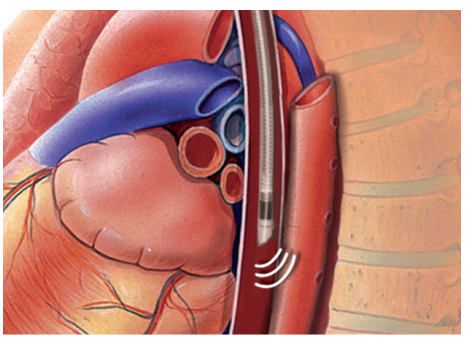
Getting Started

- Switch on the TrueVue™ at front
- Insert the probe into the oesphagus as early as possible e.g. after intubation, to allow a settling in process and to create a good oesophageal mucus bond
- Apply water-based gel to the tip of the probe
- Insert to depth marker 2 for oral use, or 3 for nasal (slightly deeper may be required occasionally)
- Never use excessive force to insert the probe as this may harm the patient
- Connect the probe to theDoppLink
- Select [Start] and enter data as requested
- Select [Auto Patient ID] or use the onscreen keyboard to enter ID, age, weight & height. Note: If the patient is outside the nomogram limits, the nomogram field will display “Linear” meaning FTc, PV, SO will be available to user. Volumetric results e.g. CO, SV are then not available
- Check details and select [OK]
- Focus the probe (see below). Hold the probe steady. Use the [Options] - [Gain] to adjust gain manually for best signal quality
- Check cycles [Options]. To change, select [Options] and [Cycles]
- To add respiratory rate for SVV, PPV, PVV etc, select [Calcs] and then use the onscreen keys to make adjustments
- To change parameters, select the ellipsis in the paramters box and [select parameter]
- If using the additional option of an arterial line, ensure it is zeroed, levelled and tested for damping
- Connect the appropriate arterial blood pressure cable to the rear of the monitor and move between Pressure and Flow monitoring modes using the tabs in top right corner of screen



Locating the Descending Aortic Waveform

How to focus

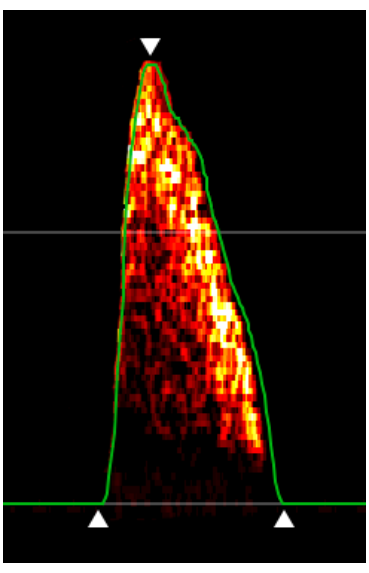
- Rotate the probe slowly through 360° in one direction without letting go
- If the descending aortic signal is not seen, remove the probe by approximately 1 cm. Rotate again in the opposite direction. Do not rotate and change depth at the same time.

Correct signal

- Tallest, brightest waveform above the line with loudest, sharpest ‘whip crack’ sound
- Incisors near to markers 1 or 2, or nostrils near to markers 2 or 3. Note this position to find the signal easily again
- Recheck at different depths to ensure the optimal signal has not been missed
- To refocus, return probe to the known depth, increase volume and rotate slowly.

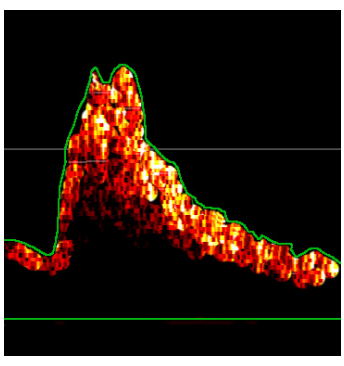
Optimal waveform

- Orange/white along edges with a dark centre
- Green follower line sits neatly against the waveform with the 3 white arrows on the points of the triangle.



Waveforms from Other Vessels

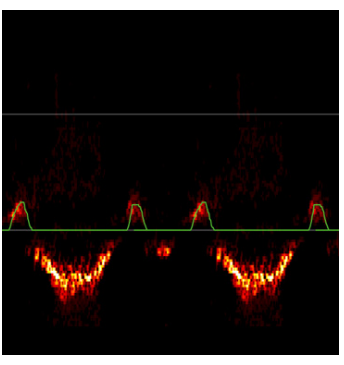
Coeliac Axis



Waveform is wide. Diastolic flow tapers down to baseline. Results usually implausible.

Probe too low

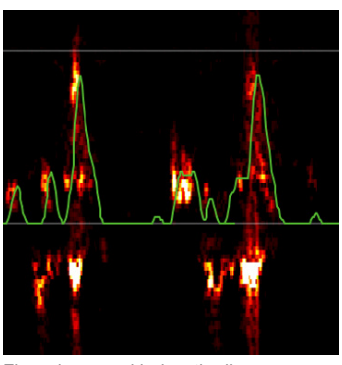
AzygosVein



Flow below the line. Sounds slower and ‘whooshy’

Rotate probe and withdraw slightly if necessary.

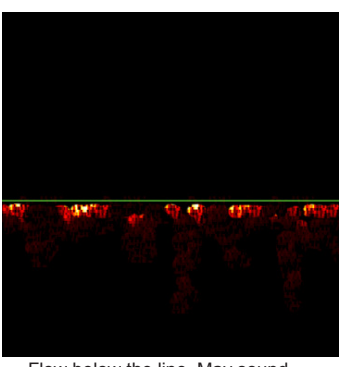
Intracardiac



Flow above and below the line. Sounds like a ‘galloping horse’.

Rotate probe. Adjust depth if necessary.

Pulmonary Vein



Flow below the line. May sound similar to the descending aorta.

Probe too far out. Insert probe to appropriate depth markers and rotate.

Interpreting Results

Doppler Parameters

Stroke Distance (SD)

Also known as the Velocity Time Integral (VTI) is the area within the waveform and is the basic measured parameter upon which calculations of Stroke Volume (SV), all other Cardiac Output (CO) and indexed measurements are made. SV is the parameter of choice for fluid management protocols, however changes in SO or SVI can also be utilised.

Flow Time corrected (FTc)
Flow Time is measured from the base of the waveform and depends on Heart Rate (HR), left ventricular filling and afterload. Flow Time is corrected to a HR of 60 bpm and is inversely correlated to aftertoad and can be used instead of SVR.

Normal range 330-360 ms (represents 1/3 of the cardiac cycle)*. The most common cause of a short FTc i.e. < 330 ms which indicates an increasing afterload, is hypovolaemia. Hypovolaemia is the result of a low preload where an increasing afterload occurs due to compensation. If FTc does not increase after an appropriate fluid challenge, other causes of vasoconstriction e.g. excess vasopressors or hypothermia should be considered. A long FTc i.e. > 360 ms is seen in conditions associated with a low afterload e.g. sepsis or anaesthetic drugs.

Peak Velocity (PV)

The fastest velocity measured at each ejection, seen at the top of the waveform.

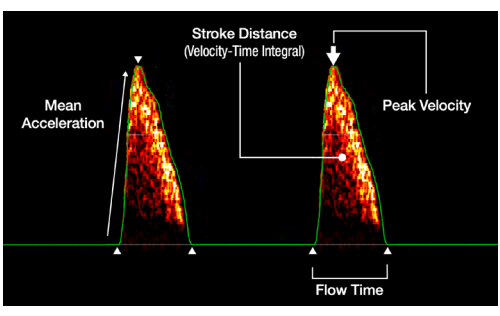
Normal ranges*:

20 years.....90-120 cm/s	60 years.....60-90 cm/s
30 years.....85-115 cm/s	70 years.....50-80 cm/s
40 years.....80-110 cm/s	80 years.....40-70 cm/s
50 years.....70-100 cm/s	90 years.....30-60 cm/s

Mean Acceleration (MA)

The average acceleration during ejection, measured on the upstroke of the waveform. Normal values are not available but trends can be used. Both PV & MA are markers of contractility, but will also be affected by changes in preload and afterload.

*Note: Any ‘normal’ values are for a healthy resting individual. It may be more appropriate to aim for ‘optimal’ values (not low) in clinical situations.



Dynamic Variables

Stroke Volume Variation (SVV) and Pulse Pressure Variation (PPV]
Only a 10% Stroke Volume Optimisation (SVO) algorithm has been proven to provide statistically significant reductions in postoperative complications and length of hospital stay. SVV and PPV may predict fluid responsiveness but under strict conditions:

- Full ventilation with no spontaneous breaths
- Tidal Volumes (TV) 8 ml/kg
- Normal chest compliance (including closed chest)
- No increased abdominal pressure
- Static TV and PEEP
- No change in position
- No arrhythmias
- No ventricular dysfunction
- No interventions occurring during an assessment of SVV and/or PPV (for up to 30 minutes).

Only Doppler is proven to improve outcomes by providing TruFlow information to guide Stroke Volume Optimisation.

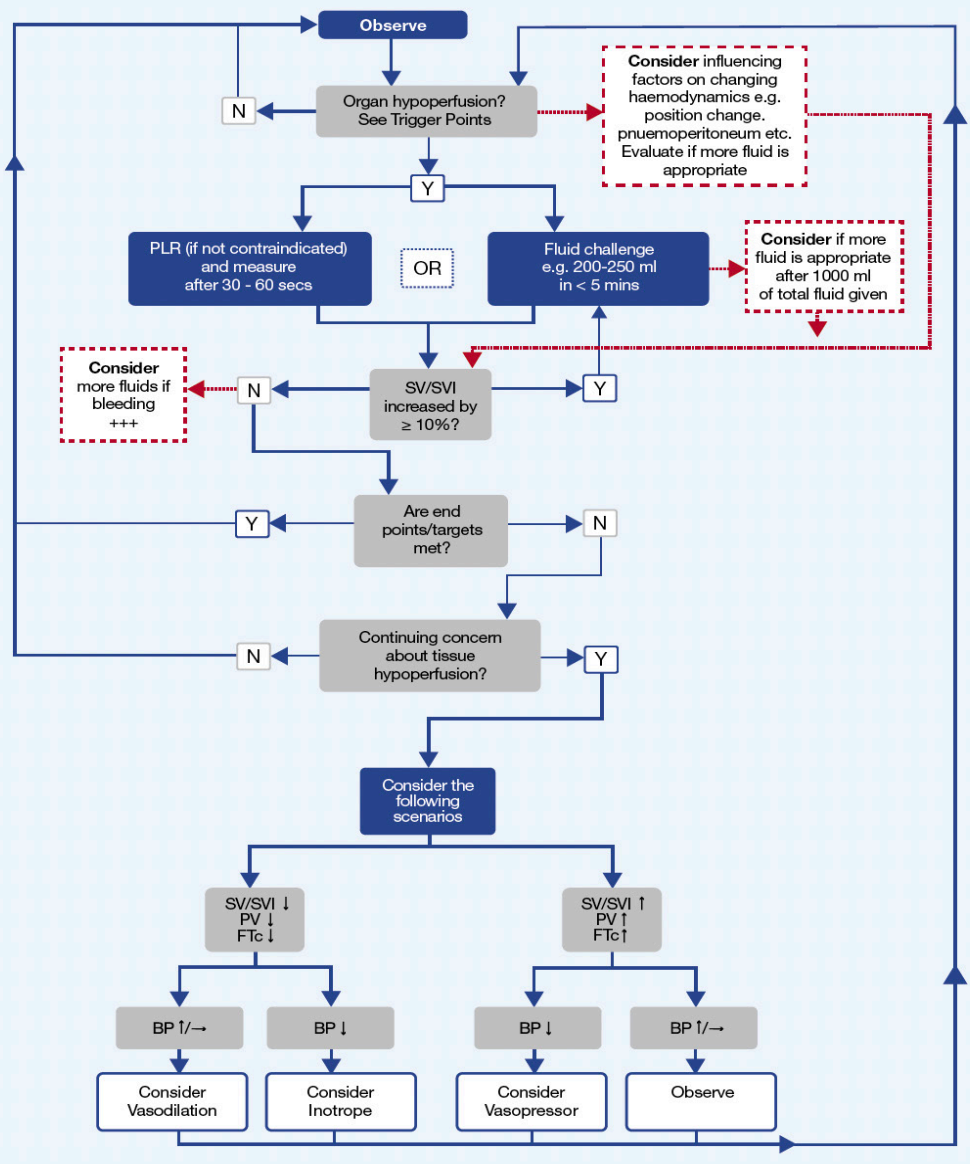
TrueVue

Quick Reference Guide

Deltex Medical

For enquiries: Telephone: +44(0) 1243 774 837 **Email:** customer.services@deltexmedical.com
Address: Terminus Road I Chichester I West Sussex I P019 8TX

Decision Tree



Trigger Points/Concerns

Please Note:

- Should not be assessed in isolation
- Are not the same as physiological targets
- Are indicative and not absolute
- Are not prioritised

Primary Clinical Indicators

- Hypotension: e.g. systolic< 100 mmHg, MAP< 60-70 mmHg OR a clinically significant drop in MAP e.g. 30-40 mmHg from assumed 'normal' or baseline
- Tachycardia: e.g. > 90 bpm
- Oliguria: < 0.5 ml/kg/hr
- Low Cardiac Output State

Flow Indicators

- Reduced FTc: < 330 ms OR considered low for clinical condition e.g. any high resistant state
- Low Cardiac Output: significantly below 'normal' e.g. CO < 4-6 L, CI < 2.5 Umin/m2
- Low Stroke Volume: significantly below 'normal' e.g. SV < 50-70 ml, SVI < 30 ml

Supplementary Clinical Indicators

- Hypertension: e.g. systolic > 180 mmHg or > 30-40 mmHg above baseline
- Lactate: > 2 mmol/L
- Base Excess: -3 or +3 mEq/L
- Peripheral Shutdown: looks 'unwell' e.g. pale, sweaty OR a clinical picture of poor perfusion
- Sa02: < 93% OR having to increase Fi02 by 20% to maintain sats
- Low ScVOi < 65-70%
- Reduced Conscious Level: any deterioration rather than a score

Exclusions - not trigger points

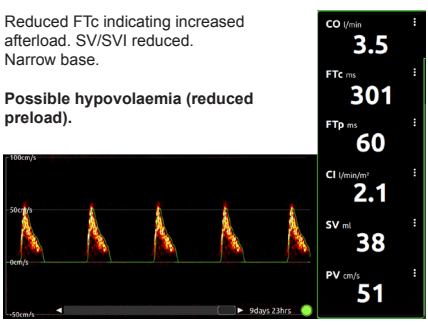
- Temperature
- 002
- CVP
- SVR
- SVV/PPV.

Refer to www.dopplerdecisiontree.info and the Deltex Guide app

Examples of Predominant Changes (following interventions)

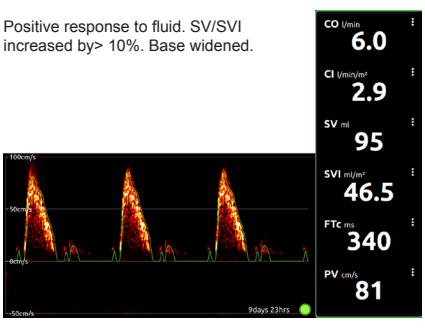
Reduced FTc indicating increased afterload. SV/SVI reduced. Narrow base.

Possible hypovolaemia (reduced preload).



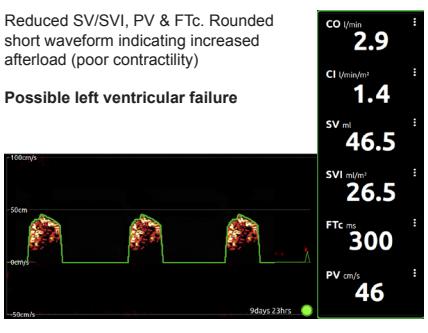
Fluid

Positive response to fluid. SV/SVI increased by> 10%. Base widened.



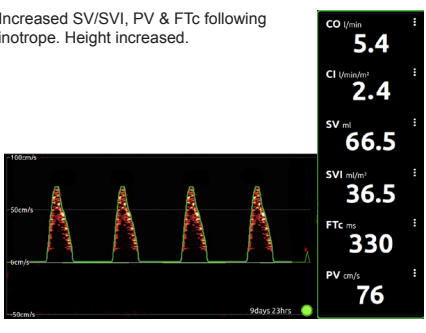
Reduced SV/SVI, PV & FTc. Rounded short waveform indicating increased afterload (poor contractility)

Possible left ventricular failure



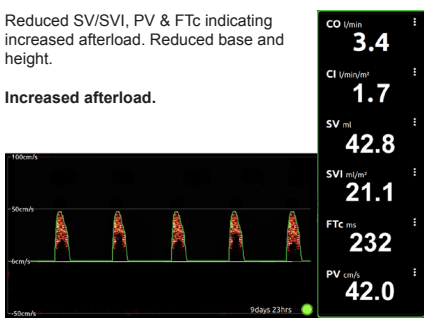
Inotrope

Increased SV/SVI, PV & FTc following inotrope. Height increased.



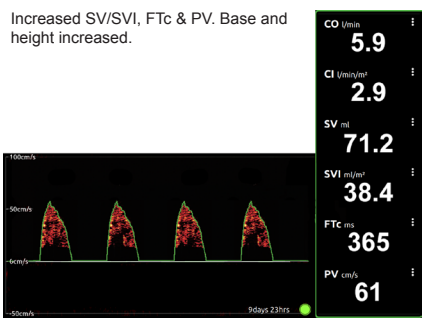
Reduced SV/SVI, PV & FTc indicating increased afterload. Reduced base and height.

Increased afterload.



Vasodilation

Increased SV/SVI, FTc & PV. Base and height increased.



Additional Features

Filter: In Focus screen, select filter for any low frequency noise e.g. valve noise

Snapshots: Record waveforms for comparison. Freeze the screen or select in run mode, and select [Snapshot]. To view later, select gallery

Continuous Trend: Automatic updates of parameters every 30 seconds. To view, select [Trend]

Additional Calculations: Use for spot readings of SVR/SVRI or DO2/DO2I. Select [Calcs], and then select [SVR] or [DO2]. Enter details as requested.

For continuous SVR/SVRI or DO2/DO2I, ensure an arterial line is connected to the monitor. Select [Calcs] and then enter requested values.

Arterial Pressure Calibration for Cardiac Output

See 'Getting Started' re arterial line

In Flow Mode as seen in the green tab and border, ensure optimal Doppler signal is maintained

Select Calibrate

Select Pressure mode by pressing the tab, Pressure mode will be displayed

The pulse pressure waveform analysis algorithm is now calibrated using the known good CO from the oesophageal Doppler

Pressure-based CO results will now be displayed even if Doppler signal is lost

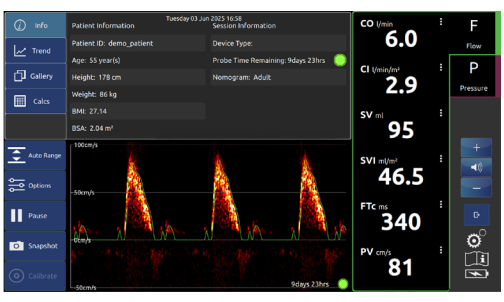
Toggle between Pressure and Flow as required

Use Flow mode for interventions

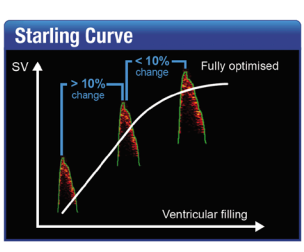
Use Pressure mode for continuous monitoring if required

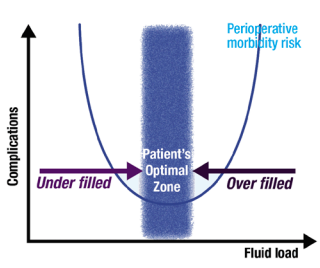
Calibrate at any time, but especially whenever there are known or suspected arterial compliance changes

SVR and DO2 parameters will turn yellow if pressure is older than 4 hours or when SV has drifted by 20% from calibration point.



Doppler is the ONLY technology proven to guide the 10% Stroke Volume Optimisation protocol. Individualised fluid management is key to keeping patients in their optimal zone.





TrueVue Quick Reference Guide