

# Goal Directed Fluid Therapy

1 Does your patient qualify?

2 Fluid management algorithm and FAQs

3 Interpreting SPV/PPV with the GE monitor

4 Algorithm variant if using LiDCO

5 Interpreting SV and SVV with a LiDCO monitor

## Goal Directed Fluid Therapy Team

### Attendings:

Michael Bokoch  
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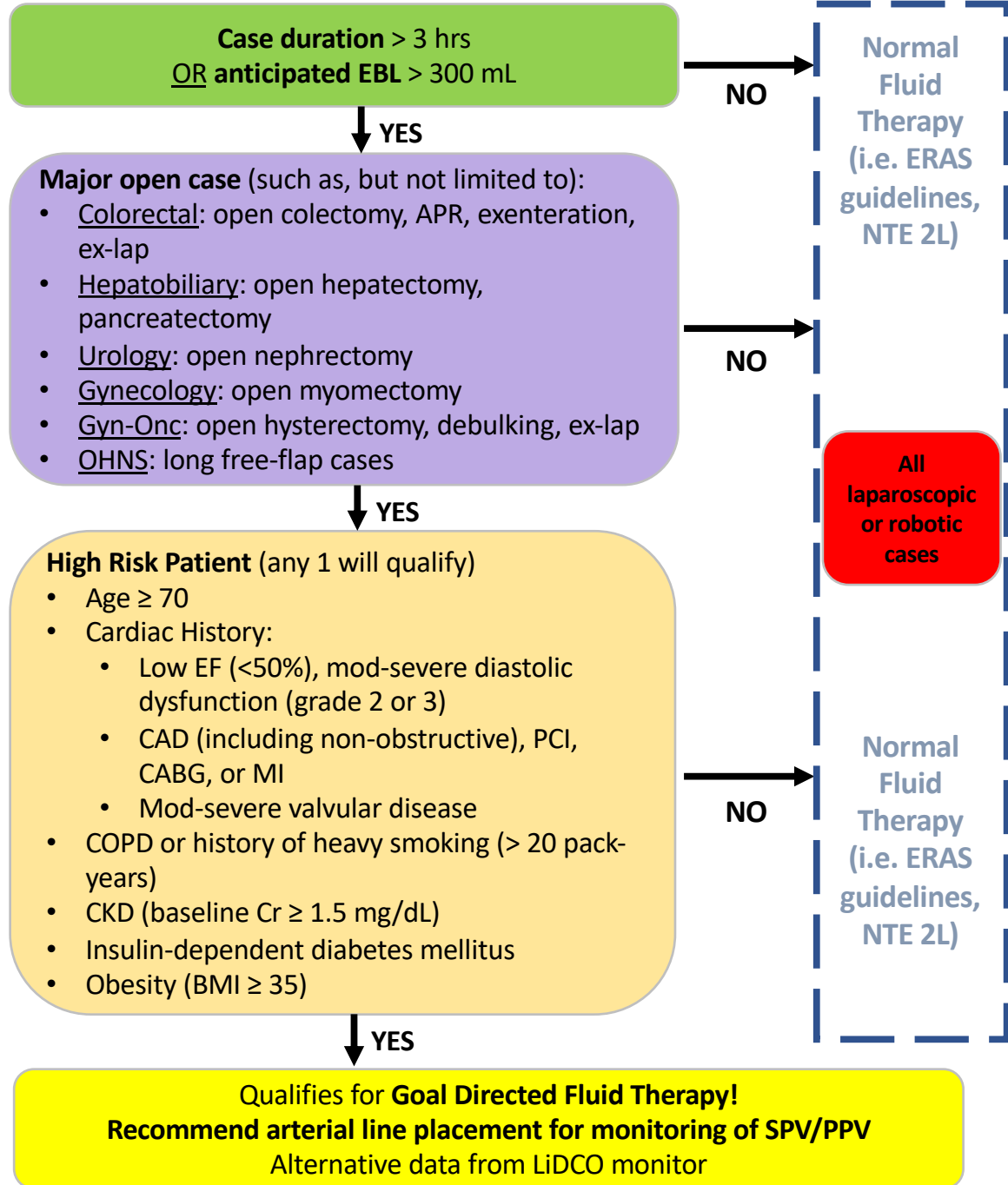
### CRNAs:

Jon Flores  
Amanda Fulton  
Mercy Vigil  
Sarah Zhang

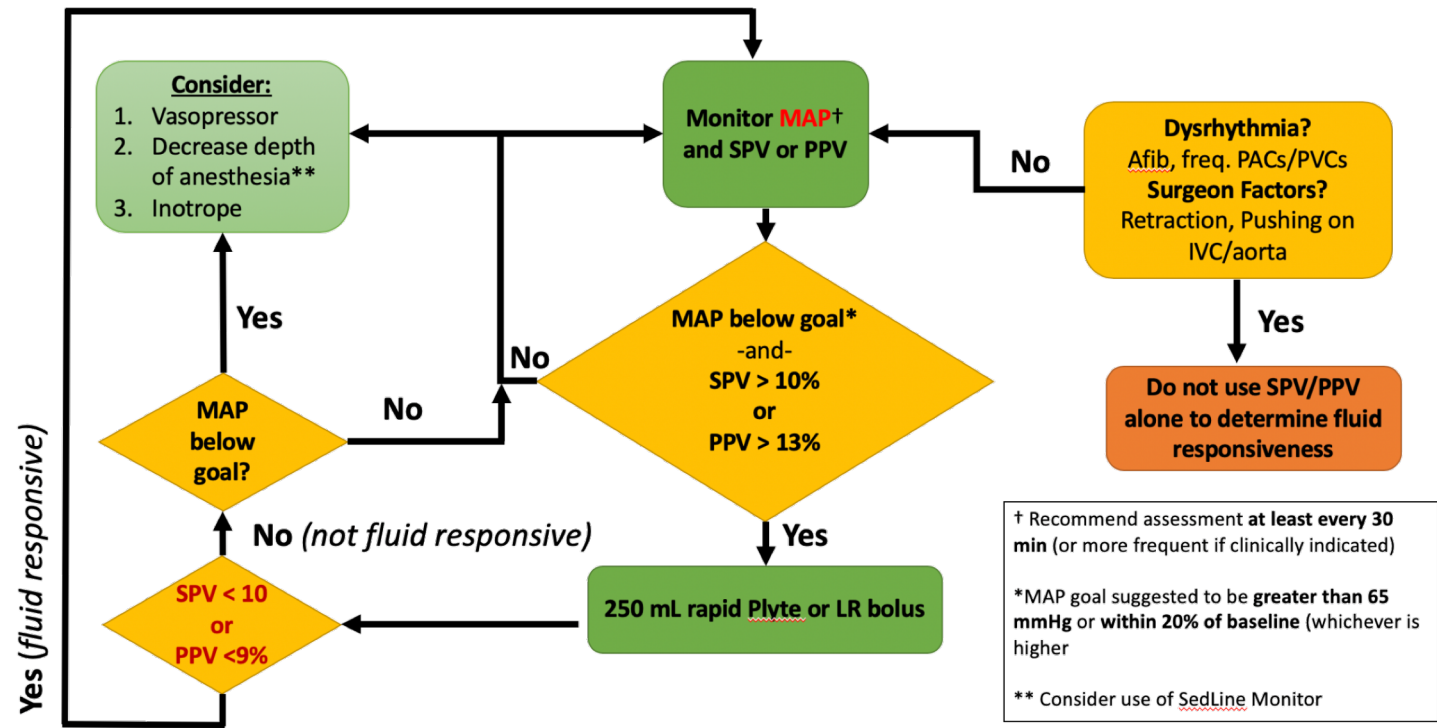
### Residents:

Catherine Chiu  
Christine Choi  
Edward Labovitz  
Dylan Masters

# 1. Does your patient qualify?



## 2. Fluid management algorithm and FAQs



What Crystalloid Solution is Preferred?

Plasmalyte

LR is an acceptable alternative

Do not use 0.9% NaCl (normal saline) unless for a specific indication

What about Colloid Products?

Should not be 1<sup>st</sup> line therapy

Acceptable to switch to Albumin (5%) if:

rapid resuscitation is needed, EBL>1L, Crystalloid > 3L, or other specific indication

Continue GDFT with 250mL albumin boluses

Do not use Hextend/Hetastarches

What about Blood Products?

Transfuse pRBCs to maintain Hgb > 7 g/dL intraop (or Hgb > 8 if actively bleeding)

Administer FFP/platelets instead of Plyte/LR/Albumin if clinically indicated

Continue GDFT with boluses of blood product if feasible

Any other caveats?

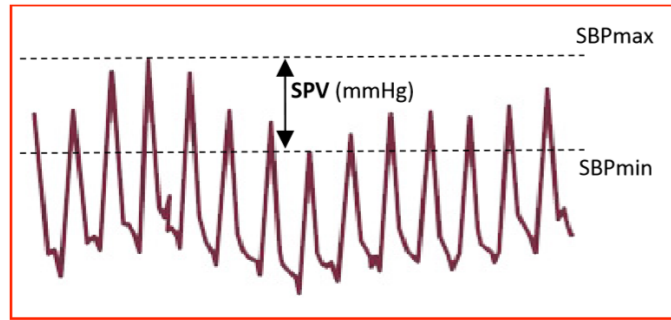
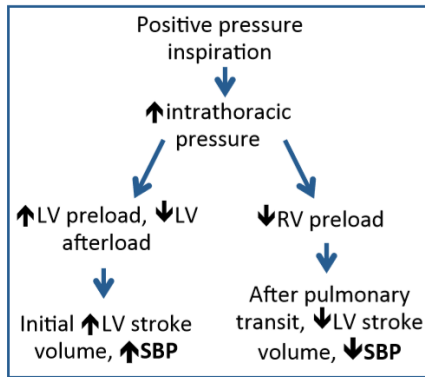
If patient is prone, SPV and PPV may **not** be a good prediction of fluid responsiveness for:

- BMI > 30, or
- Low lung compliance, i.e. peak pressures > 30 cmH<sub>2</sub>O

Anesthesiologists **may abort GDFT algorithm at any time** if patient is not improving or the algorithm is thought to be harming the patient's condition

# 3. Interpreting SPV/PPV with the GE monitor

## Systolic Pressure Variation (SPV)



*“Every breath is a bolus”*

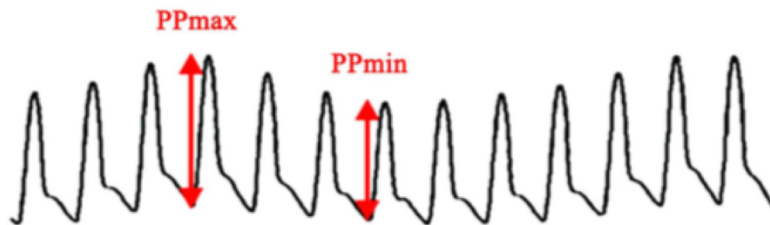
If respiratory variation is creating differences of SBP such that **SPV is greater than 10mmHg**, in the right clinical context this is suggestive that patient may be fluid responsive.

If SPV is less than 10mmHg, there could be other reasons causing soft blood pressures, and additional fluids are less likely to help.

**Display SPV on GE Monitor:** select Monitor Setup, select Screen Setup; select Lower Parameter Area; in an unused space scroll up to SPV. (displays averaged SPV value in mmHg updated serially, also displays PPV %)

**Manually calculate SPV on GE Monitor:** select SPV window; allow curve to be drawn, select Freeze; adjust SBPmax and SBPmin lines with toggle buttons. (displays this SPV value in mmHg until next manual calculation)

## Pulse Pressure Variation (PPV)



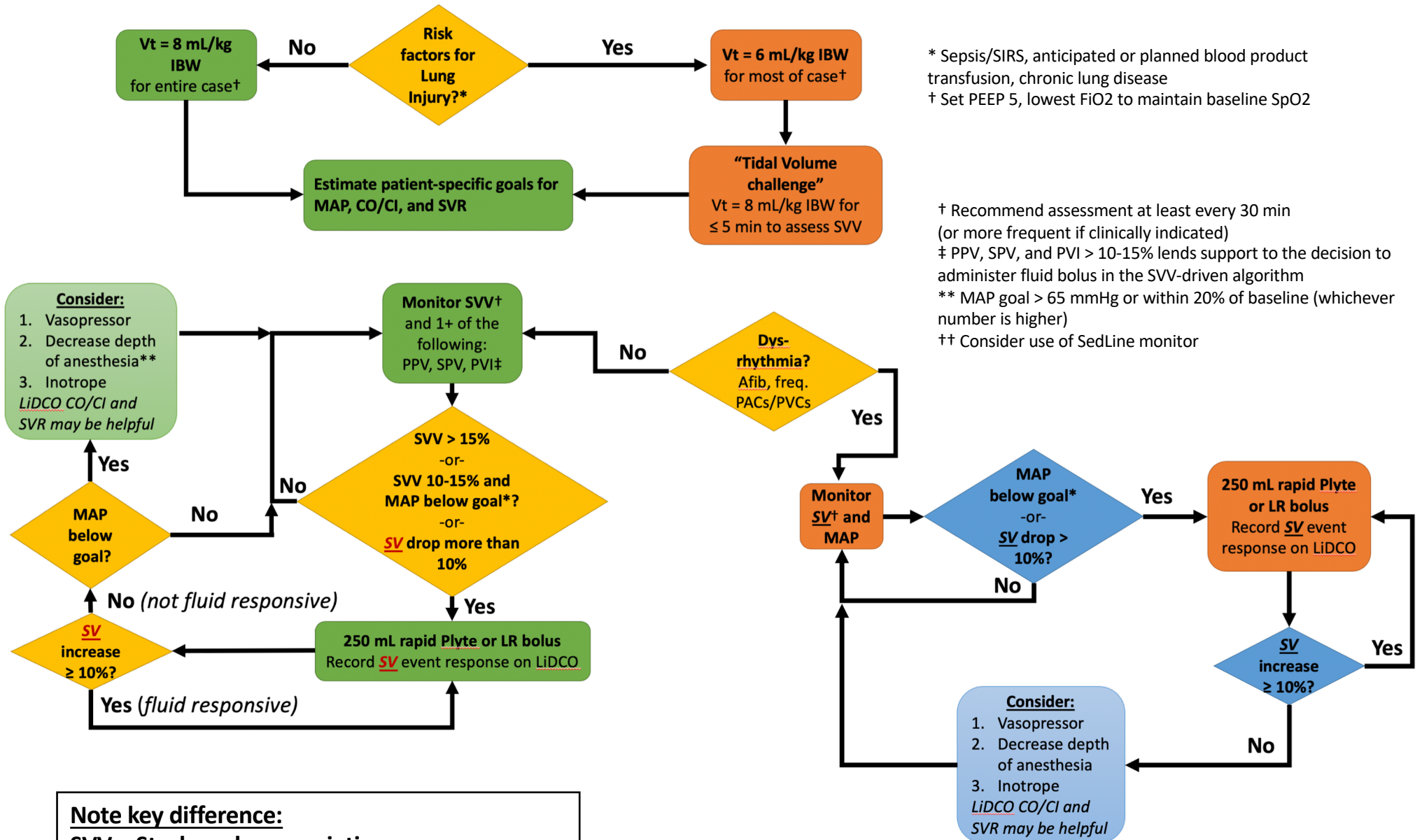
$$PPV = \frac{PP_{max} - PP_{min}}{PP_{mean}} \times 100$$

PPV > 13% : likely fluid responsive  
 PPV < 9% : not fluid responsive  
 9% < PPV < 13% : “gray zone”

- Limitations
- Requires arterial BP monitoring
  - Extreme bradycardia or high RR
  - Arrhythmia/irregular HR (e.g. atrial fibrillation)
  - ↑intra-abdominal pressure (e.g. pneumoperitoneum)
  - Open thorax
  - Spontaneous ventilation, low tidal-volume ventilation
  - Low arterial compliance (high-dose vasopressors, severe atherosclerosis/PVD)
  - RV and/or LV failure

**References:**  
 PMID 21906322 and PMID 19602972  
 Miller’s Anesthesiology 8<sup>th</sup> ed. 2015  
 Michard F, Anesthesiology 2005

# 4. Algorithm Variant if using LiDCO



\* Sepsis/SIRS, anticipated or planned blood product transfusion, chronic lung disease  
† Set PEEP 5, lowest FiO2 to maintain baseline SpO2

† Recommend assessment at least every 30 min (or more frequent if clinically indicated)  
‡ PPV, SPV, and PVI > 10-15% lends support to the decision to administer fluid bolus in the SVV-driven algorithm  
\*\* MAP goal > 65 mmHg or within 20% of baseline (whichever number is higher)  
†† Consider use of SedLine monitor

### Note key difference:

#### SVV = Stroke volume variation

- Useful for continuous monitoring of fluid responsiveness

#### SV = Stroke volume

- Gold standard for assessing successful fluid challenge

### Note:

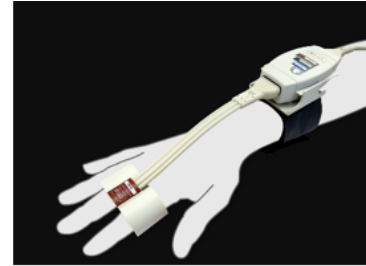
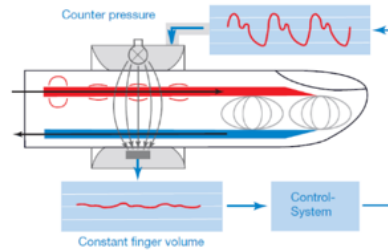
In the presence of dysrhythmia, **Stroke Volume (SV)** monitoring remains useful in a GDFT algorithm

Do not use SVV, PPV, SPV, or PVI.

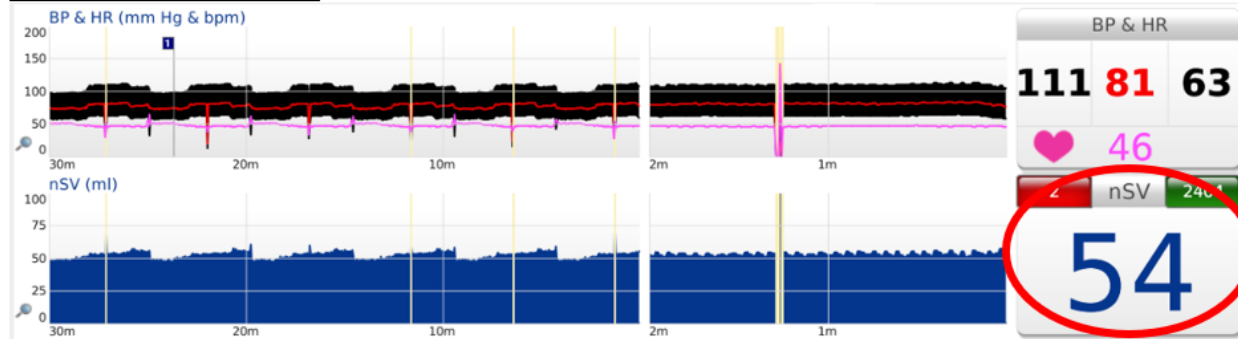
# 5. Interpreting Stroke Volume (SV) and Stroke Volume Variation (SVV) with the LiDCO monitor

## Materials needed

- 1) Regular arterial line (preferred) OR
- 2) CNAP sensor



## Hemodynamic Window



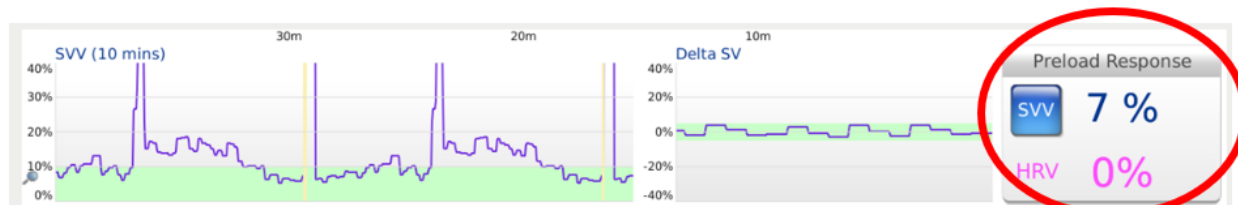
nSV = scaled stroke volume, based on patient parameters from a nomogram (height, weight, age)

nCO = scaled cardiac output (i.e. nSV \* HR)

For the curious:

LiDCO uses a proprietary PulseCO algorithm that converts an arterial pressure wave form into a presumed **stroke volume**

## Dynamic Preload Parameters Window



Evidence shows that **stroke volume variation >10-15%** may indicate fluid responsiveness

Pitfalls:

- Overdamped or Underdamped arterial lines
- Pathologies affecting vascular compliance (PAD, aortic regurgitation, IABP)
- Spontaneous breathing
- Low tidal volumes (<8ml/kg)
- Arrhythmias
- Pediatric patients (nomogram is not established)

## Blood Pressure Window



## References:

- LiDCO website ([www.lidco.com](http://www.lidco.com))
- Drummond KE et al. "Minimally invasive cardiac output monitors." BJA. 2011; 12(1):5-10
- Perase RM et al. "Equipment review: An appraisal of the LiDCO plus method of measuring cardiac output." Crit Care. 2004; 8(3):190-95