

ABSTRACT

A novel technique for improving fluid resuscitation in septic shock

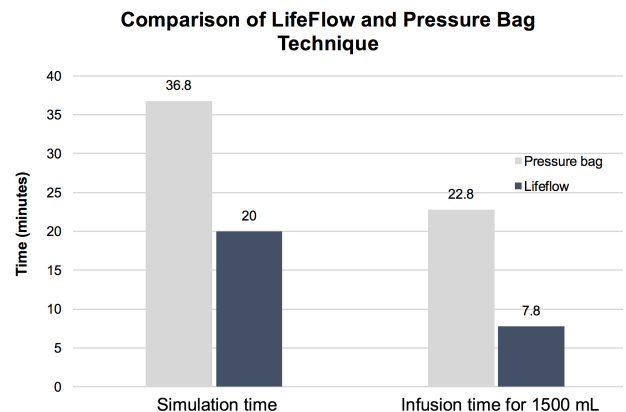
Background: Rapid fluid delivery is commonly required in sepsis and other conditions leading to shock and hypotension. Since gravity flow and infusion pumps are unable to deliver a fluid bolus rapidly, pressure bags are commonly used to increase flow rates. Disadvantages of this technique include progressive decrease in flow rate without continuous re-inflation of the bag, difficulty administering accurate doses, particularly with smaller volumes, and the risk of inadvertent air embolism.

LifeFlow is an intuitive single-use device that provides rapid and controlled infusion, enabling a healthcare provider to administer a measured fluid bolus and quickly assess clinical response.

Objective: This goal of this study was to compare the LifeFlow to pressure bag in simulated pre-hospital and hospital settings.

Methods: Registered Nurses and Paramedics participated in a simulated septic shock resuscitation and were randomly assigned to administer repeated fluid boluses with the LifeFlow or pressure bag. Training was provided if the participant was not familiar with either method. Participants were given a clinical sepsis scenario that required administration of three, 500 ml boluses (totaling 1500 ml) through a 20G IV catheter into simulated patient. The scenario involved a variety of clinical tasks including a physical exam, vitals assessment, delivery of oxygen via nasal cannula, medication administration, manual charting, and fluid administration. Total scenario time and fluid infusion times were determined by video recording of the scenario. Fluid volume was measured by weight to determine the accuracy of each bolus. Variance was defined as difference between actual and desired fluid bolus volume.

Results: Fourteen providers (8 RNs, 6 Paramedics) delivered three 500 ml normal saline boluses during the septic shock scenario. Average time to completion of each bolus was 2.5 minutes for LifeFlow vs. 7.6 minutes for pressure bag. Total infusion time for 1500 ml was almost 3 times as fast for LifeFlow vs pressure bag (7.8 vs 22.8 minutes). Total time to completion of the sepsis scenario was 1.8 times as fast for LifeFlow compared pressure bag (20 vs. 36.3 minutes). Variance in fluid volume administered was less for LifeFlow than pressure bag infusion (± 39.1 vs ± 184 ml, $p=0.04$).



Conclusions: When compared to pressure bag, use of the LifeFlow device resulted in significantly faster time to completion of the septic shock resuscitation scenario. Times to completion of each bolus, and infusion time for the total 1500 ml, were significantly faster. The LifeFlow also reduced variance in the size of fluid bolus administered, indicating that clinicians can more accurately deliver the correct fluid volume and avoid inadvertently providing more fluid than is needed. This technique may offer a faster and more efficient method of fluid resuscitation in sepsis and septic shock.