Refeeding: Case based discussion

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The Lennard-Jones
Intestinal Failure Unit

St MARK'S
HOSPITAL

Case study

63 year old male admitted for HPN

PMH
2012 TIA
2014 Pancreatic insufficiency
2015 ERCP sphincterotomy and stent insertion
CT mesenteric angio – stenosis of mesenteric arteries and coeliac trunk

Anthropometry parameter	Result
Weight	41Kg
BMI	12.7kg/m^2
Usual weight & % weight loss	70kg = 41% in $^6/_{12}$
Tricep skinfold thickness	3.0mm (<5th)
Mid arm muscle circumference	17 (<5th)
Handgrip	18.5kg (<85% normal)

Date	10/2
WCC	**12.9**
CRP	2
Na	140
K	4.2
Urea	4.8
Cr	**42**
Alb	43
Adj Ca	2.48
Mg	0.87
PO4	1.19

Case study

Clinical

- c/o constipation
- On Creon 40,000units tds
- Very low mood

Diet

- Ongoing abdominal pain on eating
- Lost sense of taste and smell
- Has malt drink and breakfast cereal only
- Tried ONS but unable to ↑ weight
- Never tried NG feeding
- Day 2 PICC inserted

Risk of refeeding?

- No risk
- At risk
- At high risk
- At extreme high risk

Risk of refeeding

High risk	≥1 risk factor	≥2 risk factor
BMI (kg/m^2)	<16	<18.5
% weight loss in $^{3\text{-}6}/_{12}$	>15%	>10%
Little or no intake (days)	>10	>5
Extreme high risk		
BMI (kg/m^2)	<14	
Little or no intake (days)	15	

National Collaborating Centre for Acute Care, February 2006. *Nutrition support in adults Oral nutrition support, enteral tube feeding and parenteral nutrition.* ISBN 0-9549760-2-9

D grade evidence

How to feed extreme high risk patients

- *Consider* starting at a maximum of **5kcal/kg** increasing slowly to meet or exceed requirements by 4-7d

Electrolyte	Per kg/day
Potassium	2-4mmol
Magnesium	0.2mmol
Phosphate	0.3-0.6mmol

- Immediately before and during the first 10 days of feeding:
  - Oral thiamine 200-300mg/d and vitamin B co-strong 1 or 2 tablets tds or full dose IV
  - Balanced multivitamin/trace element supplement once daily
- *Consider* restoring circulatory volume and monitoring fluid balance and overall clinical status closely

D grade evidence

What rate would you start PN?

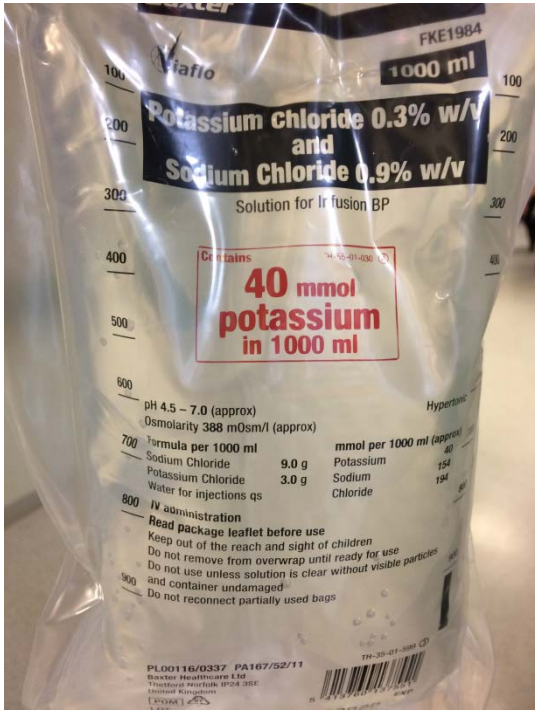
- 5kcal/kg
- 10kcal/kg
- 15kcal/kg
- 20kcal/kg

	NICE (2006)	Prescription
Energy	205 (5kcal/kg)	400 glucose 500 lipid 225 protein 1125 total } 27kcal/kg
Nitrogen	No recommendation	9g (0.2g/kg)

10kcal/kg from glucose

How much potassium?

- 1mmol/kg
- 2mmol/kg
- 3mmol/kg
- 4mmol/kg

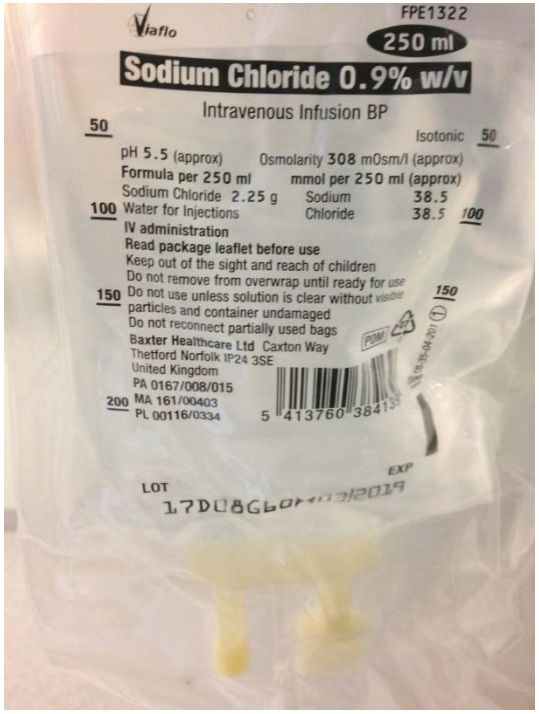


1L saline + 40mmol KCL

	NICE (2006)	Prescription
Potassium (mmol)	82-164 (2-4mmol/kg)	60 (1.5mmol/kg)

How much magnesium?

- 0.1mmol/kg
- 0.2mmol/kg
- 0.3mmol/kg
- 0.4mmol/kg

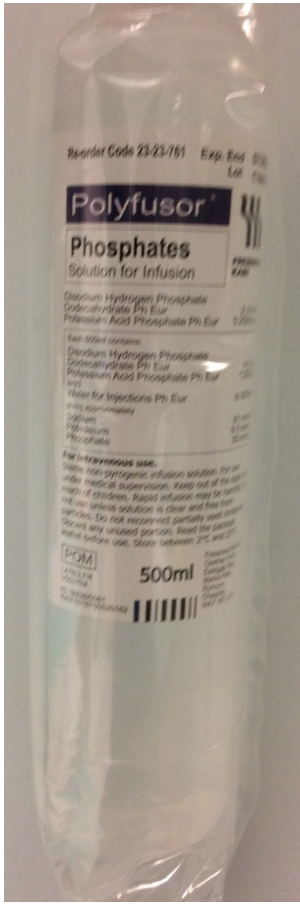


250ml saline + 20mmol Mg

	NICE (2006)	Prescription
Magnesium (mmol)	8 (0.2mmol/kg)	8 (0.2mmol/kg)

How much phosphate?

- 0.3mmol/kg
- 0.5mmol/kg
- 0.6mmol/kg
- 0.7mmol/kg



50mmol PO4
81mmol Na
9.5mmol K

	NICE (2006)	Prescription
Phosphate (mmol)	12-21 (0.3-0.5mmol/kg)	30 (0.7mmol/kg)

How many days thiamine?

- 3 days
- 5 days
- 7 days
- 10 days

	NICE (2006)	Prescription
Thiamine (dose & days)	200-300 mg/d for 10d & Vitamin B co strong 1-2 tablets tds **OR** Full dose intravenous vitamin B preparation if necessary	Pabrinex bd for 5 days

Requirements

	NICE (2006)	Prescription
Sodium (mmol)	No recommendation	60 (1.5mmol/kg)
Potassium (mmol)	82-164 (2-4mmol/kg)	60 (1.5mmol/kg)
Magnesium (mmol)	8 (0.2mmol/kg)	8 (0.2mmol/kg)
Phosphate (mmol)	12-21 (0.3-0.5mmol/kg)	30 (0.7mmol/kg)
Fluid (ml)	No recommendation	1250 (30ml/kg)
Thiamine (dose & days)	200-300 mg/d for 10d & Vitamin B co strong 1-2 tablets tds **OR** Full dose intravenous vitamin B preparation if necessary	Pabrinex bd for 5 days

Case study

Date	N	Glucose	Lipid	Energy	Na	K	Ca	Mg	PO4	Volume	Rate
NICE	-	-	-	205	-	82-164	-	8	12-21	-	-
11/2	9	400	500	1125	60	60	2	8	30	1250	20
12/2	9	400	500	1125	60	60	2	8	30	1250	16
16/2	9	800	500	1525	60	60	2	8	30	1250	16
17/2	9	800	500	1525	60	60	2	8	30	1250	12
18/2	9	1000	500	1725	60	60	2	8	30	1250	12

Day 1 27kcal/kg total energy
Increased to full requirements by day 6

Biochemistry

Date	10/2	12/2	13/2	14/2	16/2	18/2	23/2	28/2
WCC	12.9	11.6	11.9	11.8	16.9	13.9	14.4	13.6
CRP	2	1	1	1	3	3	2	5
Na	140	142	141	139	137	139	137	138
K	4.2	4.4	4.0	4.0	4.8	5.0	4.7	4.5
Urea	4.8	5.1	5.8	5.4	6.7	7.4	7.4	8.0
Cr	42	45	42	63	45	43	48	48
Alb	43	39	39	40	41	38	40	37
Adj Ca	2.48	2.38	2.29	2.26	2.41	2.34	2.39	2.47
Mg	0.87	0.92	0.94	0.73	0.93	0.89	0.86	-
PO4	1.19	1.09	0.89	0.67	1.12	1.16	1.55	1.28

Case study

	Weight kg	BMI kg/m^2	TST mm	MAMC cm	Grip kg
Admission	41	12.7	3	17.06	18.5
Discharge	46	14.3	4	18.25	25

Clinical

- BO x 1 daily
- On Creon 40,000units when eating
- Mood much improved, wants to go home
- Micronutrients normal
- UTI treated with antibiotics

Diet

- Less abdominal pain on eating and regained sense of taste and smell
- Appetite improving

No aseptic unit?

	Volume ml	Energy kcal	N g	Na mmol	K mmol	Mg mmol	PO_4 mmol
NICE recommendation	-	**205** (5kcal/kg)	-	-	**82-164** (2-4mmol/kg)	**8** (0.2mmol/kg)	**12-21** (0.3-0.6mmol/kg)
PN (MCB) 986ml	200	223	1.6	8	6	1	2.4
Sodium	2000	0	0	304	0	0	0
Potassium	0	0	0	0	80	0	0
Magnesium	100	0	0	15	0	8	0
Phosphate	200	0	0	32.4	3.8	0	20
Vitamins	5	0	0	0	0	0	0
Trace elements	10	0	0	0	0	0	0
Total	**2515**	**223**	**1.6**	**359.4**	**89.8**	**9**	**22.4**

Total fluid provision = 2515ml

Total sodium provision = 359mmol

Refeeding guidelines

1. Solomen & Kirby (1990) *JPEN*, 14:90. 2. Dewar & Horvath (2001) A pocket guide to clinical nutrition (PENG). 3. Crook *et al* (2001) *Nutrition*, 7:632. 4. National Collaborating Centre for Acute Care, February 2006. *Nutrition support in adults Oral nutrition support, enteral tube feeding and parenteral nutrition.* 5. Stanga *et al* (2008) *Eur J Clin Nutr* 62:687. 6. Khan *et al* (2011) *Gastro Res Pract*, ii: 410971

Other guidelines

Reference	Energy	Electrolytes	Fluid	Micronutrients
Solomen & Kirby (1990) *JPEN*, 14:90	20kcal/kg	_	_	_
Dewar & Horvath (2001) A pocket guide to clinical nutrition (PENG)	20kcal/kg	Replenish as required	_	Thiamine IV 48hrs → Oral Forceval daily
Crook et al (2001) *Nutrition*, 7:632	20kcal/kg	Replenish as required	_	Thiamine IV 48hrs → Oral
Kraft et al (2005) *Nutr Clin Pract*. 20:625	25% of requirement	10-15 of PO4/1000kcal Replenish as required	<1L/d	Thiamine IV 50-100mg/d or 100mg PO 5-7d & multivitamin
Stanga et al (2008) *Eur J Clin Nutr* 62:687	10kcal/kg 50-60% CHO 30-40% Fat	K 1-3mmol/kg/d Mg 0.3-0.4mmol/kg/d PO4 0.5-0.8mmol/kg/d Na <1mmol/kg/d	20-30ml/ kg	Thiamine 200-300mg IV, then daily IV or oral until day 3. No Iron
Khan et al (2011) *Gastro Res Pract*, ii: 410971	10kcal/kg 50-60% CHO 30-40% Fat	K: 1-3mmol/kg/d Mg 0.3-0.4mmol/kg/d PO4 0.5-0.8mmol/kg/d Na <1mmol	20-30ml /kg	Thiamine IV and Vit B complex for 3 days

Attitudes to NICE refeeding guidelines

- Unpublished survey of HCP
- 44% of doctors followed the guidance vs. 70% of dietitians
- 39% thought guidance was safe practice
- 36% thought excessively cautious
- Obstacle to providing adequate nutrition
- Other never seen refeeding despite providing 100% requirement from day 1

De Silva *et al* (2008) *BMJ,* 337:67

Dietetic practice in refeeding

Questionnaire including 3 case studies

- 90% had read NICE and 67% changed practice based on NICE
- 90% do not wait for normal biochemistry
- Feed increased over 3-4 days
- 75% supplement electrolytes reactively
- Current practice is inconsistent but 20kcal/kg common
- Common themes:
  - Lack of evidence
  - Overcautious & exacerbate malnutrition
  - Better safe than sorry
- Clinical judgment
- Advice on supplementation confusing or difficult to follow and often impractical

Wagstaff (2011) *JHND* 24:505

Food for thought…

- Do we over diagnose risk of re-feeding syndrome?
  - How accurate is percentage weight loss reported?
  - How easy is it to determine if little or no nutrition has been consumed over the last 10 days?

- Do we under-feed and have a negative impact on the existing degree of malnutrition
  - Is there a difference depending on the route of feeding e.g. parenteral, enteral or oral

- Do we focus on total calorie provision and neglect the composition of the feed and adequate electrolyte provision?
  - Is the proportion of carbohydrate important?

Response to case study

	Do we over diagnose risk?	How accurate is % weight loss?	How easy is little or no nutrition to determine?
DGH department	Yes	Difficult	Difficult
ICU	Yes	Very difficult	Very difficult
Band 5	Yes	-	-
Renal	Yes	Difficult	Difficult
UGI/HPB	Yes	Difficult	Struggle
Community	Yes	“Can’t see if refeeding risk”	-
ICU	Yes	Difficult	-
NST	Yes	Not accurate	Very subjective
DGH department	Yes	Not very accurate	Difficult

Response to case study

	Do we underfeed?	Difference depending on route?	Focus on total kcals and neglect composition & electrolytes	Is proportion of CHO important? Focus on kcal from glucose not total kcal?
DGH department	Yes	Probably	Yes	Yes (10kcal/kg)
ICU	Yes	Yes	Yes	Yes
Band 5	5kcal/kg too cautious	-	-	-
Renal	Difficult to know	Yes	Yes	Maybe
UGI/HPB	Yes	More cautious with oral	Yes	Yes use fat supplements
Community	-	-	-	-
ICU	-	-	-	Yes
NST	Yes	Oral hardest	MCB PN only	Yes but MCB PN
DGH department	Yes	Oral difficult	Nitrogen priority	Yes but MCB PN

Response to case study

Profession over diagnose risk and is overly cautious

Put patients at risk of underfeeding syndrome

Risk of fluid overload

No current or previous weight, poor historians

Should focus on CHO content of feeds. Rarely use 5kcal/kg

Over cautious with thiamine. Continued in community, waste

Hard to determine intake, patients vague. Use <500kcal/d

Feed progress delayed waiting for bloods.

What to do in the community?

The challenge

R C T

Home enteral feeding case

Anna Hardman

Specialist Community Dietitian

Rotherham General Hospital

Patient History

- PEG placed in hospital secondary to stroke
- Patient became unwell placed on End Of Life (EOL) care and was fast tracked to a care home
- Patient's family wanted a small amount of feed to be given (300kcal) decision made in hospital
- Decision made not for hospital readmission or further investigations

4 months later

- Remained on EOL
- Family started to become concerned patient was loosing weight and developed a pressure sore (patient not being weighed)

6 months later

EOL care stopped

Patient commenced on antibiotics due to a chest infection

Weight 50kg, BMI 22kg/m^2

22% weight loss in 6 months

- What should we do with the feed?
- Is the patient for hospital admission?
- Is the patient for further interventions?

GP discussion

- Explained high risk of refeeding due to weight loss and minimal intake over 6 months
- GP not wanting to re-start feed
- Practice are not happy to prescribe vitamin & mineral supplementation
- No real awareness of re-feeding

Best interest meeting with GP and family

Discussion had:

- As patient was being actively treated, feed should recommence
- What is refeeding and the importance of monitoring etc
- What to do if electrolytes are low and correcting

Decisions made:

- To recommence feed slowly as patient was being actively treated
- **GP on board** - To obtain refeeding bloods every 3 days and commenced on vitamin and mineral supplementation (Thiamine, Vitamin B co strong and Forceval) prior to increasing feed
- For hospital admission if required

Biochemistry

	Reference values	Baseline Bloods
Potassium mmol/L	3.5-5.3	3.8
Sodium mmol/L	133-146	135
Urea mmol/L	2.5-7.8	2.9
Creatinine µmol/L	6-120	35
Magnesium mmol/L	0.7-1.05	0.83
Phosphate mmol/L	0.8-1.5	1.0

NICE electrolyte requirements

50kg

- 2 – 4mmol/kg K = 100 – 200mmol
  - 8 – 16 Sando K tablets
- 0.3 – 0.6mmol/kg Po4 = 15 – 30mmol
  - 1 – 2 Phosphate Sandoz (20 – 40mmol Na)
- 0.4mmol/kg Mg = 20mmol
  - 2 sachets Magnaspartate

Electrolytes

- At 10kcal/kg standard enteral feed will supply ~ 19mmol K, 4.5mmol Mg, 12mmol PO4
- How much addition K do we give?
- Serum Mg and PO4 in normal range, would you give extra?

Prophylactic electrolyte replacement

- How much extra PO4 do we give?
- How much extra Mg do we give?
- How do we convince the GP to prescribe them when blood levels normal?
- What do we do if they refuse?
- What we did in this case…

First increase

Feed increased to 500ml of Fresubin Original fibre to provide – 500kcal and 19g of protein

	Reference values	Baseline Bloods	Bloods after 1st increase
Potassium mmol/L	3.5-5.3	3.8	3.2*
Sodium mmol/L	133-146	135	137
Urea mmol/L	2.5-7.8	2.9	2.9
Creatinine µmol/L	6-120	35	40
Magnesium mmol/L	0.7-1.05	0.83	0.76
Phosphate mmol/L	0.8-1.5	1.0	0.81

Dietetic assessment

Nutritional requirements ~ 1290kcal and 60g of protein and 1500ml

Aim feed: 1000ml of Fresubin 1200 complete

How quickly do we increase the feed?

Second increase

- Sando K given via the PEG
- Feed increased to 800ml of Fresubin Original fibre – 800kcal and 30g of protein

	Reference values	Baseline bloods	Bloods after 1st increase	Bloods after 2nd increase
Potassium mmol/L	3.5-5.3	3.8	3.2*	3.3*
Sodium mmol/L	133-146	135	137	135
Urea mmol/L	2.5-7.8	2.9	2.9	2.7
Creatinine µmol/L	6-120	35	40	37
Magnesium mmol/L	0.7-1.05	0.83	0.76	0.73
Phosphate mmol/L	0.8-1.5	1.0	0.81	0.79*

How quickly to increase?

- Do we wait until electrolytes corrected before increasing rate?
- What we did in this case…..

Third increase

- Increased feed to meet full requirements 1000ml of Fresubin 1200 complete

	Reference values	Baseline bloods	Bloods after 1st increase	Bloods after 2nd increase	Bloods at full requirements
Potassium mmol/L	3.5-5.3	3.8	3.2*	3.3*	3.5
Sodium mmol/L	133-146	135	137	135	138
Urea mmol/L	2.5-7.8	2.9	2.9	2.7	2.8
Creatinine µmol/L	6-120	35	40	37	36
Magnesium mmol/L	0.7-1.05	0.83	0.76	0.73	0.75
Phosphate mmol/L	0.8-1.5	1.0	0.81	0.79*	0.67*

Key points

- GP has to be on board and aware of refeeding in particular around obtaining bloods and supplementation
- It is very important to ask if patients are for hospital readmission if found to have severe deficiency
- Are your GPs happy to prescribe vitamin and mineral supplementation?
- MDT approach