Publication Brief

Effect of Furosemide on Cardiac Index and Circulating Blood Volumes in Pediatric ICU Patients

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BACKGROUND
Although furosemide is a commonly administered diuretic in pediatric ICU (PICU) patients, its hemodynamic effects are not well defined in the literature. COstatus® permits measurement of cardiac index (CI) and blood volumes (Total End Diastolic Volume Index [TEDVI], Central Blood Volume Index [CBVI] and Active Circulation Volume Index [ACVI]) in PICU patients.

OBJECTIVE
To evaluate effect of furosemide infusion on CI and blood volumes in stable PICU patients requiring diuresis.

STUDY
• 10 PICU patients (2.8-60 kg) with indwelling arterial and ventral venous catheters were infused with furosemide (0.5-1 mg/kg, 20 mg maximum).
• Ultrasound Flow/Dilution Measurements: A extracorporeal AV loop was connected between the arterial and venous catheters. A roller pump circulated blood (10–12 ml/min) from the artery to the vein. Body temperature isotonic saline (1.0 ml/kg, up to 30 ml) was injected into the venous limb of the loop. COstatus® measurements were performed before furosemide infusion and after infusion.
• Urine output was also measured.

RESULTS
• After furosemide infusion, CI increased in 7 PICU patients and decreased in 3 patients.
• Blood volumes largely changed when CI changed in most patients. TEDVI increased in 9 out of 10 patients when CI increased; CBVI in 7 out of 10 patients; ACVI in 8 out of 10 patients.
• Urine output increased 3-4 times (mean 3.4 cc/kg/hour).

STUDY’S CONCLUSIONS
• CI and blood volumes largely increase after infusion of furosemide, despite brisk urine output.
• Data suggest that diuresis normalizes cardiac filling volumes, thus improving cardiac output.
• COstatus® may be useful in assessing the effects of medications on cardiac output and blood volumes in critically ill pediatric patients.

TRANSONIC OBSERVATIONS
• No reliable, non-invasive method exists for measuring cardiac output and blood volumes in PICU patients.
• COstatus® can measure flow and blood volumes in PICU patients through an extracorporeal loop connected between existing arterial and central venous catheters.

REFERENCES
Ostrowicki R, Powers K, Rubenstein J, Harmon W, “Effect of Furosemide on Cardiac Index and Circulating Blood Volumes in Pediatric ICU Patients,” Pediatric Critical Care Colloquium Pittsburgh, PA, May 15-17, 2010 (Transonic Reference # CO8027A) Study supported by NIH SBIR Grant # R44 HL061994)