

Hospital: **Parenteral Nutrition Consultation and Monitoring Service  
for Adults and Adolescents**

Reference #: RX356

Effective Date: Revision Date: 06/2011  
 Reviewed Date: 05/2011 Origination Date: 02/2006

**Approved by:** Pharmacy and Therapeutics Committee  
 Patient Care Committee  
 Medical Board  
**Approval Date:** 05/2011  
 06/2011  
 06/2011

**Policy Owner:** Director of Pharmacy  
**Information Resource:** Pharmacy Managers

Stakeholder Groups
Pharmacy Department
Clinical Nutrition Services

**SCOPE: Applicable to:**

Departments, Divisions, Operational Areas	Personnel
Pharmacy	Nutrition Services
	Pharmacists, Dietitians

**POLICY STATEMENT:**

The Pharmacy and Clinical Nutrition Departments shall be responsible for initiating and monitoring parenteral nutrition (PN) in adult patients when consulted by physicians. The pharmacist and dietitian will assist physicians in providing optimal nutrition therapy to patients unable to receive nutrition by the oral or enteral route.

**DEFINITIONS:**

- PN – Parenteral Nutrition
- TPN – Total Parenteral Nutrition
- PPN – Peripheral Parenteral Nutrition
- EN – Enteral Nutrition
- RD – Registered Dietitian
- EEE – Estimated Energy Expenditure
- REE – Resting Energy Expenditure
- Kcal(s) – kilocalorie(s)
- ABW – Actual body weight
- IBW – Ideal body weight
- BMI – Body Mass Index
- CRRT – Continuous Renal Replacement Therapy
- TBili – Total Bilirubin
- SCr – Serum Creatinine
- NS – Normal Saline

**PROCEDURE AND PROCESS:**

**Procedure:**

<b>Responsibility:</b>	<b>Action:</b>
Pharmacist/ Dietitian	1. Obtain the names of patients receiving TPN in his/her patient care area of practice via an electronic health record system list.
	2. Estimate the patient's nutritional caloric needs using validated energy requirement calculation methods.
Pharmacist	3. Consider the patient's current nutrition status, disease states, clinical status, lab values, medications and IV fluids when initiating or adjusting a TPN.

**Pharmacist Role for All Following Categories:**

1. Prior to initiating or adjusting TPN, the pharmacist will successfully pass a general TPN competency exam.
2. Pharmacists will monitor fluid, electrolyte, acid-base status and blood glucose in patients using standard laboratory values.
3. Pharmacist will leave a progress note if one of the criteria below is met:
  - a. TPN being initiated
  - b. TPN formula is changed or modified
  - c. Within 24 hours of patient transfer in level of care
  - d. Every 48 hours in the absence of criteria a,b, or c above
4. Pharmacists will write orders for macronutrients and electrolytes per TPN guidelines listed in this policy.
5. Changes to the amount of a macronutrient or electrolyte in a continuous TPN will be effective with the next continuous TPN bag to be hung at 2200 daily unless the clinical condition requires these changes to be made sooner.
6. Changes to the amount of macronutrient or electrolyte in a cyclic TPN will be effective the next cyclic TPN bag to be hung at 2000 daily unless the clinical condition requires these changes to be made sooner.
7. Pharmacists may order labs or procedures deemed necessary to provide optimal nutrition management including electrolytes, electrolyte protocols, renal and hepatic function tests, triglycerides, serum glucose checks, CRP, prealbumin and indirect calorimetry.
8. When signing TPN and lab orders, pharmacists will enter the name of the physician who placed the original consult order in the Ordering Provider field and "Protocol/ No Co-Sign/ Follow Up" in the Authorizing Provider field.

<b>Estimate Energy Requirements</b>	<ol style="list-style-type: none"> <li>1. Determine patient's weight:                             <ol style="list-style-type: none"> <li>a. <b>Actual Body Weight in kg (ABW)</b> – the patient's actual body weight at hospital admission will be used for all energy requirement and protein requirement calculations except where specifically stated.</li> <li>b. <b>Ideal Body Weight in kg (IBW) – Hamwi Method</b> – the patient's ideal body weight will be used in specific circumstances such as obesity, pregnancy, chronic hemodialysis as outlined in Appendix A.                                     <p style="margin-left: 40px;"><u>Male:</u> 48 kg + 2.7 x (height in inches - 60)</p> <p style="margin-left: 40px;"><u>Female:</u> 45.5 kg + 2.3 x (height in inches - 60)</p> </li> <li>c. Obese = BMI ≥ 30</li> </ol> </li> <li>2. Calculate EEE/24 hours using validated energy requirement calculation methods relevant to patient's clinical condition. (see Appendix A)</li> </ol>
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	<p>3. Estimate stress factor, if applicable. (see Appendix A)</p>
<p><b>Fluid Volume</b></p>	<ol style="list-style-type: none"> <li>1. TPN should <i>not</i> be used to completely satisfy fluid requirements. Most TPNs infuse at a rate of 50-75 mL/hr. If additional fluid is required, physicians should order a maintenance fluid in addition to TPN.</li> <li>2. Assess need for fluid restriction (specifically, CHF, renal failure) and concentrate TPN as able.</li> </ol>
<p><b>Estimate Protein Requirements and Support Recommendations</b></p> <p><b>Amino Acids: 4 kcal/g</b></p>	<ol style="list-style-type: none"> <li>1. See Appendix B for estimated protein requirements in various patient populations and disease states.</li> <li>2. Prealbumin (<math>t_{1/2} = 2-3</math> days) is preferred over albumin as an indicator of nutritional status (<math>t_{1/2} = 20</math> days). Prealbumin will be checked a minimum of once weekly.</li> <li>3. C-Reactive Protein: recommended if prealbumin does not trend upward in the absence of other clinical explanations.</li> <li>4. Monitor BUN and SCr and consider limiting protein when risk of nephrotoxicity is high (i.e. acute or chronic renal insufficiency).</li> <li>5. Specialized hepatic amino acid formulas (Branched Chain Amino Acids) will be considered in patients with &gt; Grade II hepatic encephalopathy.</li> <li>6. Consider checking nitrogen balance to monitor protein utilization (<math>1g N_2 = 6.5 g</math> protein) in appropriate patients.</li> </ol>
<p><b>Estimate Lipid Requirements and Support Recommendations</b></p> <p><b>Lipids: 9 kcal/g 2 kcal/mL</b></p>	<ol style="list-style-type: none"> <li>1. Lipid bottle and tubing will be changed daily at 22:00 for continuous TPN and 20:00 for cyclic TPN unless otherwise specified by a physician or pharmacist.</li> <li>2. The maximum hang time for each lipid bottle is 24 hours.</li> <li>3. Optimal dose: 25-30% of total kcal.</li> <li>4. Required minimum of 4-10% of total kcal to prevent essential fatty acid deficiency (EFAD).</li> <li>5. Baseline and weekly triglyceride (TG) level will be monitored and should remain &lt; 400 in order for lipids to be infused.</li> <li>6. When TG &gt; 400, give 500 kcal (250 mL) of lipid once to twice weekly to prevent EFAD. Monitor TG at least twice weekly in this patient population.</li> <li>7. For patients receiving propofol, lipids may be held or the rate adjusted as deemed appropriate by the pharmacist. Triglycerides will be monitored to determine need for adjustments, starting or stopping lipids due to concurrent use of propofol.</li> </ol>

<p><b>Estimate Carbohydrate (dextrose) Requirements and Support Recommendations</b></p> <p><b>Dextrose: 3.4 kcal/g</b></p>	<ol style="list-style-type: none"> <li>1. Dextrose will provide the balance of required kcals not provided by protein and lipids.</li> <li>2. Dextrose should provide approx 50-60% of total kcals (2-5 mg/kg/min).</li> <li>3. MAXIMUM concentration of dextrose will be 10% peripherally and 35% centrally.</li> <li>4. At the time of TPN initiation, if the patient is not currently on corrective dose insulin or an insulin infusion protocol and does not have a hospitalist or intensivist currently consulted, the pharmacist will initiate subcutaneous corrective dose insulin using regular insulin per the TPN order set and enter the standard low scale doses as follows: <table border="1" data-bbox="560 682 1328 987" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">Blood Glucose</th> <th style="text-align: left;">Add'l Insulin</th> </tr> </thead> <tbody> <tr> <td>&lt; 60</td> <td>See hypoglycemia protocol</td> </tr> <tr> <td>60-119</td> <td>No insulin</td> </tr> <tr> <td>120-149</td> <td>0 units</td> </tr> <tr> <td>150-199</td> <td>1 unit</td> </tr> <tr> <td>200-249</td> <td>2 units</td> </tr> <tr> <td>250-299</td> <td>3 units</td> </tr> <tr> <td>300-349</td> <td>4 units; call physician if &gt; 300 x 2</td> </tr> <tr> <td>&gt; 350</td> <td>5 units and call a physician</td> </tr> </tbody> </table> </li> <li>5. Further adjustments to insulin orders will be made by a physician.</li> <li>6. <b><i>If two consecutive blood glucose levels are ≥150 mg/dL, the pharmacist will notify the physician and recommend a hospitalist consult for management of hyperglycemia. Pharmacists will also decrease dextrose in the TPN formulation as able to minimize further hyperglycemic risk.</i></b></li> <li>7. At the time of TPN initiation, if the patient does have current insulin orders and/or a hospitalist or intensivist consult, the pharmacist will notify the physician of the TPN initiation so he/she can review and adjust the insulin orders as needed.</li> <li>8. Calculate non-protein kcal:nitrogen ratio (NPK:N<sub>2</sub>) to determine if there is adequate kcal necessary for proper protein utilization. <ul style="list-style-type: none"> <li>- Recommended NPK:N<sub>2</sub> for maintenance = 150:1, mild to moderate stress = 90 -120:1, severe stress/critical illness = 70-100:1.</li> </ul> </li> </ol>	Blood Glucose	Add'l Insulin	< 60	See hypoglycemia protocol	60-119	No insulin	120-149	0 units	150-199	1 unit	200-249	2 units	250-299	3 units	300-349	4 units; call physician if > 300 x 2	> 350	5 units and call a physician
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<b>Electrolytes</b>	
<p><b>Sodium (Na)</b>   <b>Normal Serum Value: 135 – 145 mEq/L</b></p>	<p>Standard amount in TPN is 30-80 mEq/L (1/2 NS = 77mEq/L)                      Pharmacists will initiate TPN with standard Na unless physician and/or disease state requires otherwise.</p> <p><b><u>Hyponatremia</u></b></p> <ol style="list-style-type: none"> <li>1. Pharmacist will consider fluid status and disease states in patients with mild to moderate hyponatremia (Na 125-135). If patient is fluid overloaded, no adjustments will be made.</li> <li>2. If patient is determined to be in normal fluid balance and 2 consecutive Na levels are low, pharmacist may increase Na in next TPN.</li> </ol> <p><b><u>Hypernatremia</u></b></p> <ol style="list-style-type: none"> <li>1. Pharmacist will consider fluid status of the patient and reduce Na in next TPN as appropriate.</li> <li>2. Pharmacist will consider using a low sodium amino acid formulation to minimize Na content of TPN as appropriate.</li> </ol>
<p><b>Potassium (K)</b>  <b>Normal Serum Value: 3.5 - 5.1 mEq/L</b></p>	<p>Standard amount in TPN is 30-40 mEq/L                      Pharmacist will initiate TPN with standard K unless physician and/or disease state requires otherwise.</p> <p><b><u>Hypokalemia</u></b></p> <ol style="list-style-type: none"> <li>1. <b>K replacement protocol will be ordered at the initiation of TPN for all patients with the exception of dialysis patients.</b></li> <li>2. K in TPN will be increased per pharmacist discretion based on lab value, diuretic use, other IV fluids, and total K replaced per protocol.</li> </ol> <p><b><u>Hyperkalemia</u></b></p> <ol style="list-style-type: none"> <li>1. For K &gt; 6 or symptomatic hyperkalemia, TPN rate will be reduced or stopped (if TPN contains K) and pharmacist will adjust amount of K in next TPN per his/her discretion.</li> </ol>
<p><b>Magnesium (Mg)</b>  <b>Normal Serum Value: 1.8-2.6 mEq/L</b></p>	<p>Standard amount in TPN is 4-12 mEq/L                      Pharmacist will initiate TPN with standard Mg unless physician and/or disease state requires otherwise.</p> <p><b><u>Hypomagnesemia</u></b></p> <ol style="list-style-type: none"> <li>1. <b>Mg replacement protocol will be ordered at the initiation of TPN for all patients with the exception of dialysis patients.</b></li> <li>2. Mg in TPN will be increased per pharmacist discretion based on lab value and total Mg replaced per protocol.</li> </ol> <p><b><u>Hypermagnesemia</u></b></p> <ol style="list-style-type: none"> <li>1. If patient experiences symptomatic hypermagnesemia, TPN rate will be reduced or stopped (if TPN contains Mg) and pharmacist will adjust amount of Mg in next TPN per his/her discretion.</li> </ol>

<p><b>Calcium (Ca)</b>  <b>Normal Serum</b>  <b>Value: 8.5 - 10.5</b>  <b>mg/dL</b></p> <p><b>Ionized Calcium</b>  <b>(iCa)</b>  <b>Normal Serum</b>  <b>Value:</b>  <b>1.19 – 1.3 mMol/L</b></p>	<p>Standard amount in TPN is 5-10 mEq/L  Pharmacist will initiate TPN with standard Ca unless physician and/or disease state requires otherwise.</p> <ul style="list-style-type: none"> <li>- To minimize risk of precipitate formation in TPN solution:  <math>Ca \text{ (mEq/L)} + Phos \text{ (mMol/L)} \leq 45</math></li> <li>- To minimize risk of precipitate formation in soft tissues:  <math>Ca \text{ (mg/dL)} \times Phos \text{ (mMol/L)} \leq 60</math></li> </ul> <p><b><u>Hypocalcemia</u></b></p> <ol style="list-style-type: none"> <li>1. Pharmacist will consider patient’s serum albumin and may order an ionized Ca prior to increasing Ca in next bag of TPN.</li> <li>2. Ca in TPN will be increased per pharmacist discretion based on lab value and any replacement doses given.</li> </ol> <p><b><u>Hypercalcemia</u></b></p> <p>If patient experiences symptomatic hypercalcemia TPN rate will be reduced or stopped (if TPN contains Ca) and pharmacist will adjust amount of Ca in next TPN per his/her discretion.</p>
<p><b>Phosphorus</b>  <b>(Phos)</b>  <b>Normal Serum</b>  <b>Value: 2.4 - 4.7</b>  <b>mMol/L</b></p>	<p>Standard amount in TPN is 10-15 mMol/L  Pharmacists will initiate TPN with standard Phos unless physician and/or disease state requires otherwise.</p> <ul style="list-style-type: none"> <li>- To minimize risk of precipitate formation in TPN solution:  <math>Ca \text{ (mEq/L)} + Phos \text{ (mMol/L)} \leq 45</math></li> <li>- To minimize risk of precipitate formation in soft tissues:  <math>Ca \text{ (mg/dL)} \times Phos \text{ (mMol/L)} \leq 60</math></li> </ul> <p><b><u>Hypophosphatemia</u></b></p> <ol style="list-style-type: none"> <li>1. <b>Phos replacement protocol will be ordered at the initiation of TPN for all patients with the exception of dialysis patients.</b></li> <li>2. Phos in TPN will be increased per pharmacist’s discretion based on lab value and total Phos replaced per protocol.</li> </ol> <p><b><u>Hyperphosphatemia</u></b></p> <ol style="list-style-type: none"> <li>1. Pharmacist will decrease Phos in next TPN per his/her discretion. Note that lipid formulas contain phosphorus so patient may continue to receive some phosphorus even if it is removed from TPN.</li> </ol> <ul style="list-style-type: none"> <li>- Both 10% and 20% lipid emulsions (i.e. propofol and Liposyn III®) contain 15.5 mMol of phosphorus per liter</li> </ul>

<p><b>Chloride &amp; Acetate (Bicarbonate) Normal Serum Values: Cl: 98 - 110 mEq/L Bicarbonate: 22 - 32 mEq/L</b></p>	<p>Standard acetate:chloride ratio in TPN is 1:1</p> <p><b><u>Metabolic acidosis</u></b></p> <ol style="list-style-type: none"> <li>1. If severe, pharmacist should minimize chloride in TPN.</li> <li>2. If mild/moderate, the ratio may be adjusted per pharmacist discretion.</li> </ol> <p><b><u>Metabolic alkalosis</u></b></p> <ol style="list-style-type: none"> <li>1. If severe, pharmacist should minimize acetate in TPN.</li> <li>2. If mild/moderate, the ratio may be adjusted per pharmacist discretion.</li> </ol>
<p><b>Multi-vitamin</b></p>	<ol style="list-style-type: none"> <li>1. Pharmacist will order standard multivitamin with vitamin K unless otherwise specified by the physician. (See Appendix C for ingredients)</li> <li>2. Patients receiving anticoagulation with warfarin may remain on multivitamin with vitamin K with careful monitoring of INR or CFX values.</li> </ol>
<p><b>Trace Elements</b></p>	<ol style="list-style-type: none"> <li>1. Pharmacist will order standard trace elements unless otherwise specified by the physician. (See Appendix C for ingredients)</li> <li>2. Disease states where certain elements will be removed:             <ol style="list-style-type: none"> <li>a. Renal Dysfunction (SCr &gt; 2-3 unless patient is receiving dialysis): Consider removal of selenium and chromium if on long-term TPN (10+ days) due to a risk of accumulation.</li> <li>b. Hyperbilirubinemia (TBili &gt; 3-4): Consider removal of copper and manganese if on long-term TPN (10+ days) due to a risk of accumulation.</li> </ol> </li> </ol>
<p><b>Additional Supplementation</b></p>	<p><b>No additional additives other than the standard multi-vitamin and trace elements as stated above will be added to any TPN formulation except those specifically stated in this section.</b></p> <p><b><u>Vitamin C</u></b></p> <ol style="list-style-type: none"> <li>1. Patient population: Wound healing of surgical incisions or stage 2 or greater pressure ulcers may benefit from vitamin C supplementation             <ol style="list-style-type: none"> <li>a. Pharmacist may add ascorbic acid 500-1,000 mg/day to TPN</li> <li>b. Patients with renal insufficiency who are not receiving dialysis will receive a maximum of 500 mg/day</li> <li>c. Patients with a history of or at risk for nephrolithiasis will not receive additional ascorbic acid</li> </ol> </li> </ol> <p><b><u>Zinc</u></b></p> <ol style="list-style-type: none"> <li>1. Patient population: Wound healing of surgical incisions or pressure ulcers may benefit from zinc supplementation.             <ol style="list-style-type: none"> <li>a. Pharmacist may add zinc 5-10 mg/day to TPN</li> </ol> </li> <li>2. Patient population: Patients with significant stool and/or GI fluid loss from diarrhea, ostomies, fistulas, etc. are at risk of deficiency</li> </ol>

	<p>and may benefit from supplementation.</p> <p>a. Pharmacist may add zinc 5-10 mg/day to TPN</p> <p>3. Patient population: Patients who receive propofol infusion for &gt; 5 days are at risk of deficiency due to the chelating effects of EDTA.</p> <p>a. Pharmacist may add zinc 5 mg/day to TPN</p> <p>If a patient has more than one of the above indications for zinc supplementation, a maximum of 10 mg/day will be added to TPN.</p> <p><b><u>Insulin</u></b></p> <p>1. Insulin may be added to the TPN bag at the physician’s discretion after the TPN infusion has been at goal rate for at least 24 hours.</p> <p>2. Physicians will be responsible for making all insulin dose adjustments.</p> <p>3. Initiation of insulin and dose adjustments will be communicated to the pharmacist either verbally or via ERx 292861 “TPN changes from provider to pharmacy”.</p> <p>4. For any TPN containing insulin, all changes made by pharmacy to the dextrose concentration will be communicated to the physician.</p> <p>5. When any TPN containing insulin is discontinued, pharmacy will contact the physician for new insulin orders if not already addressed.</p>
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<p><b>Osmolarity</b> (for peripheral line TPN)</p>	<p>Total osmolarity for <u>peripheral</u> TPN must be ≤ 900 mOsm/L to prevent phlebitis.</p> <p><u>Osmolarity of substrates and additives:</u></p> <p>Amino Acids: 100 mOsm/gm% (e.g. 4% AA contributes 400 mOsm/L)</p> <p>Dextrose: 50 mOsm/gm% (e.g. 8% dextrose contributes 400 mOsm/L)</p> <p>Electrolytes: 1 mOsm/mEq (e.g. 20 mEq of K contributes 20 mOsm/L)</p> <p>Lipids: Iso-Osmolar, can be given peripherally or centrally</p>
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<p><b>Administration Rate</b></p>	<p>In general, TPN will be initiated at ½ goal rate for 24 hours and then increased to goal rate.</p> <p>1. In patients deemed to be at risk for refeeding syndrome, the TPN will be initiated at a maximum of ½ goal rate for a minimum of 24 hours and then increased to goal rate per pharmacist discretion.</p> <p>2. The maximum hang time for all TPN bags is 36 hours.</p> <p>3. In patients recently on TPN or changing from continuous to cyclic TPN, the titration to goal rate may be accelerated per pharmacist discretion.</p> <p>4. If TPN is to be discontinued, cut TPN rate in half for 2-4 hours and then discontinue or per physician recommendations.</p> <p>5. Lipids do not need to be tapered when discontinuing.</p>
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**PROTOCOL:** N/A



**FORMS:** N/A

**ALGORITHM:** N/A

**ADDENDA:**

- Appendix A – Calculations for Estimation of Energy Expenditure (EEE)
- Appendix B – Estimated Daily Protein Requirements
- Appendix C – TPN Standard Product Formulations

**FAQs:**

Parenteral nutrition (PN) delivers nutrients intravenously to patients unable to receive enteral nutrition (EN) or who are unable to maintain their nutritional status solely by enteral means. This policy and procedure outlines the process and expectations for pharmacists and Dietitians providing consultation for total and peripheral parenteral nutrition.

**REFERENCES:**

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**Related Regulations and Laws:** N/A

**Additional Search Terms:** hyperalimentation

**Related Policies:**

Name of Policy	Content ID
TPN Formulation	RX329

**Policies Replacing:** N/A

## Appendix A – RX356

### Calculations for Estimation of Energy Expenditure (EEE)

For all equations:

A = age in years

W = actual body weight in kg *regardless* of BMI (i.e. do *not* adjust weight if obese)

H = height in cm

S = sex (male = 1, female = 0)

T = trauma (present = 1, absent = 0)

B = burns (present = 1, absent = 0)

O = obesity = BMI > 27 kg/m<sup>2</sup> (present = 1, absent = 0)

#### **Non-ventilator dependent, BMI < 30:**

##### Mifflin-St. Jeor Equation

Men: REE = 10(W) + 6.25(H) – 5(A) + 5

Women: REE = 10(W) + 6.25(H) – 5(A) – 161

EEE = REE + stress factor

##### Stress factor

Weight maintenance or mildly stressed patient: 1.1 – 1.3

- Routine surgery

Cancer patient: 1.1 – 1.5

Minor infection or moderately stressed patient: 1.2 – 1.3

Severely stressed, mechanically ventilated: 1.3 – 1.5

- Sepsis or multiple trauma

Acute renal failure patient: 1.5 – 2

Chronic renal failure patient: 1 – 1.5

Burn patient: 2

#### **BMI ≥ 30; Non-ventilator and ventilator dependent**

22 kcal/kg IBW

#### **Non-ventilator dependent, hemodialysis**

30-35 kcal/kg ABW

#### **Non ventilator-dependent, pregnant**

36-40 kcal/kg IBW

#### **Ventilator-dependent patients, BMI < 30**

Ireton-Jones (1992 version)

Ventilator dependent: EEE = 1925 – 10(A) + 5(W) + 281(S) + 292(T) + 851(B)

DO NOT use stress factor with this equation

Note: When a patient's status changes from non-ventilated to ventilated (or vice versa), energy requirements will be recalculated with the appropriate formula

**Appendix B – RX356**

Estimated Daily Protein Requirements

**\*\*All weights are in kg of *actual* body weight unless otherwise indicated\*\***

Maintenance, healthy, no stress	0.8 – 1 g/kg
Mild stress	1 – 1.2 g/kg
Moderate stress, protein repletion, elderly	1.3 – 1.5 g/kg
Severe stress, extensive repletion, burns	1.5 – 2.5 g/kg

Protein needs in specific disease states:

Hepatic Failure	0.8 – 1 g/kg
- hepatic encephalopathy	< 0.8 g/kg – consider BCAA
Acute Renal Failure	0.8 – 1.2 g/kg
<b><i>Note: patients with these disease states are often not able to tolerate the higher protein load</i></b>	
Chronic Renal Failure (non-dialysis)	0.6 – 0.8 g/kg
Hemodialysis	1.2 – 1.5 g/kg
- dependent upon stress, malnutrition, & dialysis regimen	
CRRT	1.5 – 2.5 g/kg
Obesity – BMI 30-40	2 g/kg/ <u>IBW</u> (adjust for organ
dysfunction)	
Obesity – BMI > 40	2.5 g/kg/ <u>IBW</u> (adjust for organ
dysfunction)	
Pancreatitis	1 – 1.5 g/kg
Respiratory Failure or Diabetes	1 – 1.5 g/kg
Sepsis	1.5 – 2.5 g/kg
Short-bowel Syndrome, IBD	1 – 2 g/kg
Hyperemesis gravidarum	1.2 – 1.7 g/kg

## Appendix C – RX356

### TPN Standard Product Formulations

Dextrose: 70% stock solution

Amino acids:

Standard: Aminosyn II<sup>®</sup> – 15% stock solution

Sodium-free: Clinisol<sup>®</sup> – 15% stock solution

Branched chain: BranchAmin – 4% stock solution

Lipids: Liposyn III<sup>®</sup> 20%

Multivitamin: Infuvite<sup>®</sup> Adult (per 10 mL added to each TPN bag)

Ascorbic Acid (C): 200 mg

Vitamin A: 3,300 International Units

Vitamin D<sub>3</sub> (cholecalciferol): 200 International Units

Thiamin (B<sub>1</sub>): 6 mg

Riboflavin (B<sub>2</sub>): 3.6 mg

Pyridoxine (B<sub>6</sub>): 6 mg

Niacin (B<sub>3</sub>): 40 mg

Pantothenic acid: 15 mg

Vitamin E: 10 International Units

Vitamin K: 150 mcg

Folic acid: 600 mcg

Biotin: 60 mcg

Cyanocobalamin (B<sub>12</sub>): 5 mcg

Trace Elements: Multitrac<sup>®</sup> - 5 (per 3 mL added to each TPN bag)

Zinc: 3 mg

Copper: 1.2 mg

Manganese: 0.3 mg

Chromium: 12 mcg

Selenium: 60 mcg