

**Abstract:**

**Background:** Critically ill neonates and pediatric patients commonly require multiple low flow infusions. Volume limitations are imposed by small body habitus and co-morbidities like cardiopulmonary disease, renal failure, or fluid overload. Vascular access is limited by diminutive veins. Maintenance fluids or parenteral nutrition in conjunction with actively titrated infusions such as insulin, fentanyl, prostaglandins, inotropes and vasopressors may necessitate simultaneous infusions using a single lumen to maintain vascular catheter patency. This requirement for multiple titratable infusions requires concentrated medications at low flows, rather than more dilute drugs at higher flows that in combination may volume overload small infants.

**Aim:** To determine whether carrier fluid reduces variability that variability of low flow drug infusions is proportional to syringe size in pediatric critical care.

**Methods:** We assessed concentrations of orange “drug” in a 0.2 mL/h low flow clinical model with blue dyed carrier fluid at 5 mL/h, using 3-, 10-, or 60-mL syringes. A graduated volumetric pipette was used to measure total flow. Mean time to target concentration was 30, 21, and 46 min in 3-, 10-, and 60-mL syringes, respectively ( $P = 0.42$ ). After achieving target concentration, more dilute drug was delivered by 60-mL ( $P < 0.001$ ) and 10-mL syringes ( $P = 0.04$ ) compared to 3-mL syringes. Drug overdoses were observed during the initial 45 min of infusion in 10- and 60-mL syringes. Total volumes infused after target concentration were less in the 60-mL condition compared to 3-mL ( $P < 0.01$ ) and 10-mL ( $P < 0.001$ ) syringes.

**Results:** Linear mixed effects models demonstrated lesser delivered drug concentrations in the initial 30 min by 3-mL compared to 10- and 60-mL syringes ( $P = 0.005$  and  $P < 0.001$ , respectively) but greater drug concentrations and total infused drug in the subsequent 30-60 and 60-90 min intervals with the 3- and 10-mL compared to 60-mL syringes.

**Conclusion:** With carrier fluid, larger syringes were associated with significantly less drug delivery, less total volume delivered, and other flow problems in our low flow drug model. Carrier fluid should not be used to compensate for inappropriately large syringes in critical low flow drug infusions.

**Reference:**

Madson ZC, Vangala S, Sund GT, Lin JA. Does carrier fluid reduce low flow drug infusion error from syringe size? *World J Clin Pediatr.* 2020 Sep 19;9(2):17-28. doi:

10.5409/wjcp.v9.i2.17. PMID: 33014719; PMCID: PMC7515749.

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