 C R E D I T • V A L L E Y <small>THE CREDIT VALLEY HOSPITAL</small>		CLINICAL PRACTICE GUIDELINE	PROFESSIONAL PRACTICE
TITLE: Neonatal Total Parenteral Nutrition (TPN)			
DATE OF ISSUE: 2007, 05	PAGE 1 OF 6	NUMBER: CPG 14-7	
SUPERCEDES: 2000, 02	ISSUED BY: _____ TITLE: Chief of Medical Staff		
	ISSUED BY: _____ TITLE: President		

Purpose:

To provide a guideline for the administration of Total Parenteral Nutrition (TPN) to neonates.

Definition:

Parenteral nutrition should be used when enteral feedings are not possible due to surgical conditions which preclude feeding or when enteral feedings are inadequate as in cases of severe prematurity, prolonged feeding intolerance and intractable diarrhea.

Clinical Considerations:

Infants <1500 grams should be started on TPN by 48 hours of age unless they are expected to be tolerating full feeds within 24-48 hours.

Infants >1500 grams should be started on TPN by 72 hours of age if they are not expected to be enterally fed by day 5.

Selection Criteria:

Inclusion:

- Infants with respiratory distress syndrome (RDS) or bronchopulmonary dysplasia (BPD) or gastrointestinal malformations or NEC who are unable to tolerate feedings
- Infants <1500 grams who cannot be maintained entirely on feedings because of GI tract hypomotility, low gastric capacity, and other aspects of prematurity
- Infants with absorption problems, short bowel syndrome, or intractable diarrhea

Responsibilities:

A Paediatrician or Clinical Nurse Specialist/Nurse Practitioner may order neonatal total parenteral nutrition. They may initiate this guideline by completing the preprinted Physician order **Neonatal Total Parenteral Nutrition (TPN) (#70007)**.

The Registered Dietitian will assess the nutritional needs of all infants on TPN and may fill in the blanks on the Physician's Orders TPN (Neonate) as per Policy M16-5.

Treatment and Monitoring:**I. Components of TPN****A. Fluids**

1. Start fluids at 80 mL/kg/day.
2. Increase by 10-20 mL/kg/day (assuming no abnormal weight loss or gain, or need to fluid restrict) to a target of 160-180 mL/kg/day.
3. NPO unless ordered otherwise.
4. Weigh infant daily.
5. Test urine for glucose/ketones q 24 hours. If abnormal q 12h.

Clinical Considerations:

6. The extremely low birth weight infant may require as much as 200-300 mL/kg/day due to insensible losses.
7. A weight gain of more than 25 grams/kg/day should be regarded with suspicion and probably represents fluid retention rather than an increase in lean body mass.

B. Carbohydrates

<u>Dextrose</u>	<u>mg/kg/min</u>	<u>g/kg/day</u>
Initial dose	6 – 8	7
Avg. daily increase	1 – 3	0.5 – 1
Maximum dose	12 – 14	10 – 17

Energy value 3.4 kcal/g; 2.8 kJ/mmol (14.3 kJ)

Conversions 1 mmol = 0.2 g = 200 mg = 2.8 kJ (0.67 kcal)

1. Adjust the percent dextrose daily according to the infant's tolerance as measured by glucometer, blood sugars and urine dipsticks.

Note: The maximum percent dextrose should not exceed 12.5% when delivered peripherally or 30% centrally.

2. If plasma glucose concentration is greater than 8.3 mmol/L sepsis should be evaluated and treated.

C. Electrolytes

<u>Electrolytes</u>	<u>When to Start (hr of age)</u>	<u>Usual Dose (mmol/kg/day)</u>
Sodium	48 hr	2-5
Potassium	48 hr	2-3
Chloride	48 hr	2-7
Magnesium	48 hr	0.2-0.3
Calcium	48 hr	1.5-2
Phosphorus	48 hr	1.5-1.9

Clinical Considerations:

1. Sodium: Very small infants with poor renal tubular function may need as much as 8-10 mmol/kg/day. In premature infants who suffer from persistent metabolic acidosis due to urinary loss of bicarbonate it may be helpful to give 50% of the sodium as acetate.
2. Potassium: May require adjustment if the infant is on diuretics or has poor urine output.
3. Chloride: Ordinarily this amount is delivered automatically as a side effect of the usual doses of NaCl and KCl in the IV.
4. **Magnesium:** An abnormally high magnesium level may be due to maternal treatment with magnesium sulfate. * Remove Mg from TPN if serum Mg is greater than 1.25 mmol/L. Resume Mg when levels normalize. The renal clearance of magnesium is poor during the first few days and infants may accumulate magnesium given in the TPN solution and reach even higher levels with no warning.
5. Calcium: Higher risk infants may require higher doses of calcium.
*Ensure Ca:Phos molar ratio is 1:1 – 1.3:1 for optimal mineral retention.

D. Protein

<u>Protein</u>	<u>g/kg/day</u>
Initial dose (by 48 hrs)	1.5
Avg. daily increase	0.5
Max usual dose	3.8

Energy Value: 4 Kcal/g (16.8 kJ/g)

1. Restrict protein dose in renal failure and hepatic failure to 0.5-1.5 g/kg/day.
2. For infants with sepsis, high cardio-pressor support, or significant birth asphyxia, start at 1g/kg/day and advance as tolerated.

E. Lipids

<u>Lipids</u>	<u>Initiate by 48h of Age</u>
Initial dose (g/kg/day)	1 g/kg/day
Increase every 2-3 days	0.5 g/kg/day
<u>Maximum dose (g/kg/day)</u>	<u>3-4 g/kg/day</u>

Energy Value 20% - 2 kcal/mL; 8.4 kJ/mL and 0.2 g/mL

1. Check TG level after each incremental increase in IV lipid.
2. Maintain serum TG level below 2.26 mmol/L.
*If TG \geq 2.26 mmol/L reduce or discontinue IV lipid and ensure at least 0.5-1 g/kg/day of fat to prevent essential fatty acid deficiency (EFAD).

Clinical Considerations:

3. Infants with sepsis or with severe compromise in oxygenation and/or severe hyperbilirubinemia should be maintained at 0.5 – 1 g/kg/day.
4. Initiate IV lipids within the first 3 days of life to prevent essential fatty acid deficiency (EFAD). Minimum intake to prevent EFAD is 0.5 – 1 g/kg/day.

**Reported complications of high lipid levels

- a) Enhancement of RBC and platelet clumping.
- b) Competition of free fatty acids with bilirubin for albumin binding sites.
- c) An adverse effect of the oxygen diffusion capacity in the lungs.
- d) Deposition on intravenous lipids in the RES (reticuloendothelial system) and potential blocking of RES function.

F. Vitamins

1. The vitamin requirements of the premature/newborn infant are met by the addition of the Pediatric MVI to amino acid-glucose solution.

G. Iron

1. Initiate iron dextran at 18 umol/L on day 30 of life if TPN is greater than 50% of TFI.

H. Trace Elements

1. Cholestatic Liver Disease: Conjugated Bilirubin > 34 umol/L reduce trace elements to twice weekly. If receiving enteral nutrition, discontinue trace elements.
2. Persistent diarrhea and GI loss: Increase Zinc

Routine TPN Biochemistry Orders – See Physician’s Orders

Test	First 3 Days	Thereafter
Na, K, CL, Glucose	q day	q Monday/Thursday
Phosphorus, Ca, Mg, Urea, Bili, Albumin	Baseline	q Monday
CBC	Baseline	q Monday
TG	q Monday/Thursday	When ill/When IV Lipid Increased

II. Transitional Feeds (See Appendix 1):

Reduce IV Lipid by 50% when infant tolerates > 50% of TFI as enteral feeds
Discontinue TPN when an infant is tolerating 75% of full enteral feeds.

Evaluation:

An audit of the guideline will be done after the first 5 cases of infants receiving TPN to review compliance with the guideline.

References:

This guideline is based on the consensus of all Paediatricians at The Credit Valley Hospital.

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Approval:

Department of Paediatrics: May 2007

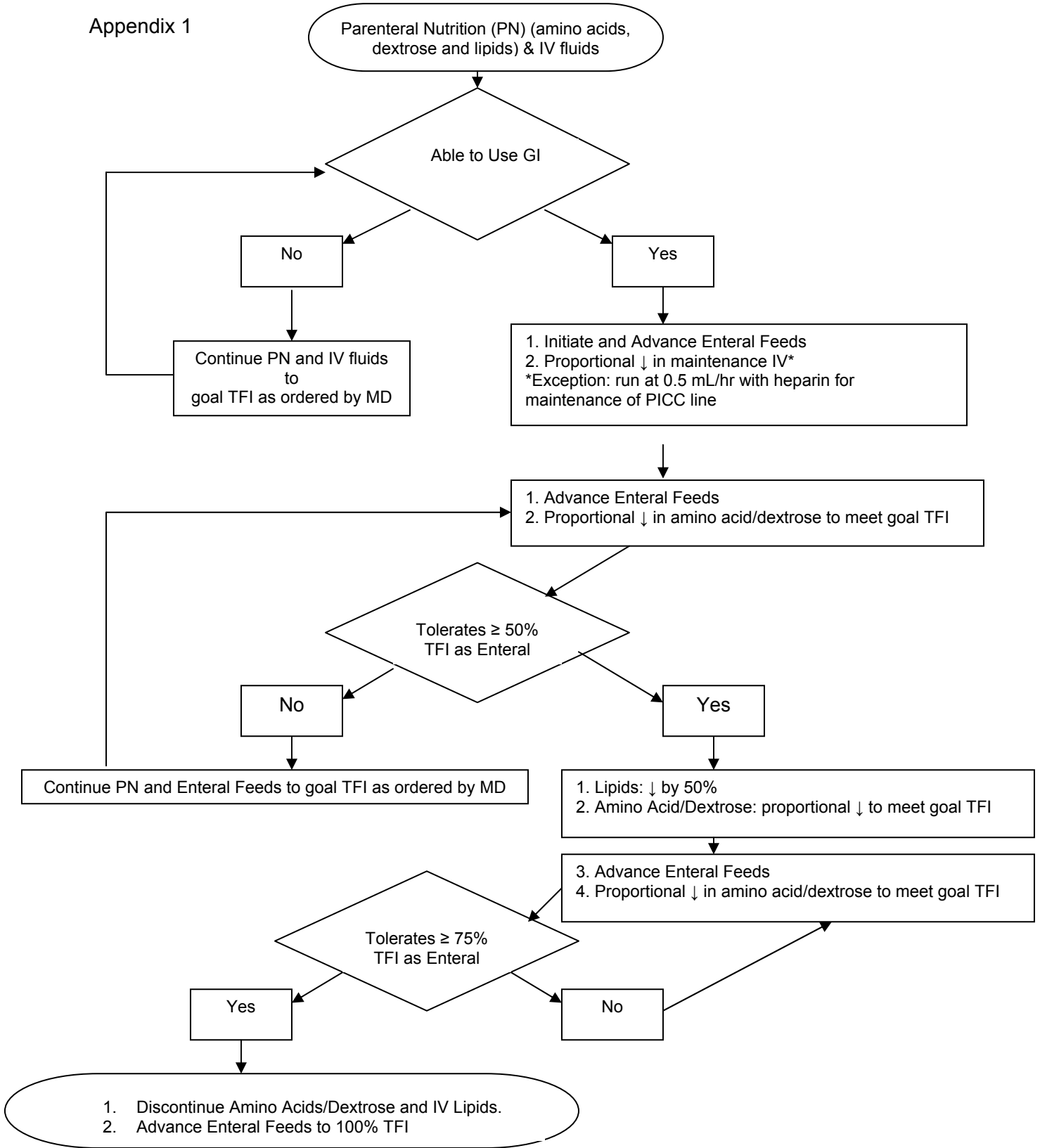
Perinatal Steering Committee: May 9, 2007

Professional Practice Committee: June 25, 2007

Clinical Quality Care Committee: June 20, 2007

Medical Advisory Committee: , 2007

Appendix 1



¹ Prepared by the Registered Pediatric Dietitians at Credit Valley Hospital, May 2004. **References:** (1) Groh-Wargo S, Thompson M, Cox JH. *Nutritional Care for High Risk Newborns*, 3rd edition. Chicago: Precept Press, 2000. (2) ASPEN. *The Science and Practice of Nutrition Support: A Case-Based Core Curriculum*. Iowa: Kendall/Hunt Publishing, 2001. (3) Hospital for Sick Children. *Guidelines for the Administration of Enteral and Parenteral Nutrition in Pediatrics*, 2nd edition. Toronto: Hospital for Sick Children, June 2002.