

Total Parenteral Nutrition Calculations & Case Scenarios

Dr. Prakash Kumar Soni

Objectives

- Calculations in TPN Charting
- Case Scenarios

A 26weeker, 800gm newborn, spontaneous vaginal delivery, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

7 Steps in calculation of TPN

1. Fluids
2. Amino acids
3. Lipids
4. Supplements: Na, K, Ca, Mg, MVI
5. Dextrose by GIR
6. Calorie nitrogen ratio
7. Heparin

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

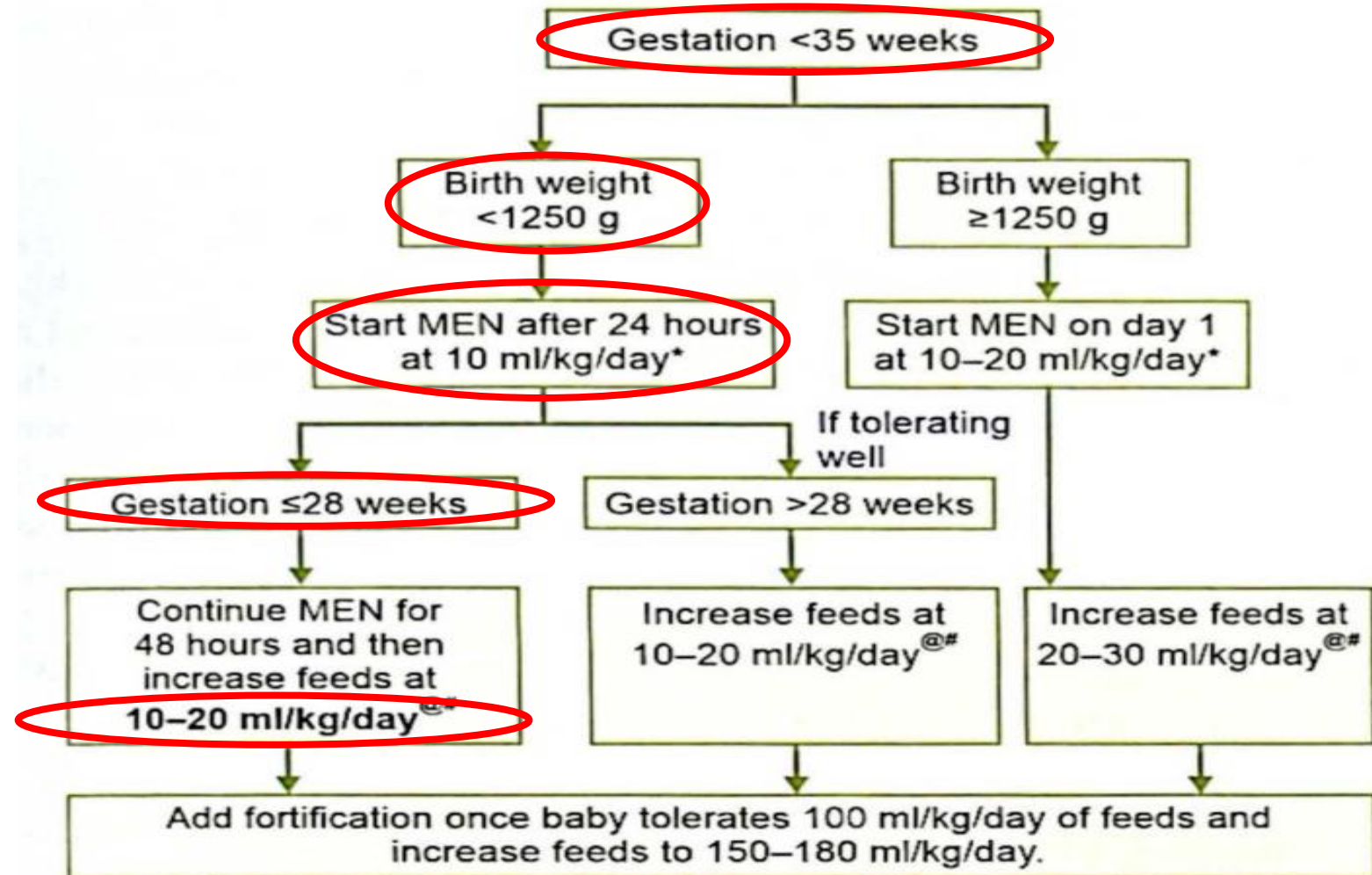
1. Indication?
2. Fluids
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Table 49.1: Indications of parenteral nutrition

- Birth weight less than 1000 g: TPN to be started on day 1 (MEN to be started along with TPN if hemodynamically stable and no contraindication for feeding like A/REDF).
- Birth weight 1000–1499 g and anticipated to be not on significant feeds for 3 or more days.
- Birth weight more than 1500 g and anticipated to be not on significant feeds for 5 or more days.
- Surgical conditions: necrotizing enterocolitis, gastroschisis, omphalocele, tracheoesophageal fistula, intestinal atresia, malrotation, short bowel syndrome, meconium ileus, and others that prevent the initiation of enteral feeds.

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respiratory distress syndrome. How will you take care of the nutrition?

1. Indication?
2. Fluids
3. Amino acids
4. Lipids
5. Supplements: Na, K, Ca, Mg, MVI
6. Dextrose by GIR
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A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?
2. **Fluids**
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	Parenteral fluid in mL/kg/d Day after birth						
	1	2	3	4	5	6	7
>1500 g	60-80	80-100	100-120	120-140	140-160	140-160	140-160
<1500 g	80-90	100-110	120-130	130-150	140-160	150-170	150-180
Electrolyte requirement (mEq/kg)*							
Sodium	3-4 (careful adjustment needed in neonates weighing <1000 g)						
Potassium	1-2 (start after the onset of diuresis)						
Chloride	3-4						

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

- ## 1. Indication?

2. Fluids So, **80-90ml/kg/day**

3. Amino acids

Lets say **80ml/kg/day,**

5. Supplements: Na, K, Ca, Mg, MVI $80 \times 0.8 \text{ kg} = 64 \text{ ml/day}$

6. Dextrose by GIR

7. Calorie nitrogen ratio

8. Heparin

	Parenteral fluid in mL/kg/d Day after birth						
	1	2	3	4	5	6	7
>1500 g	60-80	80-100	100-120	120-140	140-160	140-160	140-160
<1500 g	80-90	100-110	120-130	130-150	140-160	150-170	150-180
Electrolyte requirement (mEq/kg)*							
Sodium	3-4 (careful adjustment needed in neonates weighing <1000 g)						
Potassium	1-2 (start after the onset of diuresis)						
Chloride	3-4						

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?

2. Fluids

Aminoven(10%) contains 10gm/100ml (ie 1gm = 10ml)

3. **Amino acids**

So, $0.8 \times 1.5\text{gm} = 1.2\text{gm}$

4. Lipids

5. Supplements: Na, K, Ca, Mg, MVI

And $1.2\text{gm} =$ **12ml** Aminoven

6. Dextrose by GIR

7. Calorie nitrogen ratio

8. Heparin

Proteins in PN:

The amount started on day 1 of PN has varied from **0.5 to 3.0 g/kg/d** in different studies.

A higher intake of 3-3.5 g/kg/d can be safely administered starting from the first day of birth.

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?

2. Fluids

3. Amino acids

4. **Lipids**

5. Supplements: Na, K, Ca, Mg, MVI

6. Dextrose by GIR

7. Calorie nitrogen ratio

8. Heparin

Commercially available lipid formulations (SMOF) available as 10 & 20%;
But, 20% is preferable (ie 1gm = 5ml)

So, $0.8 \times 1.5\text{gm} = 1.2\text{gm}$

And $1.2\text{gm} = \text{6ml}$ Lipid

Lipids:

Fats are provided as intravenous lipid emulsions and should be started on the first day at a dose of **1.5 g/kg/d** and then increased gradually by 0.5 to 1.0 g/kg/d stepwise to reach 3.5 g/kg/d.

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5. **Supplements: Na, K, Ca, Mg, MVI**
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Daily requirement of minerals

Mineral	Requirement
Sodium	0-3 mEq/kg/d (1st week of life) 2-3 mEq/kg/d (beyond 1 st week in term neonates) 3-5 mEq/kg/d (beyond 1 st week in preterm neonates)
Potassium	0-2 mEq/kg/d (1st week of life) 1-3 mEq/kg/d (beyond 1 st week)
Chloride	2-3 mEq/kg/d
Calcium	2-4 mEq/kg
Magnesium	0.3-0.5 mEq/kg
Phosphorus	1-2 mEq/kg

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

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3. Amino acids
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Daily requirement of minerals

Mineral	Requirement
---------	-------------

1st 48hours of life, we don't supplement **Na, K, Cl..**

As renal handling is poor for these electrolytes..

Calcium, Mg, Phosphorus can be given

Calcium	2-4 mEq/kg
Magnesium	0.3-0.5 mEq/kg
Phosphorus	1-2 mEq/kg

Multivitamin injection (**MVI**), when added in a dose of 1.5 mL/kg to lipid solution, meets the need for vitamin A and most other vitamins.

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?
2. Fluids
3. Amino acids
4. Lipids
5. **Supplements: Na, K, Ca, Mg, MVI**
6. Dextrose by GIR
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Daily requirement of minerals

Mineral	Requirement	
Sodium	Don't give	
Potassium	Don't give	
Chloride	Don't give	
Calcium	2mEq/kg	$= 2 \times 0.8 = 1.6\text{mEq} = 1.6/0.45 = 3.5\text{ml}$
Magnesium	0.3mEq/kg	$= 0.3 \times 0.8 = 0.24\text{mEq} = 0.24/4 = 0.06\text{ml}$
MVI	1.5ml/kg	$= 1.5 \times 0.8 = 1.2\text{ml}$
Total	$3.5\text{ml} + 0.06\text{ml} + 1.2\text{ml} = 4.26\text{ml}$	

Multivitamin injection (**MVI**), when added in a dose of 1.5 mL/kg to lipid solution, meets the need for vitamin A and most other vitamins.

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?
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6. **Dextrose by GIR**
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	Day 1 (mg/ kg/min)	Advancement (mg/ kg/min)	Maximum rate (mg/ kg/min)
NICE	Preterm and term: 4 to 6.25	-	6.25 to 11.1
ESPGHAN	Preterm: 4 to 8 Term: 2.5 to 5	Advance over 2 to 3 days	Preterm: 5 to 10 (max 12) Term: 8 to 10 (max 12)
ASPEN	Preterm: 6 to 8 Term: 6 to 8	Advance over 7 to 10 days	10 to 14 (max 14 to 18)

In this case, we should give a **GIR** of **6mg/kg/min**

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6. **Dextrose by GIR**
7. Calorie nitrogen ratio
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To give a **GIR** of 6mg/kg/min

$$= \frac{6 \times 0.8 \times 60 \times 24}{1000}$$

$$= \mathbf{6.9 \text{ gm}}$$

Volume of dextrose

$$= \text{total fluid} - \text{AAs} - \text{lipid} - \text{electrolyte}$$

$$= \mathbf{64} - \mathbf{12} - \mathbf{6} - \mathbf{4.26} = \mathbf{42ml}$$

6.9gm in **42ml**

... which is **16% Dextrosity**

So, 80-90ml/kg/day

Lets say 80ml/kg/day,

$$80 \times 0.8 \text{kg} = \mathbf{64ml/day}$$

Aminoven(10%) contains 10gm/100ml

$$\text{So, } 0.8 \times 1.5 \text{gm} = 1.2 \text{gm}$$

$$\text{And } 1.2 \text{gm} = \mathbf{12ml} \text{ Aminoven}$$

Commercially available lipid
But, 20% is preferable (ie 1

$$\text{So, } 0.8 \times 1.5 \text{gm} = 1.2 \text{gm}$$

$$\text{And } 1.2 \text{gm} = \mathbf{6ml} \text{ Lipid}$$

Sodium	Don't give
Potassium	Don't give
Chloride	Don't give
Calcium	2mEq/kg = $2 \times 0.8 = 1.6 \text{mEq}$
Magnesium	0.3mEq/kg = $0.3 \times 0.8 = 0.24 \text{mEq}$
MVI	1.5ml/kg = $1.5 \times 0.8 = \mathbf{1.2ml}$
Total	$3.5 \text{ml} + 0.06 \text{ml} + 1.2 \text{ml} = \mathbf{4.26ml}$

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?

2. Fluids

3. Amino acids

4. Lipids

5. Supplements: Na, K, Ca, Mg, MVI

6. **Dextrose by GIR**

7. Calorie nitrogen ratio

8. Heparin

Question is commercially available solutions of 16% Dextrose is not available!!

How to prepare?

To prepare **16%**, mixing is needed of two commercially available dextrose solutions in calculated amount

Options possible:

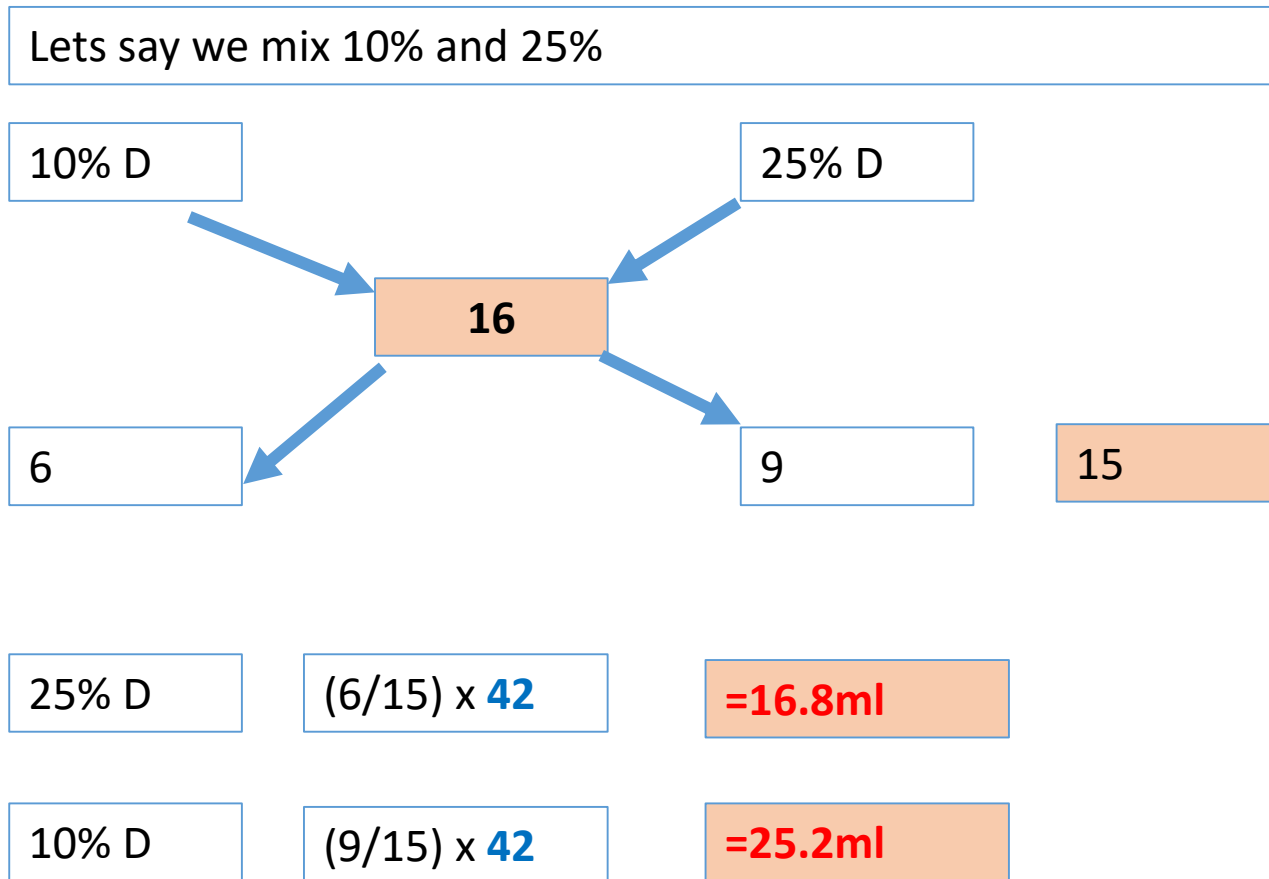
- 10% & 25%
- 10% & 50%
- 5% and 50%
- 5% and 25%

Options not possible:

- 5% & 10%
- 25% & 50%

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?
2. Fluids
3. Amino acids
4. Lipids
5. Supplements: Na, K, Ca, Mg, MVI
6. **Dextrose by GIR**
7. Calorie nitrogen ratio
8. Heparin



Options available:

- 10% & 25%
- 10% & 50%
- 5% and 50%
- 5% and 25%

To give a **GIR** of 6mg/kg/min

$$= \frac{6 \times 0.8 \times 60 \times 24}{1000}$$

$$= \mathbf{6.9 \text{ gm}}$$

Volume of dextrose

$$= \text{total fluid} - \text{AAs} - \text{lipid} - \text{electrolyte}$$

$$= \mathbf{64 - 12 - 6 - 4.26 = 42ml}$$

6.9gm in **42ml**

... which is **16% Dextrosity**

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?
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7. **Calorie nitrogen ratio**
8. Heparin

$$\begin{aligned} &= \frac{(\text{carbohydrate calories} + \text{fat calories}) \times 6.25}{\text{protein (gm)}} \\ &= \frac{\{(6.9 \times 3.4) + (1.2 \times 9)\} \times 6.25}{1.2} \\ &= \frac{\{23.5 + 10.8\} \times 6.25}{1.2} \\ &= 178 \text{ Cal/gm} \end{aligned}$$

Target = 100 – 200 cal/gm

A 26weeker, 800gm newborn, emergency CS for AREDF in USG doppler, normal APGARs at birth. Admitted to NICU for respirtatory distress syndrome. How will you take care of the nutrition?

1. Indication?
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8. **Heparin**

Line-1:

1. Inj. Dextrose:
 - 10D = 25.2ml
 - 25D = 16.8ml
2. Inj. Calcium gluconate (10%) = 3.5ml
3. Inj 50% MgSO4: 0.06ml/ml
4. Inj. 10% Aminoven = 12ml

Total: **57.6ml** over 24hr (+ **57IU** Heparin)
Run at: **2.4ml/hr**

Line-2:

1. Inj. 10% Lipid = 6ml
2. Inj. MVI = 1.2 ml

Total: **7.2ml** over 24hr (+ **7.2IU** Heparin)
Run at: **0.3ml/hr**

A 27weeker, 1000gm newborn, emergency CS for gastroschisis, normal APGARs at birth. Admitted to NICU for monitoring. On day3 how will you take care of the nutrition?

1. Indication?
2. Fluids
3. Amino acids
4. Lipids
5. Supplements: Na, K, Ca, Mg, MVI
6. Dextrose by GIR
7. Calorie nitrogen ratio
8. Heparin

Indication: Yes

Fluid: 120ml/kg = 120ml

Amino Acid (@1.5): 1.5gm = 15ml

Lipid (@1.5): 1.5gm = 7.5ml

Supplements: Na=4ml, K=1ml, Ca=4.4ml, Mg=0.08ml, MVI=1.5ml

Dextrose in gram: 8.64gm, Balance for Dextrose= 86.5ml

Dextrosity = $(8.6/86.5) \times 100 = 10\%$

Dextrosity delivered = $[8.6/(86.5+15+9.4)] = 7.7\%$

Calorie-Nitrogen ratio = 178

Prescription:

Line1:

- Inj. Dextrose 10% 86.5ml
- Inj. Aminoven 15ml
- Inj. 3% NaCl 4ml, Inj. KCl 1ml, CG 4.4ml, MgSO4 0.08ml
- 111ml/24hour So, Run at **4.6**ml/hr

Line2: (*Aluminium foil around the syringe & tubings*)

- Inj. Lipid 7ml
- Inj. MVI 1.5ml
- 9.5ml/24hour So, Run at **0.4**ml/hr

A 28weeker, 900gm newborn, emergency CS for gastroschisis, normal APGARs at birth. Admitted to NICU for monitoring. On day10, develops NEC. How will you take care of the nutrition?

1. Indication?
2. Fluids
3. Amino acids
4. Lipids
5. Supplements: Na, K, Ca, Mg, MVI
6. Dextrose by GIR
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8. Heparin

Indication: Yes

Fluid: 150ml/kg = 135ml

Amino Acid (@2): 1.8gm = 18ml

Lipid (@1.5): 1.35gm = 6.75ml

Supplements: Na=3.6ml, K=0.9ml, Ca=4ml, Mg=0.06ml, MVI=1.35ml

Dextrose in gram: 7.78gm, Balance for Dextrose= 100.34ml

Dextrosity = $(7.78/100.34) \times 100 = 7.75\%$

Dextrosity delivered = $[7.78/(100.34+18+8.56)] = 6.13\%$

Calorie-Nitrogen ratio = 134

Prescription:

Line1:

- Inj. Dextrose 10% 45ml
- Inj. Dextrose 5% 55ml
- Inj. Aminoven 18ml
- Inj. 3% NaCl 3.6ml, Inj. KCl 0.9ml, CG 4ml, MgSO4 0.06ml
- Run at **5.29**ml/hr

Line2: (*Aluminium foil around the syringe & tubings*)

- Inj. Lipid 6.75ml
- Inj. MVI 1.5ml
- Run at **0.4**ml/hr

File Home Insert Page Layout Formulas Data Review View Tell me what you want to do...

Paste Cut Copy Format Painter Clipboard

Arial 10 A A B I U Font

Wrap Text Merge & Center Alignment

Number % , .00 .00 Number

Conditional Formatting Format as Table

	A	B	C	D	E	F	G	H	I	J	K
B32			=100*(B30)/(B18+B19)								
1	B/o XYZ	08-06-2025	Do not type in BLUE BOXES!!								
2											
3	Amino acids	2.00	Percentage of Amino acids	10							
4	Lipids	1.50	Percentage of Lipids	20							
5	Dextrose	6.00	Amino acid (in gram)	1.80							
6	Sodium	2.00	Fat (in gram)	1.35							
7	Potassium	2.00	Calorie (in gram)	7.78							
8	Calcium	2.00									
9	Calorie:Nitrogen Ratio	133.99									
10	Body Weight	0.90									
11	Fluid intake	150.00									
12	Total fluid volume	135.00									
13	Feeds	0.00									
14	Drugs	0.00									
15	Other losses(Sampling)	0.00									
16	Total TPN Volume	135.00									
17	Fat volume	6.75									
18	TPN solution Volume Ordered	126.90									
19	How Much Vol. You want to add as spillage losses?	0.00									
20	Wastage factor	1.00									
21	Additive Volume										
22	Amino Acids	18.00									
23	Sodium	3.60									
24	Potassium	0.90									
25	Calcium	4.00									
26	Magnesium	0.06									
27	MVI	1.35									
28	Fat volume	6.75									
29	Sum of additive volume	34.66									
30	Dextrose Absolute amount	7.78									
31	Dextrose Volume	100.34									
32	Final Dextrose Conc	6.13									
33	Dextrose Concentration for Calculation	7.75									
34	Lower Conc.of Dextrose %age= D1	5.00									
35	Higher Conc.of Dextrose %age= D2	10.00									
36											
37	Volume of D1	45.17									
38	Volume of D2	55.18									
39	Give TPN at the rate of	5.29	ml/hour for 24 hours								
40	Give Lipid at the rate of	0.34	ml/hour for 24 hours								

TPN Calculator