Assessment and Device Selection for Vascular Access
Greetings from Doris Grinspun  
Executive Director  
Registered Nurses Association of Ontario

It is with great excitement that the Registered Nurses Association of Ontario (RNAO) disseminates this nursing best practice guideline to you. Evidence-based practice supports the excellence in service that nurses are committed to deliver in our day-to-day practice.

We offer our endless thanks to the many institutions and individuals that are making RNAO’s vision for Nursing Best Practice Guidelines (NBPGs) a reality. The Ontario Ministry of Health and Long-Term Care recognized RNAO’s ability to lead this project and is providing multi-year funding. Tazim Virani –NBPG project director– with her fearless determination and skills, is moving the project forward faster and stronger than ever imagined. The nursing community, with its commitment and passion for excellence in nursing care, is providing the knowledge and countless hours essential to the creation and evaluation of each guideline. Employers have responded enthusiastically to the request for proposals (RFP), and are opening their organizations to pilot test the NBPGs.

Now comes the true test in this phenomenal journey: will nurses utilize the guidelines in their day-to-day practice?

Successful uptake of these NBPGs requires a concerted effort of four groups: nurses themselves, other health care colleagues, nurse educators in academic and practice settings, and employers. After lodging these guidelines into their minds and hearts, knowledgeable and skillful nurses and nursing students need healthy and supportive work environments to help bring these guidelines to life.

We ask that you share this NBPG, and others, with members of the interdisciplinary team. There is much to learn from one another. Together, we can ensure that Ontarians receive the best possible care every time they come in contact with us. Let’s make them the real winners of this important effort!

RNAO will continue to work hard at developing and evaluating future guidelines. We wish you the best for a successful implementation!

Doris Grinspun, RN, MScN, PhD (candidate)

Executive Director
Registered Nurses Association of Ontario
How to Use this Document

This nursing best practice guideline is a comprehensive document providing resources necessary for the support of evidence-based nursing practice. The document needs to be reviewed and applied, based on the specific needs of the organization or practice setting/environment, as well as the needs and wishes of the client. Guidelines should not be applied in a “cookbook” fashion but used as a tool to assist in decision making for individualized client care, as well as ensuring that appropriate structures and supports are in place to provide the best possible care.

Nurses, other health care professionals and administrators who are leading and facilitating practice changes will find this document valuable for the development of policies, procedures, protocols, educational programs, assessment and documentation tools, etc. It is recommended that the nursing best practice guidelines be used as a resource tool. Nurses providing direct client care will benefit from reviewing the recommendations, the evidence in support of the recommendations and the process that was used to develop the guidelines. However, it is highly recommended that practice settings/environments adapt these guidelines in formats that would be user-friendly for daily use. This guideline has some suggested formats for such local adaptation and tailoring.

Organizations wishing to use the guideline may decide to do so in a number of ways:

- Assess current nursing and health care practices using the recommendations in the guideline.
- Identify recommendations that will address identified needs or gaps in services.
- Systematically develop a plan to implement the recommendations using associated tools and resources.

RNAO is interested in hearing how you have implemented this guideline. Please contact us to share your story. Implementation resources will be made available through the RNAO website to assist individuals and organizations to implement best practice guidelines.
Assessment and Device Selection for Vascular Access

Guideline Development Panel Members

Julia Johnston, RN, BScN, MN, CINA(c)
**Team Leader**
Nurse Clinician
Infusion Therapy
Mount Sinai Hospital
Toronto, Ontario

Sharon Armes, RN, CINA(c)
Vascular Access Clinician for Canada
Bard Canada Inc.
Mississauga, Ontario

Elaine Barringer, RN
Staff Nurse – Emergency Department
Ontario Nurses Association Representative
Peterborough Regional Health Centre
Peterborough, Ontario

Patti Dickieson, RN, BScN
Manager –
Education, Research, Special Projects
Victorian Order of Nurses – Sudbury Branch
Sudbury, Ontario

Lina D’Onofrio, RN, MN
Clinical Nurse Specialist –
Transfusion Services
University Health Network
Toronto, Ontario

Cyndi Giff, RN
Clinical Practice Consultant
ParaMed Home Health Care
Carleton Place, Ontario

Wilma Koopman, RN, MScN
Nurse Practitioner/Clinical Nurse Specialist
Neuromuscular Services – Ambulatory Care
London Health Sciences Centre
London, Ontario

Eileen Koza, RN
Infusion Therapy Consultant/Trainer
Independent Practice
Waterloo, Ontario

Karen Laforet, RN, BA, CINA(c)
Professional & Technical Services for IV
Site Care Management and Wound Care
3M Canada
London, Ontario

Heather McConnell, RN, BScN, MA(Ed)
RNAO Project Staff- Facilitator
Project Manager, Nursing Best Practice Guidelines Project
Registered Nurses Association of Ontario
Toronto, Ontario

Anne McKenzie, RPN
RPNAO Representative
Community Nurse
Carepartners
Fergus, Ontario

Susanne Nelson, RN, BScN, MN(c), CINA(c)
Nurse Coordinator – Vascular Access
University Health Network
Toronto, Ontario

Sharon Rodkin, RN, CINA(c)
Clinical Consultant Medication Delivery
Baxter Corporation
Mississauga, Ontario

Lisa Valentine, RN, BScN, MN
Practice Consultant
College of Nurses of Ontario
Toronto, Ontario

Declarations of interest and confidentiality were made by members of the guideline development panel. Further details are available from the Registered Nurses Association of Ontario.
Assessment
and Device Selection
for Vascular Access

Project team:

Tazim Virani, RN, MScN
Project Director

Heather McConnell, RN, BScN, MA(Ed)
Project Manager

Josephine Santos, RN, MN
Project Coordinator

Jane M. Schouten, RN, BScN, MBA
Project Coordinator

Stephanie Lappan-Gracon, RN, MN
Project Coordinator –
Best Practice Champions Network

Carrie Scott
Project Assistant

Melissa Kennedy, BA
Project Assistant

Elaine Gergolas, BA
Project Coordinator – Advanced Clinical/Practice
Fellowships

Keith Powell, BA, AIT
Web Editor
Acknowledgement

Stakeholders representing diverse perspectives were solicited for their feedback and the Registered Nurses Association of Ontario wishes to acknowledge the following for their contribution in reviewing this Nursing Best Practice Guideline.

Catherine Arnott, RPN
Private Practice
Toronto, Ontario

Linda Ballentine, RN, MEd, CNeph(c)
Professional Practice Leader
York Central Hospital
Richmond Hill, Ontario

Nancy Berdusco, RPN, BA
RPN Charge Nurse
Townsview Complex
Hamilton, Ontario

Rosemary Bland, RN, BScN, CON(c), CINA(c), ONC
Nurse Manager – Palliative Care, Oncology and Ambulatory Care
Joseph Brant Memorial Hospital
Burlington, Ontario

Linda Brickwood, RN
Venous Access Consultant
London Health Sciences Centre
London, Ontario

Mary Brown, RN, ENC(c)
Clinical Resource Nurse – Emergency Department
Stratford General Hospital
Stratford, Ontario

Dr. Lisa Burry, BScPharm, PharmD, FCCP
Critical Care Pharmacotherapy Specialist
Mount Sinai Hospital
Toronto, Ontario

Nan Cleator, RN, CINA(c)
National Clinical Consultant
VON Canada
Clinical Resource Nurse
VON – North Bay, Muskoka, East Parry Sound
Huntsville, Ontario

Lilia Concepcion, RN, BSN, MN
Infection Control Practitioner
The Scarborough Hospital
Scarborough, Ontario

Jean Dean, RN, BN
Manager of Vascular Support Services
Saint John Regional Hospital
Saint John, New Brunswick

Barb Ferreira, RN, BScN, CINA(c)
Clinical Educator, Infusion Program
Vancouver General Hospital
Vancouver, British Columbia

Judith Lynn Fleming, RN, BScN
Registered Nurse – ICU
Mount Sinai Hospital
Toronto, Ontario
Carol Goldman, RN, BScN, CIC  
Infection Control Practitioner  
The Hospital for Sick Children  
Toronto, Ontario

Susan Harper, RN, BScN, MEd  
Nurse Educator – Emergency Services  
Peterborough Regional Health Centre  
Peterborough, Ontario

Inara H. Karrei, RN, BScN, MEd, CON(c)  
Nurse Educator  
Oncology, Hematology & BMT Units  
The Ottawa Hospital  
Ottawa, Ontario

Sherry Kenwell, RN, BA, CINA(c), ENC(c)  
Past President – Canadian Intravenous Nurses Association  
Emerg-Plus Inc.  
Hamilton, Ontario

Lia I.T. Kutzscher, RN(EC), BScN, MScN, CINA(c), CON(c)  
Nurse Practitioner – Oncology  
Orillia Soldiers’ Memorial Hospital  
Orillia, Ontario

Weena LeJarde, RN, BScN  
RN Post Anaesthetic Care Unit  
Mount Sinai Hospital  
Toronto, Ontario

Nancy MacFadyen, RN, BN, MN(c), CINA(c)  
Clinical Resource  
Prince County Hospital  
Summerside, Prince Edward Island

Joan Maguire, RN, CINA(c)  
IV Therapy Resource Nurse  
Southlake Regional Health Centre  
Newmarket, Ontario

Anne Martin, RN, BScN  
Educator – Intensive Care Unit  
Peterborough Regional Health Centre  
Peterborough, Ontario

Maureen McNally, RN, BScN  
Case Manager  
Peterborough Community Access Centre  
Peterborough, Ontario

Marie Meredith, RN, BN  
Manager – Vascular Access Team  
Health Sciences Centre  
Winnipeg, Manitoba

Pat Nicholas, RN, PHN  
Clinical Nurse Educator  
Carepartners  
Fergus, Ontario

Laura Nicholson, RN, BScN, ENC(c)  
Professor of Nursing  
Ryerson, Centennial and George Brown Collaborative Nursing Program  
Toronto, Ontario

Debra Richardson, RN, BScN  
Clinical Consultant  
Abbott Laboratories  
St. Laurent, Quebec
Assessment and Device Selection for Vascular Access

Donna Robichaud, RN, BScN
Registered Nurse – CCU
Mount Sinai Hospital
Toronto, Ontario

Joanne Ross, RPN
Staff Nurse – Operating Room
Hamilton Health Sciences Centre
Hamilton, Ontario

Olivia Saqui, RN
Nurse Clinician, TPN
Home TPN Program
University Health Network – Toronto General Hospital
Toronto, Ontario

Pamela Savage, RN, MAEd, CON(c)
Clinical Nurse Specialist
University Health Network – Princess Margaret Hospital
Toronto, Ontario

Margaret Seguss
Client/Family Reviewer
Ottawa, Ontario

Ronald K. Seguss
Client Reviewer
Ottawa, Ontario

Marianne Siemens, RN, MN
Patient Care Manager
Foothills Medical Centre
Calgary, Alberta

Dale Smith, RN
Administrative Coordinator – Emergency Medicine Program/
Medical Ambulatory Day Unit
York Central Hospital
Richmond Hill, Ontario

Judy Smith, RN, BScN, ENC(c)
Nurse Educator – Emergency Medicine Program/Medical Ambulatory Day Unit
York Central Hospital
Richmond Hill, Ontario

Susan Watson, RN, CINA(c), NCA
Nursing Supervisor
ParaMed Home Health Care
Chatham, Ontario

Sahar Whelan, BScPhm, MScPhm
Director of Pharmacy
Coram Healthcare Ltd.
Toronto, Ontario

Margaret Wilson, RN, BScN
Infection Control Practitioner
The Hospital for Sick Children
Toronto, Ontario
Assessment and Device Selection for Vascular Access

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## Summary of Recommendations

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<th>RECOMMENDATION</th>
<th>*LEVEL OF EVIDENCE</th>
</tr>
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<tr>
<td><strong>Practice Recommendations</strong></td>
<td></td>
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<tr>
<td><strong>Assessment and Device Selection</strong></td>
<td>IIb</td>
</tr>
<tr>
<td>1. All clients requiring vascular access, regardless of duration of therapy, require the use of a structured approach such as an algorithm to facilitate a comprehensive client assessment and the development of a vascular access care plan prior to the initiation of therapy.</td>
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<tr>
<td>2. To determine the most appropriate type of vascular access device, the nurse needs to consider the following factors:</td>
<td></td>
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<tr>
<td>- Prescribed therapy – Level Ib;</td>
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<td>- Duration of therapy – Level Ib;</td>
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<tr>
<td>- Physical assessment – Level IV;</td>
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<tr>
<td>- Client health history – Level IV;</td>
<td></td>
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<tr>
<td>- Support system/resources – Level IV;</td>
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<tr>
<td>- Device availability – Level IV; and</td>
<td></td>
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<tr>
<td>- Client preference – Level IV.</td>
<td></td>
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<tr>
<td><strong>Client Education</strong></td>
<td>IV</td>
</tr>
<tr>
<td>3. Nurses will discuss the options for vascular access devices with the client and family caregivers. Device selection is a collaborative process between the nurse, client, physician and other members of the health care team, however, the nurse has a role to educate and advocate for clients in relation to the selection of appropriate devices.</td>
<td></td>
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<tr>
<td><strong>Documentation</strong></td>
<td>IV</td>
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<tr>
<td>4. Nurses will document comprehensive information regarding assessment of infusion therapy and device recommendations. This documentation should include, as a minimum:</td>
<td></td>
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<tr>
<td>- Assessment completed and the written plan of care developed; and</td>
<td></td>
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<tr>
<td>- Client and family caregiver education.</td>
<td></td>
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<tr>
<td><strong>Education Recommendation</strong></td>
<td>IV</td>
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<tr>
<td>5. The principles and practice of infusion therapy should be included in the basic education of nurses in their core curriculum, be available as continuing education, be provided in orientation to new organizations and be made available through continuing professional development opportunities.</td>
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</table>

*See pg 12 for details regarding "Interpretation of Evidence".*
<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Level of Evidence</th>
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<tbody>
<tr>
<td>6. Health care organizations should have access to infusion therapy nursing expertise to support optimal vascular access outcomes.</td>
<td>III</td>
</tr>
<tr>
<td>7. Health care organizations must have quality improvement systems in place to monitor client outcomes. This should include an interdisciplinary process that will monitor quality indicators related to vascular access and infusion therapy, the provision of timely feedback for improved client outcomes, and systems for reporting and capturing data to support practice improvements.</td>
<td>IV</td>
</tr>
<tr>
<td>8. In order to support continuity of client care within and between organizations, all clients with a vascular access device and/or their caregivers need to have available comprehensive information about the device, which should include, as a minimum: Details of therapy; Type of vascular access device, including number of lumens; Date of insertion; Tip location, for all central vascular access devices; Delivery system in use; Client education plan; Client specific instructions; Details of any complications experienced; and Appropriate resources, as required.</td>
<td>IV</td>
</tr>
<tr>
<td>9. Nursing best practice guidelines can be successfully implemented only where there are adequate planning, resources, organizational and administrative support, as well as appropriate facilitation. Organizations may wish to develop a plan for implementation that includes: An assessment of organizational readiness and barriers to education. Involvement of all members (whether in a direct or indirect supportive function) who will contribute to the implementation process. Dedication of a qualified individual to provide the support needed for the education and implementation process. Ongoing opportunities for discussion and education to reinforce the importance of best practices. Opportunities for reflection on personal and organizational experience in implementing guidelines.</td>
<td>IV</td>
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**Interpretation of Evidence**

**LEVELS OF EVIDENCE**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>Ia</td>
<td>Evidence obtained from meta-analysis or systematic review of randomized controlled trials.</td>
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<tr>
<td>Ib</td>
<td>Evidence obtained from at least one randomized controlled trial.</td>
</tr>
<tr>
<td>IIA</td>
<td>Evidence obtained from at least one well-designed controlled study without randomization.</td>
</tr>
<tr>
<td>IIB</td>
<td>Evidence obtained from at least one other type of well-designed quasi-experimental study, without randomization.</td>
</tr>
<tr>
<td>III</td>
<td>Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.</td>
</tr>
<tr>
<td>IV</td>
<td>Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities</td>
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</tbody>
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Responsibility for Guideline Development

The Registered Nurses Association of Ontario (RNAO), with funding from the Ministry of Health and Long-Term Care, has embarked on a multi-year project of nursing best practice guideline development, pilot implementation, evaluation and dissemination. In this fourth cycle of the project, one of the areas of emphasis is on infusion therapy. This guideline was developed by a panel of nurses convened by the RNAO, conducting its work independent of any bias or influence from the Ministry of Health and Long-Term Care.

Purpose and Scope

Best practice guidelines are systematically developed statements to assist practitioners’ and clients’ decisions about appropriate health care (Field & Lohr, 1990). This best practice guideline focuses on assisting all nurses providing care to clients requiring infusion therapy in diverse practice settings, both institutional and community. This guideline incorporates best practices related to client assessment and appropriate device selection, which is applicable to all clients requiring vascular access. Nurses working in specialty areas such as pediatrics, gerontology, oncology and dialysis will require further practice direction from guidelines in their unique area of practice. This guideline does not include recommendations related to the care of clients requiring infusion therapy through the following devices: arterial lines; fistulas for hemodialysis; pulmonary artery lines; pheresis lines; epidural catheters; pressure monitoring devices; umbilical artery; umbilical vein; and/or intraosseous lines.

Nurses working in partnership with the interdisciplinary health care team, individuals requiring infusion therapy and their families, have an important role in providing infusion therapy. This guideline focuses its recommendations on: Practice Recommendations, including client assessment and device selection, client education and documentation; Education Recommendations for supporting the skills required for nurses; and Organization and Policy Recommendations addressing the importance of a supportive practice environment as an enabling factor for providing high quality nursing care, which includes ongoing evaluation of guideline implementation.
The purpose of the guideline is to provide evidence-based support for nurses related to client assessment and device selection, client education and documentation. Specific clinical questions to be addressed include:

- What should an assessment include prior to the initiation of infusion therapy?
- What criteria should be used to select/recommend an appropriate vascular access device?
- How can the risk of complications be minimized through appropriate assessment and device selection?

It is acknowledged that the individual competencies of nurses varies between nurses and across categories of nursing professionals (RPNs and RNs) and are based on knowledge, skills, attitudes, critical analysis and decision making which are enhanced over time by experience and education. It is expected that individual nurses will perform only those aspects of assessment and device selection for which they have appropriate education and experience. It is expected that nurses will seek appropriate consultation in instances where the client’s care needs surpass the individual’s ability to act independently. It is acknowledged that effective health care depends on a coordinated interdisciplinary approach incorporating ongoing communication between health professionals and clients, ever mindful of the personal preferences and unique needs of each individual client.

**Development Process**

In January of 2003, a panel of nurses with expertise in infusion therapy practice and education from institutional and community settings (including vendor companies) was convened under the auspices of the RNAO. At the outset, the panel established the scope of the guideline through a process of discussion and consensus. It was determined that the guideline would focus specifically on assessment and device selection – including client assessment, client risk factors, device risk factors, weighing the risks against the benefits and the need to educate clients about device options.

A set of nine published guidelines related to vascular access were identified through a structured search, the details of which are described in Appendix A. These guidelines were reviewed according to a set of initial inclusion criteria, which resulted in the elimination of two guidelines. The inclusion criteria were: guideline is in English; guideline is dated no earlier than 1996; guideline is strictly about the topic area; guideline is evidence-based; and the guideline is available and accessible for retrieval.
The seven resulting guidelines were critically appraised with the intent of identifying existing guidelines that were current, developed with rigour, evidence-based and which addressed the scope identified by the panel for the best practice guideline. A quality appraisal was conducted on these seven clinical practice guidelines using the “Appraisal of Guidelines for Research and Evaluation Instrument” (AGREE Collaboration, 2001). This process yielded a decision to work primarily with four existing guidelines. These were:


The panel members divided into subgroups to undergo specific activities using the short listed guidelines, other literature and additional resources for the purpose of drafting recommendations for nursing interventions. This process yielded a draft set of recommendations. The panel members as a whole reviewed the recommendations, discussed gaps, available evidence and came to consensus on a draft guideline.

This draft was submitted to a set of external stakeholders for review and feedback – an acknowledgement of these reviewers is provided at the front of this document. Stakeholders represented various health care disciplines, clients and families, as well as professional associations. External stakeholders were provided with specific questions for comment, as well as the opportunity to give overall feedback and general impressions. The results were compiled and reviewed by the development panel – discussion and consensus resulted in revisions to the draft document prior to publication and evaluation.
Definition of Terms

For clinical terms not included here, please refer to Appendix B.

**Clinical Practice Guidelines or Best Practice Guidelines:** Systematically developed statements to assist practitioner and client decisions about appropriate health care for specific clinical (practice) circumstances (Field & Lohr, 1990).

**Consensus:** A process for making decisions, not a scientific method for creating new knowledge. At its best, consensus development merely makes the best use of available information, be that scientific data or the collective wisdom of the participants (Black et al., 1999).

**Education Recommendations:** Statements of educational requirements and educational approaches/strategies for the introduction, implementation and sustainability of the best practice guideline.

**Infusion Therapy:** The parenteral administration of fluids, medications, nutritional support, and transfusion of blood and blood products, delivered though a vascular access device (VAD) inserted into a peripheral or central vein.

**Organization & Policy Recommendations:** Statements of conditions required for a practice setting that enable the successful implementation of the best practice guideline. The conditions for success are largely the responsibility of the organization, although they may have implications for policy at a broader government or societal level.

**Practice Recommendations:** Statements of best practice directed at the practice of health care professionals that are ideally evidence-based.
Background Context

Infusion therapy has evolved from an extreme measure used only as a last resort with the most critically ill, to a highly scientific, specialized form of treatment used for greater than 90% of hospitalized clients (Corrigan, 1995). Infusion therapy is the parenteral administration of fluids, medications, nutritional support, and transfusion of blood and blood products, delivered through a vascular access device (VAD) inserted into a peripheral or central vein. Vascular access devices (VADs) are an integral aspect of health care for neonates, children, and adults (Health Canada, 1997) and have moved beyond the acute care setting to chronic care, long term care, and the home in both urban and rural centres.

Unfortunately, very little has been published about the state of infusion therapy practice and outcomes in Ontario or Canada. However, American data suggest opportunity exists for nurses to improve client outcomes:

- Approximately 150 million intravenous catheters are purchased annually (Ryder, 1995);
- Over five million central venous catheters are inserted annually (Macklin, Chernecky, Nugent, Waller, 2002);
- Complications occur in approximately 10 – 25% of all clients with a vascular access device (FDA CVC working group, 1994);
- 52% of reported complications are directly related to practitioner knowledge or technique (FDA CVC working group, 1994);
- Client morbidity is at least 10% (FDA CVC working group, 1994); and
- Clients and their families currently play a minor role in the selection of a vascular access device at the onset of treatment (Kokotis, 2001; Macklin et al, 2003).

Client assessment by nurses at the onset of infusion therapy, coupled with access device insertion by nurses and physicians has demonstrated improved client satisfaction, fewer delays in therapy related to loss of vascular access, fewer device complications, preservation of peripheral veins, less nursing time spent attempting to gain vascular access, shorter hospital stays, fewer emergency room visits, and decreased costs associated with infusion therapy (Barton, Daneck, Johns & Coons, 1998; Kokotis, 2001). However, an American study conducted in 2000 asked nurses if clients who require IV therapy for longer than one week were routinely evaluated for midline or peripherally inserted central catheters within three days of admission. The results reported indicated that 77% of nurses responded that clients are not routinely assessed for intermediate dwelling vascular access devices (Kokotis, 2001).
Decentralization of infusion therapy team functions to nurses in Ontario during the 1990s required front-line staff to learn the skill of vascular access initiation. Credentialed infusion therapy experts, nursing educators, administrators, researchers, and policy makers supported nurses by researching and disseminating evidence-based knowledge to guide client care decisions, improve client outcomes, and decrease the costs and morbidity associated with infusion therapy (CDC, 2002; INS, 2000, Mermel et al., 2001). Nurses with special training in infusion therapy and vascular access device care and practice, along with supportive organizational structures and processes, results in improved client outcomes and decreased complications (CDC, 2002; INS, 2000; Mermel et al., 2001).

Factors that contribute to supporting the structure necessary for effective infusion therapy include, and are not limited to: utilization of infusion nurse specialists; allocated financial resources; dedicated human resources; organizational policies; environmental readiness; nursing research and continuous quality improvement processes (Barton et al., 1998; CDC, 2002; Health Canada, 1997; INS, 2000). Refer to Appendix C for a summary of factors that impact on vascular access assessment and planning.
Practice Recommendations

This Best Practice Guideline is developed on the foundation provided by the following standards of practice of the College of Nurses of Ontario:

- **Practice Standard – Professional Standards Revised 2002** (2004g), which outlines professional expectations of all Ontario nurses in the areas of service to the public related to accountability, continuing competence, ethics, knowledge, knowledge application, leadership and relationships;
- **Practice Standard – Medication (2004f)**, which provides standards for nurses to administer medications safely and effectively in all practice settings;
- **Practice Standard – Documentation (2004d)**, which outlines nurses’ professional accountability in record keeping, and the expectations for documentation for all nurses in direct practice;
- **Practice Standard – Ethics (2004e)**, which describes the ethical values that are most important to the nursing profession in Ontario;
- **Practice Standard – Infection Control (2004c)**, that provides direction for general infection control practices, recognizing that some client care situations may require consultation with an Infection Control Practitioner;
- **Practice Standard – Therapeutic Nurse-Client Relationship (2004h)**, which provides direction regarding establishing therapeutic nurse-client relationships;
- **Practice Standard – Guide to Decide (2004b)**, which is designed to assist nurses in understanding their accountability in performing procedures, and provides a framework for decision making; and
- **Practice Standard – Consent (2004a)**, which provides an overview of the major features of the Health Care Consent Act, 1996 (HCCA) and the Substitute Decisions Act, 1996 (SDA). It does not address consent under the Mental Health Act.

In addition to the College of Nurses of Ontario documents identified above, it is expected that nurses will have knowledge of workplace policies and procedures that support infusion therapy within their organization.
Assessment and Device Selection

Recommendation • 1

All clients requiring vascular access, regardless of duration of therapy, require the use of a structured approach such as an algorithm to facilitate a comprehensive client assessment and the development of a vascular access care plan prior to the initiation of therapy. (Level IIb)

Discussion of Evidence

At the current time, vascular access needs are not routinely assessed at time of client admission and at regular intervals thereafter. This has impacted on financial, therapeutic and satisfaction indicators (Halderman, 2000; Ryder, 1993). Appropriate decisions related to vascular access devices made at the beginning of therapy have an impact on clinical and financial outcomes as they reduce nursing time, costs, and the client’s traumatic experience of painful repeated venipuncture (Ryder, 1993). Further, a client’s vascular access needs may change over time; therefore assessment is an ongoing process of observations, which requires nursing evaluation and judgement. Nurses are in an opportune position to proactively assess for factors involved in successful vascular access outcomes (INS, 2000; Winslow, Grammel & Camp-Sorrell, 1995).

Selection of the most appropriate vascular access device is important to enhance therapeutic client benefits and minimize client discomfort, morbidity, mortality and cost (Vanek, 2002a). The goal for device selection is to use the least invasive device with the lowest risk of complications (infectious and non-infectious), which will last the duration of therapy or be managed with minimal replacements (CDC, 2002; INS, 1999; Markel-Poole, 1999).

The use of an algorithm organizes the information necessary for successful assessment and device selection (Galloway, 2002). Several vascular access planning algorithms have been proposed in the literature, and address the key criteria of the prescribed therapy, expected duration of therapy, client’s vascular integrity, and the types of devices available (Barton et al., 1998; Danek & Kilroy, 1997; Halderman, 2000; Kokotis, 1999; Ryder, 1993). Although many vascular access planning algorithms have been described, there has been little research done on the use of these algorithms in clinical practice. However, a quasi-experimental study conducted by Barton et al. (1998), focusing on the impact of an algorithm for vascular access planning on specific clinical and economic outcomes, included surgical, medical and pediatric clients, distributed into treatment and control groups. They concluded that clients whose infusion plan was consistent with a structured algorithm reported fewer IVs; less difficulty starting IVs, and less stress; waited significantly less time until central venous line placement (for those who required it); and had significantly shorter lengths of stay.

Refer to Appendix D for an example of a vascular access algorithm.
**Recommendation • 2**

To determine the most appropriate type of vascular access device, the nurse needs to consider the following factors:

- **Prescribed therapy** – Level Ib;
- **Duration of therapy** – Level Ib;
- **Physical assessment** – Level IV;
- **Client health history** – Level IV;
- **Support system/resources** – Level IV;
- **Device availability** – Level IV; and
- **Client preference** – Level IV.

**Discussion of Evidence**

*Prescribed Therapy (Level Ib)*

Prescribed therapy considers the type of therapy, which may include infusions (e.g., nutrition solutions, vesicants, irritants) (Barton et al., 1998) and frequency of blood sampling. Once the type of fluid is identified, the osmolality and pH of the solution needs to be determined. The incidence of phlebitis increases as pH and osmolarity of the intravenous solution differs from that of the blood (Stranz, 2002).

Fluids with higher osmolality and solutions of acidic or alkaline pH cause endothelial damage and subsequent phlebitis and thrombus formation (Fonkalsrud et al., 1968; Gazitua et al., 1979; Maki & Ringer, 1991; Ryder, 1993; Ryder, 1995; Wermeling et al., 1985). The risk of chemically induced thrombosis is the key issue in selecting catheter tip position and choosing the appropriate access device (Ryder, 1995). Orr and Ryder (1993) indicate that chemically induced thrombosis is related to the osmolality of the infusate and rate of blood flow at the tip of the catheter. The rate of blood flow at the superior vena cava is greater than a peripheral vein – the larger the vessel, the greater the dilution and less irritation to the vein. Therefore, parenteral nutrition, hyperosmolar solutions, chemotherapy, and vesicants should not be infused through peripheral catheters with tips positioned in the upper arms, subclavian vein or innominate vein. Rather, intermediate or long-term infusion of these solutions should be delivered through catheters terminating in the distal superior vena cava. Catheter tips that are malpositioned into the veins of the arms or small veins of the neck or chest usually result in thrombosis.
A study determining peripheral vein tolerance to amino acid infusions found that all solutions with osmolarities greater than 600 mOsm/L produced phlebitis (Gazitua et al., 1979). A pH outside the range of 5 – 9 and/or osmolarity greater than 500 mOsm/L should be administered through a vascular access device that delivers the infusate into a blood vessel with a high rate of blood flow (Fonkalsrud et al., 1968; Gazitua et al., 1979; INS, 2000; Stranz, 2002).

Chemical structure of the infusate impacts on client outcomes. As reported in a randomized controlled trial by Maki and Ringer (1991), “A great deal of evidence indicates that the nature of the infusate administered through a peripheral intravenous catheter powerfully influences the occurrence of infusion phlebitis” (p. 850). For additional details regarding pH, osmolality and vesicant drugs, refer to Appendix F.

Complexity of therapy and the number of lumens required to safely administer the prescribed infusate(s) is also a consideration for device selection at the onset of therapy. Use only the number of lumens clinically indicated to deliver the prescribed therapy – additional lumens may impact on care, maintenance and infection rates (CDC, 2002; Orr & Ryder, 1993).

**Duration of Therapy (Level Ib)**

Maki and Ringer (1991) reported that 27 – 70% of clients receiving peripheral infusion therapy develop phlebitis. They concluded that multiple factors contributed to the development of phlebitis, including: cannula material, length and bore size, skill of the health care provider inserting the device, the anatomic site of cannulation, the duration of cannulation, the character of the infusate, and client factors (age, race, gender, and the presence of underlying disease). The incidence of phlebitis rose progressively with increasing length of cannulation. The risk for phlebitis was approximately 30% by day 2, and 39 - 49% by day 3.

Practice guidelines related to the prevention of intravascular infections (CDC, 2002) strongly recommend that all clients requiring infusion therapy greater than six days in duration should be assessed for the selection of an intermediate or long-term device.

**Physical Assessment (Level IV)**

A physical assessment should include consideration of the acuity level of the client’s medical condition. The existence of a chronic disease state may impact directly on device selection, as the preservation of veins is a critical goal for clients with chronic disease who require
long-term vascular access (Bowen Santolucito, 2001). Historically, central vascular access devices were not considered until all peripheral access had been exhausted. Despite the plethora of evidence to support early patient assessment and device selection, there has been little impact on current practice.

Through the physical examination, the nurse should assess the following (ASPEN, 1999; Bowen Santolucito, 2001; Camp-Sorrell, 1996; Galloway, 2002; Kokotis, 1999):

- Circulatory status – impaired circulation, lymphedema, post-operative swelling;
- Vascular status;
- Mobility – use of crutches, walkers or transfer aids;
- Mentation – level of cooperation, mental status;
- Integrity of skin – loss of connective tissue, trauma, open wounds, surgical or radiation damage;
- Activity level – lifestyle factors that may impact on device selection and maintenance;
- Obesity – veins difficult to palpate; and
- Hydration status – dehydration resulting in poor venous filling.

Client Health History (Level IV)
A comprehensive client history related to vascular access may include (Bowen Santolucito, 2001; Camp-Sorrell, 1996; Galloway, 2002; INS, 2000; Kokotis, 1999; National Kidney Foundation, 2001):

- Age – older clients may experience diminished renal function and cardiovascular changes;
- Medical diagnosis;
- Current medical condition;
  - Medication profile, including over the counter drugs and use of herbal supplements;
  - Current coagulation status;
  - Past medical history, including complications of diabetes, if applicable;
- Previous history of infusion therapy (peripheral or central) – devices, therapies, outcomes;
- Lifestyle – leisure/recreational activities and occupation;
- Language/cultural barriers;
- History of intravenous drug use;
- Medical and surgical history (e.g., diabetes, mastectomy, renal dialysis, immunocompromised, MRSA positive);
- Allergies (particularly latex); and
- Prognosis.
Support System/Resources (Level IV)
Infusion therapy care may be provided to individuals of all ages, with a wide variety of diagnoses, and within care settings that may include the home, long-term care, acute care, the workplace and other locations (INS, 2000). The plan of care for the individual receiving infusion therapy may include collaboration with the client and the client’s family and/or significant others. Consideration in the device selection process should be given to the individual’s support system and resources including (ASPen, 1999; Camp-Sorrell, 1996; Galloway, 2002):
- Home support/resources (caregiver availability);
- Aspects of the home environment;
  - Availability of a sanitary water supply;
  - Electricity and refrigeration;
  - Adequate storage space for supplies; and
  - Access to a telephone.
- Ability of the client and family to care for the device and administer the infusion therapy, if needed at discharge from hospital;
- Psychosocial aspects of care;
- Community resources; and
- Financial resources.

Device Availability (Level IV)
Nurses and other health care professionals have many choices when it comes to selecting a vascular access device (Galloway, 2002), however, not all devices are available in all practice settings. In some communities, certain devices may not be available as an option for insertion due to supply contracts, lack of resources for insertion, or decreased availability for follow-up care and management in the home. Refer to Appendix E for a summary of vascular access devices and considerations for their use.
**Client Preference (Level IV)**

The involvement of clients and their family caregivers in decisions related to device selection support self-care and self-efficacy. Individuals need an opportunity to consider their options and reflect on what they can deal with in relation to self-care, particularly in a situation where long-term devices are necessary. Self-care can be enhanced through a collaborative approach to device selection, therefore, the client and family caregivers need to be included in the decision-making process (Camp-Sorrell, 1996; Chernecky et al., 2003; CINA, 1999; Galloway, 2002; INS, 2000; Macklin et al., 2003; NKF, 2001).

**Client Education**

<table>
<thead>
<tr>
<th>Recommendation • 3</th>
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<tbody>
<tr>
<td>Nurses will discuss the options for vascular access devices with the client and family caregivers. Device selection is a collaborative process between the nurse, client, physician and other members of the health care team, however, the nurse has a role to educate and advocate for clients in relation to the selection of appropriate devices. (Level IV)</td>
</tr>
</tbody>
</table>

**Discussion of Evidence**

Selection of a vascular access device should be based on input from the client, family caregivers, nurse, physician and other members of the health care team. This multidisciplinary approach encourages consideration of the various devices available, and addresses the specific needs of the client (Winslow, Trammell & Camp-Sorrell, 1995). The involvement of the client in the decision-making process supports self-care and a client-centred model of care (Nugent, Chernecky & Macklin, 2002; RNAO, 2002a).

Macklin et al. (2003) report on a survey that looked at client information needs related to vascular access devices, and the education nurses provided. They found that the priority information needs of clients in making decisions regarding device selection included safety, treatment issues, activities of daily living, independence and care. Additionally, clients indicated that comfort, availability of caregiver, body image and financial impact were also of concern in selecting a device. These information needs were different from the details they received from nurses. Nurses, in discussing options with clients, most commonly provided information on treatment issues, prescribed medications, venous assessment and safety. This disparity highlights the need to include information about the issues that are of interest.
to the client in the selection process, which may help to enhance self-efficacy and lead to improved client outcomes (Macklin et al., 2003).

Nugent et al. (2002) examined, through qualitative and quantitative means, client and caregiver preferences, decision making processes, the information required to make a vascular access device choice, and the information needed to care for a vascular access device. Various themes emerged from the data; however, an overriding theme of the lack of a shared decision-making model emerged. Shared decision making assumes that the client has an active involvement in the decisions associated with their care. Participants expressed their need to be a partner in making decisions, but felt they did not have the information necessary to participate in a meaningful way. The authors concluded that health care providers need to continue to include clients in decision making, ensuring that they are involved and have enough information to evaluate their care. In addition, nurses require organizational support and resources in order to advocate for their clients to ensure appropriate device selection and insertion.

Depending on who will be providing device care on a long-term basis, nurses need to consider the educational content provided to clients and their families. This information may include such issues as ongoing management, prevention and detection of complications, and when and how to contact a health care professional. Nurses have the responsibility for teaching clients about device care, how to troubleshoot complications and how to access the assistance of a health care professional. In planning for any client education activity, the nurse needs to individualize the education provided to the client and family, taking into consideration such factors as physical status, background characteristics and psychosocial issues (McDermott, 1995).
Documentation

**Recommendation • 4**

Nurses will document comprehensive information regarding assessment of infusion therapy and device recommendations. This documentation should include, as a minimum:

- Assessment completed and the written plan of care developed; and
- Client and family caregiver education.

*(Level IV)*

**Discussion of Evidence**

Documentation in the health record is an integral component of effective and safe nursing practice. Documentation that is clear, comprehensive and accurate is a record of the critical thinking and judgement used in professional nursing practice, and provides an account of nursing's unique contribution to health care (College of Nurses of Ontario, 2004d).

Practice guidelines for infusion therapy support documentation that is established in organizational policies and procedures (Camp-Sorrell, 1996; CINA, 1999; INS, 2000). The Oncology Nursing Society (Camp-Sorrell, 1996) provides a comprehensive list of documentation criteria for assessment, insertion, care and access, use of device, follow-up care, malfunction of device, and removal of device.

Documentation that supports the recommendations of this guideline should include: documentation of assessment for device selection; plan of care (Barton et al., 1998; Danek & Kilroy, 1997; Halderman, 2000; Kokotis, 1999; Ryder, 1993); and client and family caregiver education (Camp-Sorrell, 1996).
Education Recommendation

Recommendation • 5

The principles and practice of infusion therapy should be included in the basic education of nurses in their core curriculum, be available as continuing education, be provided in orientation to new organizations and be made available through continuing professional development opportunities. (Level IV)

Discussion of Evidence

Nurses are responsible to ensure that they have the knowledge, skill and judgement necessary to provide safe and effective infusion therapy (CNO, 2004b). Organizations should provide support by facilitating opportunities for nurses to continue to develop their knowledge and skills in this clinical area. Continuing education is essential to sustain and advance nursing practice, and is required of all nurses. The nurse’s active participation in infusion-related continuing education programs is essential to ensure current knowledge of infusion care, and improved client outcomes (INS, 2000).

In a study conducted in the United States over a two year period, it was found that 55% of vascular access device complications reported to the Food and Drug Administration were found to be related to health care professionals not having sufficient education and training in this area (FDA CVC Working Group, 1994). In terms of reduction of infectious complications associated with vascular access, the Centers for Disease Control and Prevention (2002) strongly supports health care professional education and training that includes the indications for intravascular catheter use, proper procedures for the insertion and maintenance of these devices, and appropriate infection control measures to prevent intravascular catheter infections.

Nurses with a range of knowledge and expertise practice infusion therapy. This expertise ranges from a generalist nurse who is providing infusion therapy to the specialist nurse who is practicing in an expanded role (INS, 2000). However, the knowledge necessary to provide safe infusion therapy has some common elements, and both the Canadian Intravenous Nurses Association (1999) and the Intravenous Nurses Society (2000) support a curriculum for infusion therapy education that addresses both theoretical knowledge and clinical application. Ryder (1993) stresses not only mastering a skill, but also of practice in which skill, knowledge, competency demonstrations and accountability are required. The educational...
framework addressing the theories, principles and practice of infusion therapy should include (CINA, 1999: Dugger, 1997; INS, 2000):

- Principles and practices of vascular access planning, including client assessment and device selection;
- Anatomy and physiology;
- Technology and clinical application (e.g., devices, delivery systems);
- Fluid and electrolyte balance;
- Pharmacology;
- Infection control;
- Recognition of specialty populations (e.g., pediatrics, hematology, geriatrics, oncology);
- Transfusion therapy;
- Parenteral nutrition;
- Approaches to prevent, detect and minimize complications; and
- Communication and advocacy.

Refer to Appendix G for a list of educational resources to support nursing professional development.

**Organization & Policy Recommendations**

**Recommendation • 6**

Health care organizations should have access to infusion therapy nursing expertise to support optimal vascular access outcomes. *(Level III)*

The guideline development panel recognizes that not every organization will be able to support such a resource on site, but suggest that opportunities for collaboration and access to this type of resource between community partners be considered. At a minimum, the nursing expertise required for this resource would be recognition by a national certification body.
Discussion of Evidence

Support of Nurses in the Provision of Direct Care

High quality care results in desired client outcomes and decreased morbidity and mortality associated with infusion therapy. The delivery of infusion therapy by highly skilled and educated infusion nurse specialists provides the highest quality of care to clients and is also the most cost-effective method of providing these treatment modalities (INS, 2000). The insertion, care and management of vascular access devices requires skill, knowledge, competency demonstration and accountability by an expert (Galloway, 2002).

Maki and Ringer (1991) examined infusion-related factors for phlebitis in peripheral infusions. They found that the experience of the person inserting a vascular access catheter, along with other factors, influences the risk for phlebitis. The availability of a nurse with expertise in infusion therapy resulted in a two-fold lower rate of infusion related phlebitis and an even greater reduction in catheter-related sepsis in comparative trials.

Policy and Procedure Development

Policies and procedures must be developed and adapted to meet the needs of the vascular access device selection program (Galloway, 2002). Specialized documentation tools that assist in the application of infusion–related policy may facilitate implementation. Education and stringent care protocols are necessary for positive client outcomes (Ryder, 1995). Policies regarding the competencies for vascular access care should be documented, and may include requirements such as prerequisites, education and training, policy and procedure review, evaluation and frequency of evaluation and minimum number of procedures to remain current (Markel Poole, 1999). The development of the standards of care and of expertise in staff are important components to successfully prevent catheter-related complications, as staff inexperience has been documented to be the factor most frequently related to catheter complications (Wickham, Purl & Welker, 1992).

Nursing research is required to provide additional support for nursing practice. In addition, continued multidisciplinary efforts are necessary in order to understand the problems and benefits of long-term vascular access devices, and are a significant step in maximizing the use of appropriate devices (Wickham et al., 1992).
Selection of Vascular Access Equipment

A multidisciplinary approach to the selection of vascular access devices available in a health care organization should include the involvement of a health care professional with expertise in infusion therapy. The process for selection should include data collection, outcome reporting, evaluation and a feedback mechanism to facilitate modifications to the program in the future. A nurse with expertise in infusion therapy should be involved in the selection of the various vascular access devices the organization will have available for use (Galloway, 2002).

Recommendation • 7

Health care organizations must have quality improvement systems in place to monitor client outcomes. This should include an interdisciplinary process that will monitor quality indicators related to vascular access and infusion therapy, the provision of timely feedback for improved client outcomes, and systems for reporting and capturing data to support practice improvements. (Level IV)

Discussion of Evidence

Client safety and cost containment is of primary concern among health care administrators today. However the trauma and hidden costs associated with multiple venipunctures and failure to select and insert the appropriate device at the onset of therapy continues to be a significant barrier for health care organizations (Bowen Santolucito, 2001).

Health care organizations that deliver infusion therapy should consider the following elements to improve performance and manage risks to both the client and the health care provider: appropriate device selection; qualified staff; maintenance of staff competency; appropriate documentation and the use of standardized forms to assist in implementation; client teaching; follow-up documentation; and performance improvement activities (Markel Poole, 1999). Refer to Appendix C for a summary of factors that impact on vascular access assessment and planning.

Once a vascular access program is in place, health care organizations should develop a program to monitor the most applicable client outcomes related to their program. A current state analysis that includes identification of current practice will provide a baseline with which to measure change. Attempting to monitor too many indicators can be problematic, and a benchmarking program should start small and grow from the results of the data. One
consideration for an indicator would be tracking total number of attempts to establish a peripheral intravenous site. This should include documentation of the actual number of attempts, which would support the need for assessment for the most appropriate device. Clinicians should be involved in monitoring to facilitate data collection, understand the significance of measurement, the indicators being tracked and the progress being made (Galloway, 2002).

Recommendation • 8

In order to support continuity of client care within and between organizations, all clients with a vascular access device and/or their caregivers need to have available comprehensive information about the device, which should include, as a minimum:

- Details of therapy;
- Type of vascular access device, including number of lumens;
- Date of insertion;
- Tip location, for all central vascular access devices;
- Delivery system in use;
- Client education plan;
- Client specific instructions;
- Details of any complications experienced; and
- Appropriate resources as required.

*(Level IV)*

**Discussion of Evidence**

Transfer of client care within and between organizations should include comprehensive information about the client’s access device. A commitment to collaborative practice is evident in structured, comprehensive documentation and access to information by all those providing care. Several practice guidelines (Camp-Sorrell, 1996; CINA, 1999; INS, 2000) support specific content for documentation for infusion therapy, and the development panel supports the sharing of this information between practice settings in order to support continuity of care. The client with a vascular access device should be provided with written information regarding:

- Insertion procedure:
  - Type, length and gauge of device
  - Date and time of insertion, name of person inserting catheter
  - External catheter length
  - Effective length of catheter inserted and radiographic confirmation of anatomical tip location for all central venous access devices
  - Insertion complications, and interventions, if applicable.
Follow-up care:
- Site condition and appearance of peripheral access devices using standardized phlebitis and infiltration scales.
- Referral to community agency, if applicable
- Provision of information regarding device and client education provided
  - Care and maintenance of device
- Activity restrictions.

**Recommendation • 9**

Nursing best practice guidelines can be successfully implemented only where there are adequate planning, resources, organizational and administrative support, as well as the appropriate facilitation. Organizations may wish to develop a plan for implementation that includes:

- An assessment of organizational readiness and barriers to education.
- Involvement of all members (whether in a direct or indirect supportive function) who will contribute to the implementation process.
- Dedication of a qualified individual to provide the support needed for the education and implementation process.
- Ongoing opportunities for discussion and education to reinforce the importance of best practices.
- Opportunities for reflection on personal and organizational experience in implementing guidelines.

*Level IV*

**Discussion of Evidence**

The Registered Nurses Association of Ontario (through a panel of nurses, researchers and administrators) has developed the *Toolkit: Implementation of Clinical Practice Guidelines* (RNAO, 2002b), based on available evidence, theoretical perspectives and consensus. The *Toolkit* is recommended for guiding the implementation of the RNAO nursing best practice guideline on *Assessment and Device Selection for Vascular Access*. Successful implementation of best practice guidelines requires the use of a structured, systematic planning process and strong leadership from nurses who are able to transform the evidence-based recommendations into policies and procedures that impact on practice within the organization. The RNAO *Toolkit* (2002b) provides a structured model for implementing practice change. Refer to Appendix H for a description of the *Toolkit.*
Evaluation & Monitoring of Guideline

Organizations implementing the recommendations in this nursing best practice guideline are recommended to consider how the implementation and its impact will be monitored and evaluated. The following table, based on a framework outlined in the RNAO Toolkit: Implementation of Clinical Practice Guidelines (2002b), illustrates some indicators for monitoring and evaluation:

<table>
<thead>
<tr>
<th>Objectives</th>
<th>STRUCTURE</th>
<th>PROCESS</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>To evaluate the supports available in the organization that allow for nurses to deliver safe infusion therapy.</td>
<td>To evaluate the changes in practice that lead towards improved infusion therapy practices.</td>
<td>To evaluate the impact of implementation of the recommendations.</td>
<td></td>
</tr>
<tr>
<td>Organization/Unit</td>
<td>Review of best practice guideline recommendations by organizational committee(s) responsible for policies or procedures.</td>
<td>Monitoring of device complications:</td>
<td>Decrease in readmission rates related to central vascular access device complications.</td>
</tr>
<tr>
<td></td>
<td>Availability of, and access to, infusion therapy specialists.</td>
<td>■ Phlebitis;</td>
<td>Existence of policies related to vascular access.</td>
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<td></td>
<td>Structures to facilitate continuity of care between provider organizations.</td>
<td>■ Infiltration;</td>
<td>Insertion of recommended device.</td>
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<td></td>
<td>Structures to support nurses to attend educational sessions re. infusion therapy.</td>
<td>■ Line occlusion;</td>
<td></td>
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<tr>
<td>Nurse</td>
<td>Availability of educational opportunities re. infusion therapy practices within the organization.</td>
<td>■ Infection.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of nurses attending educational sessions re. vascular access.</td>
<td>Monitoring of total number of attempts to establish a peripheral IV site.</td>
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<tr>
<td></td>
<td>Evidence of a structured assessment that guides vascular access device selection.</td>
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<tr>
<td></td>
<td>Evidence of documentation in client record consistent with guideline recommendations regarding:</td>
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<td></td>
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<tr>
<td></td>
<td>■ Assessment;</td>
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<td>■ Care Plan;</td>
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<td>■ Client Education.</td>
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<td>Documentation of device complications:</td>
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<tr>
<td></td>
<td>■ Phlebitis;</td>
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<td>■ Infection.</td>
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<td></td>
<td>Documentation of total number of attempts to establish a peripheral IV site.</td>
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</table>
### Nursing Best Practice Guideline

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>PROCESS</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>Evidence of client/family involvement in decision-making related to device selection.</td>
<td>Documented client infection rates – site (local) and systemic.</td>
</tr>
<tr>
<td></td>
<td>Evidence that client/family education included:</td>
<td>Client satisfaction related to:</td>
</tr>
<tr>
<td></td>
<td>- Device options;</td>
<td>- Number of attempts for access;</td>
</tr>
<tr>
<td></td>
<td>- Implications for care and maintenance;</td>
<td>- Pain experienced during procedure;</td>
</tr>
<tr>
<td></td>
<td>- Complications;</td>
<td>- Number of complaints related to IV therapy.</td>
</tr>
<tr>
<td></td>
<td>- Resources for follow-up.</td>
<td>Percentage of clients who completed therapy successfully.</td>
</tr>
</tbody>
</table>

An evaluation focusing on reviewing existing evaluation measures, identifying gaps and developing new tools has been designed to support the monitoring of the implementation of guideline recommendations. These tools will be published on the RNAO website at [www.rnao.org/bestpractices](http://www.rnao.org/bestpractices) as they become available.
Implementation Tips

The Registered Nurses Association of Ontario, the guideline development panel and evaluation team have compiled a list of implementation tips to assist health care organizations or health care providers who are interested in implementing this guideline. A summary of these strategies follows:

- Have a dedicated person who will provide support, clinical expertise and leadership such as an advanced practice nurse or a clinical resource nurse. The individual should have good interpersonal, facilitation and project management skills.

- Establish a steering committee that is comprised of key stakeholders and members who are committed to leading the initiative. Keep a work plan to track activities, responsibilities and timelines.

- Provide educational sessions and ongoing support for implementation. The education sessions may consist of presentations, facilitator’s guide, handouts, and case studies. Binders, posters and pocket cards may be used as ongoing reminders of the training. Plan education sessions that are interactive, include problem solving, address issues of immediate concern and offer practice of new skills (Davies & Edwards, 2004).

- Provide organizational support such as having the structures in place to facilitate the implementation. For example, hiring replacement staff so participants will not be distracted by concerns about work, and having an organizational policy that reflects the value of best practices through policies and procedures. Develop new assessment and documentation tools (Davies & Edwards, 2004).

- Identify and support designated best practice champions on each unit to promote and support implementation. Celebrate milestones and achievements, acknowledging work well done (Davies & Edwards, 2004).

In addition to the tips mentioned above, the RNAO has developed implementation resources that are available on the website. A Toolkit for implementing guidelines can be helpful if used appropriately. A brief description of this Toolkit can be found in Appendix H.
Process for Update / Review of Guideline

The Registered Nurses Association of Ontario proposes to update the Best Practice Guidelines as follows:

1. Each nursing best practice guideline will be reviewed by a team of specialists (Review Team) in the topic area every three years following the last set of revisions.

2. During the three-year period between development and revision, RNAO Nursing Best Practice Guidelines project staff will regularly monitor for new systematic reviews and randomized controlled trials (RCTs) in the field.

3. Based on the results of the monitor, project staff will recommend an earlier revision period. Appropriate consultation with a team of members comprised of original panel members and other specialists in the field will help inform the decision to review and revise the guideline earlier than the three-year milestone.

4. Three months prior to the three-year review milestone, the project staff will commence the planning of the review process by:
   a. Inviting specialists in the field to participate in the Review team. The Review Team will be comprised of members from the original panel as well as other recommended specialists.
   b. Compiling feedback received, questions encountered during the dissemination phase as well as other comments and experiences of implementation sites.
   c. Compiling new clinical practice guidelines in the field, systematic reviews, meta-analysis papers, technical reviews and randomized controlled trial research, and other relevant literature.
   d. Developing detailed work plan with target dates and deliverables.

The revised guideline will undergo dissemination based on established structures and processes.
References


Assessment and Device Selection for Vascular Access


Bibliography


Assessment and Device Selection for Vascular Access


Appendix A: Search Strategy for Existing Evidence

STEP 1 – Database Search
A database search for existing infusion therapy guidelines was conducted by a university health sciences library. An initial search of the Medline, Embase and CINAHL databases for guidelines and articles published from January 1, 1995 to November 2002 was conducted using the following search terms: “intravenous therapy”, “infusion therapy”, “IV therapy”, “venous access”, “practice guideline(s)”, “clinical practice guideline(s)”, “standards”, “consensus statement(s)”, “consensus”, “evidence-based guidelines” and “best practice guidelines”

STEP 2 – Structured Website Search
One individual searched an established list of websites for content related to the topic area. This list of sites, reviewed and updated in October 2002, was compiled based on existing knowledge of evidence-based practice websites, known guideline developers, and recommendations from the literature. Presence or absence of guidelines was noted for each site searched as well as date searched. The websites at times did not house a guideline but directed to another website or source for guideline retrieval. Guidelines were either downloaded if full versions were available or were ordered by phone/email.

- Alberta Heritage Foundation for Medical Research - Health Technology Assessment: http://www.ahfmr.ab.ca//hta
- Alberta Medical Association - Clinical Practice Guidelines: http://www.albertadoctors.org
- American College of Chest Physicians: http://www.chestnet.org/guidelines
- American Medical Association: http://www.ama-assn.org
- British Medical Journal - Clinical Evidence: http://www.clinicalevidence.com
- Canadian Coordinating Office for Health Technology Assessment: http://www.ccohta.ca
- Canadian Task Force on Preventive Health Care: http://www.ctfphc.org
- Centers for Disease Control and Prevention: http://www.cdc.gov
- Centre for Evidence-Based Mental Health: http://cebmh.com
- Centre for Evidence-Based Pharmacotherapy: http://www.aston.ac.uk/lhs/teaching/pharmacy/cebp
- Centre for Health Evidence: http://www.cche.net/che/home.asp
- Centre for Health Services and Policy Research: http://www.chspr.ubc.ca
- Clinical Resource Efficiency Support Team (CREST): http://www.crestni.org.uk
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- Cochrane Database of Systematic Reviews: http://www.update-software.com/cochrane
- Database of Abstracts of Reviews of Effectiveness: http://nhscrd.york.ac.uk/darehp.htm
- Evidence-based On-Call: http://www.eboncall.org
- Institute for Clinical Systems Improvement: http://www.icsi.org/index.asp
- Institute of Child Health: http://www.ich.ucl.ac.uk/ich
- Medscape Women’s Health: http://www.medscape.com/womenshealthhome
- National Institute for Clinical Excellence: http://www.nice.org.uk
- Netting the Evidence: A ScHARR Introduction to Evidence-Based Practice on the Internet: http://www.shef.ac.uk/scharr/ir/netting
- NHS Centre for Reviews and Dissemination: http://www.york.ac.uk/inst/crd
- NHS Nursing & Midwifery Practice Development Unit: http://www.nmpdu.org
- Queen's University at Kingston: http://post.queensu.ca/~bhc/gim/cpgs.html
- Royal College of General Practitioners: http://www.rcgp.org.uk
- Royal College of Nursing: http://www.rcn.org.uk/index.php
- Royal College of Physicians: http://www.rcplondon.ac.uk
- Sarah Cole Hirsh Institute: http://fpb.cwr.edu/HirshInstitute
- Scottish Intercollegiate Guidelines Network: http://www.sign.ac.uk
- The Canadian Cochrane Network and Centre: http://cochrane.mcmaster.ca
- The Qualitative Report: http://www.nova.edu/ssss/QR
STEP 3 – Search Engine Web Search
A website search for existing intravenous therapy guidelines was conducted via the search engine “Google”, using the search terms identified above. One individual conducted this search, noting the search term results, the websites reviewed, date and a summary of the findings. The search results were further critiqued by a second individual who identified guidelines and literature not previously retrieved.

STEP 4 – Hand Search/Panel Contributions
Additionally, panel members were already in possession of a few of the identified guidelines. In some instances, a guideline was identified by panel members and not found through the previous search strategies. These were guidelines that were developed by local groups or specific professional associations.

STEP 5 – Core Screening Criteria
This above search method revealed nine guidelines, and numerous studies related to infusion therapy.

The final step in determining whether clinical practice guidelines would be critically appraised was to have two individuals screen the guidelines based on specific inclusion criteria. These criteria were determined by panel consensus:

- Guideline is in English;
- Guideline is dated no earlier than 1996;
- Guideline is strictly about the topic area;
Guideline is evidence-based, e.g., contains references, description of evidence, sources of evidence; and
Guideline is available and accessible for retrieval.

Results of the search strategy
The results of the search strategy and the decision to critically appraise identified guidelines are detailed below. Seven guidelines met the screening criteria and were critically appraised using the “Appraisal of Guidelines for Research and Evaluation” (AGREE, 2001) instrument.

<table>
<thead>
<tr>
<th>TITLE OF THE PRACTICE GUIDELINE RETRIEVED AND CRITICALLY APPRAISED</th>
</tr>
</thead>
</table>


### Appendix B: Glossary of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannula:</td>
<td>A hollow tube made of silastic, rubber, plastic, metal or other substance used for accessing the body (INS, 2000).</td>
</tr>
<tr>
<td>Central Vascular Access Device (CVAD):</td>
<td>Catheter inserted into a centrally located vein with the tip residing in the vena cava; permits intermittent or continuous infusion and/or access into the venous system (INS, 2000).</td>
</tr>
<tr>
<td>Delivery System:</td>
<td>A product that allows for the administration of intravenous solutions. The system can be integral or can have component parts, and includes all products used in the administration, from the solution container to the catheter (INS, 2000).</td>
</tr>
<tr>
<td>Extravasation:</td>
<td>Inadvertent infiltration of vesicant solution or medication into surrounding tissue; rated by a standard scale (INS, 2000).</td>
</tr>
<tr>
<td>Hypertonic Solution:</td>
<td>A solution of higher osmotic concentration than that of a reference solution or of an isotonic solution; having a concentration greater than the normal tonicity of plasma (INS, 2000). Hypertonic solutions have a concentration greater than 350 mOsm/L (CINA, 1999).</td>
</tr>
<tr>
<td>Hypodermoclysis:</td>
<td>The subcutaneous infusion of fluids (Sasson &amp; Shvartzman, 2001).</td>
</tr>
<tr>
<td>Hypotonic Solutions:</td>
<td>A solution of lower osmotic concentration than that of a reference solution or of an isotonic solution; having a concentration less than the normal tonicity of plasma (INS, 2000). Hypotonic solutions have a concentration less than 250 mOsm/L (CINA, 1999).</td>
</tr>
<tr>
<td>Implanted Port:</td>
<td>A catheter surgically placed into a vessel or body cavity and attached to a reservoir located under the skin (INS, 2000).</td>
</tr>
<tr>
<td>Infiltration:</td>
<td>Inadvertent administration of a non-vesicant solution or medication into surrounding tissue; rated by a standard scale (INS, 2000).</td>
</tr>
</tbody>
</table>
**Infusate:** Parenteral solution administered into the vascular or nonvascular systems (INS, 2000).

**Irritant:** An agent which can cause aching, tightness and phlebitis at the injection site or along the vein, with or without inflammatory reaction.

**Isotonic Solution:** Having the same osmotic concentration as the solution with which it is compared, i.e., plasma (INS, 2000). Isotonic (or iso-osmotic) solutions have an osmolality equivalent to plasma, 240 - 340 mOsm/L (CINA, 1999).

**Midline Catheter:** A peripheral catheter between 3 – 8 inches (7.5 – 20 cm) long; inserted within 1.5 inches (3.75 cm) above or below the antecubital fossa. The catheter tip ends in the peripheral vasculature below the axilla (Halderman, 2000).

**Non-vesicant:** An agent devoid of significant vesicant or irritant effects.

**Osmolality:** The characteristic of a solution determined by the concentration of the dissolved substance per unit of solvent; measured in milliosmoles/kilogram. This value can be calculated using sodium chloride equivalents or determined experimentally by osmometry (Stranz, 2002).

**Parenteral:** A substance administered by any route other than the alimentary canal, such as the intravenous, subcutaneous, or intramuscular route (INS, 2000).

**Percutaneous Non-tunneled Catheter:** A large-diameter catheter, often with multiple lumens, inserted percutaneously through the subclavian, jugular, or femoral vein, with the tip in the vena cava (Halderman, 2000).

**Peripheral Vascular Access Device (PVAD):** A peripheral catheter 3 inches (7.5 cm) or less in length, generally inserted in the upper extremity.

**Peripherally Inserted Central Catheter (PICC):** A soft, flexible central venous catheter inserted into a peripheral vein and advanced until the tip is positioned in the vena cava (INS, 2000).

**pH:** The degree of acidity or alkalinity of a substance (INS, 2000). This value denotes the number of hydrogen ions present in the solution.
**Phlebitis:** Inflammation of a vein; may be accompanied by pain, erythema, edema, streak formation, palpable cord; rated by a standard scale (INS, 2000).

**Thrombosis:** Formation, development, or existence of a blood clot within the vascular system (INS, 2000).

**Tunneled Catheter:** A vascular access device whose proximal end is tunneled subcutaneously from the insertion site and brought out through the skin at an exit site (INS, 2000).

**Vascular Access Device (VAD):** A device used to access the vascular system, which can terminate in the peripheral or central vasculature.

**Vesicant:** Agent capable of causing tissue necrosis when it escapes from the intended vascular pathway into surrounding tissue (INS, 2000).
Appendix C: Factors Associated with and Planning

- Material
  - type of access
    - device brand
    - device size
    - securing of device
  - long-term vs. short-term
    - MD preference
    - education (RN, MD)
    - local anesthetics or heat
  - teaching mission
  - knowledge of decision tree
  - fastest method for access
  - reason for access
  - what works/what does not

Vascular Access Assessment

Factors Included in IV Assessment

Staff
- time constraints
- available backup
- patient load
- experience level
- experience level
- "bad day"

Patient
- patient preference
- skin condition
- mental status
- diagnosis
- vascular limitations
- previous IV experience
- drug profile
- activity level
- patient status
- age
- stress, fear, anxiety

Nursing Best Practice Guideline
Appendix D: Assessment and Device Selection for Vascular Access


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Infusate criteria for use in peripheral infusions:
- Osmolality must be less than 500 mOsm/L.
- The pH must be between 5 and 9.
- The medication must not be a vesicant or irritant.

Catheter lumens:
- Consider the need for single or multi-lumen catheter to deliver the prescribed therapy.
- Select the least number of lumens to deliver the required therapy.
Considerations for subcutaneous infusions include:

- Hydration, intermittent infusions, and continuous infusions of isotonic fluids and a few selected medications.
- Assessing for this mode of therapy with some client populations.
### Appendix E: Overview of Vascular Access

<table>
<thead>
<tr>
<th>TYPE OF DEVICE</th>
<th>CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peripheral – Short</strong></td>
<td><strong>Peripheral catheters should be used for anticipated IV therapy not greater than 6 days, infusions which are iso-osmotic or near iso-osmotic and whose pH value is between 5 – 9. Central access is recommended for vesicant drugs.</strong></td>
</tr>
<tr>
<td><strong>Device Description:</strong></td>
<td></td>
</tr>
<tr>
<td>Catheter, less than 3 inches (7.5 cm) in length; over-the-needle catheter is most common. Inserted by percutaneous venipuncture, generally into a hand or arm vein (Halderman, 2000).</td>
<td></td>
</tr>
<tr>
<td><strong>Peripheral – Midline</strong></td>
<td><strong>Midline catheters should be considered for IV therapy where more than 3 IV catheters may be needed, infusions which are iso-osmotic or near iso-osmotic and whose pH value is between 5 – 9. Central access is recommended for vesicant drugs.</strong></td>
</tr>
<tr>
<td><strong>Device Description:</strong></td>
<td></td>
</tr>
<tr>
<td>Between 3 – 8 inches (7.5 – 20 cm) long; inserted within 1.5 inches (3.75 cm) above or below the antecubital fossa. Catheter tip ends in the peripheral vasculature below the axilla (Halderman, 2000).</td>
<td></td>
</tr>
</tbody>
</table>
# Access Devices

## DISCUSSION OF EVIDENCE

<table>
<thead>
<tr>
<th><strong>Gauge and Length of Device</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The vasculature shall accommodate the gauge and length (INS, 2000).</td>
<td></td>
</tr>
<tr>
<td>Select the smallest gauge and shortest length (Camp-Sorrell, 1996; CDC, 2002; INS, 2000; Markel Poole, 1999).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Length of Dwell</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Three days has been established as the maximum length of time to use peripheral intravascular lines. Health Canada retains 3 days as the upper limit for peripheral sites in all settings (Health Canada, 1997).</td>
<td></td>
</tr>
<tr>
<td>Peripheral veins are prone to phlebitis and subcutaneous perivenous infiltration, and the catheter should not stay in one site longer than 48 – 72 hours (Vanek, 2002a).</td>
<td></td>
</tr>
<tr>
<td>Rotate sites q72 – 96 hours to reduce risk for infection and phlebitis (CDC, 2002).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Length of Therapy</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel or plastic cannula may be left in place for up to 72 hours (Health Canada, 1997).</td>
<td></td>
</tr>
<tr>
<td>Use a midline catheter or PICC when the duration of therapy will likely exceed 6 days (CDC, 2002).</td>
<td></td>
</tr>
<tr>
<td>Devices used for short term use (Markel Poole, 1999); Short term therapy – contraindicated for therapy longer than approximately 5 days (Vanek, 2002a).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Length of Therapy</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use a midline catheter or PICC when the duration of IV therapy will likely exceed 6 days (CDC, 2002).</td>
<td></td>
</tr>
<tr>
<td>For therapy of more than 5 days, to preserve the integrity of the veins and increase client comfort (Camp-Sorrell, 1996).</td>
<td></td>
</tr>
<tr>
<td>Fluids and medications close to normal serum osmolality and pH to prevent vein wall irritation.</td>
<td></td>
</tr>
<tr>
<td>Not recommended for the infusion of parenteral nutrition solutions, vesicants or other irritant medication (Orr &amp; Ryder, 1993).</td>
<td></td>
</tr>
<tr>
<td>Medium term (Markel Poole, 1999); short term 3 days to 6-8 weeks (Vanek, 2002a); intermediate dwell (Lawson, 2003); mean anticipated length of therapy = 13 days (King, 1995).</td>
<td></td>
</tr>
</tbody>
</table>
### Central – Peripherally Inserted Central Catheter (PICC)

**Device Description:**
A single or double lumen central venous catheter inserted via a peripheral vein – the tip terminates in the superior vena cava (SVC) (Halderman, 2000).

**CONSIDERATIONS**
- PICCs are recommended for all infusion therapies. If anticipated therapy exceeds more than one year, a tunneled catheter or implanted port should be considered.
- May be inserted at the bedside or in radiology under fluoroscopy.
- Use of maximum sterile barrier during insertion (CDC, 2002; EPIC, 2001c).
- Low rate of infection.
- Upper arm contractures, injury or other vascular or musculoskeletal conditions may prevent successful insertion (Halderman, 2000).
- Radiographic confirmation of tip location is required prior to use.

### Central – Tunneled Central Venous Catheter

**Device Description:**
Single, double or triple lumen device, surgically tunneled through subcutaneous tissue to an exit site generally on the chest or abdominal wall. The tip rests in the vena cava. A cuff that lies in the subcutaneous tunnel, around which fibrous tissue grows, helps to secure the device (Halderman, 2000).

**CONSIDERATIONS**
- Requires surgical placement.
- Cuff secures catheter in place, and prevents bacteria from migrating into the bloodstream (Halderman, 2000).
- Use optimum aseptic technique, including a sterile gown, gloves, and a large sterile drape for the insertion of central venous catheters (CDC, 2002; EPIC, 2001c).
### Length of Therapy
- Duration of IV therapy will likely exceed 6 days – use for clients requiring frequent or continuous access.
- Several weeks or months (EPIC, 2001c; Winslow et al., 1995); medium term (Markel Poole, 1999).
- Intermediate to long term access in general, or the need for central vascular access (Vanek, 2002a).
- Specific diagnoses that are often associated with prolonged needs for reliable access (Bowen Santolucito, 2001).
- IV access greater than 10 – 14 days (Ryder, 1995).
- For therapy lasting more than 6 days to preserve the integrity of veins and increase comfort (CDC, 2002; Camp-Sorrell, 1996).

### Tip Position
- Tip dwelling in the superior vena cava (INS, 2000).
- If the catheter tip is located outside of the vena cava, the catheter is no longer considered a central catheter and should be removed as the tip location may no longer be appropriate for the prescribed therapy (INS, 2000).

### Other considerations
- Client selection criteria – infusion of vesicant or irritating drugs; hyperosmolar solutions, client preference, client location (home setting) (Camp-Sorrell, 1996);
- Consider the use of PICCs as an alternative to subclavian or jugular vein catheterization (EPIC, 2001c).
### TYPE OF DEVICE

<table>
<thead>
<tr>
<th>TYPE OF DEVICE</th>
<th>CONSIDERATIONS</th>
</tr>
</thead>
</table>
| Central – Percutaneous Non-Tunneled Catheter | **Device Description:** A catheter, often with multiple lumens, inserted percutaneously through the subclavian, jugular, or femoral vein (Halderman, 2000).  

**Recommended for short-term access to the central circulation in critical situations, or when peripheral access is inadequate or inappropriate.**

Not generally recommended for home care, but client circumstances and care requirements should be considered on an individual basis.

- Use optimum aseptic technique, including a sterile gown, gloves, and a large sterile drape for the insertion of central venous catheters (CDC, 2002; EPIC, 2001c).

| Central – Implanted Port | Requires a minor surgical procedure for placement and removal.  
When not in use, requires less maintenance than other VADs.  
May preserve a client's body image.  
Medication delivery requires injection through skin (Halderman, 2000).  
Use optimum aseptic technique, including a sterile gown, gloves, and a large sterile drape for the insertion of central venous catheters (CDC, 2002; EPIC, 2001c). |

**Device Description:** An implanted reservoir generally placed in the chest or arm, attached to a catheter with tip position in the central vasculature. Infusate is delivered to the reservoir via an external non-coring needle and extension tubing (Halderman, 2000).
DISCUSSION OF EVIDENCE

Length of Therapy
- Short-term continuous therapy (5 – 10 days) (Camp-Sorrell, 1996).

Tip Position
- If the catheter tip is located outside the vena cava, the catheter is no longer considered a central catheter and should be removed as the tip location may no longer be appropriate for the prescribed therapy (INS, 2000).
- Tip dwelling in the superior vena cava (INS, 2000).

Length of Therapy
- Use smallest gauge needle and appropriate length to access – change every 7 days (INS, 2000). Needles should be changed frequently enough to prevent skin breakdown. This should be at least every 7 days (Health Canada, 1997).
- Use a tunneled catheter or an implanted vascular access device for clients in whom long-term (30 days) vascular access is anticipated (EPIC, 2001c).
- Long-term, intermittent therapy (CDC, 2002).
- Cuffed tunneled catheters or totally implanted devices as appropriate for the intended purpose should be used for clients requiring long-term vascular access (Health Canada, 1997).
### Assessment and Device Selection for Vascular Access

#### Subcutaneous Infusions (Hypodermoclysis)
- a) intermittent
- b) continuous

**Device Description:**
A fine gauge device developed specifically for the s/c route, placed in the subcutaneous tissue of the upper arm, chest wall, upper back, abdomen, thigh etc. as an alternative to vascular access, where appropriate.

<table>
<thead>
<tr>
<th>TYPE OF DEVICE</th>
<th>CONSIDERATIONS</th>
<th>DISCUSSION OF EVIDENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subcutaneous Infusions (Hypodermoclysis)</td>
<td>Can be used for continuous or intermittent infusions of isotonic fluids and selected medications (e.g., s/c opioid infusion) (INS, 2000).</td>
<td>Length of Therapy</td>
</tr>
<tr>
<td></td>
<td>Hypodermocysis fluid administration is appropriate as a short-term measure to restore or to maintain hydration in clients who are mildly dehydrated or who are at risk of dehydration.</td>
<td>Rotate sites every 3-7 days, as necessary. Smallest, shortest gauge (INS, 2000).</td>
</tr>
<tr>
<td></td>
<td>Subcutaneous infusions are as effective as intravenous infusions in restoring and maintaining hydration and are less likely than intravenous infusions to produce fluid overload (O’Keeffe &amp; Geoghegan, 2000).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In using as an alternative to infusion therapy, lower risk of complications.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F: Prescribed Therapy – Characteristics of the Infusate

Nurses may wish to consult a clinical pharmacist in their organization, if available, to obtain further information regarding the characteristics of prescribed therapy, and potential impact on client outcomes.

pH
The pH scale is a measurement scale used to quantify the concentration of hydrogen ions (H⁺) in a solution. The scale runs from 0 to 14, with 0 to 6 being acidic, 7 neutral and 8 – 14 being alkaline (basic). What is critical to understand is that a small change in pH results in a large change in H⁺ ion concentration. The following table provides a comparison of pH values as an illustration of this concept (Stranz, 2002).

**pH - Blood pH = 7.35 – 7.45**

<table>
<thead>
<tr>
<th>pH</th>
<th>Example</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid</td>
<td>1</td>
<td>Stomach acid</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Lemon juice</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Vinegar</td>
</tr>
<tr>
<td>Neutral</td>
<td>7</td>
<td>Tap water</td>
</tr>
<tr>
<td>Base</td>
<td>11</td>
<td>Ammonia</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Mineral lime Ca(OH)²</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Draino®</td>
</tr>
</tbody>
</table>

Osmolality

The concentration of particles dissolved in each solution is referred to as its osmolality. In human plasma, the concentration of dissolved particles is about $290 \times 10^3$ M, so its osmolality is $290 \text{ mOsm/L}$ (Stranz, 2002).

Separate solutions containing the same amount of particles are called iso-osmotic. The term isotonic is used interchangeably with the term iso-osmotic. Normal saline is iso-osmotic/isotonic with blood and the venous endothelium. Solutions containing fewer particles (lower osmolality) than normal saline are called hypotonic. Administration of hypotonic solutions results in fluid moving into the more concentrated venous endothelial cells and blood cells. Solutions containing more particles (higher osmolality) are called hypertonic. When hypertonic solutions are administered, they draw fluid from the endothelium and blood cells, resulting in the cells shrinking and being more susceptible to damage (Stranz, 2002).

Vesicant Drugs

The following list includes some commonly administered vesicant drugs capable of causing injury when the drug escapes from the intended vascular pathway into surrounding tissue (INS, 2000). It is not intended to be a comprehensive list, but rather an example for consideration.

- Alteplase
- Calcium Chloride
- Calcium Gluconate
- Dacarbazine
- Daunorubicin
- Dextrose 10%
- Diazepam
- Dopamine
- Lorazepam
- Metronidazole
- Midazolam
- Nitroprusside
- Pentobarbital
- Phenytin (Dilantin)
- Potassium Chloride 40meq
- Promethazine (Phenergan)
- Rifampin
- Sodium Bicarbonate
- Vancomycin
- Vincristine
Diagnostic Contrast Media

All ionic contrast media should be considered potential vesicants, especially Diatrizoate products; those with an asterix include a statement in the Compendium of Pharmaceuticals and Specialities (CPA, 2004) under adverse reactions that extravasation may cause necrosis; those with no asterix have no monograph listed in CPS. Ionic Contrast Media include:

- Diatrizoate Meglumine (Hypaque-M 18%; Hypaque-M 30%; Hypaque-M 60%; Reno-60; Reno-Dip)
- Diatrizoate Meglumine/Diatrizoate Sodium (Hypaque-M 76%; MD-60; MD-76; Renocal-76)
- Iothalamate Meglumine* (Conray 30; Conray 43; Conray 60)
- Iothalamate Sodium* (Conray 325; Conray 400)
- Iothalamate Meglumine/Iothalmate Sodium (Vascoray)
- Ioxaglate Meglumine/Ioxaglate Sodium* (Hexabrix 200; Hexabrix 320)

Non-ionic contrast media include (those with an asterix include a statement in the CPS under adverse reactions that extravasation may cause necrosis; those with a double asterix - not stated in CPS; others have no monograph listed in the CPS):

- Gadodiamide** (Omniscan)
- Gadoteridol (Prohance)
- Gadoversetamide** (Opimark)
- Iodixanol (Visipaque)
- Iohexol* (Omnipaque 180; Omnipaque 240; Omnipaque 300; Omnipaque 350)
- Iopamidol (Isovue 200; Isovue 300; Isovue 370)
- Iopromide* (Ultravist 240; Ultravist 300; Ultravist 370)
- Ioversol* (Optiray 160; Optiray 240; Optiray 300; Optiray 320; Opitray 350)

References:


Appendix G: Educational Resources

The following resources for nurses are intended to assist in supporting vascular access education. These are sample resources only, and are not intended to be a comprehensive listing.

American Nurses Association – Safe Needles Save Lives
http://www.needlestick.org

American Society for Parenteral and Enteral Nutrition (ASPEN)
http://www.nutritioncare.org

Association for Vascular Access (formerly NAVAN)
http://www.avainfo.org/cgi-avainfo/pages/NVPcat.cgi

Canadian Association of Nurses in Oncology
http://www.cos.ca/cano

Canadian Intravenous Nurses Association
http://www.cina.ca

Center for Disease Control and Prevention Guidelines and Recommendations – Prevention of Health Care Related Infections

DOQI: Dialysis Outcome Quality Initiatives
http://www.kidney.org/professionals/kdogi/index.cfm

K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification and Stratification

EPIC
Developing National Evidence-based Guidelines for Preventing Health Care Associated Infections
http://www.epic.tvu.ac.uk

Health Canada
Infection Control Guidelines: Preventing Infections Associated with Indwelling Intravascular Access Devices

Infusion Nurses Society
http://www.ins1.org

Institute for Safe Medication Practice (ISMP)
http://www.ismp.org

INSERT: Intravenous Access Network
http://www.iveam.com

Journal of Vascular and Interventional Radiology
http://www.jvir.org

League of Intravenous Therapy Education – LITE
http://www.lite.org

Medical Device and Diagnostic Industry
http://www.devicelink.com/mddi

National Alliance for the Primary Prevention of Sharps Injuries
http://www.napssi.org

National League for Nursing
http://www.nln.org

National Patient Safety Foundation
http://www.npsf.org

Oncology Nursing Society
http://www.ons.org

The OLEY Foundation
http://c4isr.comoley

U.S. Food and Drug Administration – Center for Devices and Radiological Health
http://www.fda.gov/cdrh/index.html

* Central Venous Catheter Complications Video
http://www.fda.gov/cdrh/ohip/dupsa/cvcvideo.html
Companies manufacturing infusion therapy products often have educational resource material specific to product use. Many also have educational programs about infusion therapy in general, and assessment and device selection specifically. Consult your vendor company representative to determine educational resources that may be appropriate for your specific needs and clinical setting.

**Appendix H: Description of the Toolkit**

Best practice guidelines can only be successfully implemented if there are: adequate planning, resources, organizational and administrative support as well as appropriate facilitation. In this light, RNAO, through a panel of nurses, researchers and administrators has developed the *Toolkit: Implementation of Clinical Practice Guidelines* based on available evidence, theoretical perspectives and consensus. The *Toolkit* is recommended for guiding the implementation of any clinical practice guideline in a health care organization.

The *Toolkit* provides step-by-step directions to individuals and groups involved in planning, coordinating, and facilitating the guideline implementation. Specifically, the *Toolkit* addresses the following key steps in implementing a guideline:

1. Identifying a well-developed, evidence-based clinical practice guideline
2. Identification, assessment and engagement of stakeholders
3. Assessment of environmental readiness for guideline implementation
4. Identifying and planning evidence-based implementation strategies
5. Planning and implementing evaluation
6. Identifying and securing required resources for implementation

Implementing guidelines in practice that result in successful practice changes and positive clinical impact is a complex undertaking. The *Toolkit* is one key resource for managing this process.

The *Toolkit* is available through the Registered Nurses Association of Ontario. The document is available in a bound format for a nominal fee, and is also available free of charge off the RNAO website. For more information, an order form or to download the *Toolkit*, please visit the RNAO website at www.rnao.org/bestpractices
Supplement Integration

This supplement to the nursing best practice guideline *Assessment and Device Selection for Vascular Access* is the result of a scheduled review of the guideline. As part of its commitment to ensure consistency with the best available evidence, the Registered Nurses’ Association of Ontario (RNAO) has established a monitoring and review process which involves a full review of each guideline every 3 years.

As part of the health care team, nurses caring for clients requiring vascular access have an important and continued role across the continuum of care. Please note that to ensure consistency with the scope of the original guideline, this review has not addressed nurses working in specialty areas such as pediatrics, gerontology, oncology and dialysis, or the care of clients requiring infusion therapy through the following devices: arterial lines, hemodialysis catheters, pulmonary artery lines, pheresis lines, epidural catheters, pressure monitoring devices, umbilical vein, femoral catheters, and/or intraosseous lines. Nurses working in these areas or with these devices will require further practice direction from guidelines in their areas of practice.

Review Process

A panel of specialists was assembled for this review, comprised of members from the original development panels of the *Assessment and Device Selection for Vascular Access and Care and Maintenance to Reduce Vascular Access Complications* guidelines, as well as other recommended individuals with particular expertise in this practice area. A structured evidence review based on the scope of the original guideline was conducted to capture the relevant literature. Initial findings regarding the impact of the current evidence base on the original guideline were summarized for the review panel. The review panel members were given a mandate to review the original guideline in light of the new evidence, specifically to ensure the validity, appropriateness and safety of the guideline recommendations as published in 2004. In December 2007, the panel met to achieve consensus on the impact of this new evidence on the existing recommendations.
Review of Existing Guidelines

One individual searched an established list of websites for published guidelines and other relevant content. This list was compiled based on existing knowledge of evidence-based practice websites and recommendations from the literature. Six international guidelines were critically appraised using the Appraisal of Guidelines for Research and Evaluation Instrument (AGREE, 2001). From this appraisal, two guidelines were identified to inform the review process and were circulated to all panel members:


Literature Review

Concurrent with the review of existing guidelines, a search for recent literature relevant to the scope of the guideline was conducted with guidance from the Review Chair. The search of electronic databases, including CINAHL, Medline and EMBASE, was conducted by a health sciences librarian. A Master’s prepared nurse completed the inclusion/exclusion review, quality appraisal and data extraction of the retrieved studies, and the summary of the literature findings. The comprehensive data tables and reference lists were provided to all panel members. A summary of the evidence review is provided in the Review Process Flow Chart.

Panel Review

After a review of the current evidence, no substantive changes were made to the recommendations. It was noted by the panel (particularly in regards to Recommendation 2.0) that the reference from the Intravenous Nurses Society (2000) cited in the original document has been updated, and is no longer applicable to the original discussion of evidence. The updated INS document (2006) has been reviewed by the panel, and is cited as a reference to support this guideline. Additional resources to support implementation and evaluation, such as the RNAO vascular access e-learning course and chart audit tool, are available on the RNAO website at www.RNAO.org/bestpractices.

Review Findings

A review of the most recent studies and relevant guidelines published since the development of the original guideline does not support changes to the recommendations, but rather suggests stronger evidence for our approach to assessment and device selection for vascular access. The panel would like to emphasize the need for further research in this area in the future.
References/ Bibliography:


For implementation resources developed to support the uptake of this guideline, please visit the RNAO website at www.rnao.org/bestpractices.
Nursing Best Practice Guideline
Assessment and Device Selection for Vascular Access

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