Alberta Health Services

PROCEDURE

TITLE
NEONATAL PARENTERAL NUTRITION ADMINISTRATION AND MONITORING

SCOPE
Provincial: Acute Care

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NOTE: The first appearance of terms in bold in the body of this document (except titles) are defined terms – please refer to the Definitions section.

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OBJECTIVES

- To provide a standardized process for the safe storage, administration, and monitoring of **parenteral nutrition (PN)** to reduce the risk of infection and complications for neonatal **patients** in Acute Care within **Alberta Health Services (AHS) settings**.

APPLICABILITY

Compliance with this document is required by all Alberta Health Services employees, members of the medical and midwifery staffs, students, volunteers, and other persons acting on behalf of Alberta Health Services (including contracted service providers as necessary).

ELEMENTS

1. Points of Emphasis

1.1 Parenteral nutrition (PN) is a **high-alert medication**. An **independent double-check** (IDC) shall be performed as per the AHS *Independent Double-Check* Guideline.

1.2 Di-ethylhexyl-phthalate (DEHP)-free equipment is required for administration of all PN.

1.3 Trace all infusion lines from patient to point of origin and label all lines as per the AHS *Invasive Infusion Line and Tubing Verification* Policy.

1.4 **Hand hygiene** shall be followed as per the AHS *Hand Hygiene* Policy and Procedure.

1.5 Minimize the use of add-on devices for administration sets as each device is a potential source of contamination, misuse, and disconnection; use an administration set that already integrates the devices (e.g., filters) into the set.

1.6 Maintain PN infusion as a closed system by avoiding disconnections for medication administration, diagnostic tests, or patient transfer.

2. Prior to Administration

2.1 Storage of PN:

a) Amino acid dextrose solution at room temperature should be administered immediately upon delivery from the pharmacy and protected from light exposure. If not administered immediately, store in the medication refrigerator.

(i) When ready to administer, the refrigerated amino acid dextrose solution should be warmed to room temperature for at least 30 to 60 minutes prior to priming and administering.

b) Lipid emulsions should be stored at room temperature and protected from light exposure.

2.2 **Health care professionals** shall verify all components on the PN bag/container labels against the PN order in accordance with the AHS *Independent Double-Check* Guideline.

2.3 Inspect the formulation for particulate matter, crystallization, layering discolouration, holes, or leaks in the bag/container. If any of these are present or there are any other concerns, do not use and contact the pharmacy.

2.4 Gather the following equipment on a clean work surface:

a) **Safer Medication Administration (through) Technology (SMART) pumps** for all PN infusions;

b) light-protected amino acid dextrose solution and lipid emulsion;

c) light protective covering or tubing is recommended for entire PN (amino acid dextrose solution and/or lipid emulsion) administration set up (tubing, syringe, filter, and extension set) if possible;

d) DEHP-free amino acid dextrose solution administration set with 0.22 or 0.2 micron filter (in-line recommended);

e) DEHP-free lipid emulsion administration set with 1.2 micron filter (in-line recommended);

f) DEHP-free extension set (e.g., a trifuse or bifuse extension set);

(i) A needleless connector should be used to maintain a closed system.

g) DEHP-free syringe and tubing for an **alternate closed system** if syringe pump is required;

h) IV tubing labels;

i) AHS-approved antiseptic agent; and

j) gloves and other personal protective equipment as required, at **point of care risk assessment** as per the AHS *Glove Use and Selection: Infection Prevention & Control (IPC) Best Practice Guideline*.

3. Administration Set Up

3.1 Do not prime administration sets until just prior to administration.

3.2 Perform hand hygiene as applicable throughout the procedure.

3.3 Maintain **asepsis** with **no touch technique** as appropriate.

3.4 Verify patient identity using two (2) patient identifiers as per the AHS *Patient Identification* Policy.

3.5 Verify appropriate vascular access prior to initiating PN infusion in alignment with standard infusion therapy practice.

a) PN may be administered via a central or peripheral line as per **authorized prescriber**'s order. If central access is no longer available, notify authorized prescriber for next steps. For more information, see the AHS *Provincial Neonatal Nutrition Support Manual*.

3.6 Ensure patency of vascular access device (VAD) catheter.

3.7 Prime and remove air in tubing and filter according to directions on package, as available.

3.8 Scrub needleless connector or injection port vigorously on top and sides for a minimum of 15 seconds using AHS-approved antiseptic solution and allow to air dry (do not blow on or pat dry). After disinfection of needleless connectors or injection ports, do not touch these surfaces, and ensure they do not come into contact with unsterile surfaces (e.g., hands, patient's skin, clothing, linens).

3.9 Trace tubing from the patient to the point of origin (bag, pump, and device) and label all lines as per the AHS *Invasive Infusion Line and Tubing Verification* Policy.

3.10 Ensure all connections are secure.

3.11 Perform independent double-check of patient verification, pump setting, and line tracing prior to initiation at bedside.

4. Hang Time and Tubing Changes

4.1 Amino acid dextrose solution set up:

a) **Hang/infusion time** of 24 hours maximum from priming.

b) Administration set, filter, and extension set (e.g., multi-port) to be changed up to a maximum of 96 hours as per local facility process.

(i) All tubing, including the extension set, requires needleless connectors.

4.2 Lipid emulsion set up:

a) Hang/infusion time of 24 hours maximum from priming.

(i) If using a syringe pump with an alternate closed system and a syringe change is needed during the 24 hours, use a new sterile syringe. A needleless connector shall be used and disinfected as per section 3.8 above.

b) Change administration sets and filters every 24 hours.

5. Infusion Practices During Administration

5.1 A dedicated venous access line and/or lumen for PN infusion should be used. When possible, the PN line and/or lumen should not be used for:

a) administration of medications (refer to the AHS *Provincial Parenteral Monographs* and/or contact the Pharmacist for special circumstances);

b) administration of blood products or components; and/or

c) blood sampling.

5.2 All PN shall be administered directly from the PN bags/containers compounded by an AHS pharmacy or the original manufacturer's container. Do not decant directly into syringes; use an alternate closed system when a syringe is required.

5.3 No additions shall be made to PN outside of an AHS pharmacy that provides the PN.

5.4 When changing administration sets, coordinate with changing of the PN bag/containers at the same time, whenever possible.

5.5 If unable to use amino acid dextrose solution and a replacement bag is not available, hypoglycemia is a major risk. If enteral feeds are not adequate, an

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appropriate dextrose solution is required immediately until the replacement is available.

a) An authorized prescriber's order is required for a dextrose or standard solution replacement. Refer to the AHS *Provincial Neonatal Nutrition Support Manual*.

6. Monitoring

6.1 Monitor and assess the patient for the following, as per authorized prescriber's orders, which may include but are not limited to:

a) vital signs;

b) weight;

c) intake and output/fluid status;

d) blood glucose and other applicable laboratory values;

e) change in patient status;

f) potential complications (see Appendix A of this document); and

g) integrity of PN and/or delivery system (tubing/filters/infusion pump).

For more information see the AHS *Provincial Neonatal Nutrition Support Manual*.

6.2 Vascular access device (VAD), site, and administration set up shall be assessed in alignment with standard infusion therapy practice.

6.3 PN and administration tubing shall be changed immediately if contamination is suspected.

7. Titrating and Discontinuing

7.1 A titrating period may be required to gradually decrease the volume of PN given to the patient as the patient increases oral/enteral consumption.

a) A titration order is required from an authorized prescriber to make on-going rate adjustments based on total fluid intake.

b) Abrupt discontinuation of PN without adequate nutritional support is not recommended in order to prevent hypoglycemia.

8. Patient Education

8.1 The health care professional administering the PN shall ensure the family receives and/or is aware of the following information:

a) rationale for the PN;

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b) signs and symptoms that indicate a therapeutic response, potential complications, or an adverse reaction;

c) importance of hand hygiene and keeping the vascular site clean and dry in order to reduce the risk of infection;

d) procedures to be followed for the proper administration of PN; and

e) explanation and rationale for all related procedures, such as catheter care and laboratory testing.

9. Documentation

9.1 Documentation of PN in the patient's health record shall include but is not limited to:

a) patency of the vascular access device (VAD);

b) initiation, titration, and discontinuation times of infusion;

c) infusion rate and any rate changes;

d) route of administration;

e) results of blood glucose monitoring (as appropriate);

f) patient's response to therapy;

g) patient/family education and any resources provided; and

h) signatures of both health care professionals that performed the independent double-check of PN.

DEFINITIONS

Alberta Health Services (AHS) settings means any environment where treatment/procedures and other health services are delivered by, on behalf of or in conjunction with, Alberta Health Services.

Alternate closed system means the PN (including lipid emulsion) provided in the original manufacturer's or AHS pharmacy bag/container is connected to an administration set. Connected as a closed system are tubing and a syringe that are used to facilitate the syringe to 'pull' the lipid emulsion into it, then infuse it via syringe pump to the patient. A one-way valve is required on this tubing to allow PN to go from the bag to the syringe or to the patient from the syringe so that there is no backflow.

Amino acid dextrose solution means a complex formulation of dextrose, amino acids, electrolytes, minerals, vitamins and trace elements. For neonates, amino acid dextrose solution can be standardized as 'Neonatal Starter PN solution' which is only to be used for the first 24 hours of life. It is started for infants when customized PN is not available immediately.

Asepsis means the process for keeping away disease producing micro-organisms. It is implemented to protect the patient by minimizing contamination to reduce the risk of infection.

Authorized prescriber means a health care professional who is permitted by Federal and Provincial legislation, their regulatory college, Alberta Health Services, and practice setting (where applicable) to prescribe medications.

Hand hygiene means practices which remove micro-organisms, with or without soil, from the hands (refers to the application of alcohol-based hand rub or the use of plain/antimicrobial soap, and water hand washing).

Hang/infusion time means the period of time beginning with the flow of a fluid to the patient through an administration set and catheter and ending with the completion of the infusion.

Health care professional means an individual who is a member of a regulated health discipline, as defined by the *Health Disciplines Act* (Alberta) or the *Health Professions Act* (Alberta), and who practices within scope and role.

High-alert medication(s) means medications that bear a heightened risk of causing significant patient harm when used in error.

Independent double-check means a verification process whereby a second health care professional conducts a verification of another health care professional's completed task. The most critical aspect is to maximize the independence of the double-check by ensuring that the first health care professional does not communicate what they expect the second health care professional to see, which would create bias and reduce the visibility of an error.

Lipid emulsion means a mixture of one (1) or more fats for intravenous use. Lipid emulsions are available in different types and volumes.

No touch technique means the overriding basic principle that the key sites (i.e., infusion tubing spike, infusion site, wound), must not come into contact with any item (hand, equipment, solution) that is not sterile.

Sterile gloves are not always required for standard no touch technique. Each procedure must be assessed for risk of contamination. Whether sterile or non-sterile gloves are worn depends on if you can avoid touching the sterile parts of equipment which will come into contact with the susceptible areas (i.e., tubing spike, infusion cannula, site, wound, etc.). If you can carry out the procedure without touching the key part with your hands, non-sterile clean gloves may be worn.

Parenteral nutrition (PN) means an intravenous provision of nutritional needs for a patient who is unable to take appropriate amounts of nutrition enterally; typical components include carbohydrates, proteins, and/or lipids/fats, as well as additives such as electrolytes, vitamins, and trace elements.

Patient means all persons who receive or have requested health care or services from AHS and its health care providers and also means, where applicable:

a) A co-decision-maker with the person; or
b) An alternate decision-maker on behalf of the person.

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Point of care risk assessment (PCRA) means the health care worker evaluation of the likelihood of exposure to an infectious agent, for a specific interaction with a specific patient in a specific environment. The health care worker makes decisions such as patient room placement and choice of personal protective equipment based on the PCRA.

Safer medication administration (through) technology (SMART) pumps means infusion pumps with dose error reduction software (DERS). DERS means pre-determined programming for compatible pumps with digital memory, including minimum and maximum doses and minimum and maximum rates of administration, for given standard concentrations of solution.

REFERENCES

- Appendix A: *Potential Complications of Parenteral Nutrition*
- Alberta Health Services Governance Documents:
  - *Adult Parenteral Nutrition Administration and Monitoring* Procedure (#HCS-218-01)
  - *Hand Hygiene* Policy and Procedure (#PS-02)
  - *Independent Double-Check* Guideline (#PS-60-01)
  - *Invasive Infusion Line and Tubing Verification* Policy (#PS-15)
  - *Management of High Alert Medications* Policy (#PS-46)
  - *Parenteral Nutrition Administration and Monitoring* Policy (#HCS-218)
  - *Parenteral Nutrition Management* Policy (#HCS-217)
  - *Patient Identification* Policy (#PS-06)
  - *Pediatric Parenteral Nutrition Administration and Monitoring* Procedure (#HCS-218-03)
- Alberta Health Services Resources:
  - *Glove Use and Selection: Infection Prevention & Control (IPC) Best Practice Guideline*
  - *Provincial Parenteral Monographs*
  - *Provincial Neonatal Nutrition Support Manual*
- Non-Alberta Health Services Documents:
  - *Infusion Nursing Standards of Practice, 2016* (Infusion Nurses Society)
  - *Medication Guidelines, 2015* (College and Association of Registered Nurses of Alberta [CARNA])
  - *Parenteral Nutrition: Administering -- an Overview, 2016* (CINAHL Nursing Guide)
  - *Parenteral Nutrition: Administering via Central Venous Access, 2016* (CINAHL Nursing Guide)
  - *Parenteral Nutrition Safety Consensus Recommendations, 2014* (American Society for Parenteral and Enteral Nutrition [ASPEN])

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APPENDIX A

Potential Complications* of Parenteral Nutrition

Complication	Signs and Symptoms
Infection	• Fever • Inflammation, redness or drainage at catheter insertion site • Chills
Fluid Volume Excess	• Sudden weight gain • Edema • Dyspnea • Pulmonary Congestion • Tachycardia
Electrolyte Imbalances (Ca++, K+, Na+, Mg++, PO4)	• Hypo/Hypercalcemia • Hypo/Hyperkalemia • Hypo/Hypernatremia • Hypo/Hypermagnesemia • Hypo/Hyperphosphatemia
Hyperglycemia	• Dehydration • Elevated serum osmolarity • Seizures • Coma • Somnolence
Hypoglycemia	• Weak • Shaky • Cool • Clammy
Hepatic Dysfunction	• Review results of PN blood work for abnormal lab results.
Allergic/Adverse Reactions	• Fever, chills, nausea/vomiting, hives, back pain, headache, dyspnea, chest pain
Fat/Lipid Overload	• Change in temperature, vital signs, breathing or neurological status
Extravasation	• Redness, burning, stinging sensation, blistering or necrosis at the catheter insertion site • Fever, chills

*If the patient exhibits any of the above complications, notify the authorized prescriber and follow the applicable Zone/site/unit protocol or process.

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