

# Implementing standardised neonatal PN across a network and managing the provision without 'on-site' pharmacy aseptic services

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By your side

# Contents

- SWMMNN Network PN 'Our story'
- Composition of our standard bags
- Management at ward level
- Working with no 'on-site' aseptic service
- Supporting materials



# Our story- Standard PN

- Aim- Standardised neonatal PN across SWMMNN network
- Design
- Manufacture
- Launch



# SWMMNN Network PN

- 1<sup>st</sup> meeting 24/3/2014
- Pharmacists / dieticians / consultants



- Concentrate-Nutrition as essential drug and not a fluid



# Background

- National Confidential Enquiry into Patient Outcome and Death (NCEPOD) 2010



# NCEPOD overall assessment

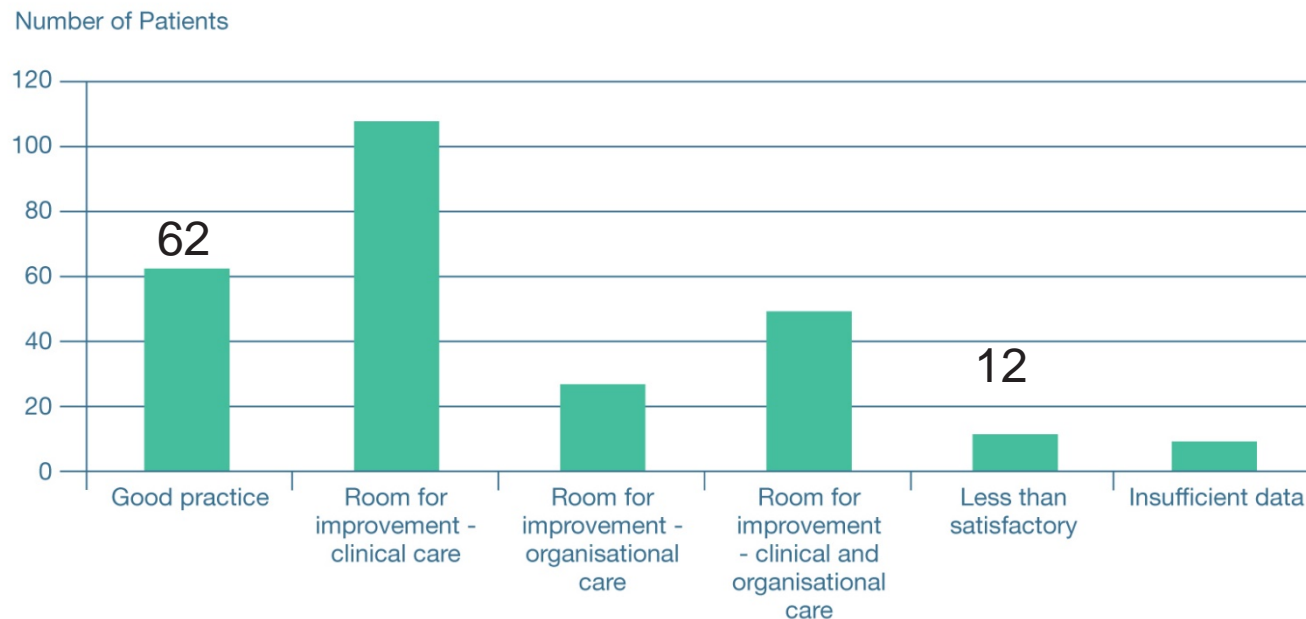


Figure 3.2 Overall of assessment of PN care – Advisors' opinion

23.5% (62/264) Good practice

4.5% (12/264) Less than satisfactory



- The Paediatric Chief Pharmacists Report (2011)
  - Improving practice and reducing risk in the provision of parenteral nutrition for neonates & children
- Unnecessary variation in neonatal PN
- Greater consensus needed
- Greater use of standardised PN

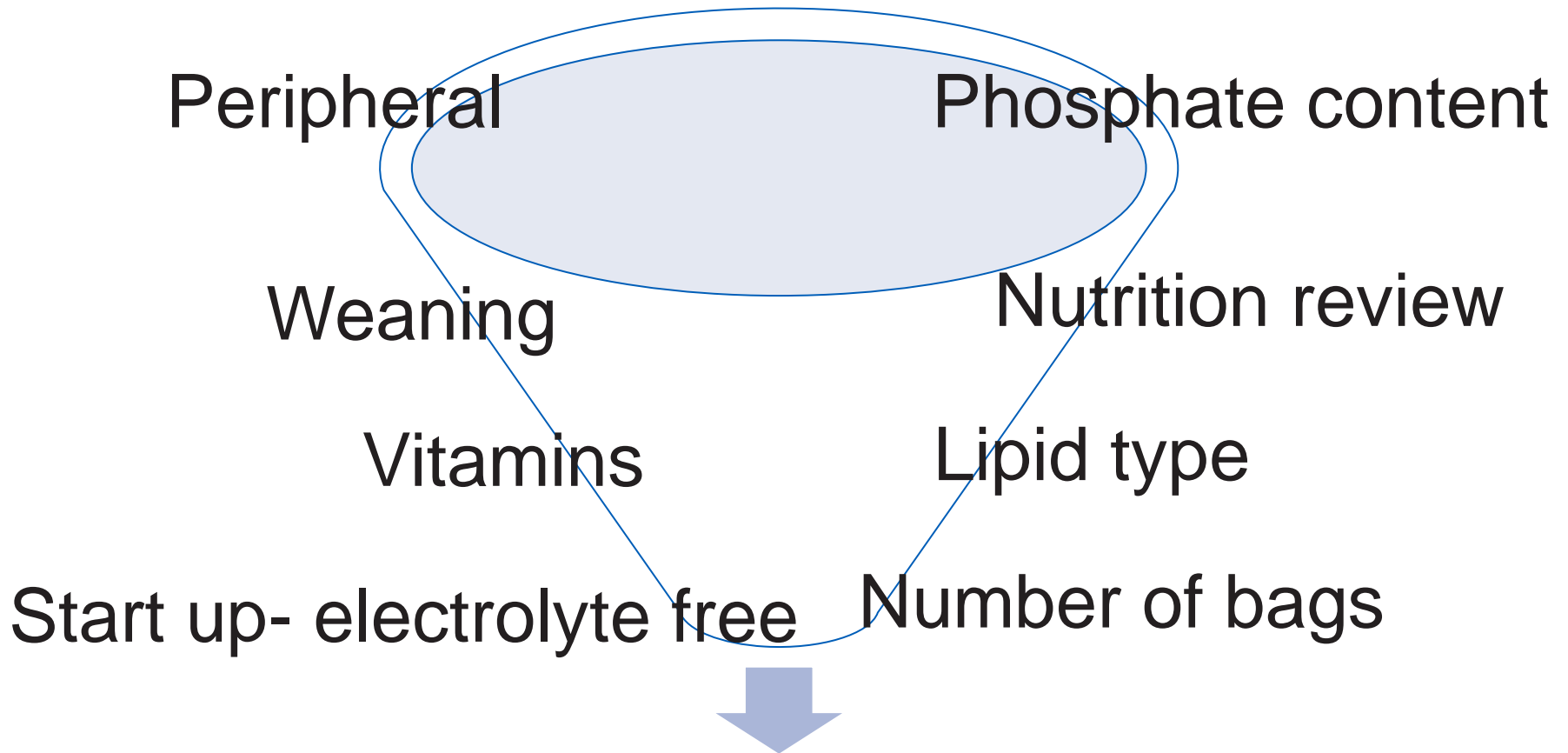


# What is a standard.....

- Off the shelf, ready to use
- Product requiring / suitable for further aseptic manipulation



# Considerations.....



# 15/9/14....6 months on



- Timescale: aim to circulate proposals of standard bag compositions mid November 2014 for comments by mid January 2015



# Design process

- Comparison of current formulations across units
- Review of guidelines/ evidence/ best practice
- 5 bags proposed February 2015
  - 2 start up, 2 pre-term, 1 term
  - Zinc / selenium or peditrace
- Feedback proposed contents October 15
- Stability data October 15
- Names agreed November 15
- Tender



# Final formulations

- 4 aqueous bags
- 3 month expiry
  - Zinc / selenium as standard
- Peditrace reduce expiry 7 days
- All run for maximum 48 hours
  
- Lipids- SMOF and intralipid + vits – 7 day expiry
- All run for maximum 24 hours



# Which bag?

**Start Up** – Use as initial infusion fluid for up to 24 hours of life. Can also be given peripherally if central access is temporarily unavailable in a baby already established on PN, or by either route if electrolyte free PN is required.

**Preterm Maintenance 12** - initial maintenance PN to be infused for at least 48 hours; when glucose tolerance established move to Preterm Maintenance 15 (see below). Prolonged use may be required in infants with glucose intolerance or acidosis (contains acetate). Please note this does not provide adequate nutrition for long term growth.

**Preterm Maintenance 15** - standard maintenance PN for all preterm infants.

**Term Baby** – for use in preterm infants over 2.5kg and/or infants born from 37 weeks onwards.



# Launch April 2017

- .....nearly 3 years after 1<sup>st</sup> meeting

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<b>APRIL 2017</b>						
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						



# November 2017

- 7 Trusts in the network
- 3 Trusts using it
- 2 about to start



- 41 cots
  - 21 HDU/ ITU
    - Max 12 ventilated babies due to equipment
  - 20 SC
- Majority medical babies
  - Can have up to 5 surgical babies (not fixed)
- Most PN < 3 weeks (and majority <2 weeks)
  - Unless extremely preterm or surgical
  - Worst case scenario PN for months



# Composition

Standard bag	Preterm maintenance 12	Preterm maintenance 15	Term baby	Preterm maintenance 12+peditrace	Preterm maintenance 15+peditrace	Term baby+peditrace
Max rate	100ml/kg/day	110ml/kg/day	100ml/kg/day	100ml/kg/day	110ml/kg/day	100ml/kg/day
Amount/kg/day						
<b>Protein(g)</b>	3.49	3.49	3.06	3.49	3.49	3.06
<b>Glucose (g)</b>	12	15	15	12	15	15
<b>Total calories (Kcal)</b>	61.97	73.97	72.23	61.97	73.97	72.23
<b>Sodium (mmol)</b>	5.004	5	4.95	5.004	5	4.95
<b>Potassium (mmol)</b>	2	2.5	2.5	2	2.5	2.5
<b>Calcium (mmol)</b>	2.016	2.016	1.5165	2.016	2.016	1.5165
<b>Magnesium (mmol)</b>	0.2	0.2	0.2	0.2	0.2	0.2
<b>Phosphate (mmol)</b>	1.9	1.9	1.5	1.9	1.9	1.5
<b>Acetate (mmol)</b>	1.804			1.804		
<b>Chloride (mmol)</b>	1.8	3.7	4.45	1.8	3.7	4.45
<b>Zinc (micromol)</b>	4	4	4	3.056	3.82	3.82
<b>Selenium (nanomol)</b>	25	25	25	20.24	25.3	25.3
<b>Copper (micromol)</b>				0.252	0.315	0.315
<b>Manganese (nmol)</b>				14.56	18.2	18.2
<b>Fluoride (micromol)</b>				2.4	3	3
<b>Iodide (nmol)</b>				6.304	7.88	7.88
<b>Expiry</b>	28 days	28 days	28 days	7 days	7 days	7 days



## Mode of Delivery

### Peripheral PN

It is recommended that all PN is run centrally. In the absence of central access Start Up Vamin (electrolyte free and comprising 10% glucose and amino acids) may be run peripherally, for example on day of birth or when central access is temporarily unavailable in a baby already established on PN. There is some evidence to suggest running lipid peripherally in addition to the Vamin component may prolong the life of the peripheral cannula.<sup>9</sup>

### Central PN

Central access should be sought as soon as possible

All Parenteral Nutrition (glucose >10% ) should be administered centrally via an umbilical venous catheter (UVC), percutaneous long line or surgically inserted central venous catheter in view of the high concentration of glucose and calcium. Due to the increasing reports of PN extravasation when administered via a UVC, prolonged infusion via a UVC is not recommended<sup>10</sup>



# Electrolyte abnormalities

- SWMMNN bags developed to provide adequate **nutrition** at the maximum prescription rate
- Maintenance PN delivered at maximum rate will provide 120-130ml/kg/day (dependent on bag) this may not provide adequate fluid, particularly in the first week of life. It may be necessary to provide extra fluid, which can be given alongside the PN as clinically necessary



# Electrolyte abnormalities

- Additional infusion
- Syringes prepared at ward level
- The future...standardised concentration, premade syringes, standard tables of rates to deliver ...mmol/kg/day for differing weights



# Weaning with enteral

## Weaning PN

Enteral feeds should be commenced as soon as possible and increased as per SWMNN Enteral Feeding Guideline.

To ensure the provision of adequate nutrition during the introduction of enteral feeds the volume of parenteral nutrition delivered should not be reduced until the baby is receiving a total volume of 180mls/kg/day (Enteral and Parenteral )(unless fluid restricted). Once this volume is reached the vamin and lipid components of the parenteral nutrition should be weaned in proportion to ensure the ratio of calorie provision by fat and carbohydrate remains

For every 1ml/hr increase in enteral feeds Preterm maintenance 15 Vamin should be reduced by 0.85ml/hr and Lipid syringe by 0.15ml/hr and Preterm maintenance 12 Vamin and Term baby should be reduced by 0.83ml/hr and Lipid syringe by 0.17ml/hr

Enteral vitamins (if required) should be started when baby on <10ml/kg/day lipid



# Weaning table

Appendix 4c.. Table showing contribution to nutritional intake from Preterm Maintenance 15 PN & MEBM

Parenteral Nutrition - Preterm Maintenance 15						Enteral Nutrition MEBM				Combined Parenteral and Enteral Nutrition			
volume	vamin	lipid syringe	energy	protein	sodium	volume	energy	protein	sodium	volume	energy	protein	sodium
ml/kg/d	ml/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kgd	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d
130	110	20	108	3.49	5	0	0	0.0	0	130	108	3.49	5.0
130	110	20	108	3.49	5	20	13.2	0.3	0.14	150	122	3.75	5.1
130	110	20	108	3.49	5	30	19.8	0.4	0.20	160	128	3.88	5.2
130	110	20	108	3.49	5	40	26.4	0.5	0.27	170	135	4.01	5.3
130	110	20	108	3.49	5	50	33	0.7	0.34	180	141	4.14	5.3
120	102	18	100	3.2	4.6	60	39.6	0.8	0.41	180	139	4.0	5.0
110	93.5	16.5	91	3.0	4.3	70	46.2	0.9	0.48	180	137	3.9	4.7
100	85	15	83	2.7	3.9	80	52.8	1.0	0.54	180	136	3.7	4.4
90	76.5	13.5	75	2.4	3.5	90	59.4	1.2	0.61	180	134	3.6	4.1
80	68	12	66	2.2	3.1	100	66	1.3	0.68	180	132	3.5	3.8
70	59.5	10.5	58	1.9	2.7	110	72.6	1.4	0.75	180	131	3.3	3.5
60	51	9	50	1.6	2.3	120	79.2	1.6	0.82	180	129	3.2	3.1
50	42.5	7.5	41	1.3	1.9	130	85.8	1.7	0.88	180	127	3.0	2.8
40	34	6	33	1.1	1.5	140	92.4	1.8	0.95	180	126	2.9	2.5
								add BMF					
30	25.5	4.5	25	0.8	1.2	150	120	3.9	4.4	180	145	4.7	5.5
20	17	3	17	0.5	0.8	160	128	4.2	4.7	180	145	4.7	5.4
10	8.5	1.5	8	0.3	0.4	170	136	4.4	5.0	180	144	4.7	5.4
0	0	0	0	0.0	0.0	180	144	4.7	5.3	180	144	4.7	5.3



# Stock control

- Order Monday before 11am for delivery Tuesday (Sunday night registrar task)
- Order Thursday before 11am for delivery Friday (Wednesday night registrar task)
  - Following Wednesday afternoon nutrition round
- Same day- in an emergency
- Take care- bank holidays / Easter / Christmas
- Have had no access to on-site aseptic service for 5+ years



# Order sheet

Email completed order form before 9am on each of the specified days

[Pharmacybwh@bwnft.nhs.uk](mailto:Pharmacybwh@bwnft.nhs.uk)

Date	Start Up Vamin			Preterm maintenance 12 Vamin			Preterm maintenance 15 Vamin			Term baby Vamin			Preterm maintenance 12 with Peditrace			Preterm maintenance 15 with Peditrace			Term baby with Peditrace		
	(Order in multiples of 5)			(Order in multiples of 5)			(Order in multiples of 5)			(Order in multiples of 5)			(Order exact quantity)			(Order exact quantity)			(Order exact quantity)		
Record number:	Babies on	In fridge	Ordered	Babies on	In fridge	Ordered	Babies on	In fridge	Ordered	Babies on	In fridge	Ordered	Babies on	In fridge	Ordered	Babies on	In fridge	Ordered	Babies on	In fridge	Ordered
Thursday 2nd																					
Monday 6th				Intralipid Syringe			SMOF Lipid			Lipid Bags		Anything that has expired and/or been discarded	Name of prescriber ordering TPN								
Thursday 9th				(Order exact quantity)			(Order exact quantity)			(Suitable amount)			The order is not valid if this detail is								
Monday 13th				Babies on	In fridge	Ordered	Babies on	In fridge	Ordered	In fridge	Ordered										



## NEONATAL PN FRIDGE

### Staff Guidance

Please read this information carefully as it is here to guide you on what is kept in this fridge and how best to utilise the contents of it.

#### Fridge Layout

Shelf 1	Peditrace® containing bags	Start-up Vamin
Shelf 2	Preterm maintenance 12 Vamin	Preterm maintenance 12 Vamin
Shelf 3	Preterm maintenance 15 Vamin	Preterm maintenance 15 Vamin
Shelf 4	Term baby Vamin	Term baby Vamin
Shelf 5	SMOFlipid® syringes	Intralipid syringes
Tray	Intralipid bags	

7-day expiry Use first *	Use only if you are out of the Intralipid or SMOF syringes	Longer expiry Use later	Shorter expiry Use first
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#### How to utilise the products

- Go to the correct shelf, for **stock bags** (Preterm maintenance 12, Preterm maintenance 15, Term baby Vamin) choose a product on the **left-hand-side** of the fridge as this will have the **shortest date**.
- If there is nothing on this side, go to the **right-hand-side** and choose the uppermost packet (next shortest expiry). **Do not choose the bottom packet (longest expiry)**.
- \* Use **Peditrace® containing bags** only in babies who have been identified to be on these. *Where a given baby has come off this type of PN (for whatever reason) and there are bags left in the fridge that will expire within the next 3 days, to avoid wastage, please use these bags in babies on the corresponding Vamin (without peditrace) instead- n.b will need to get prescription rewritten.*
- Use **Intralipid syringes** in all babies who are prescribed this, **SMOF** in identified babies with conjugated hyperbilirubinaemia, and **Intralipid bags** when you are out of the previous types.

A RECORD MUST BE KEPT FOR ALL PN BAGS AND LIPID SYRINGES THAT ARE TO BE UTILISED IN A GIVEN BABY. THE 'PN RECORD SHEET' FOR THIS PURPOSE IS KEPT IN A FOLDER ON TOP OF THIS FRIDGE.

*Please keep 3 months' worth of record sheets in the folder only. All other sheets should be archived and/or stored elsewhere.*

Any **discarded/expired stock** should be recorded on the 'PN Order Form' which is located electronically via [G:\PN Ordering Forms](#)



# Record sheet

## NEONATAL PARENTERAL NUTRITION RECORD SHEET

- Check expiry date of the **PN bag** that you are using alongside others of the same type in the fridge – use the one with the shortest expiry date.
- If any **Preterm maintenance 12 / 15 or Term baby + Peditrace** is due to expire within the next **3 days**, please use in place of Preterm maintenance 12 / 15 or Term baby in babies on these corresponding bags where possible.
- Check expiry dates of all **intralipid syringes**, and use the one with the shortest expiry date first.
- If there are no intralipid syringes, use **SMOFlipid® syringe**
- Only use **intralipid 20% bags** if there are no lipid syringes that are in date.

PLEASE ENSURE RECORDS ARE IN CHRONOLOGICAL ORDER WHERE POSSIBLE

Date Given	Baby's Hospital No.	Baby Surname	Nutrition product utilised*	Batch No.	Expiry	Name of nurse (Please print)	If bag not used, please specify here (including reason)
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						

\* Please specify type of product from this list:

Start-up Vamin	Preterm maintenance 12	Preterm maintenance 15	Term baby	Preterm maintenance 12 + Peditrace	Preterm maintenance 15 + Peditrace	Term baby. + Peditrace	Intralipid syringe	SMOFlipid® syringe	Intralipid 20% bag
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# Supporting documents

- Network wide policy
- Standard prescriptions
- Standard order sheet



## **South West Midlands Neonatal Network Parenteral Nutrition Guideline**

**May 2017**

Produced for SWMNN by Dr Gemma Holder, Consultant Neonatologist, BWCH, Dr Gill Preston, Clinical Fellow, BWCH, Louise Whitticase, Lead Pharmacist, BWCH, Sara Clarke, Senior Specialist Neonatal Dietitian, SWMNN with contributions from SWMNN Nutrition Group.



# Standard Prescription

## NEONATAL PARENTERAL NUTRITION PRESCRIPTION CHART

### PRETERM MAINTENANCE 12 + PEDITRACE BAG

**\*\*Administer via CENTRAL LINE only\*\***

Use a single central line lumen ONLY for PN

Registration No.		NHS No.		Sex	Ward
Surname			First Name		
Age	D.O.B.	Consultant			

#### Nutrition and electrolyte summary

	20 mL/kg	40 mL/kg	60 mL/kg	80 mL/kg	100 mL/kg
Protein (g)	0.7	1.4	2.09	2.79	3.49
Glucose (g)	2.4	4.8	7.2	9.6	12
Total Calories (Kcal)	12.4	24.8	37.2	49.6	62
Sodium (mMol)	1	2	3	4	5
Potassium (mMol)	0.4	0.8	1.2	1.6	2
Calcium (mMol)	0.4	0.81	1.21	1.62	2.02
Magnesium (mMol)	0.04	0.08	0.12	0.16	0.2
Phosphate (mMol)	0.38	0.76	1.14	1.52	1.9
Acetate (mMol)	0.38	0.72	1.08	1.44	1.8
Chloride (mMol)	0.38	0.72	1.08	1.44	1.8
Zinc (µMol)	0.81	1.22	1.84	2.45	3.06
Selenium (nMol)	4.05	8.1	12.14	16.19	20.24
Copper (µMol)	0.05	0.1	0.15	0.2	0.25
Manganese (nMol)	2.91	5.82	8.74	11.65	14.56
Fluoride (µMol)	0.48	0.96	1.44	1.92	2.4
Iodide (nMol)	1.26	2.52	3.78	5.04	6.30

Working weight:		
Date recorded:		

Details from nutrition round:

Date of round:	Preferred PN bag to change to:	Lipid type to be used:

Lipid syringe (see guidelines if using intralipid 20% bag)

Day 1 (with Start-up <u>Vamin</u> )	12 mL/kg/day	2 g/kg/day	20 Kcal/kg/day
Day 2	18 mL/kg/day	3 g/kg/day	30 Kcal/kg/day
Day 3 onwards	20 mL/kg/day	3.4 g/kg/day	34 Kcal/kg/day

**WEANING - VAMIN** Decrease ml/hr = Total volume to decrease/hr x 0.83      **LIPID** Total volume to decrease/hr x 0.17

Date	Total fluid volume before weaning	Enteral Feed		Weaning volume (mL/hr)		Signature
		Amount increase	Frequency	<u>Vamin</u>	Lipid	

Solution formula (Aqueous volume = 400ml)	
Water for Injection	8.65
<u>Vaminolact</u>	240.86
Sodium Chloride, 30%	0.16
Calcium Gluconate, 10%	36.65
Sodium <u>Glycerophosphate</u> , 21.6%	6
Glucose, 50%	96
Magnesium <u>Sulfate</u> , 50%	0.4
Potassium Chloride, 15%	3.2
<u>Peditrace</u>	3.2
Potassium dihydrogen Phosphate 13.6%	1.6
Sodium acetate 30%	3.28



# Standard prescription

Date	Nutrition type	VOLUME (mL/kg/day)	RATE (mL/hr)	ROUTE	Prescriber's Signature	Print Name	Batch No.	Expiry	CHECK BY	Start time	Volume at start	Pharmacist Clinical Check
	PRETERM MAINTENANCE 12 + PEDITRACE (run for 48 hours)											
	LIPID TYPE (for first 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	LIPID TYPE (for next 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	PRETERM MAINTENANCE 12 + PEDITRACE (run for 48 hours)											
	LIPID TYPE (for first 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	LIPID TYPE (for next 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	PRETERM MAINTENANCE 12 + PEDITRACE (run for 48 hours)											
	LIPID TYPE (for first 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	LIPID TYPE (for next 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	PRETERM MAINTENANCE 12 + PEDITRACE (run for 48 hours)											
	LIPID TYPE (for first 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											
	LIPID TYPE (for next 24hrs) <i>Please circle</i>											
	INTRALIPID SYRINGE    SMOFLIPID SYRINGE    INTRALIPID 20% BAG											



# What's next

- Stock control across the network
- Audit in-house
  - Calcium and phosphate
- Audit network wide
- Investigate change in AA for increased expiry with peditrace
- Review.....
  - Commercial products
  - National consensus



# Declarations of interest

- FK advisory board- April 2017

