Date _____ Time noted _____ RN signature _____

UNIVERSITY MEDICAL CENTER

Adult Parenteral Nutrition Order Sheet

Addressograph

Date: Age:

Dosing Weight: _____

1) All orders must be received in pharmacy before 1:00PM Fax
2) Please see reverse side for guidelines for parenteral nutrition
3) A new order sheet must be completed and signed by the physician daily.
4) For assistance with the nutritional management of a patient, please consult the Nutrition Support Service.

I. MACRONUTRIENTS

Please check one box:	❑ Initial Central (See reverse)	❑ Standard Central	❑ Fluid Restricted Central	❑ Central Specialized	❑ Standard Peripheral
Total Calories	710 kcal	1870 kcal	1630 kcal	kcal	kcal
Standard Amino Acid 4 kcal/gm Other: (See reverse side) _____	50 gm	75 gm	70 gm	gm	75 gm
Dextrose 3.4 kcal/gm	150 gm	300 gm	280 gm	gm	150 gm
Total Volume of Base Solution	1000 ml	1500 ml	1000 ml	ml	2000 ml
Lipid Emulsion* 10% (1.1 kcal/ml) 20% (2 kcal/ml)	No lipid	10%/500 ml (550 kcals)	20%/200 ml (400 kcal)	❑ No Lipid ❑ 10%/500ml (550 kcal) ❑ 20%/200ml (400 kcal) ❑ 20% / _____ mls	❑ No Lipid ❑ 10%/500ml (550 kcal) ❑ 20% / _____ mls

II. ELECTROLYTES	Recommended Adult Daily Dose	Total DAILY Dose Please Specify Total Quantities or Will Be Omitted
Sodium	60 to 150 mEq	**mEq Sodium Chloride**
		mEq Sodium Acetate
Potassium	60 to 100 mEq	**mEq Potassium Chloride**
		mEq Potassium Acetate
Phosphate 15 mM PO_4 = 22 mEq K 15 mM PO_4 = 20 mEq Na	15 to 45 mM	**mM Potassium Phosphate**
		mM Sodium Phosphate
Calcium gluconate	10 mEq	**mEq Calcium Gluconate**
Magnesium sulfate	10 mEq	**mEq Magnesium Sulfate**

III. ADDITIVES:

Multivitamin	Dosed by pharmacy
Heparin 1 unit/ml	❑ Omit Heparin
Trace Elements	Dosed by pharmacy
❑ **Cholestasis** (Direct Bilirubin > 2 mg/dl) (See Trace Elements on back)	
Famotidine	**mg**
Folic Acid	**mg**
Regular Human Insulin	**units**
Zinc	**mg**

IV. OTHER ADDITIVES:

V. INFUSION RATE: TPN/PPN will begin at 6 PM unless otherwise specified by unit policy or cycling schedule.
Base solution **over 24 hours**
Lipid emulsion **over 12 hours**

FOR CYCLING RATE: (Please check box)
❑ Infuse over _____ hours; begin infusion at 6 PM.
(Please indicate cycling rates in the spaces provided on the right)

Cycled Rates:
_____ ml/hr (1st hour)
_____ ml/hr
_____ ml/hr (last hour)

MD Signature: _____

Pager: _____ Time _____

For Pharmacy Use:

Prepared by: _____ Checked by: _____

STANDING LABORATORY ORDERS:
1. Baseline chemscreen, magnesium, phosphate, transferrin, & triglycerides
2. Daily miniscreen, magnesium, phosphate
3. Fingerstick for blood glucose Q6h until controlled, then Q12h
4. Repeat transferrin , triglycerides and LFTs weekly on Monday
5. If TPN is interrupted, hang $D_{10}W$ at the same rate for at least 6 hours to prevent hypoglycemia. $D_{10}W$ is not necessary upon discontinuation of PPN

GUIDELINES FOR PARENTERAL NUTRITION

(These guidelines assume normal renal/hepatic function and may not be applicable to all patients)

A. Indications for Parenteral Nutrition (PN):

1. Patients with non-functional gastrointestinal tracts
2. Central (Total Parenteral Nutrition) vs. Peripheral:

Central (TPN)	Peripheral (PPN)
• Full caloric needs	• Hypocaloric support
• Fluid restriction	• Can tolerate high fluid volumes
• Severely ill	• Not severely ill
• Anticipated duration of NPO > 5 days	• Anticipated duration of NPO < 5-7 days

B. Intravenous Access and Administration:

1. For central nutrition:
   - Confirm placement of central access prior to infusing TPN.
   - Begin TPN infusion through an unused catheter/lumen. If an unused lumen has not been reserved, the central catheter can be changed over a guidewire. Use distal port whenever possible.
2. Base solutions (amino acid/dextrose) must be filtered through a 0.22 micron filter. The appropriate in-line filter will be provided by pharmacy with the TPN solution.
3. Lipid emulsion is administered as a separate infusion via Y-site and does not require an in-line filter.

C. Estimation of Nutritional Requirements:

1. Total calories can be calculated using the Harris-Benedict equation plus an activity factor (20%-50%) or can be estimated as 25-30 Kcal / kg based on dry weight (estimated as weight upon admission)

Harris-Benedict Estimate of Basal Calories =
M: 66.5 + (13.8 x Wgt in kg) + (5 x Hgt in cm) - (6.8 x Age)
F: 655 + (9.6 x Wgt in kg) + (1.8 x Hgt in cm) - (4.7 x Age)

2. Protein (amino acids): 1 to 1.5 gm of protein / kg. If actual wgt is > 120%, use ideal body weight (IBW) to estimate protein requirements
   IBW = Male: 50 + (2.3 X inches over 5 feet)
   Female: 45 + (2.3 X inches over 5 feet)
3. Lipid Emulsion: 20-30% of total calories
4. PN should be initiated at half the estimated energy needs (approx 150-200 gm dextrose) for the first 24 hours to prevent refeeding syndrome and increase to goal calories based on glucose and electrolyte tolerance.

D. Amino Acids (AA): (4 kcal/gm)

1. Standard amino acid solution contains a balanced profile of essential and non-essential amino acids; a 15% stock solution is routinely used to compound TPN/PPN solutions.
2. Other Amino Acid solution:
   HepatAmine: Contains greater amounts of branched chain amino acids, BCAA, (leucine, isoleucine and valine) and lower amounts of aromatic amino acids, AAA, (phenylalanine, tryptophan and tyrosine). May be considered for Stage III or IV hepatic encephalopathy to provide greater protein intake via BCAA vs. AAA. BCAA-enriched TPN solutions have not been shown to be superior to standard amino acid solution in clinical trials.

E. Carbohydrates (Dextrose): (3.4 kcal/gm)

1. A standard 70% dextrose solution is used to compound TPN/PPN solutions.
2. The maximum recommended rate for carbohydrate infusion is 5 mg/kg/min. Excess carbohydrate administration has been associated with hyperglycemia, hepatic steatosis and increased CO_2 production.

F. Lipid Emulsion:

1. Lipid emulsion is available as:
   - 10% / 500 ml (1.1 kcal/ml)
   - 20% / 200 ml or 500 ml (2 kcal/ml)
2. Lipid 10% and 20% emulsion are isotonic and can be administered via peripheral or central vein.
3. Lipid intake should be reduced or avoided if triglycerides >400 mg/dl.
4. Medications formulated in lipid emulsion should be considered when developing a TPN regimen. (ie . Propofol contains 10% lipid emulsion and provides 1.1 kcal/ml)

G. Electrolytes/Acid-Base:

1. The recommended electrolyte ranges will provide maintenance intake for an adult patient. Select patients may require higher or lower amounts; however, PN should not be used to treat acute electrolyte abnormalities.
2. Calcium and phosphate have limited solubilities in PN solutions. In general, the product of calcium (mEq/L) times phosphate (mmol/L) should not exceed 300 when the amino acid concentration is ≤ 4% to avoid the formation of a precipitate. Contact the pharmacist for information regarding the solubility of a specific TPN solution.
3. Sodium and potassium can be included in a TPN solution as either an acetate or chloride salt. Acetate functions as a precursor to bicarbonate. When metabolic acidosis is present, Na or K can be provided predominantly as the acetate salt. When metabolic alkalosis is present, Na and K can be provided as the chloride salt.

H. Vitamins:

The multivitamin preparation in TPN provides maintenance requirements to prevent deficiencies in most adult patients.

Adult multivitamin dose (10 cc) contains:

Vit A (retinol)	330 IU	Vit D_3 (cholecalciferol)	200 IU
Vit E (dl-α tocoph)	10 IU	Vit C (ascorbic acid)	200 mg
Vit B_1 (thiamine)	6 mg	Vit B_2 (riboflavin)	3.6 mg
Vit B_6 (pyridoxine)	6 mg	Niacin	40 mg
Pantothenic Acid	15 mg	Folic acid	600 mcg
Vit B_{12} (Cyanocobalamin)	5 mcg	Biotin	60 mcg
		Vit K	150 mcg

I. Trace Elements:

1. The trace elements in PN solution provide maintenance requirements and prevent deficiencies for most adult patients. Standard amounts of trace elements will be added to TPN: Zinc 4 mg, Copper 1 mg, Manganese 0.8 mg, Chromium 10 mcg
2. Patients experiencing significant gastrointestinal loss from the small bowel (ie ileostomy output > 500 ml/24 hrs) may require increased zinc supplementation. (10 mg per liter of output)
3. If the "Cholestasis" box is checked, manganese and copper will be omitted from TPN. Manganese and copper are eliminated via biliary tract and may accumulate with repeated doses.

J. Peripheral Parenteral Nutrition (PPN):

1. Total calorie and protein requirements may not be met in most patients by PPN due to the osmolarity and volume considerations.
2. The osmolarity (Osm) of PPN formulas should be less than 900 mOsm/L. The osmolality of PPN solutions can be estimated by the following equation:

PPN Osmolarity (mOsm/L)= (grams of dextrose/L X 5) + (grams of AA/L X 10) + (mEq cations/L X 2)

3. PPN should contain no more than 60 mEq/L of potassium or >8% dextrose concentration.
4. Due to the increase risk of phlebitis, PPN should not exceed a 14 day duration.

K. Insulin:

For patients with glucose levels persistently >200 mg/dl, 0.1 units of regular insulin/gm dextrose may be added to PN solution (e.g. 20 units insulin per 200 gm dextrose). If glucose levels are persistently >200 mg/dl, the PN insulin may be increased by 0.05 units of regular insulin /gm dextrose up to 0.2 units of insulin/ gm dextrose (eg. 40 units insulin per 200 gm dextrose). If glucose remains above 200 mg/dl despite insulin coverage of PN solution and sliding scale with regular insulin, initiation of a separate insulin infusion may be helpful in achieving adequate glycemic control. GOAL: Blood glucose between 100-150 mg/dl unless otherwise specified.

L. Additives:

If an H2 Antagonist is indicated (stress ulcer prophylaxis in an ICU setting, history of GI bleeding or ulceration, etc.), the following doses are recommended based on the patient's renal function:

Famotidine: 40mg in PN solution every 24 hours
Renal dose: (CLcr < 50 ml/min) 20 mg in PN every 24 hours

Famotidine (Pepcid®) PO/IV will be automatically discontinued if IV famotidine is added to the TPN solution.

M. Cycling of TPN:

Cycling is a method of reducing the duration of PN infusion to a shorter interval. If home TPN is planned, cycling should begin 4 days prior to discharge. For recommendations on how to cycle parenteral nutrition, please consult NSS.