



To Heparinize or Not to Heparinize

Wanda Rodriguez RN, CPN
CHOC Children's, Orange, CA



Background

Most children admitted to an acute health care facility require placement of a peripheral intravenous (IV) device for medication and/or fluid administration. Maintaining patency of a “non-infusing” peripheral IV (peripheral intravenous infusion device, or PIID) is extremely important to continue administration of intermittent IV medications, minimize the number of IV catheter placements and decrease the cost of supplies associated with multiple IV placements. Since the 1980s, numerous studies and systematic reviews have shown that the use of normal saline flushes is equivalent to the use of heparin flushes to maintain patency of PIID's (Cook et al., 1998; Goode et al., 1991; Mitsiou et al., 2008). Most of the studies have been completed using adult populations. One of the first studies evaluating saline flush use in the pediatric population began in 1988. (Lombardi et al., 1988). Due to the side effects related to heparin use, it is important to evaluate the use of normal saline flushes as an alternative to heparin flushes to maintain PIID patency in the pediatric population.

PICO Question

In the medical surgical young children and adolescent population does a ten unit heparin flush given at intervals through a non-infusing peripheral IV increase the length of patency compared with normal saline?

Clinical Trigger

EBP review undertaken because the use of heparin flushes is the current standard in our institution for PIID's irrespective of patient age, diagnosis, or gauge of catheters.

Current literature suggests the efficacy of saline flushes to maintain the patency of an intermittent IV access site for children of all ages, including neonates, using catheters of 24 gauge and larger.

Heparin is a medication that can cause:

- Allergic reactions, hemorrhage, thrombocytopenia.
- Pain at the injection site during infusion of the flush.
- Incompatibility with certain medications, thus requiring the use of the SASH (saline, med, saline, heparin) procedure to mitigate this effect
- Increased cost due to actual cost of heparin and nursing time.

Evidence Search

Databases searched for this review included: CINAHL, Pub Med, Ovid. Reviewed web sites included AHRQ, Joanna Briggs, National Institute of Health, and Elsevier Health.

Fifteen articles related to the PICO question were reviewed. Publication dates ranged from 1988-2008. Reviewed articles included systematic reviews, meta-analysis, randomized controlled trials, quasi-experimental trials and descriptive studies.

Synthesis of Evidence

- Use of normal saline as an intermittent flush in PIID's is as effective as heparin flush for maintaining patency of the device (Leduc, 1997; Mitsiou et al, 2008; Randolph et al., 1997; Shaw et al., 2005; Thamlitkul et al., 2006). (Level 1)
- Use of heparin as an intermittent flush in peripheral IV catheters leads to more incidences of phlebitis (Lombardi et al., 1988; Tripathi et al., 2008). (Level 1)
- Use of normal saline as an intermittent flush in peripheral IV catheters is more efficient when positive pressure technique is used with the flush (Beecroft et al., 1997; Gyr, 1995; Kleiber et al., 1993; LeDuc, 1997; Tang et al., 2001). (Level 1)
- Use of heparin as an intermittent flush in peripheral IV catheters is costly due to costs of heparin and in nursing time (Campbell et al., 2005; LeDuc, 1997; Lombardi et al., 1988; Mitsiou et al., 2008; Mok et al., 2006; Thamlitkul et al., 2006). (Level 1)

Summary of Findings

Study	Setting/Sample	Gauge of Peripheral Catheter	Solution Used	Amount of Infusion	Interval Between Infusions	Technique	Findings
Beecroft et al., 1997	1 children's and one community hosp in NSW, Australia	22-24 gauge	10Units heparin in 10Units heparin in NS	Not discussed	Not discussed	Positive pressure	Hep group patent longer than NS.
Chick & Norris, 1992	General pediatric unit, PICU, and NICU, newborn	22-24 gauge	10Units heparin in NS	1ml	1hr	Others	Saline was effective than Hep for maintaining function.
Gyr et al., 1995	Paediatric unit, Pediatric and NICU.	16-24 gauge (25-30%)	10Units heparin in NS	Not discussed	1 hourly	Positive pressure over 10-20 seconds	Saline flush had more problems with clotting, infiltrations and patency.
Kocher et al., 1993	Paediatric units	24 gauge and smaller	10 units heparin in NS	Not discussed	Others	Positive pressure	Hep and NS comparable.
LeDuc, 1997	18 yrs, 1-25 yrs	22-24 gauge	10Units heparin in NS	1ml	1hr	Not discussed	No difference between 2 groups for demographic or complications.
Lombardi et al., 1988	Paediatric unit (NICU) 40-18 yrs	Not discussed	10Units heparin in NS	1ml	1hr	Others	NS and Hep equally effective.
McMillen et al., 1993	Birth to 18 yrs	16-24 (range) catheters of 24	10Units heparin in NS	Not discussed	Not discussed	Not discussed	No significant difference between Hep and NS.
Mok, Kwan, & Chan, 2006	General pediatric	22-24 gauge (range 24)	10Units heparin in NS	1ml	1hr	Others	No benefits of Hep over NS.
Mudge, Forster & Statters, 1998	newborn 2m to 27m (postnatal)	24 gauge	10Units heparin in NS	1ml	Q8-12hrs	Not discussed	Hep group patent significantly longer than NS with more saline flushed catheters removed.
Nelson & Graves, 1998	Medical and surgical infant unit at NICU, birth-1yr	26gauge	10Units heparin in NS	1.5ml	1.5hr	Q 8hrs	No significant difference between Hep and NS.
Tracy, 1997	Infants 20kgs and older	Not discussed	10Units heparin in NS	1ml	1hr	Not discussed	No statistical difference between Hep and NS for duration of use.
Tang, Cheng, & Yip, 2000	PICU and general pediatric, pre-term 1yr	20-24 gauge	10Units heparin in NS	Not discussed	Not discussed	Positive pressure	No statistical difference between Hep and NS.



Recommendations

- Saline flush is as efficacious as heparin flush for maintaining patency in PIID's of young children and adolescents with catheter gauges of 24 and larger.
- When saline flush is used rather than heparin the technique of positive pressure displacement is important. This technique involves injecting the last 0.1 mL of saline while simultaneously removing the syringe tip or closing the white side clamp on a T-connector to create positive pressure.
- Saline flushes may be administered every 6 to 12 hours for optimal catheter maintenance.
- Amount of the saline flush used to maintain patency each time administered may range between 0.6 mL – 3.0 mL.
- Policies and procedures at the institution need to be changed to reflect use of saline flush rather than heparin flush to maintain patency of PIID's.

Literature Cited

Available upon request.

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