Objectives

Upon completion of this session, the participant will be able to:

• Describe safety issues with parenteral nutrition (PN)
• Present the PN-use process including pharmacist roles
• Discuss the available safe practice guidelines for PN
June 2012

Risk Management in Parenteral Nutrition
– the U.S. Perspective

J. Boullata, PharmD, RPh, BCNSP
Professor of Pharmacology & Therapeutics
Pharmacy Specialist, Clinical Nutrition Support Services
Hospital of the University of Pennsylvania, Philadelphia, PA
Hospital of the University of Pennsylvania
Outline

• Risk-Benefit with PN
• The PN-Use Process
• Guidelines for Safe Practices
• Conclusion
Risk-Benefit with PN
Is Parenteral Nutrition Safe?

NO      YES
Parenteral Nutrition (PN)

- The most complex drug preparation available
Do PN Benefits Outweigh Risks?
Complications of Using PN

• **Mechanical**
  – Pneumothorax, hemothorax, air embolus, thrombosis, malposition, catheter

• **Infectious**
  – Product contamination, line-related bacteremia

• **Metabolic**
  – Poor glycemic control, hypertriglyceridemia, abnormal electrolytes, abnormal LFTs, metabolic bone disease, GI complications
Safe Initiation of Adult PN

• Requires new (or changed over wire) central access

• PN ordering guidelines on day #1 (prior to consult):
  – Amino acids: 1 g/kg (~60 g)
  – Glucose: 2-3 g/kg (~400-500 kcal)
  – Fat: 0.5-0.8 g/kg (~300-500 kcal)
  – Regular electrolytes unless contraindicated
  – Standard vitamins and trace elements
Complications of Using PN

• But more than just the PN preparation itself
• Some current practices in the PN-use process can place patients at some significant risk
• For example, NOT …
  – … using standardized PN orders
  – … maintaining PN formula safety
  – … using dose warning limits in compounding
  – … avoiding parenteral misconnections
  – … administering other drugs appropriately
Complications of Using PN

• But more than just the PN preparation itself
• Some current practices in the PN-use process can place patients at some significant risk
• For example, NOT ...
  – … using standardized PN orders
  – … maintaining PN formula safety
  – … using dose warning limits in compounding
  – … avoiding parenteral misconnections
  – … administering other drugs appropriately
ISMP Medication Error Report Analysis
Another Tragic Parenteral Nutrition Compounding Error

Change in *Anzemet* Indication
Teva’s Lansoprazole Orally Disintegrating Tablet
Lawyers Weigh in on Consistent Use of Smart

Michael R. Cohen, RPh, MS, ScD,* and Judy L. Smetzer,

PN Sterility Compromised (adults)

Mix-up of Sodium for Calcium (neonate)

Role of IV solution in 9 Alabama patient deaths may never be known
By Tom Watkins, CNN
March 30, 2011 5:03 p.m. EDT

Nineteen patients were infected after they were fed intravenously.

**STORY HIGHLIGHTS**
- NEW: “We don’t know, and may never know,” says chief medical officer of the Baptist Health System (CNN) -- As health officials continued their investigation into what role a bacterial infection may have had in the deaths of nine hospital patients and the infection of 10 others in six Alabama hospitals, one official acknowledged that they may never find out.
Safety Summits

- American Society for Parenteral & Enteral Nutrition (A.S.P.E.N.)
  - Parenteral nutrition safety summit proceedings: http://pen.sagepub.com/content/36/2_suppl.toc

- Institute for Safe Medication Practices (ISMP)
  - Sterile preparation compounding safety summit proceedings: http://www.ismp.org/Tools/guidelines/IVSummit/comments/default.asp
The PN-Use Process


**PN-Use Process**

**Prescriber**
- Ordering PN
  - Standardized order form

**Pharmacist**
- PN Order Review/Verification
  - Dosing appropriateness
  - Stability & Compatibility
- Compounding
  - Sterile preparation
  - Product testing
- Dispense PN
  - Labeling
  - Delivery
  - Storage

**Dietitian, Nutrition Support Team**
- Assess
  - Review patient data
  - Provide nutrition assessment
  - Recommend nutrition care plan (PN)
  - Communicate with prescriber

**Nurse, Patient Caregiver**
- Administer the PN
  - Order verification
    - Access
    - Infusion
    - Infection control

**Documentation**
- Medical record
- Transitional care

**Monitoring**
- Mechanical
- Metabolic
- Patient outcome
PN-Use Process

• A Complex Process
  – Benefits from **standardization** & **communication**
  – … at each node of the process
PN-Use Process

• A Complex Process
  – Benefits from standardization & communication
  – … at each node of the process

• Document Outcomes
  – Deviations from standard of care?
  – PN-related medication errors?
INTERDISCIPLINARY NUTRITION CARE

Dietitian, Nutrition Support Team

Assess
- Review patient data
- Provide nutrition assessment
- Recommend nutrition care plan (PN)
- Communicate with prescriber

Monitoring
- Mechanical
- Metabolic
- Patient outcome

Prescriber

Ordering PN
- Standardized order form

Pharmacist

PN Order Review/Verification
- Dosing appropriateness
- Stability & Compatibility

Compounding
- Sterile preparation
- Product testing

Dispense PN
- Labeling
- Delivery
- Storage

Nurse, Patient Caregiver

Administer the PN
- Order verification
  - Access
  - Infusion
  - Infection control

Documentation
- Medical record
- Transitional care

JPEN 2012;36:10S
Clinical Nutrition Support Services

- 800 consults per month
- 22 FTEs
- 3100 patient interventions per month

Consults
- EN/PN Orders
- Prescribers
- Nurses

Teams:
- Team A
- Team B
- Team D
- Team E
- Team F
- Moon Team
Survey Results (2011)

- Prescribing
  - 67% of PN orders are still being handwritten
  - Only 26-35% order nutrients in amount-per-day

- Order Review
  - A pharmacist is not always dedicated to review PN
  - Very few PN orders seem to require clarification

- Compounding
  - 64% of organizations use automated compounding devices but only 65% of them make use of “alerts” (i.e., dose warning limits)
Survey Results (2011)

• Dispensing
  – Half don’t keep PN refrigerated/out of light at least 75% of time between compounding and start of infusion

• Documentation
  – 46% document PN review process on paper

• Med errors
  – Transcription is required in >80% of organizations
  – Frequency and node involved often not known
  – Limited clinical effectiveness/quality improvement programs for PN
<table>
<thead>
<tr>
<th>Safe Practice Issue</th>
<th>2003 (n=651)</th>
<th>2011 (n=895)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ≤5 PN admixtures daily</td>
<td>33%</td>
<td>50-82%</td>
</tr>
<tr>
<td>• Outsourcing of PN compounding</td>
<td>15%</td>
<td>21%</td>
</tr>
<tr>
<td>• Exclusive use of premixed PN products</td>
<td>- -</td>
<td>21%</td>
</tr>
<tr>
<td>• Administer outside PN preparations</td>
<td>43%</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Order Communication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Standardized PN order form</td>
<td>88%</td>
<td>90%</td>
</tr>
<tr>
<td>• CPOE for PN</td>
<td>31%</td>
<td>33%</td>
</tr>
<tr>
<td>• Electronic interface available</td>
<td>- -</td>
<td>7%</td>
</tr>
<tr>
<td>• Transcription required</td>
<td>- -</td>
<td>81%</td>
</tr>
<tr>
<td>• Ordered in amount/day (or amount/kg/day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Macronutrient</td>
<td>&lt;19%</td>
<td>21-26%</td>
</tr>
<tr>
<td>• Electrolytes</td>
<td>39%</td>
<td>11-35%</td>
</tr>
<tr>
<td><strong>Order Review &amp; Clarification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Dedicated pharmacist time = 0 FTEs</td>
<td>- -</td>
<td>23%</td>
</tr>
<tr>
<td>• ≤10% of orders requiring clarification</td>
<td>61%</td>
<td>69%</td>
</tr>
<tr>
<td><strong>PN Compounding</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ACD in use for PN preparations</td>
<td>22%</td>
<td>64%</td>
</tr>
<tr>
<td>• Order transcription to ACD required</td>
<td>84%</td>
<td>82%</td>
</tr>
<tr>
<td>• ACD active dose limits in place</td>
<td>- -</td>
<td>65%</td>
</tr>
<tr>
<td>• PN admixture kept refrigerated/out of light</td>
<td>- -</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Nurse has access to full PN order for review</td>
<td>- -</td>
<td>83%</td>
</tr>
<tr>
<td>• Policy &amp; procedure for IVFE administration</td>
<td>84%</td>
<td>65%</td>
</tr>
<tr>
<td><strong>Medication Errors &amp; Documentation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Performance improvement process</td>
<td>54%</td>
<td>40%</td>
</tr>
<tr>
<td>• Oversight of PN-use process</td>
<td>- -</td>
<td>96%</td>
</tr>
<tr>
<td>• Aware of PN-related medication errors</td>
<td>- -</td>
<td>34-42%</td>
</tr>
<tr>
<td>• Document PN order review process in MR</td>
<td>- -</td>
<td>27-35%</td>
</tr>
</tbody>
</table>
Guidelines for Safe Practices
Special Report

Safe Practices for Parenteral Nutrition

Task Force for the Revision of Safe Practices for Parenteral Nutrition: Jay Mirtallo, MS, RPh, BCNSP, Chair, Todd Canada, PharmD, BCNSP, Deborah Johnson, MS, RN, Vanessa Kumpf, PharmD, BCNSP, Craig Petersen, RD, CNSD, Gordon Sacks, PharmD, BCNSP, David Seres, MD, CNSP, and Peggi Guenter, PhD, RN, CNSN

Approved by A.S.P.E.N. Board of Directors July 21, 2004
Safe Practices

Task Force for the Revision of Safe Practices

Todd Canada, PharmD, BCNSP, CSP
Craig Petersen, RD, CNSD, GCP

Approved by American Society for Parenteral and Enteral Nutrition
Standardized PN order process and forms:

- Reduce prescribing errors
- Provide prescriber education
- Improve efficiency & productivity
ADULT- Parenteral Nutrition

Demographics:

Height (cm) __________________________ Weight (kg) __________________________

(Check if applicable) Egg and/or Soy Allergy □

Start Date: ___________ Hour: ___________ Infuse Over: ___________ hours

(If, unless cycled over 24, 16, or 12 hours)

Route: (Check one) Central IV □ Peripheral IV □

Indication for PN:

☐ Unable to obtain safe enteral access
☐ Failed TEN trial
☐ Failed enteral access
☐ Bowel obstruction
☐ Paralytic ileus
☐ Incomplete resuscitation/hemodynamic instability
☐ Uncontrolled diabetes
☐ High output fistula
☐ Intestinal failure NOS

Macronutrients:

Amino Acids (g/day): __________________________ Devoflose (mL/day): __________________________

Glutamine (g/day): __________________________ Fat Emulsion (mL/day): __________________________

Hepatic (g/day): __________________________

Micronutrients:

Electrolyte Package (Check one)

Regular □ High-Acte-Lo Chloride □

Na: 80 60 20 10 16 0 28 K: 0 0 0 0 0 0 0

No Potassium □

No Sodium □

Custom □

For Peripheral □

Sodium: ___________ mEq

Potassium: ___________ mEq

Calcium: ___________ mg

Magnesium: ___________ mg

Phosphate: ___________ mg

Vitamin Package

☐ Standard

☐ None

Trace Element Package (Check one)

☐ Standard

☐ Cholestasis

☐ None

Custom Additives (Check only as needed)

Chromium □ 50 mg or 100 mg

Copper □ 0.4 mg or 0.4 mg

Folic Acid □ 2 mg or 2 mg

Manganese □ 100 mg or 100 mg

Additives:

Regular Human Insulin (units/day): __________________________

Date/Time of Order: __________________________

Signature: __________________________

Date/Time of Review: __________________________

Signature: __________________________
**Parenteral Nutrition Order Set HUP**

<table>
<thead>
<tr>
<th>Order</th>
<th>Electrolyte Package</th>
<th>NaCl (mEq)</th>
<th>Na Acetate (mEq)</th>
<th>KCl (mEq)</th>
<th>K Acetate (mEq)</th>
<th>Ca Gluconate (mEq)</th>
<th>Mg Sulfate (mEq)</th>
<th>Na Phos (mEq)</th>
<th>K Phosphate (mEq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parenteral Nutrition Adult</td>
<td>Regular</td>
<td>80</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Parenteral Nutrition Adult</td>
<td>High Acetate Low Chloride</td>
<td>20</td>
<td>80</td>
<td>20</td>
<td>0</td>
<td>10</td>
<td>16</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Parenteral Nutrition Adult</td>
<td>No Potassium</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Parenteral Nutrition Adult</td>
<td>No Sodium</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Parenteral Nutrition Adult</td>
<td>Peripheral Nutrition</td>
<td>50</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>16</td>
<td>10</td>
<td>28</td>
</tr>
</tbody>
</table>

- **Multivitamins/day**
  - Standard: retinol 0.5 mg, calciferol 2.5 mcg, tocopherol 5 mg, phylloedine 75 mcg, thiamine 5 mg, riboflavin 1.8 mg, niacin 20 mg, pyridoxine 5 mg, folic acid 300 mcg.

- **Trace Elements/day**
  - Standard trace elements: chromium 5 mcg, copper 5 mcg, manganese 250 mcg, selenium 30 mcg, zinc 2.5 mcg.

- **Custom Additives**
  - zinc 2 mg, ascorbic acid 50 mg, copper 0.4 mg, manganese 100 mcg, thiamine 100 mg, selenium 60 mcg, folic acid 400 mcg, levocarnitine 100 mg

- **Regular Insulin**
  - Once/day: 20 units

**TPN Monitoring**

- Glucose Testing Finger
- Glucose Testing Finger Sticks (CYCLED parenteral nutrition infusion)
- Subcutaneous Insulin Sticks
- Weigh Patient

**Active TPN Monitoring Orders**

**Active Diabetic Treatment Orders**
**Parenteral Nutrition, Adult (HUP)**

- Infuse via intravenous-central
- Infuse over 24 hours
- Amino acid (Grams): 10.0%
- Amino acid concentration (%): 10
- Glutamine (Grams): 25 mg
- Glutamine 2.5% AA 8.5% (ml): 1000
- Dextrose (kilocalories): 500
- Fat Emulsion (kilocalories): 500
- Electrolyte Package Custom: NaCl (mEq): 80; Na Acetate (mEq): 10; KCl (mEq): 20; K Acetate (mEq): 10; Ca Gluconate (mEq): 10; Mg Sulfate (mEq): 10; Na Phos (mEq): 10; K Phosphate (mEq): 28
- Trace Elements: Standard trace elements: chromium 5 mcg, copper 0.5 mg, manganese 250 mcg, selenium 30 mcg, zinc 25 mg = Additive Manganese (MICROgrams) 100 + Additive Copper (mg): 0.4 + Additive Selenium (MICROgrams) 60 + Additive Zinc (mg): 2
- MVI: Adult Standard (ml): 5
- MVI: Adult Standard (mg): 100
- MVI: Adult Standard (mcg): 400
- MVI: Adult Standard (mg): 500
- MVI: Adult Standard (mcg): 100
- Regular Human Insulin (units/day): 20
- Unverified by Pharmacy
• 3 Steps to Review the PN Order
  1. Order verification
  2. Order review – clinical
  3. Order review – pharmaceutical
Parenteral Nutrition
Pharmacist Verification and Review Process

1. Order Verification
   - Confirm presence of IV access if this is the first PN order for the patient (or if aware that the patient has had recent access issues)
   - All elements of the order have been completed by the prescriber composing the order
   - Received before the 3:00 pm cutoff time
   - Any transcription has occurred correctly
   - Document all required interventions
Parenteral Nutrition
Pharmacist Verification and Review Process

Order Review – Clinical
- The dose of each macronutrient is appropriate for the individual patient
- The dose of each micronutrient is appropriate for the individual patient
- Evaluate clinical dosing (especially if an alert is generated) against the CNSS note
- Compare dosing with the “Ordering PN” guidelines
- Document all required interventions
Alert Summary

Alert: Check TPN Limits

Message:
- The Amino Acids Grams/Patient's weight = 0.186, is less than minimum of 0.5, please adjust the amount of Amino Acids and or Glutamine.
- The Carbohydrate Grams/Patient's weight = 0.264, is less than minimum of 1, please adjust the amount of Dextrose.
- The Calcium Phosphate Ratio is greater than 40.
- The total sodium of 153.3 must be less than or equal to 150 mEq to order Electrolytes.
- The total potassium of 104.2 must be less than or equal to 100 mEq to order Electrolytes.
- The total calcium of 20 must be less than or equal to 15 mEq to order Electrolytes.
- The total magnesium of 90 must be less than or equal to 40 mEq to order Electrolytes.

560.66ml Sterile Water Added

Acknowledgement Comment:

To view suggested actions for the Parenteral Nutrition, Adult (HUP) order click View.
To continue with the Parenteral Nutrition, Adult (HUP) unchanged click Proceed.
To return to the Parenteral Nutrition, Adult (HUP) and discard alerts click Go Back.
Clinical Nutrition Support Services  
Hospital of the University of Pennsylvania  

Parenteral Nutrition Order Review Guidelines

These dose limits are not absolute, they represent guidelines outside which nutrient supply may exceed the metabolic capacity or micronutrient needs of a specific patient. These limits do not address compatibility/stability of a specific admixture, which the pharmacist will also need to evaluate. When an order is flagged because of exceeding a dose limit, the pharmacist will make appropriate intervention (in part based on the current CNSS note for the patient).

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Dose Limits Per Day- Central PN</th>
<th>Dose Limits Per Day- Peripheral PN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>Amino acids</td>
<td>0.5 g/kg</td>
<td>2.5 g/kg</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>2 g/kg</td>
<td>7 g/kg</td>
</tr>
<tr>
<td>Fat</td>
<td>0 g/kg</td>
<td>2.5 g/kg</td>
</tr>
<tr>
<td>Sodium</td>
<td>0 mEq</td>
<td>150 mEq</td>
</tr>
<tr>
<td>Potassium</td>
<td>0 mEq</td>
<td>100 mEq</td>
</tr>
<tr>
<td>Acetate</td>
<td>For acid/base</td>
<td>balance</td>
</tr>
<tr>
<td>Chloride</td>
<td>For acid/base</td>
<td>balance</td>
</tr>
<tr>
<td>Calcium</td>
<td>0 mEq</td>
<td>15 mEq</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0 mEq</td>
<td>40 mEq</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>0 mmol</td>
<td>48 mmol</td>
</tr>
<tr>
<td>Chromium*</td>
<td>0 µg</td>
<td>24 µg</td>
</tr>
<tr>
<td>Copper*</td>
<td>0 mg</td>
<td>0.8 mg</td>
</tr>
<tr>
<td>Manganese*</td>
<td>0 µg</td>
<td>200 µg</td>
</tr>
<tr>
<td>Selenium</td>
<td>0 µg</td>
<td>120 µg</td>
</tr>
<tr>
<td>Zinc</td>
<td>0 mg</td>
<td>10 mg</td>
</tr>
<tr>
<td>Ascorbic Acid</td>
<td>0 mg</td>
<td>300 mg</td>
</tr>
<tr>
<td>Cyanocobalamin</td>
<td>0 µg</td>
<td>1000 µg</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>0 mg</td>
<td>1 mg</td>
</tr>
<tr>
<td>Thiamin</td>
<td>0 mg</td>
<td>106 mg</td>
</tr>
<tr>
<td>Phytonadione</td>
<td>0 mg</td>
<td>1 mg</td>
</tr>
<tr>
<td>Pyridoxine</td>
<td>0 mg</td>
<td>10 mg</td>
</tr>
<tr>
<td>Glutamine 2.5%</td>
<td>0 mL</td>
<td>1500 mL</td>
</tr>
<tr>
<td>Insulin</td>
<td>0 units</td>
<td>100-200 units</td>
</tr>
<tr>
<td>L-carnitine</td>
<td>0 mg</td>
<td>1000 mg</td>
</tr>
</tbody>
</table>
Data:
Ht: 182.9 cm, Wt: 64.9 kg, IBW: 80.9 kg (%IBW: 80), UBW: 81.8 kg (%UBW: 79) x 2 years ago

CBW: 60 kg -- REVISED BMI: 17.9 Underweight

BEE: 1380

Estimated nutrition needs: 1518-1800 ncp (BEE x 1.1-1.3) and protein needs: 130 g/day (2 g/kg)

Macronutrient limitations: 1100 dextrose kcs, 500 lipid kcs

CNSS Outcome Summary: Pt remains on vent and pressors. Trophic TEN started at 10ml/hr. Remains on TPN, current electrolytes appropriate. Due to shortage of concentrated amino acids, will need to change pt to 10% amino acids in TPN.

CNSS Recommendations:
--Adjust TPN: 130 g protein (10%), 800 fat kcs, 500 dextrose kcs

  Suggest change to CUSTOM LYTES, infuse x 24 hours, NaCl = 0 mEq, KCl = 20 mEq, magnesium = 0 mEq, Kphos: 0 mmol, calcium: 10 mEq.

  CUSTOM ADDITIVES: 100 mg thiamine, 400 mcg folate, 100 mg ascorbic acid, 7 mg zinc.

  --As safe/feasible, attempt TEN via J-tube with Peptide Based @ 10 ml/hr.

  --Eventual goal is Peptide Based @ 50 ml/hr with 1 pack TEN liquid protein q 12 hrs
  (1487 NPC/26 g protein)

  --If volume an issue, decrease to 100gm amino acid in TPN.

  --Consider checking ammonis level in setting of LFT abnormalities.

Marianne Aloupis MS RD CNSC
#287-250-7295

Duration of Care: 30 min
Order Review – Pharmaceutical

- The ordered components are *compatible* with each other in the prescribed amounts
- The PN preparation is expected to be *stable* from compounding through duration of infusion
- Document all required interventions
• **Compounding**
  
  – Sterility
    – Medium-risk sterile preparation
    – Pharmacist responsibility
  
  – Validated Methods
    – Written policies & procedures
    – Manual vs Automated Compounding Device

• **Labeling**
  – Should match elements of the order
  – *All* active ingredients included
  – Beyond-use date provided

• **Storage**
  – Refrigerate and keep out of light

*JPEN 2004;28:S39 / USP34 <797> / ISMP 2012*
AMINO ACID 10% 140 g
DEXTROSE 1300 Kcal
FAT EMULSION 600 Kcal

-- Additives --
SODIUM CHLORIDE 80 mEq
POTASSIUM CHLORIDE 30 mEq
CALCIUM GLUCONATE 13 mEq
MAGNESIUM SULFATE 36 mEq
TRACE ELEMENTS 5 CONC 0.5 ml
MVI-ADULT 5 ml
ZINC 7 mg
THIAMINE 100 mg
ASCORBIC ACID 100 mg
POLYIC ACID 400 mcg

-- Approx. Electrolyte Totals/Baq (w/o intrinsics) --
Na+ 80 mEq  Cl- 110 mEq
K+ 30 mEq
Ca++ 13 mEq
Mg++ 36 mEq

Nitrogen Content: 21 42 gm  Protein Calories: 580 Kcal
Non-Protein Calories: 2100 Kcal  Dextrose Calories: 1300 Kcal
Total Calories: 2600 Kcal  Lipid Calories: 800 Kcal

Rph: CAPS  Date: 4/17/12  Time: 11:17
Expires on 04/18/12  23:17  Overfill Amount: 0. ml
2268.49 ML at 115 ml/hr will run for: 20 Hours
Delivery Time to Patient: 04/16/2012 20:00

TRACE ELEMENTS 5 CONC. 0.5 ML =

CHROMIUM 5 MCG
COPPER 0.5 MG
MANGANESE 250 MCG
SELENIUM 30 MCG
ZINC 2.5 MG

*** FOR CENTRAL LINE ADMINISTRATION ONLY ***

**********NO ADDITIONAL CHROMIUM ADDED**********

Approx. Osmolarity 1582.26 mOsm/L

Compounded Sterile Preparation
Prep by: Central Admixture Pharmacy Services, Inc. Philadelphia
263 Gibraltar Road, Horsham, PA 19044  800-595-0019
• **Match Label to the Order**
  - All critical elements

• **Integrity of PN and Equipment**
  - Administration set, filter, pump

• **Line Care**
  - Prevent complications

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**Administer the PN**
- Order verification
- Access
- Infusion
- Infection control

*Nurse, Patient Caregiver*
Documents to Come

• A.S.P.E.N. Clinical Guidelines Editorial Board
  – Evaluate data → evidence-based guidelines to support safe PN-use process

• A.S.P.E.N. Task Force
  – Common questions → best practices for PN safety
Rx # 5867004  Start 2012/06/09 20:00
TPN - CUSTOM 2 (1000ML-2000ML)(TPN - CUSTOM 2 (1000ML-2000ML))  Dose volume = 1244  IVS
Note: cycle 8pm - 12pm (infuse over 16hrs)

Intravenous
Primary continuously
70 ml/hr

***cycle 8pm - 12pm***

- Amino Acids 10% ................. 65 Gm/day
- Dextrose 70% ...................... 331 nls
- Fat Emulsion 20% .............. 210 ml
- Na Chloride ......................... 80 Meq
- Na Acetate ......................... 00 Meq
- K Chloride ....................... 00 Meq
- K Phosphate ....................... 04 mMol
- Na Phosphate .................... 00 mMol
- Ca Gluconate ..................... 00 Meq
- Mg Sulfate ......................... 00 Meq
- K Acetate ......................... 00 Meq
- Insulin "R" ......................... 55 units
- Vitamin "K" ....................... 1 mg
- Adult MVI ......................... 00
- Trace Elements ................. 1 amp
- Heparin ................................ 2000 units

Total Volume ................... 1244
Rate = 70

Due Continuous
Prepared on 2012/06/11 11:31  Use by 2012/06/13 00:00
NAME: [Redacted]
DOB: [Redacted]

SAMPLE LABEL

Physician: MD

Order Vol: 1248 mL
Overfill: 0 mL
Compound Vol: 1218 mL

AMINO ACID 10%
DEXTROSE 70%
FAT EMULSION 20%
Additives
SODIUM CHLORIDE
POTASSIUM PHOSPHATE
CALCIUM GLUCONATE
MAGNESIUM SULFATE
TRACE ELEMENTS 4 CONC.
HUMULIN INSULIN REGULAR
PHYTONADIONE
HEPARIN

65g ✓
331ml ✓
210ml ✓
80mEq ✓
4 mmole
9.6 mgq ✓
8 meq ✓
1 ml ✓
55 unit(s) ✓
1 mg ✓
2000 unit(s) ✓

1248 mL at 78 mL/hr will run for 16 Hours.
ADMINISTER VIA CENTRAL LINE

"OCYCLE TPN PER INSTRUCTION"
KEEP REFRIGERATED

Weight: kg
Hosp Rxd: 10/1161702
Conclusion
The Hazards of Hospitalization

Elihu M. Schimmel, M.D., West Haven, Connecticut

Recent medical progress has brought dramatic advances in methods of diagnosis and treatment. With each new advance, however, reports of adverse reactions have soon followed. The occurrence of occasional reactions is now considered to be an accustomed and almost predictable hazard rather than evidence of improper medical care.

These hazards have been called “the price we pay” for modern diagnosis and therapy (1). This new type of clinical pa-

Plan of Study

This investigation was planned as a prospective study of the type and frequency of hospital complications occurring in the patients of a university medical service. The project was designed for performance during the author’s tenure as chief resident on that service and was a joint effort of all the medical house officers. To allow new staff members to become accustomed to the service, the project was begun on August 1, 1960, rather than during July. It was concluded on March 31, 1961, after more than a thousand patients had been studied. The investigation included all patients
Conclusions

• PN is a high-alert medication
• The PN-use process is complex
• It benefits from better standardization and communication at each step to improve safety
• The available safe practice guidelines for PN should be applied more widely in practice
• Pharmacists can support other health care providers with their critical roles in the PN-process
Outline

• Risk-Benefit with PN
• The PN-Use Process
• Guidelines for Safe Practices
• Conclusion
References

References
