Quantitative Criteria for Assessment of Hemorrhage Using Blood Volumes Measured by Ultrasound Dilution Method

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BACKGROUND
- A quantitative estimation of blood loss helps in the choice of best treatment strategies.
- No simple method currently exists to assess hemorrhage in the critically ill.

OBJECTIVE
To evaluate the ability of Central Blood Volume Index (CBVI, volume in heart and lungs and large vessels divided by body weight) and Total End Diastolic Volume Index (TEDVI, sum of the end-diastolic volumes of the atria and ventricles divided by body weight) to quantify hemorrhage magnitude.

STUDY
- CBVI and TEDVI: measured in 14 cardiac ICU patients, 2 pigs, 8 rats (weight range of 0.3 kg to 95 kg)
- 25-35 ml/kg of blood loss (3-4 steps) was applied in 8 rats and 2 pigs.
- Cardiac index (CI), CBVI and TEDVI were measured by COstatus® before and after blood loss.

RESULTS
- Despite 30 times differences in weight, CBVI and TEDVI indexes under normo-volemic conditions range from: CBVI = 9-15 ml/kg; TEDVI = 5-9 ml/kg.
- A dramatic blood loss of 25-35 ml/kg in experimental animals produces the same magnitude 48-50% decrease in CBVI and TEDVI.

STUDY’S CONCLUSIONS
- Despite significant differences in rat to adult patient weights, both CBVI and TEDVI appeared to be close in normo-volemic situations and did quantify the magnitude of hemorrhage in experimental animals.
- More studies need to be performed to establish quantitative blood loss criteria to help in the choice of correct therapy titration.

COSTATUS® OBSERVATIONS
- COstatus® is a universal bedside method to routinely measure CI and blood volumes in patients of any age and weight including neonates and pediatrics.
- It is safe and easy and involves no blood loss as it works off the existing arterial and venous catheters and is also independent of the operator in terms of volume injected.

REFERENCES