PARENTERAL NUTRITION: RECENT GUIDELINE UPDATES AND EXPERIENCES IN CREATING AN INPATIENT DOSING SERVICE

OBJECTIVES

- Identify and discuss changes to the recent ASPEN guidelines
  - Prescribing and communicating the Parenteral Nutrition Order
  - Order review and verification process
  - Administration
- Who should receive Parenteral Nutrition? Inclusion and Exclusion Criteria
- Identify adverse events associated with Parenteral Nutrition
- Discuss creation of dosing service and the interdisciplinary team

ABBREVIATIONS

- American Society for Parenteral and Enteral Nutrition (ASPEN)
- Institution for Safe Medication Practices (ISMP)
- Parenteral Nutrition (PN)

SELF-ASSESSMENT QUESTION

Which members of the interdisciplinary team should receive education regarding total parenteral nutrition?
A. Prescribers (Physicians and physician extenders)
B. Pharmacists
C. Dietitians
D. Nurses
E. All of the above
F. None of the above

SELF-ASSESSMENT SOLUTIONS

- How frequently should education be provided and competency assessed?
  A. No education is needed. All disciplines receive enough education during training and competency assessment is not required.
  B. Every 5 years
  C. Every 1 year
  D. Every 6 months
When a pharmacy receives an order for parenteral nutrition, which is the preferred method of receiving the order?
A. Telephone order from prescriber
B. Handwritten order on a blank order form
C. CPOE order entry from prescriber
D. Verbal order from nurse stating what the physician wanted changed

Which of the following measurements should components of parenteral nutrition be ordered in?
A. Macronutrients as % and electrolytes as mEq, mmol, mg, mcg/L
B. Macronutrients as % and electrolytes as mEq, mmol, mg, mcg/mL
C. Macronutrients as grams/L and electrolytes as mEq, mmol, mg, mcg/L
D. Macronutrients as grams/day and electrolytes as mEq, mmol, mg, mcg/day
E. Anyway the physician wants to prescribe the components

GUIDELINE UPDATES: PRESCRIBING

Critical First Step
Prescribers should have a thorough knowledge of the following:
- Protein and energy requirements
- Macronutrients
- Micronutrients
- Fluid homeostasis
- Acid-base balance
- Appropriate indications for PN
- Basics in sterility and infection control
- Vascular access devices and associated complications

Standardized process for PN management
- Should be developed by clinicians with expertise in nutrition
  - From multiple disciplines
- Development of PN education
  - Competency assessed annually
- Clinicians who prescribe PN
  - Written policy
  - Credentials
  - Training

Indication
- Evaluate, clearly define, and accurately document the patient’s medical problems and indications for PN
  - Appropriate indication based on published guidelines
  - Confirmation of appropriate IV access prior to prescribing of PN therapy
  - Indication for PN and IV access included in the PN order
**PREScribing**

- Specify and document therapeutic goals of PN therapy
  - Energy and protein goals
  - Parameters and frequency of monitoring
  - Establish PN goals

**PREScribing**

- Standardization of PN ordering format and review process
  - Applicable to all patients within the health system
  - Handwritten orders should be avoided
  - Verbal or telephone orders should be avoided
  - Preferred to use computerized prescriber order entry (CPOE) technology
  - If CPOE not available, PN should be prescribed with standardized order template

**PREScribing**

- CPOE and PN order templates shall include the following:
  - Patient Information
    - Patient identifiers
    - Allergies and reactions
    - Height and dosing weight
    - Diagnosis/indication for PN
    - Vascular access device/location
    - Administration date/time

**PREScribing**

- CPOE and PN order templates shall include the following:
  - PN Ingredients (should match PN label)
    - Amino Acids
    - Dextrose
    - IVF
    - Sodium phosphate
    - Sodium chloride
    - Sodium acetate
    - Potassium phosphate
    - Potassium chloride
    - Potassium acetate
    - Magnesium sulfate or magnesium chloride
    - Calcium gluconate
    - Multivitamins
    - Trace elements
    - Additives as clinically appropriate and compatible

**PREScribing**

- CPOE and PN order templates shall include the following:
  - PN instructions
    - Total volume
    - Infusion rate
    - Start and stop times
    - Cycle information
    - Prescriber
    - Contact information

- PN ingredient ordering
  - Order as amount per day for adults and amount per kilo per day for pediatrics
  - Avoid ordering as amounts per liter or percentages
  - Macronutrients as grams per day
  - Electrolytes as mEq, mmol, mcg, or mg per day

**PREScribing**

- CPOE and PN order templates shall include the following:
  - Monitoring values
  - Full generic names of components
  - Avoid abbreviations
    - If necessary to abbreviate, follow the Joint Commission or ISMP recommendations
  - Include related orders
    - Routine care
    - Laboratory tests
    - Relevant monitoring parameters
**PRESCRIBING**

- Inclusion of non-nutrient medications should be avoided
- PN orders should have a time limitation
- Development of policies and protocols to modify PN when incompatibilities may exist
- Should be prescribed and evaluated when supported by trained personnel are available, usually during day time hours

**PRESCRIBING**

- Reordering
  - Each component should be reordered in its entirety
  - New PN orders should be evaluated more frequently
  - The reordering process should be structured to require accountability
  - Avoid a single step option of “renew” order
  - Require evaluation of orders, laboratory values, and patient’s condition

- Monitoring
  - New PN orders should be monitored daily
  - Unstable patients should be monitored daily until clinical status improves
  - Stable patients (no required change in formulation for 1 week) should be monitored every 2 to 7 days
  - Stable patients (no required change in formulation for greater than 1 week) should be monitored every 1 to 4 weeks

**GUIDELINE UPDATES: ORDER REVIEW AND VERIFICATION**

- Patient case (ISMP Medication Safety Alert [http://www.ismp.org/newsletter/acute/20110421.asp])
  - 6 week old infant died late in 2010 after receiving a PN solution that contained 60 times more sodium than prescribed
  - Order prescribed a total of 14.7 mEq of sodium chloride and 982 mg of calcium
  - Transmitted after midnight
  - Entered as 982 mEq of sodium chloride
  - Label showed erroneous content of sodium chloride but was reviewed by the pharmacist and dispensed
  - A second label was applied over the compounder label with the prescribed amount of sodium after pharmacist review
  - Nurse was unable to detect the error when comparing label to prescribed amount
  - Routine labs showed that sodium level was high but was dismissed as being inaccurate by physician and ordered lab to be redone
  - Infant experienced cardiac arrest and died before second lab could be drawn
ORDER REVIEW AND VERIFICATION

- PN should be prescribed using CPOE that is fully integrated with automated compounding device (ACD)
  - CPOE system transmits electronic data directly to ACD
  - If outsourcing PN to a third party vendor, CPOE should electronically transmit order to vendor to avoid transcription errors
  - In the absence of CPOE, PN should be prescribed utilizing a standardized PN template
  - Verbal and telephone orders should be avoided

ORDER REVIEW AND VERIFICATION

- PN should be in standardized format including the following:
  - Standardized sequence of ingredients
  - Standardized units
  - Standard formulas
  - Standard formula options
  - If transcription is required to ACD, PN order data should be formatted for direct order entry
  - PN orders should be prescribed, transmitted, and compounded when supported by properly trained personnel who regularly perform task

ORDER REVIEW AND VERIFICATION

- Organizations shall have a written policy and procedure for pharmacists review and verification of PN
- PN orders shall have all required elements as outlined in the prescribing section
- Electrolytes shall be ordered in the complete salt form rather than individual ion components
- A dose shall be provided for each of the following:
  - Each macronutrient
  - Each electrolyte
  - Each vitamin, including multivitamins
  - Each trace element
  - Each non-nutrient additive

ORDER REVIEW AND VERIFICATION

- PN orders shall undergo a clinical review to assess appropriateness and include the following:
  - Indication
  - Osmolarity
  - Dose of each component is clinically appropriate
  - Compared to the previous day’s formulation
  - Review of laboratory data to determine appropriateness of PN
- PN orders shall undergo a formulation review that will include the following:
  - Compatibility including calcium/phosphate precipitation risk
  - Expected stability

ORDER REVIEW AND VERIFICATION

- All PN orders that require transcription of order data should undergo an independent double-check process prior to compounding PN formulation
- All PN orders requiring calculations or conversion of units should undergo an independent double-check process prior to compounding PN formulation
- The organization shall develop criteria to evaluate and identify pharmacists who are competent to review and verify PN orders

ORDER REVIEW AND VERIFICATION

- PN labeling
  - Organizations shall have a policy or procedure for PN labeling
  - Elements of the PN label shall include the following:
    - Two patient identifiers (name, medical record number, date of birth)
    - Patient location or address
    - Dosing weight in metrics
    - Administration date and time
    - Beyond use date and time
    - Route of administration (central versus peripheral)
    - Prescribed volume and overfill amount
    - Infusion rate expressed in mL/hr
    - Duration of infusion (continuous versus cyclic)
    - Size of in-line filter (1.2 or 0.22 micron)
    - Complete name of all ingredients
ORDER REVIEW AND VERIFICATION

- **PN labeling**
  - Elements of the PN label shall include the following:
    - Barcode
    - All ingredients shall be listed in the same sequence and same units of measure as the PN order
    - Name of institution or pharmacy
    - Contact information including telephone number

GUIDELINE UPDATES: ADMINISTRATION

ADMINISTRATION

- The verification process of PN should be presented in a bundle format
  - Verification of integrity of the PN container and formulation prior to spiking bag
  - The PN label shall be verified against the original prescribed order. No verbal orders shall be accepted
  - Patient identity shall be confirmed using two identifiers
  - Administration tubing shall be traced to the point of origin in the body at the initiation of the infusion and at all handoffs
  - An independent double-check process and verification should be performed by a second clinician before the beginning of the infusion and documented in the medical record

ADMINISTRATION

- PN protocols shall include measures to reduce contamination through manipulation of the catheter hub
- IV access used for PN should not be used to obtain blood samples for laboratory tests unless no other access available
- Administered through a filter appropriate for type of formulation
- An occluded filter shall never be removed in response to occlusion alarms
- Administration tubing should be attached to PN containers immediately prior to use
- Tubing and filters should be changed with each new PN container

WHO SHOULD RECEIVE PARENTERAL NUTRITION?

- Proven benefit in:
  - Gastrointestinal fistula
  - Short bowel syndrome
  - Critically ill patients who have been or not expected to take enteral nutrition for 5-7 days
  - Perioperative nutrition in moderate to severe malnutrition
  - Severe acute necrotizing pancreatitis
  - Chronic malabsorptive disorders
- Avoid use
  - Perioperative when expected to have enteral nutrition within 7 days
  - Short term use due to NPO
  - Glycemic and electrolyte management

INDICATIONS FOR PN
ADVERSE EVENTS ASSOCIATED WITH PN

- Phlebitis
- Liver dysfunction
- Hepatic Steatosis
  - Caused by excessive calories
  - Specifically carbohydrates
  - Accumulation of fat in the hepatocytes
  - Characterized by a non-specific increase in liver function tests
- Gall bladder and biliary complications
  - More common in pediatrics
  - Impaired release or obstruction of bile
  - Characterized by increase in bilirubin, ALP, and GGT
- Infection

ADVENTURES IN PN

- PN dosing consult protocol
- Stay observant
- Stay flexible
- Physician champion

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REFERENCES


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