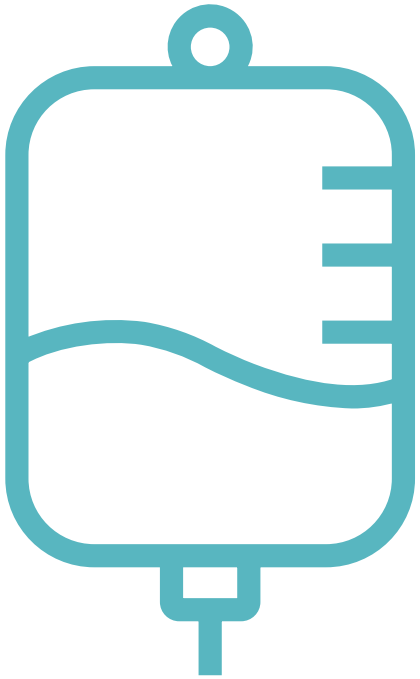


# PN Basics: Order Writing

**Kathleen Crim MS, RD, LD, CNSC**
**Karly Sullivan RD, LD, CNSC**

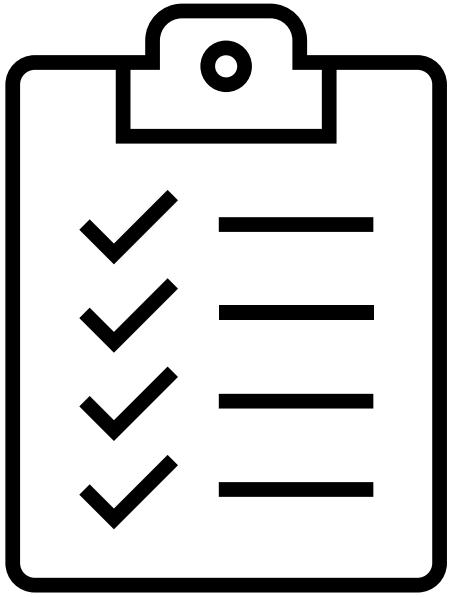
# Disclosures

Kathleen: Fresinius Kabi Speaker

Karly: No commercial relationships to disclose

# Learning Objectives

- Identify the essential components of adult and pediatric parenteral nutrition orders.
- Calculate appropriate macronutrient and micronutrient dosing in custom parenteral nutrition.
- Develop a safe and accurate parenteral nutrition order.
- Recognize parenteral nutrition ordering errors and safety considerations.



# Assessment Checklist

- Indication for PN
- Central vs peripheral access
- Weight
- Estimated calorie/protein needs
- Fluid status
- Current labs
- Medications
- Risk for refeeding syndrome

# Indications

- Unable to meet needs via the GI tract
- If EN is not possible, PN should be started within:
  - Infants: 1-3 days
  - Children: 4-5 days
  - Adults: 7 days*
- Examples:
  - Inability to tolerate EN, VLBW infants, bowel obstructions, fistulas, hemodynamic instability, intestinal failure

# Route of Administration

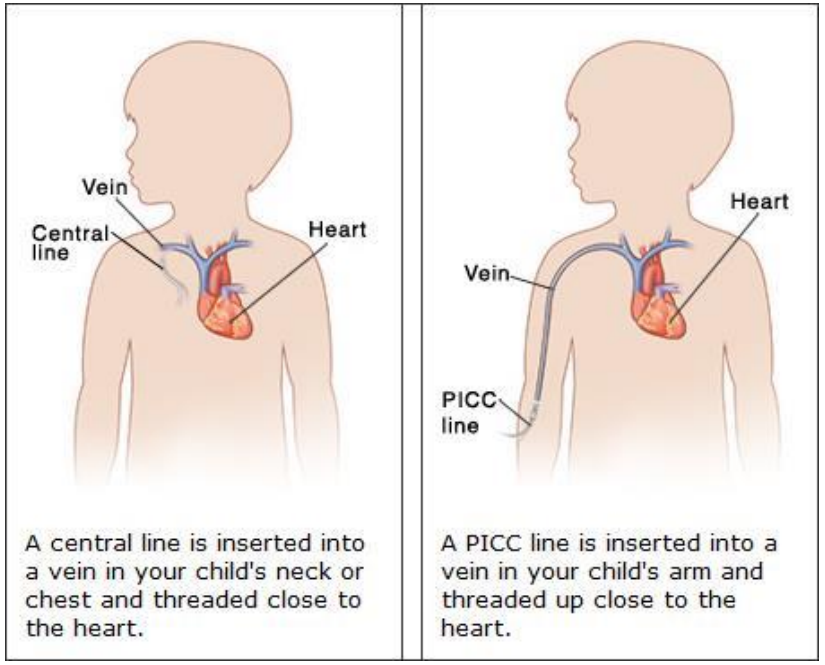
## Central

- Positioned in the vena cava or right atrium
- PICC, CVC (tunneled or non-tunneled), port

## Peripheral

- Peripheral IV or midline

## Intradialytic



# Which route to use?

**Peripheral:**

- Short term, <2 weeks
- No fluid restriction
- Calories can be met
- Maximum osmolarity of 900 mOsm/L
- Maximum dextrose 10-12.5% dextrose (institution specific)

**Central:**

- Long term, >2 weeks
- Home PN
- Fluid restriction
- Limited peripheral access
- Can meet higher calorie, protein, and electrolyte needs
- Can be hypertonic

# Composition

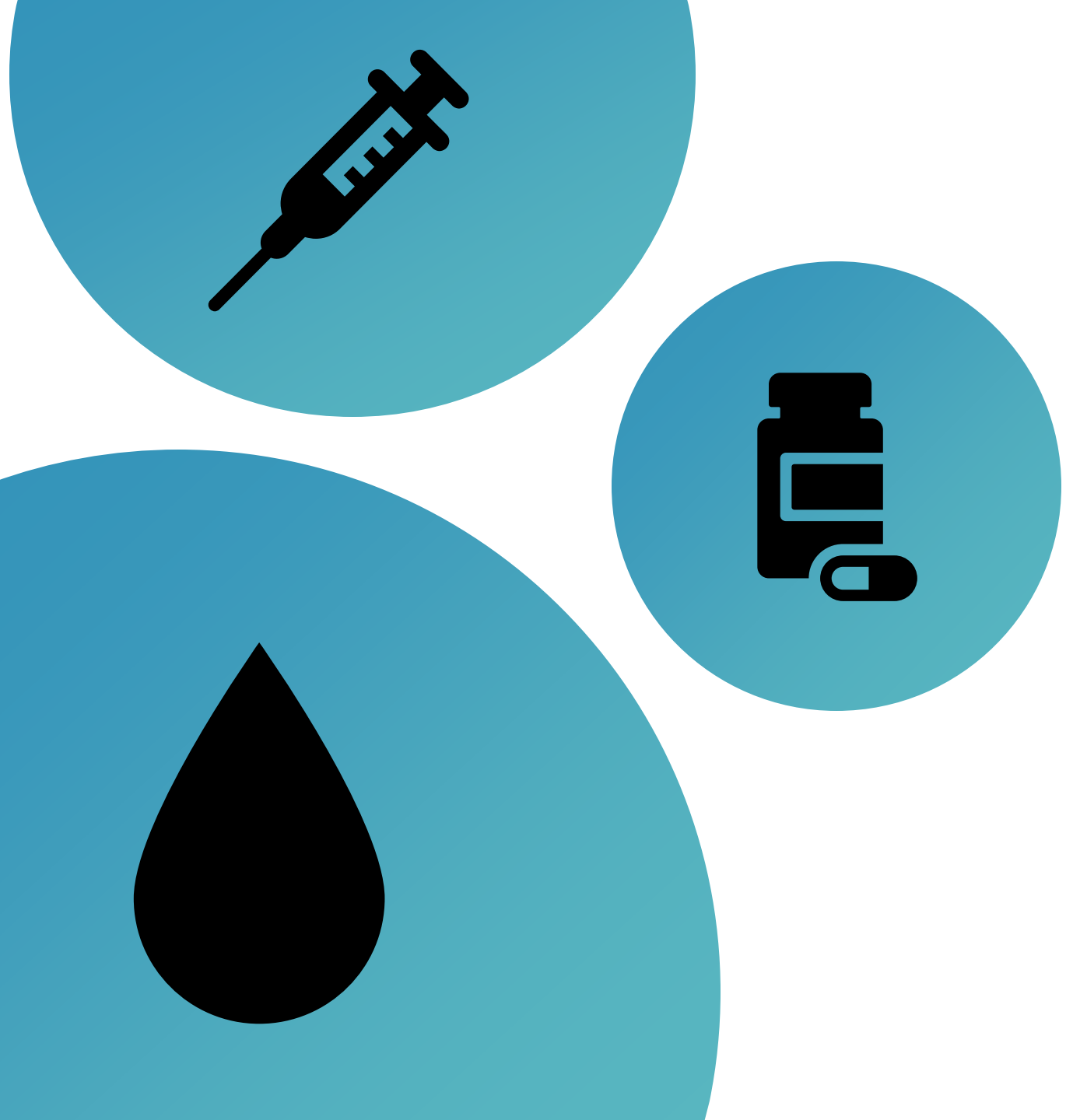
2 in 1:

- Animo acids + dextrose


3 in 1 (TNA):

- Amino acids + dextrose + lipid injectable emulsion

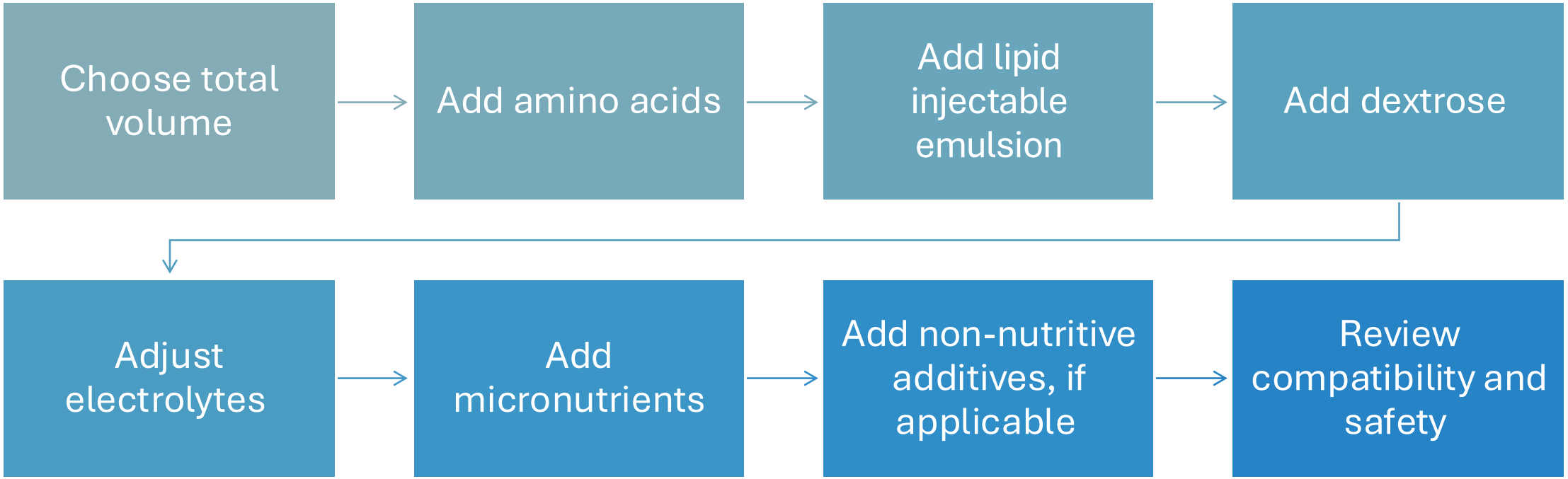

Source: Nasco Healthcare (n.d.)



# Components

- Fluid
- Macronutrients (amino acids, dextrose, lipid injectable emulsion)
- Electrolytes
- Vitamins and Trace Elements
- Non-nutritive additives
  - Examples: Heparin, famotidine, insulin, cysteine, carnitine

# Stepwise Approach to Building the Order



# Fluid Needs

- Holliday-Segar Method
- 1mL/kcal
- 4-2-1 Rule

| |
|---|
| 1-10 kg = 100 ml/kg |
| 10-20 kg = 1000 ml + 50ml/kg for every kg between 10-20 kg |
| >20 kg = 1500 ml + 20 ml/kg for every kg >20 kg |

- For critically ill patients, focus on providing minimum fluid to provide adequate macronutrients

**Take into consideration:**

- Excess losses (i.e. Emesis/G tube, ostomy, lack of colon, lack of ileum, fecal, excess urine, negative I/O's)
- Additional fluid required for maintenance when febrile, increased activity, dehydration, burns
- Conditions that require less than maintenance (i.e. ascites, cardiac, fluid overloaded, third spacing, etc.)

# Macronutrients

| | |
|---|---|
| Amino acids | 4 kcal/g |
| Dextrose | 3.4 kcal/g |
| Lipid Injectable Emulsion (ILE) | 10% = 11 kcal/g, 1.1 kcal/mL<br>20% = 10 kcal/g, 2 kcal/mL<br>30% = 10 kcal/g, 3 kcal/mL |

# Determining the Macro Prescription

## Total grams of protein

## Total grams of lipid injectable emulsion

- Dependent on fatty acid need and type of ILE being used
- Lipid infusion rate in g/kg/day

## Total grams of dextrose

- Will make up the remaining calories once protein and fat needs are met
- Starting vs goal dextrose
- Refeeding risk
- Hyperglycemia risk
- Glucose infusion rate in mg/kg/min

# Infusion Rates

**Glucose Infusion Rate (mg/kg/min)**

- GIR = $\frac{\text{Dextrose (g) x 1000}}{\text{Weight (kg) x total minutes infusing}}$

- Or dextrose (g) / weight (kg) / (total minutes infusing/1000)

**Lipid Infusion Rate (g/kg/hr)**

- LIR = $\frac{\text{ILE per day (g)}}{\text{(weight in kg) x (total hours infusing)}}$

# Factors Affecting Electrolytes

| | |
|---|---|
| **Sodium** | Fluid status, diuretics, GI losses, renal function, heart failure, cirrhosis, hyperglycemia |
| **Potassium** | Renal function, GI losses, acid base status, refeeding syndrome, catabolism/tissue breakdown, diuretics |
| **Calcium** | Bone health, vitamin D status, parathyroid function, citrate exposure (transfusions, CRRT) |
| **Magnesium** | Refeeding syndrome, GI losses, alcohol use disorder, |
| **Phosphorous** | Refeeding syndrome, malnutrition, renal function, bone health<br><br>**Limited by physical compatibility with calcium in PN admixture |

# Acid/Base Balance

Chloride and Acetate are the primary anions used in electrolyte salts in PN

Chloride has an acidifying effect

- Increase chloride provisioning in metabolic alkalosis (i.e. Gastric losses)

Acetate is the precursor to bicarbonate in the body and has an alkalizing effect

- Increase acetate in patients with metabolic acidosis, hyperchloremia, or when additional bicarbonate is warranted (i.e. in some patients with renal dysfunction)

Select the appropriate salts used to help correct or maintain the acid base balance of your patient

# Trace Elements

- Factors requiring modification:
  - Increase zinc:
    - GI losses
    - Burns
    - CRRT
  - Increase copper:
    - Biliary losses / external biliary drainage
    - GI losses
    - Burns
  - Decrease or remove copper, manganese:
    - Severe hepatic disfunction, cholestasis

# Now Time to Initiate

| | |
|---|---|
| Start | Start with a guideline-based prescription using baseline labs and concurrent sources of nutrition, fluids, and electrolytes. |
| Recheck | Recheck labs within 24 hours and adjust electrolytes as needed. |
| Advance | Advance dextrose, amino acids, and ILE per age-specific recommendations and clinical tolerance. |
| Review and Modify | Review and modify the PN prescription daily. |

# Monitoring

- Weight
- Fluid status
- Labs:
  - Electrolytes
  - Triglycerides
  - Renal function
  - Liver functions
  - Hemoglobin
  - Blood Glucose
  - Micronutrients
- Timing of labs will vary in the hospital setting vs home setting.

# Common Complications

- Refeeding syndrome
- Infection
- Electrolyte imbalances
- Metabolic bone disease
- Liver disease
- Allergic reaction

# Pediatric Dosing

# Infants <1 year old

- Energy needs:
  - Initiate 42-57 kcals/kg with a goal of 90-110 kcal/kg for growth

| Preterm | Initiation | Goal |
|---|---|---|
| Protein (g/kg/d) | 1-3 | 3-4 |
| Dextrose* (mg/kg/min) | 6-8 | 10-14 *maximum 18 |

| Term | Initiation | Goal |
|---|---|---|
| Protein (g/kg/d) | | 2.5-3 |
| Dextrose* (mg/kg/min) | 6-8 | 10-14 *maximum 18 |

*GIR

Dextrose can be advanced by 1-2 for preterm and term infants

1. Texas Children's Hospital Pediatric Nutrition Reference Guide, 12th edition

# Children

- 1-10 years old

| | Initiation | Advancement | Goal |
|---|---|---|---|
| Protein (g/kg/d) | 1.5-2.5 | | 1.5-2.5 |
| Dextrose* (mg/kg/min) | 3-6 | 1-2 | 8-10 |

Appropriate Dosing For Parenteral Nutrition: ASPEN Recommendations 2019

# Adolescents

| | Initiation | Advancement | Goal |
|---|---|---|---|
| Protein (g/kg/d) | 0.8-2 | | 0.8-2 |
| Dextrose* (mg/kg/min) | 2.5-3 | 1-2 | 5-6 |

Appropriate Dosing For Parenteral Nutrition: ASPEN Recommendations 2019

# Pediatric Electrolyte Dosing

| | Infants and children | Children >50 kg and adolescents |
|---|---|---|
| Sodium | 2-5 mEq/kg | 1-2 mEq/kg |
| Potassium | 2-4 mEq/kg | 1-2 mEq/kg |
| Calcium | 0.5-4 mEq/kg | 10-20 mEq/day |
| Magnesium | .3-.5mEq/kg | 10-30 mEq/day |
| Phosphorus | 0.5-2 mmol/kg | 10-40 mmol/day |
| Chloride/Acetate | As needed to maintain acid/base balance | |

# Pediatric Vitamins

- Vitamin A, D, E, , B6, B12, C
- Thiamine
- Riboflavin
- Niacin
- Biotin
- Pantothenic Acid
- Folate
- *not in all MVI so might need to be added

| Manufacturer Recommendations† | | NAG-AMA Recommendations◊ | |
|---|---|---|---|
| **Weight (kg)** | **Dose (mL)** | **Weight (kg)** | **Dose (mL)** |
| Less than 1 | 1.5 | Less than 2.5 | 2 mL/kg |
| 1 to less than 3 | 3.25 | Greater than or equal to 2.5 | 5 mL |
| Greater than 3 | 5 | | |

Appropriate Dosing For Parenteral Nutrition: ASPEN Recommendations 2019

# Pediatric Trace Elements

| Trace Element | Preterm Neonates | Term Neonates 3-10 kg | Children 10-40 kg | Adolescents Greater than 40 kg |
|---|---|---|---|---|
| Zinc | 400 mcg/kg | 250 mcg/kg | 50 mcg/kg (max 5000 mcg/d) | 2-5 mg |
| Copper | 20 mcg/kg | 20 mcg/kg | 20 mcg/kg (max 500 mcg/d) | 200-500 mcg |
| Manganese | 1 mcg/kg | 1 mcg/kg | 1 mcg/kg (max 55 mcg/d) | 40-100 mcg |
| Chromium | 0.05-0.3 mcg/kg | 0.2 mcg/kg | 0.2 mcg/kg (max 5 mcg/d) | 5-15 mcg |
| Selenium | 2 mcg/kg | 2 mcg/kg | 2 mcg/kg (max 100 mcg/d) | 40-60 mcg |

Appropriate Dosing For Parenteral Nutrition: ASPEN Recommendations 2019

# Adult Dosing

# Energy and Protein Needs

| Disease/Condition | Protein (g/kg/d) | Energy (kcal/kg/d) | GIR (mg/kg/min) |
|---|---|---|---|
| Stable | .8-1.5 | 20-30 | 4-5 |
| Critically ill, trauma, sepsis | 1.2-2.5 | 20-30 | <4 |

Obesity:
ASPEN recommends using 2-2.5g/kg IBW protein, 22-25kcal/kg IBW

- Indirect calorimetry is considered the gold standard
- Consider using PSU equations in critically ill, mechanically ventilated patients
- MSJ equation can be used in non-critically ill patients

Appropriate Dosing For Parenteral Nutrition:
ASPEN Recommendations 2019

# Adult Vitamins

| Vitamin | Standard Daily Requirement |
|---|---|
| Thiamin ($B_1$) | 6 mg |
| Riboflavin ($B_2$) | 3.6 mg |
| Niacin ($B_3$) | 40 mg |
| Folic acid | 600 mcg |
| Pantothenic acid | 15 mg |
| Pyridoxine ($B_6$) | 6 mg |
| Cyanocobalamin ($B_{12}$) | 5 mcg |
| Biotin | 60 mcg |
| Ascorbic acid | 200 mg |
| Vitamin A | 990 mcg |
| Vitamin D | 5 mcg |
| Vitamin E | 10 mg |
| Vitamin K | 150 mcg |

Appropriate Dosing For Parenteral Nutrition:
ASPEN Recommendations 2019

# Adult Minerals

| Trace Element | Standard Daily Requirement |
|---|---|
| Chromium | ≤10 mcg |
| Copper | 0.3-0.5 mg |
| Manganese | 55 mcg |
| Selenium | 60-100 mcg |
| Zinc | 3-5 mg |

Appropriate Dosing For Parenteral Nutrition: ASPEN Recommendations 2019

# Electrolytes

| Electrolyte | Suggested Maintenance Range | Suggested Maximum |
|---|---|---|
| Sodium | 1-2 mEq/kg | 200 mEq/L |
| Potassium | 1-2 mEq/kg | 240 mEq/d |
| Calcium | 10-15mEq/d | 25 mEq/d |
| Magnesium | 8-20 mEq/d | 48 mEq/d |
| Phosphorus | 20-40 mmol/d | 60 mmol/d |
| Chloride/Acetate | Maintain acid-base balance | |

# Lipid Injectable Emulsions (ILE)

# The Importance of ILE

## Energy source

## Ability to reduce dextrose load to meet caloric needs

- Reduces side effects from hyperglycemia
- Lowers $CO_2$ production which can increase due to excess dextrose

## Provides essential fatty acids

- Important for growth, development and function

# Oil Source Importance

- Soybean oil
  - Provides essential fatty acids
- MCT
  - Rapidly oxidize which provides immediate energy to the body
  - Does not accumulate in the liver
  - Fast metabolic clearance
- Fish oil
  - Provides Omega-3 (EPA and DHA)
  - Considered conditionally essential fatty acids
  - Less pro-inflammatory/potential anti-inflammatory activity
- Olive oil
  - Provides Omega-9
  - Provides small amounts of essential fatty acids
  - Immune neutral

# ILE's Available in the US

| | SO-ILE | 4-oil ILE | OO, SO-ILE | FO-ILE |
|---|---|---|---|---|
| **Oil Source** | Soybean Oil | Soybean Oil 30%<br>MCT 30%<br>Olive Oil 25%<br>Fish Oil 15% | Olive Oil 80%<br>Soybean Oil 20% | Fish Oil 100% |
| **FDA Approved Population** | Adults<br>Pediatrics | Adults<br>Pediatrics | Adults | Pediatrics |

Package Inserts for products

# ILE Potential Uses

| SO-ILE | 4 oil- ILE | OO, SO-ILE | FO-ILE |
|---|---|---|---|
| • Short term lipid need<br>• Normal liver function tests<br>• Treatment of EFAD<br>• Dosing meets EFA requirements | • Long term PN use (>2 weeks)<br>• Inflammatory state<br>• Elevated liver function tests<br>• Elevated triglycerides<br>• Dosing meets EFA requirements | • Calories (10 kcal/g)<br>• Essential fatty acids | • Conjugated Bili (Dbili) ≥ 2 mg/dL<br>• Allergy to soy, olive oil, palm oil, coconut oil<br>• Intolerance to other ILE |

# ILE Pediatric Dosing

| SO-ILE | 4 oil- ILE | FO-ILE |
| --- | --- | --- |
| 0.5-3 g/kg/d | Preterm infants: 3 g/kg/d<br>Term Infants 2.5-3 g/kg/d<br>Children (1-10 y/o): 2-2.5 g/kg/d<br>Adolescents: 2 g/kg/d | 1g/kg/d |

# ILE Adult Dosing

| SO-ILE | 4 oil-ILE | OO, SO- ILE |
| --- | --- | --- |
| • ≤ 1g/kg/d for stable hospitalized, home or long-term PN patients | • 1-2 g/kg/d<br>• Not to exceed 2.5 g/kg/d | • 1 – 1.5 g/kg/d<br>• Maximum dose: 2.5 g/kg/d |

# Case Studies

# Pediatric Case Study #1

- 7 y/o male
- Microvillus inclusion disease, IFALD, PN dependent since birth
- High output, excess losses
- Listed for multivisceral transplant
- 100% PN dependent

- 17.4 kg
- Estimated Needs:
  - DRI 37 kcals/kg
    - Using a stress factor of 1.7-2
    - Total: 63-74 kcals/kg
  - Protein needs 1.5 g/kg
  - Fluid: 1370 mL

# Labs

**Pertinent Labs:**

- Na 137
- K 3.8
- Cl 105
- CO2 19
- Glucose 114
- BUN 15
- Creatinine 0.42
- Adj. Ca 9.3
- Mg 2.1
- Phos 4.1
- TG 60
- D bili 1.8
- AST 94
- ALT 145
- AP 564

*Increased losses and unable to give p.o sodium bicarbonate so being treated with bicarbonates in PN, both sodium bicarb and potassium bicarb*

- *Initially on 18hr PN with SO-ILE at 1.2g/kg x 18 hrs/d.*
- *FO-ILE not approved for pediatrics at the time.*
- *Changed to 4 oil- ILE upon transfer as pt not growing and needing more calories prior to transplant.*

# Macronutrients +Volume

**Amino Acids**
- 2.5 g
- 174 kcal

**4-oil ILE**
- 2.5 g
- 435 kcal

**Dextrose**
- 235 g
- 796 kcal
- 14 GIR mg/kg/min

**Total** = 81 kcals/kg/d

**Volume**: 1680 mL (1.2x maintenance)

# PN Prescription

| | |
|---|---|
| Dosing weight(kg): 17.4<br>Access: Central | Total Volume: 1680 mL<br>Total Hours: 16 1 hr ramp up/1 hr ramp down |

| Macronutrients | Amount/day | Amount/kg |
|---|---|---|
| Amino Acids | 43.5 g | 2.5 g |
| Dextrose | 235 g | |
| ILE: 4-oil ILE | 43.5 g | 2.5 g |
| | | |
| Electrolytes | | |
| Sodium phosphate | 7.8 mmol | 0.45 mmol |
| Sodium Chloride | 9.9 meq | 0.57 meq |
| Sodium Acetate | 130 meq | 7.47 meq |
| Potassium Phosphate | 0 | 0 |
| Potassium Chloride | 68 meq | 3.9 meq |
| Potassium Acetate | 69 meq | 4 meq |
| Magnesium Sulfate | 4.9 meq | 0.28 meq |
| Calcium Gluconate | 9.7 meq | 0.56 meq |
| | | |
| Vitamins, Trace Elements, Additives | | |
| Selenium | 49 mcg | 2.8 mcg |
| Zinc | 3260 mcg | 187 mcg |
| Copper | 1000 mcg | 57 mcg |
| MVI | 5 mL | |
| Famotidine | 17 mg | 1 mg |
| Carnitine | 174 mg | 10 mg |

# Pediatric Case Study #2

- 1 year old female
- Liver failure, growth failure, fat soluble vitamin deficiencies and protein C deficiency
- Volume restriction needed
- Failed EN tolerance
  - Nausea
- Pt eats p.o foods
- Oral supplementation at times
  - Refusal and nausea
- Supplemental PN for nutrition optimization for growth
  - Meaning not need to give 100% of needs as pt is now taking oral
- 9 kg
- Estimated Needs:
  - DRI 80 kcals/kg
    - Using stress factor 1.3-1.5
    - Total: 104-120 kcals/kg
  - Protein 2-3 gm/kg/d
  - Fluid: 100 mL/kg

# Labs

**Pertinent Labs:**

- Na 135
- K 3.9
- Cl 103
- CO2 22
- Glucose 75
- BUN 13
- Creatinine 0.15
- Adj. Ca 9.96
- Mg 1.5
- Phos 4.6
- TG 113
- D bili 11.8
- AST 320
- ALT 210
- AP 1219

*Liver pt with ascites*

- *Given direct bilirubin >2, pt should be considered for FO-ILE*
- *Of note, pt was on 4 oil-ILE given close monitoring in clinic weekly and knowing pt is listed for liver , pt weight also stagnant and p.o intakes varying, could benefit from more calories*

# Scenario #1
# Macronutrients +Volume

**Amino Acids**

- 2.5 g/kg/d
- 90 kcal

**ILE: FO-ILE**

- 1 g/kg/d
- 99 kcal

**Dextrose**

- 92 g
- 312.8 kcal
- 12.2 GIR mg/kg/min

**Total**: 56 kcals/kg/d

**Volume**: 474 mL (0.5 x maintenance volume)

# PN Prescription Scenario #1

Dosing weight (kg): 9
Access: central

Total Volume: 474 mL
Total Hours: 14 with a 1 hr ramp up/1 hr ramp down

| Macronutrients | Amount/day | Amount/kg |
|---|---|---|
| Amino Acids | 22.5 g | 2.5 g |
| Dextrose | 92 g | |
| ILE: FO-ILE | 9 g | 1 g |
| | | |
| Electrolytes | | |
| Sodium phosphate | 1.6 mmol | 0.18 mmol |
| Sodium Chloride | 24 meq | 2.67meq |
| Sodium Acetate | 10 meq | 1.1 meq |
| Potassium Phosphate | 3.2 mmol | 0.36 mmol |
| Potassium Chloride | 0 | 0 |
| Potassium Acetate | 8 meq | 0.89 meq |
| Magnesium Sulfate | 1 meq | 0.11 meq |
| Calcium Gluconate | 5.6 meq | 0.62 meq |
| | | |
| Vitamins, Trace Elements, Additives | | |
| Selenium | 12 mcg | 1.3 mcg |
| Zinc | 1200 mcg | 133 mcg |
| MVI | 5 mL | |
| Carnitine | 90 mg | 10 mg |

# Scenario #2
# Macronutrients +Volume

**Amino Acids**
- 2.5 g/kg/d
- 90 kcal

**ILE: 4-oil ILE**
- 2.3 g/kg/d
- 207 kcal

**Dextrose**
- 92 g
- 312.8 kcal
- 12.2 GIR mg/kg/min

**Total**: 68 kcals/kg/d

**Volume**: 474 mL (0.5 x maintenance volume)

# PN Prescription Scenario #2

Dosing weight (kg): 9
Access: central

Total Volume: 474 mL
Total Hours: 14 with a 1 hr ramp up/1 hr ramp down

| Macronutrients | Amount/day | Amount/kg |
|---|---|---|
| Amino Acids | 22.5 g | 2.5 g |
| Dextrose | 92 g | |
| ILE: 4-oil ILE | 21 g | 2.3 g |
| | | |
| Electrolytes | | |
| Sodium phosphate | 1.6 mmol | 0.18 mmol |
| Sodium Chloride | 24 meq | 2.67meq |
| Sodium Acetate | 10 meq | 1.1 meq |
| Potassium Phosphate | 3.2 mmol | 0.36 mmol |
| Potassium Chloride | 0 | 0 |
| Potassium Acetate | 8 meq | 0.89 meq |
| Magnesium Sulfate | 1 meq | 0.11 meq |
| Calcium Gluconate | 5.6 meq | 0.62 meq |
| | | |
| Vitamins, Trace Elements, Additives | | |
| Selenium | 12 mcg | 1.3 mcg |
| Zinc | 1200 mcg | 133 mcg |
| MVI | 5 mL | |
| Carnitine | 90 mg | 10 mg |

# Adult Case Study #1

- 56 y.o. F, PMH Crohn's
- 167.6 cm, 65 kg, BMI 23.1
- Admitted for SBO x1 week
- NPO with NG to LIS (800ml output x 24h)
- PICC placed for central PN
- Receiving D5LR@100ml/hr
  - GIR of 1.28mg/kg/min
- Estimated needs:
  - Fluid: 2400ml (Holliday-Segar)
  - Energy: 1625-1950 kcal/day (25-30 kcal/kg)
  - Protein: 78-98 (1.2-1.5 g/kg)

# Macronutrients +Volume

**Amino Acids**
- 95 g
- 380 kcal

**ILE**
- 65 g
- 650 kcal

**Dextrose**
- 1900 - (380+650) = 870 / 3.4 =
- 255 g
- 867 kcal
- GIR 2.72mg/kg/min

**Total**
=1897 calories

**Volume**: 2400 mL
Over 24 hrs as 3:1
--> Cycled to 16 hours

# Electrolytes + Additives

**Labs:**

- Na 140
- **K 3.4**
- **Cl 93**
- CO2 24
- Glucose 108
- BUN 11
- Creatinine .7
- Ca 9
- Mg 2
- **Phos 2.8**
- TG 100

- Increase KCl provisioning in PN to account for the gastric losses from NG tube
- Ensure adequate phos provisioning

ADD:

- 10ml MVI
- 1ml MTE-4
- Thiamine 100mg/d

# Final Prescription

Dosing weight: 65kg
Vascular access: PICC
Total volume: 2400ml
Infuse @ 160ml/hr x 14h + 1 hour ramp up and 1hour ramp down @80ml/hr (16h total)

| Base Formula | Amount per day |
|---|---|
| Amino acids | 95g |
| Dextrose | 255g |
| 4-oil ILE | 65g |
| **Electrolytes** | |
| Sodium phosphate | 35mmol |
| Sodium chloride | 100mEq |
| Sodium acetate | - |
| Potassium phosphate | - |
| Potassium chloride | 108mEq |
| Potassium acetate | - |
| Magnesium sulfate | 12mEq |
| Calcium gluconate | 15mEq |
| **Vitamins, Trace Elements, Additives** | |
| Multicomponent vitamins | 10ml |
| Multicomponent trace elements | 1ml |
| Thiamine | 100mg |

# Adult Case Study #2

- 35y/o M, no PMH
- 180.3cm, 90kg, BMI 27.7
- Admitted for GSW to abdomen s/p numerous operations now with large, high output ECF
- R IJ CVC in place
- NPO to promote fistula management/healing
- Expected prolonged need for PN

- Estimated needs:
  - Fluid: 1ml/kcal *
  - Energy: 2250-2700 kcal/d (25-30 kcal/kg)
  - Protein: 135-225 g/d (1.5-2.5g/kg)

# Macronutrients + Volume

**Amino Acids**

- 180 g
- 720 kcal

**ILE**

- 90 g
- 900 kcal

**Dextrose**

- 2400- (720+900) = 1620 / 3.4 =
- 230 g
- 782 kcal
- GIR 1.77mg/kg/min

**Total =2402 calories**

**Volume**: 2400 mL
Over 24 hrs as 3:1

# Electrolytes + Additives

**Labs:**

- Na 144
- **K 5.3**
- **Cl 113**
- **CO2 20**
- Glucose 176
- BUN 39
- Creatinine 1.1
- Adj. Ca 8.1
- **Mg 1.7**
- Phos 3.9
- TG 198

- Omit K in the PN
- Adjust for metabolic acidosis, likely from intestinal losses
- Increase Ca and Mg

ADD:

- 10ml MVI
- 1ml MTE-4
- Thiamine 100mg/d
- Zinc 20mg/day

# Final Prescription

Dosing weight: 90kg
Vascular access: CVC
Total volume: 2400ml
Infuse @ 100ml/hr x 24h

| Base Formula | Amount per day |
|---|---|
| Amino acids | 180g |
| Dextrose | 230g |
| 4-oil ILE | 90g |
| **Electrolytes** | |
| Sodium phosphate | 24mmol |
| Sodium chloride | - |
| Sodium acetate | 100mEq |
| Potassium phosphate | - |
| Potassium chloride | - |
| Potassium acetate | - |
| Magnesium sulfate | 36mEq |
| Calcium gluconate | 20mEq |
| **Vitamins, Trace Elements, Additives** | |
| Multicomponent vitamins | 10ml |
| Multicomponent trace elements | 1ml |
| Thiamine | 100mg |
| Zinc sulfate | 20mg |

# Learning Assessment

- **Which of the following should be assessed before initiating parenteral nutrition?**
  a) **Venous access**
  b) **Laboratory values**
  c) **Medications**
  d) **All of the above**

- **When determining the electrolyte content of PN, which factor should be considered?**
  a) **Only the patient's age**
  b) **Current lab values and anticipated ongoing losses**
  c) **Trace element content of PN**
  d) **Hospital length of stay**

# Learning Assessment

- **Which statement best describes the difference between adult and pediatric PN?**
  a) **They are identical except for volume**
  b) **Pediatric PN does not include electrolytes**
  c) **Pediatric PN requires individualized, weight-based dosing**
  d) **Adult PN does not routinely include lipids**

- **Which additive is recommended for patients at risk for refeeding syndrome?**
  a) **Insulin**
  b) **Thiamine**
  c) **Zinc**
  d) **Famotidine**

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# Questions?