TO INITIATE MONITORING, YOU NEED: **STARLING MONITOR AND SENSORS**

Power On > New Patient > Enter Patient ID/Age/Wt/Ht/Gender > Start Session > **Automatically Calibrates**

DOES MY PATIENT HAVE A LOW BLOOD PRESSURE/MAP OR PERFUSION PROBLEM (I.E., LOW UOP/HIGH LACTATE)?

DO I NEED TO GIVE FLUID?

(only ~50% of hemodynamically unstable patients are fluid responsive!)

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**DYNAMIC ASSESSMENT**

**PLR**

- 3 min baseline
- 3 min challenge

* Turn off SCDs for set up and duration of PLR.

**BOLUS**

- 3 min baseline
- Challenge

Bolus: Same position throughout baseline and challenge. End bolus 1-2 minutes after infusion is complete (3-5 minutes with syringe technique).

- 250 ml in <5 min
- OR 500 ml in <10 min

**CALIBRATION VS. BASELINE:**

Calibration = signal optimization occurs during initial pt. set-up.

Baseline = initial SVI readings of a dynamic assessment

**SENSORS:**

- “Box in” the heart
- Red dashes indicate right/left and upper/lower
- White tabs point to toes
- Can be on front or back in any combination

**NEED TO RECALIBRATE:**

(Session Controls > Recalibrate)

- If any or all sensors are moved or replaced
- Once a shift

**Results:**

≥10% ΔSVI patient is likely fluid responsive

<10% ΔSVI (including negative numbers) patient is not likely fluid responsive

* "Would you like to start immediately from the challenge stage?" means “Can I use the last 3 minutes of SVI data as my baseline?” (i.e., no nursing interventions)

* "Baseline shows unstable results" means the last 3 SVI readings have changed more than 10%. Consider repeating baseline.
### Clinical Shock States

**Cardiogenic Shock**
- HR x SV/1000 \(\geq\) 2.5 – 4.0 L/min/m²
- CO/BSA

**Hypovolemic Shock**
- Normal Adult Range
- \(\Delta\) SVI
- Normal adult range
- \(\Delta\) SVI \(<10\%\)
- 60-100 mL/beat
- 4.0 – 8.0 L/min

### Equation
- \(\frac{SV}{BSA} = 80 \times \frac{(MAP)}{CI}\)

### Total Peripheral Resistance Index (TPRI)
- 1970–2390 dynes • sec/cm²

### \(\Delta\) Stroke Volume Index (\(\Delta\)SVI) to Dynamic Assessment
- \(\Delta\)SVI \(\geq\) 10\% Predictive of 15\% increase in CO with 500cc

### Dynamic Assessments Directly Challenge the Heart with Volume to Measure its Response:

#### Passive Leg Raise (PLR) Maneuver — Translocation of 250-300cc of blood from lower extremities into the heart

#### Fluid Bolus Challenge (FB) — Rapid Infusion of 250cc of fluid over 3-5 minutes

### Patients
- Shock States/Low Blood Pressure: Sepsis, Low Vascular Tone, Low Cardiac Output, Hypovolemia, Neurogenic Shock
- Patients treated with Inotropes, Vasopressors or Vasodilators
- Surgical Patients: Perioperative Volume Management, Goal Directed Therapy, Enhanced Recovery After Surgery (ERAS)
- Emergency/Trauma Patients
- Other Critical Care Conditions: Acute Respiratory Distress (ARDS), Sub-Arachnoid Hemorrhage (SAH), Acute Kidney Injury (AKI), Congestive Heart Failure (CHF)
- Patients undergoing Continuous Renal Replacement Therapy (CRRT) or patients undergoing hemodialysis

### Only ~50\% of hemodynamically unstable patients will respond to fluid by increasing cardiac output and perfusion.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal Adult Range</th>
<th>Cardiogenic Shock</th>
<th>Septic Shock</th>
<th>Hypovolemic Shock</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP (MAP)</td>
<td>&gt; 65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Rate (HR)</td>
<td>60-100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac Index (CI)</td>
<td>2.5–4.0 L/min/m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Peripheral Resistance Index (TPRI)</td>
<td>1970–2390 dynes • sec/cm²</td>
<td>(\geq) early</td>
<td>(\geq) early</td>
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<th>Equation</th>
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<tr>
<td>Stroke Volume (SV)</td>
<td>CO/HR x 1000</td>
<td>60 – 100 mL/beat</td>
</tr>
<tr>
<td>Stroke Volume Index (SVI)</td>
<td>SV/BSA</td>
<td>33 – 47 mL/beat/m²</td>
</tr>
<tr>
<td>(\Delta) Stroke Volume Index ((\Delta)SVI)</td>
<td>Change in SV after Dynamic Assessment</td>
<td>(\geq) 10% Likely to be Fluid Responsive (&lt;10%))</td>
</tr>
<tr>
<td>Cardiac Output (CO)</td>
<td>HR x SV/1000</td>
<td>4.0 – 8.0 L/min</td>
</tr>
<tr>
<td>Cardiac Index (CI)</td>
<td>CO/BSA</td>
<td>2.5 – 4.0 L/min/m²</td>
</tr>
<tr>
<td>Mean Arterial Pressure (MAP)</td>
<td>(SBP + (2 x DBP))/3</td>
<td>70 – 105 mmHg</td>
</tr>
<tr>
<td>Total Peripheral Resistance (TPR)</td>
<td>80 x (MAP)/CO</td>
<td>800 – 1200 dynes • sec/cm²</td>
</tr>
<tr>
<td>Total Peripheral Resistance Index (TPRI)</td>
<td>80 x (MAP)/CI</td>
<td>1970 – 2390 dynes • sec/cm²/m²</td>
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