Blood volume

A typical adult has a blood volume of approximately 5 liters, with females generally having less blood volume than males.

Blood volume is regulated by the kidneys.

Blood volume (BV) can be calculated given the hematocrit (HC; the fraction of blood that is red blood cells) and plasma volume (PV), with the hematocrit being regulated via the blood oxygen content regulator:

{\displaystyle BV={\frac {PV}{1-HC}}} BV={\frac {PV}{1-HC}}

Blood volume measurement may be used in people with congestive heart failure, chronic hypertension, renal failure and critical care.

The use of relative blood volume changes during dialysis is of questionable utility.

Total Blood Volume can be measured manually via the Dual Isotope or Dual Tracer Technique, a classic technique, available since the 1950s.

This technique requires double labeling of the blood; that is 2 injections and 2 standards (51Cr-RBC for tagging red blood cells and I-HAS for tagging plasma volume)as well as withdrawing and re-infusing patients with their own blood for blood volume analysis results. This method may take up to 6 hours for accurate results.

Blood Volume may also be measured semi-automatically in under one hour by the BVA-100 (FDA approved), reporting Total Blood Volume (TBV), Plasma Volume (PV) and Red Cell Volume (RCV) using the indicator dilution principle, microhematocrit centrifugation and the Ideal Height and Weight Method.

The indicator or tracer, is an I-131 albumin injection. An equal amount of the tracer is injected into a known and unknown volume. Clinically, the unknown volume is the patient’s blood volume, with the tracer having been injected into the patient’s blood stream and tagged to the blood plasma. Once the tracer is injected a technician takes five blood samples which undergo microhematocrit centrifugation to extrapolate true blood volume at time 0. The concentration of the I-131in the blood is determined from the blood radioactivity against the standard which has a known I-131 dilution in a known volume. The unknown volume is inversely proportional to the concentration of the indicator in the known volume; the larger the unknown volume, the lower the tracer concentration, thus the unknown volume can be calculated. The microhematocrit data along with the I-131 indicator data provide a normalized hematocrit number, more accurate than hematocrit or peripheral hematocrit measurements.

Measurements are taken 5 times in 6 minute intervals so that the BVA-100 can calculate the albumin transudation time to understand the flux of liquid through capillary membranes.