Estimation of cardiac output by transthoracic echo: Doppler

Doppler estimation of cardiac output

Continuous or pulse wave Doppler is aimed at an area of the left ventricular outflow tract (LVOT) or at the descending aorta.

This is a pulse-wave doppler of the descending aorta:

![Doppler image]

- **V<sub>peak</sub>** (usually ~ 100 m/sec)
- **Area under this curve is the VTI: Velocity-Time Integral.** It is a distance; because it is velocity multiplied by time. 
  \[(\text{distance } / \text{time}) \times \text{time} = \text{distance}\]

Thus, together the VTI distance and the CSA area describe a cylinder of blood which travels though the aorta with each systolic contraction. This is your stroke volume.

Thus:

\[SV = VTI \times CSA\]

**Calculation of cardiac output:**

It's not rocket science. The cross-sectional area of the aorta, multiplied by the distance traveled by the column of blood, gives you the volume ejected per beat. Once you have stroke volume and heart rate, you have cardiac output.

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From Bersten and Soni’s "Oh’s Intensive Care Manual", 6th Edition. Doppler measurement of cardiac output is well covered [here](#).