Vascular access in children carries a significant risk of accidental extravasation of intravenous (IV) fluids and medications with the potential for tissue injury. This prospective controlled study assessed the diagnostic utility of using intravenous diluted sodium bicarbonate to confirm placement of IV catheters in ventilated children. Diluted sodium bicarbonate was created using undiluted standard 8.4% (1 meq/mL) sodium bicarbonate mixed in a 1:3 and 1:7 ratio with sterile water to achieve a final diluted concentration of 2.1% and 1.05% sodium bicarbonate respectively.

Patients and Methods: In 20 ASA I-II mechanically ventilated children age 2-8 years, the effects of 1 ml/kg of dilute 2.1%, 1.05% sodium bicarbonate or 0.9% normal saline, injected in a randomized order, were analyzed. All children had oxygen saturation, blood pressure, electrocardiograph and end-tidal carbon dioxide monitoring (ETCO2). In addition, venous blood samples were taken prior to injection and 10 minutes after the final injection for analysis of venous blood pH and electrolytes.

Results: In children dilute 2.1% sodium bicarbonate resulted in an ETCO2 increase (mean of 38 + 5 mmHg to 45 + 7 mmHg) within 3 breaths. Dilute 1.05% sodium bicarbonate resulted in a less significant increase (34 + 4 mmHg to 38 + 4 mmHg) while normal saline did not result in any significant changes. 1.05% sodium bicarbonate was easily differentiated from normal saline injection by anesthesiologists observing the change in ETCO2 values immediately following injection. Analysis of pre and post injection of venous pH, bicarbonate and sodium levels could not detect any significant difference.

Conclusion: The injection of dilute 2.1% sodium bicarbonate (in mechanically ventilated children) can be used to reliably identify the correct location of an IV catheter by an increase in the exhaled carbon dioxide concentration. The injection did not create any significant changes in blood pH, bicarbonate or sodium concentration. safety and efficacy should be further evaluated in future studies.