Paramedic – Evidence Based Medicine (P-EBP) Program

Paramedic CAT (Critically Appraised Topic) Worksheet

Title: Using a mechanical pump infusion for IV drug infusions over *Gravity (roller lock) IV infusion.*

Report By: Jarett Boutwell

2nd Party Appraiser: Jen Greene

Clinical Scenario: Paramedics are treating a 25 y/o male who is laying on the ground, weak and diaphoretic. Tells you he took some heron 24hours prior and had some still in the syringe (contaminated with blood) that he then reinjected and is in septic shock. As per your treatment you decide you're going to administer a Dopamine infusion. You have a 75 min transport time.

PICO (Population – Intervention – Comparison – Outcome) Question:
Patents requiring IV drug infusion, using an infusion pump (ERC) compared to gravity (roller lock), looking to see what the risk of accidently over/under dose between two methods.

Search Strategy:
(Infusion pump OR Electronic flow control) AND (Roller Clamp control OR Gravity) AND (IV infusion)

Search Outcome:
175 results

Relevant Papers:

AUTHOR, DATE	POPULATION: SAMPLE CHARACTERISTICS	DESIGN (LOE)	OUTCOMES	RESULTS	STRENGTHS/ WEAKNESSES
Rooker J. 2007	*25patents in Inpatient hospital settings. (12 male with a 70y/o median age)* *214 1L begs of IV infusion*	*Prospective observation with retrospective control group* *-LOE 1-2*	*Accuracy and proper dosage.*	*44% of infusions were used with Gravity. 56% used with Infusion Pump.* *Accurate: 39% with pump, 21% Gravity.* *Too Slow: 57% with Pump, 69% gravity* *Too Fast: 4% with pump, 10% gravity.* *P= <0.025* *Training on the Infusion pumps with nursing staff would see an increase in accuracy with the pumps.*	*Low number of participants, large number of studies, In a controlled environment, over the course of 1 month. Was found that those studies used in the ward with more pumps were most accurate with the pump as oppose to those who don't have a large number of pumps.* *Weakness, doesn't say how many nursing staff were used to conducted the study.*
Bivins B. 1980	448 patents requiring surgical admission and an IV infusion, 700 total infusions conducted.	Prospective with control group -LOE 1	Accuracy and easy and cost	46% were roller clamp, 54% were Pump. Errors: Gravity 56.65%, Pump error only 7.83%. P<.0001 Cost: Non ICU: Roller clamp $16.37. Pump $13.49*, p=<0.08	Large Number of participants. All done at the same hospital and same floor, over the course of two 6 week periods. Large difference in numbers so there was an obvious difference between the pump

				ICU: roller: $27.93, Pump $19.60* *this is not counting the cost of $1000 per unit. Based on the useful life of greater then 5000patient, this is about $0.20 per patient	and roller clamp Weakness: Does not state on report if errors were too fast or too slow.

Comments:
-There are lots of variables that can determine the drip rate using roller control such as height above the pt and if it is being bounced around.
-While there are no studies that have been done prehospital, services such as Island EMS on PEI have adopted the Baxter Control-A-Flo as a cheaper alternative to pumps. And Alberta Health Services has started to outfit ambulances with Smart pumps, and those that aren't have been equipped with a Control a Flo.
These are rather scary results that were done in a controlled hospital setting and not in the back of an ambulance going down the road

Consider: One thing that that can be considered is that there is a price attached to having a pump on each unit in prehospital. There is alternatives to the use of pumps such as the plastic flow control "Baxter Control-A-Flo that can assist in preventing accidently over infusion. These products also aren't completely accurate as there is "plastic seep" but are a lot more accurate then counting drops.

Clinical Bottom Line: *Based on these two studies alone, there is no reason why we shouldn't be using some kind of control device prehospital to administer potential dangerous medications such as Dopamine, Epinephrine, or nitroglycerin.*

References:

Rooker JC, Gorard DA, Errors of intravenous fluid infusion rates in medical inpatients. *Clinical Medicine 2007;7:482–5*

Bivins B, Rapp R, Powers P, Butler J, Haack. D, Electronic Flow Control and Roller Clamp Control in Intravenous Therapy; A Clinical Comparison. *Arch Surg 115:70-72, 1980*