov.au/five/doc/pulse\\_contour\\_cardiac\\_output\\_HM\\_rpa.pdf](http://intensivecare.hsnet.nsw.gov.au/five/doc/pulse_contour_cardiac_output_HM_rpa.pdf)
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**APPROVAL:** Intensive Care Executive Committee

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**DATE DEVELOPED:** 2008

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**DATE REVIEWED:**

**REVIEWED BY:**