TITLE: Intravenous Access and Location Changes in Pediatric Patients: A Review of Clinical Practice Guidelines

DATE: 04 October 2010

BACKGROUND:

Intravenous (IV) therapy is required to administer fluids, medication, and nutrition to hospitalized patients when other routes of administration are deemed inappropriate. Various vascular access devices are available including peripheral cannulae, midline catheters, and central venous catheters. The appropriate selection of IV placement and the frequency of IV site change are important when one considers that children are more likely to suffer pain and distress during IV placement. The risk of infection and other complications such as phlebitis, infiltration, and extravasation exist as well.

To support and inform policy and clinical practice, this report reviews the evidence-based guidelines for the timing of IV location change and the preferred sites for IV placement in the pediatric patient.

RESEARCH QUESTIONS:

1. What are the guidelines and recommendations for frequency of IV site location changes in hospitalized pediatric patients?

2. What are the recommended anatomical sites for preferred IV access in pediatric patients?

METHODS:

A limited literature search was conducted on key health technology assessment resources, including Ovid Medline, EBSCOhost CINAHL, The Cochrane Library (Issue 9, 2010), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI (Health Devices Gold), EuroScan, international health technology agencies, and a focused Internet search. The search was limited to English language articles published between January 1, 2005 and September 8,
Evidence pertaining to either central or peripheral IVs was potentially eligible for inclusion.

### SUMMARY OF FINDINGS:

One evidence-based guideline was identified. No relevant health technology assessments, systematic reviews, and meta-analysis were identified by the search. The details of two publications that were not considered evidence-based guidelines but contained potentially relevant recommendations are provided in the Appendix.

### Guidelines and recommendations

One guideline provided recommendations on the use of central venous catheters for the administration of parenteral nutrition in children. They searched for systematic reviews, meta-analyses, randomized controlled trials, and non-randomized studies published in English and in French from 1992 to 2004. No additional details of the methodology used for formulation of recommendations were provided. The findings and recommendations pertinent to the research questions are as follows:

#### Insertion site for the administration of parenteral nutrition in the pediatric patient:

- The subclavian site is the most common site for insertion of tunneled central venous catheters although it remains unclear if the risk of infection is lower when using other sites. The risk of mechanical complications (for example pneumothorax) has not been shown to be greater than those at other insertion sites.

- Central venous catheters positioned at the femoral site do not carry a higher incidence of infectious and mechanical complications compared to other sites. However, placement is uncomfortable for children and there is a higher risk of thrombosis.

- In neonates, umbilical vessels may be used temporarily while awaiting placement of a more permanent device.

- Alternatives sites for central venous catheters placement include transhepatic, translumbar, intercostal, and the arterio-venous fistula and are used when other sites are unavailable because of complications. The choice of an alternative site will depend on physician preference and the condition of each patient.

#### Replacement schedule:

- Central venous catheters should not be replaced routinely to avoid catheter related bloodstream infections.

- In neonates, the risk of complication increases if umbilical artery catheters and venous catheters are left in place for longer than five days and 14 days, respectively.
Limitations

In the guidelines, the methods used to select the evidence that formed the basis of the recommendations were not described and it is unclear if the recommendations were based on a systematic review of the best available evidence. It is unclear if they were peer-reviewed prior to publication. They did not follow accepted standards for reporting the results.

Furthermore, our literature search spanned less than six years whereas IVs are technologies that have been in use for some time. It is possible that accepted standards of nursing practice for IVs have been researched and published before this time period.

CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING:

This report considered guidelines on the frequency of IV site location changes and anatomical sites for IVs in pediatric patients published since January 2005. One relevant guideline was identified on the use of central venous catheters to administer parenteral nutrition. No information was found on peripheral IVs.

*Frequency of IV site location changes in hospitalized pediatric patients:*

The guideline recommended that the routine replacement of central venous catheters should be avoided because of the risk of catheter related blood stream infections. The guideline also stated that in neonates, the risk of complication increases if umbilical artery catheters and venous catheters are left in place for longer than five days and 14 days, respectively.

*Preferred anatomical sites for IV access in pediatric patients:*

For the administration of parenteral nutrition, the guideline stated that the subclavian vein is the most common site for positioning tunneled central venous catheters and that in neonates, umbilical vessels may be used temporarily.

These recommendations should be considered in light of the limitations of the methods used to formulate the guidelines.

PREPARED BY:
Health Technology Inquiry Service
Email: htis@cadth.ca
Tel: 1-866-898-8439
REFERENCES:


APPENDIX: Additional Recommendations of Potential Interest

Two publications that are not clearly evidence-based guidelines but may be of interest are described below.

One publication contained recommendations on the placement of peripherally inserted central catheters in neonates based on prospective data collected between 1998 to 2005 for quality assurance purposes. The study was conducted in a 14-bed neonatal intensive care unit where 164 babies were fitted with 185 catheters. The participants’ mean age at the time of catheter placement was 10 days (range 0 to 50 days). The catheter remained in place for a mean of 12.2 days (range 1 to 38 days). From the data collected, the following recommendations were made:

- The prospective study showed that the use of the saphenous vein for peripherally inserted central catheters resulted in the lowest insertion complication rate (7.7%), followed by jugular, axillary or femoral veins (11.1%). The highest insertion complication rate was seen in upper extremity veins (23.9%). The post-insertion complication rate for saphenous vein was highest at 21.3%, and lowest with jugular, axillary or femoral veins (12.5%).

- There exists a theoretical risk of vessel and nerve damage when using deeper vessels. Hence the authors’ final recommendation was to use the largest and most visible vein for peripherally inserted central catheters.

Standards for site selection and device placement were outlined in a nursing publication. The methods used to develop the standards were not described. The following standards were provided for both adults and pediatric patients:

- For midline catheters and for peripherally inserted central catheters, the basilic, median cubital, cephalic, or brachial veins are recommended. For neonates and children, additional sites include veins of the head, neck, or lower extremities.

- For peripheral cannulae, the use of veins found on the dorsal and ventral surfaces of the upper extremities (metacarpal, cephalic, or basilic) are recommended. For the pediatric population, additional sites include veins of the head, neck, and lower extremities.