Nomogram for Simple Calculation of Cardiac Output

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A nomogram is presented which facilitates the determination of cardiac output from blood pressure measurements and the patient’s age using the formula presented by other authors.

The purpose of this paper is to present a nomogram which will facilitate calculation of cardiac output, utilizing blood pressure determinations and the formula derived by Isaac Starr and Truman G. Schnabel, Jr., in their work in simulated systole at necropsy. The formula suggested initially was:

\[ \text{Stroke volume} = 91 + 0.54 \times \text{pulse pressure} - 0.57 \times \text{diastolic pressure} - 0.61 \times \text{age} \]

This formula related the stroke volume to femoral intra-arterial pressure measurements taken at the point of disappearance of the sounds. This formula was given as:

\[ \text{Stroke volume (cc)} = 101 + 0.60 \times \text{pulse pressure (mm Hg)} - 0.59 \times \text{diastolic pressure (mm Hg)} - 0.61 \times \text{age (years)} \]

They suggested that by using this formula and multiple blood pressure determinations to
decrease the scatter due to random fluctuations, the error in two-thirds the estimates would diminish towards a value of less than 5.9 cc.

A comparison of this method with other more elaborate techniques for measuring cardiac output by the Fick, dye, acetylene, ethyl iodide and nitrous oxide methods showed a reasonable correlation in a variety of clinical and physiological conditions. Though further comparative studies are indicated, this work suggests that a means is now available to make a rough estimation of cardiac output as a routine part of the examination of every patient so that the physician taking blood pressures can interpret the findings with greater insight into their physiological meaning.

The nomogram (fig. 1) presented will enable the physician using this formula to determine stroke volume and cardiac output more readily.

**Addendum**

Additional derivation of the formula necessary to construct the nomogram is presented:

1. Stroke volume (cc) = 101 + 0.50 pulse pressure (mm Hg) − 0.59 diastolic pressure (mm Hg) − 0.61 age (years).

2. Stroke volume = 101 + 0.50 (systolic pressure − diastolic pressure) − 0.59 diastolic pressure − 0.61 age.

3. Stroke volume = 101 + 0.50 systolic pressure − 0.50 diastolic pressure − 0.59 diastolic pressure − 0.61 age.

4. Stroke volume (cc) = 101 + 0.50 systolic pressure (mm Hg) − 1.09 diastolic pressure − 0.61 age.

**Summario in Interlingua**

Es presentate un nomogramma pro determinar le rendimento cardiac super le base de mesurationes del pression sanguine e le etate del paciente. Le nomogramma es disveloppate ex un formula previemente presentate per Isaac Staar e co-laboratores. Volumine per pulso = 101 − 0,50 del pression del pulso −0,59 del pression diastolic − 0,61 del etate.

**References**


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