**Cardiac Output (CO)** can be used as a surrogate to calculate the hepatic blood flow.

**Stroke Volume (SV)**

**Heart Rate (HR)**

**Cardiac Output [ml/min] = Heart rate [1/min] \* Stroke Volume [ml]**

**Cardiac Index = Cardiac Output/BSA**

Cardiac output normalized on body surface area.

HR can vary by a factor of approximately 3, between 60 and 180 beats per minute, while stroke volume (SV) can vary between 70 and 120 ml, a factor of only 1.7.

A parameter related to SV is [**ejection fraction**](https://en.wikipedia.org/wiki/Ejection_fraction) **(EF)**. EF is the fraction of blood ejected by the left Ventricle (LV) during the contraction or ejection phase of the cardiac cycle or systole.

Prior to the start of systole, the LV is filled with blood to the capacity known as **end diastolic volume (EDV)** during the filling phase or diastole. During systole, the LV contracts and ejects blood until it reaches its **minimum capacity known as end systolic volume (ESV)**, it does not empty completely.

Stroke Volume (SV) = EDV – ESV

Ejection Fraction (EF) = (SV / EDV) × 100%

Cardiac Output (*Q*) = SV × HR

[Cardiac Index](https://en.wikipedia.org/wiki/Cardiac_index) (CI) = *Q* / Body Surface Area (BSA) = SV × HR/BSA

HR is Heart Rate, expressed as BPM (Beats Per Minute)

BSA is Body Surface Area in square metres.

Measuring cardiac output

There are a number of clinical methods for measurement of *Q* ranging from direct intracardiac catheterisation to non-invasive measurement of the arterial pulse.

* ultrasound
* echocardiography

#### **Transcutaneous Doppler: USCOM**