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Feeding difficulties in Congenital Heart Disease

Lindsay Costello, Paediatric Dietitian

Royal Manchester Children's Hospital

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Importance of dietetic input in CHD

RMCH dietetic caseload review

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Importance of dietetic input in Congenital Heart Disease (CHD)

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Up to ½ infants admitted for cardiac surgery may have feeding difficulties[1]

CHD symptoms and effect on feeding[4]:

- ↑ breathlessness
- Fatigue
- Early satiety & vomiting
- Long term effects - up to 20% may continue to show signs of feeding difficulties at 2yrs old [1]

20% of CHD patients with faltering growth prior to surgery had delayed or no referral for dietetic input[1]

RMCH dietitian caseload

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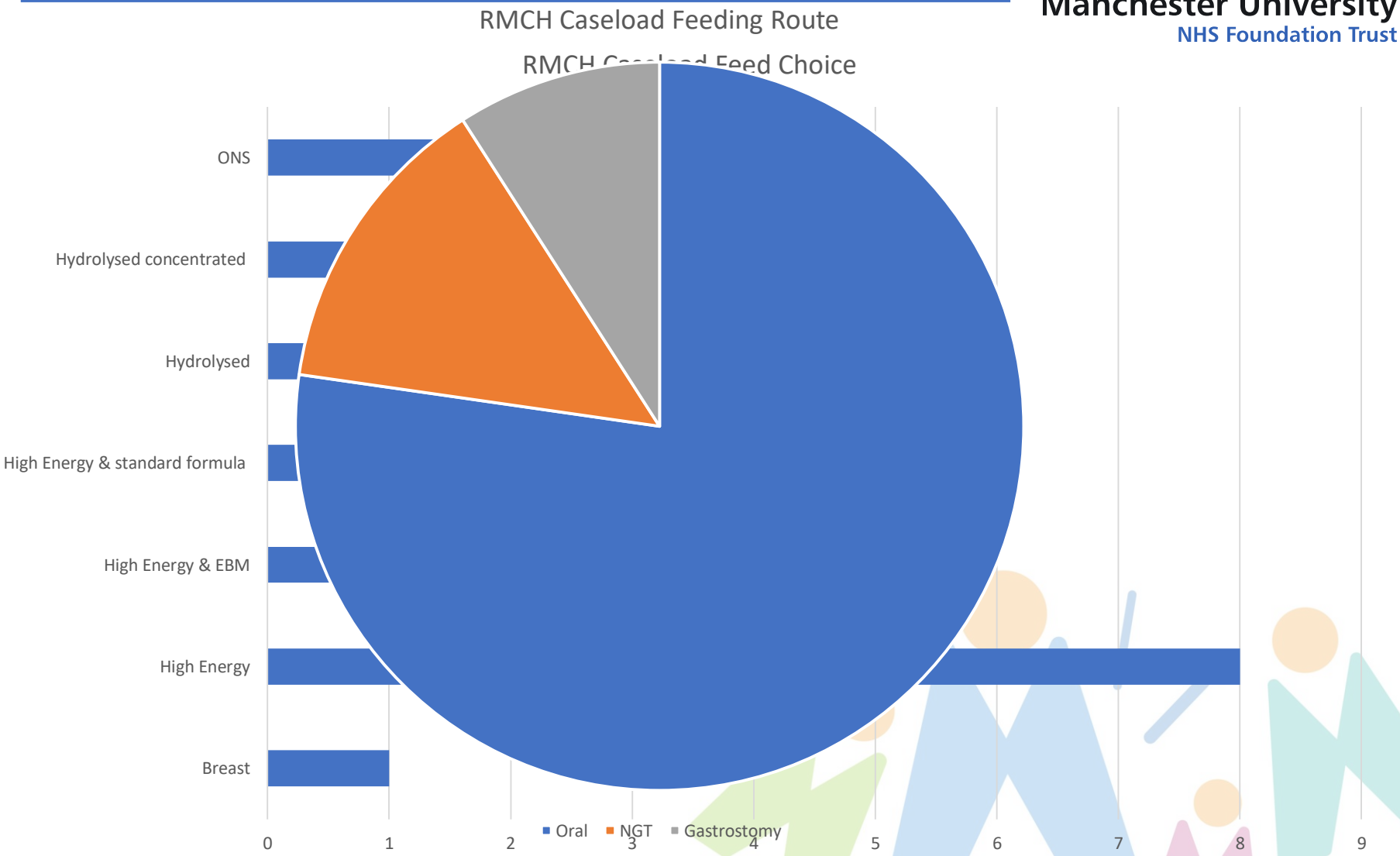

Dietetic assessment

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Clinical History	Growth History
Feeding history	Symptoms
Plan	

Clinical History

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Key message 1
The nutritional needs of infants with CHD will depend on the type of cardiac lesion

Lower nutrition risk*	Higher nutrition risk*
• Patent ductus arteriosus – (if early surgery) • Atrial septal defect • Cor triatriatum • Total anomalous pulmonary venous drainage • Pulmonary stenosis • Transposition of great arteries • Coarctation of aorta *This is not an exhaustive list and does not replace clinical judgement with respect to nutrition risk	• Pulmonary atresia • Prostin dependent lesion • Tetralogy of Fallot • Atrial septal defect – (severe lesion) • Ventricular septal defect – (moderate to large) • Arterioventricular septal defect • Hypoplastic left heart syndrome • Truncus arteriosus • Aortopulmonary window • Patent ductus arteriosus (if large or delayed surgery) • Tricuspid atresia • Ebstein Anomaly • Double outlet right ventricle • Partial anomalous pulmonary venous drainage

Notes:

- Nutrition risk will be higher in infants with more than 1 cardiac lesion congenital or chromosomal abnormality such as:T21/18/13 /MVACTRL/ CHARGE/ Gastrointestinal atresia/ Congenital chylothorax/ Severe cardiomyopathy/ Syndromes: Noonan / Turners / Williams/ Di-George
- Premature infants or those with intra uterine growth retardation / absent or reversed end diastolic flow

Growth

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Expected weight gain

- ~200g per week for first 6/12
- Unique to the baby
- Appropriate growth chart essential

Symptoms

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Gastro-oesophageal reflux (GOR) & vomiting[6]

1) Positioning *(*NB not when sleeping)*
2) Feed thickeners
3) Alginate therapy (Gaviscon)

PPI's (omeprazole) – no contraindications, ↓ acid = more comfortable feeding

Other…

1) Cows Milk Protein Allergy (CMPA)
   - Growth of infants with CHD & allergy is significantly worse vs non-allergic CHD infants
   - Detailed family / feeding / symptom hx
   - Extensively hydrolysed formula
   - Retrial to confirm allergy

Nutritional requirements

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Healthy infant	CHD infant
Energy Requirements = 96-120kcal/kg/day	Energy Requirements = 96-120kcal/kg/day
Total energy expenditure = 60-70kcal/kg/day	Total energy expenditure = 72-86kcal/kg/day
= 35-60kcal/kg/day available for growth	**= ~ 24-34kcal/kg/day available for growth**

1/3 of children with CHD have an energy expenditure 120%>normal = less available for growth

Oral feeding

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Breast feeding or expressed breast milk (EBM)

Pros - Mechanics of breast-feeding cause less cardiorespiratory distress than bottle = ↓ o2 desaturation episodes

Route	Uses	Options
Breast milk	For at least the first 6m of life	EBM via bottle / NGT
Standard infant formula	Where breast is not possible Can be concentrated	Parental preference
High energy infant formula	Combination Sole source of nutrition Oral / NGT	SMA pro, Similac high energy, Infatrini
Hydrolysed high energy infant formula	Partially digested – easier to tolerate	Infatrini Peptisorb

Enteral tube feeding (ETF)

Reasons for ETF in CHD infants

- Easily tiring / breathless when feeding
- Early satiety (not able to finish oral feeds)
- Coughing or choking when drinking - ? SLT input
- Vomiting / Severe reflux and discomfort on feeding
- Poor growth

Practical advice / bonding with tube feeding

- Top ups – continue with breast/bottle
- Eye contact / cuddles / skin to skin during feeds
- Dummy – oral skills, comfort, taste of milk

Weaning in CHD

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Practical advice:

1) Follow normal weaning guidelines – timing / textures / finger foods
2) Little and often approach
3) Increase energy density
    - Add high energy milk
    - Add butter, oil, cream
    - Add a teaspoon of nut butter
4) Encourage iron rich foods
5) Don’t avoid allergens

Case Study –November 2020

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Clinical History - Born full term • Complete balanced AVSD • Trisomy 21 • Hirschsprung's – stoma	**Growth History -** Birth weight – 91st centile Weight tracking ~50th centile Length 75th – 91st centile
Feeding history Fluid restriction: 120ml/kg/day Infatrini Peptisorb – currently 100ml/kg NGT & oral – due to cold, mostly NGT	**Symptoms** Reflux, vomiting – cries and arches back, mucus & snotty nose ½ sachet Gaviscon per feed Stoma losses – watery, seedy, changing bag every 2-3 days

Plan

1) Continue to slowly increase feeds to meet 120ml/kg/day
2) Start omeprazole (3mg per day)
3) Urinary Na requested
4) Weekly health visitor weights
5) Dietitian review ever 2 weeks

Case Study –December 2020

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Clinical History - Born full term • Trisomy 21 • Hirschprungs – stoma • Complete balanced AVSD	**Growth History –** **> 50th centile**
Feeding history Fluid restriction: 120ml/kg/day Infatrini Peptisorb (100kcal/100ml, 2.6g protein) 85ml x 7 feeds NGT & oral – was taking 30ml orally, had a cold and stopped – all NGT NGT feeds taking a long time	**Symptoms** Occasional vomits, heaving with dummy ½ sachet Gaviscon per feed Omeprazole – 3mg (could ↑ to 8mg) Urine Na <20 Stoma losses – same
Plan 1) Start NaCl supplementation as per surgeons 2) Omeprazole increased to 5mg per day 3) Discussed pump feeding	

Case Study – January- February 2021

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Clinical History Born full term Medical hx: • Trisomy 21 • Hirschprungs – stoma • Complete balanced AVSD	**Growth History** **25-50th centile**
Feeding history Infatrini Peptisorb – 120ml/kg/day 100ml x 3hourly x 6 feeds	**Symptoms** Gagging & reflux symptoms continue Snotty nose & congestion for >10 weeks on and off Green stoma OP & reflux symptoms Considered ? CMPA
Requirements and plan Trial Neocate LCP (15% concentration; 74kcal/100ml, 2g protein) Outcome – vomiting much better, stoma OP – more normal colour, thicker stool, similar to normal baby stool, cold and congestion better. Increased Neocate concentration to 18% (91kcal/100ml, 2.4g protein)	

Case Study – March – April 2021

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Clinical History Post op at AHCH ECHO – bare/minimal leak, stopped all heart meds.	**Growth History** 50-75th centile
Feeding history Fluid – 150ml/kg/day 100ml x 5 / day = 500ml = 62kcal/kg/day Water flushes meet fluid requirements Seen by SLT – weaning advice given – purees	**Symptoms** No vomiting / reflux / gagging Stoma output thicker and less frequent
Plan: 1) Awaiting stoma reversal and pull through for Hirschsprung's disease 2) Progress with weaning as per SLT 3) High energy weaning advice	

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Any questions?

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Table 1.18 Examples of energy- and nutrient-dense formulas for infants (per 100 mL).

	Energy (kcal)	kJ	Protein (g)	CHO (g)	Fat (g)	Na (mmol)	K (mmol)	Osmolality (mOsm/kg H_2O)	PE ratio
13.1% SMA PRO 1 (*normal concentration*)	67	280	1.3	7.1	3.6	1.0	1.6	296	7.8
15% SMA PRO 1	77	320	1.5	8.1	4.1	1.1	1.8	339*	7.8
17% SMA PRO 1	87	365	1.7	9.2	4.7	1.3	2.1	384*	7.8
EBM† + 3% Cow & Gate 1	84	350	1.6	8.8	4.8	0.9	1.9	–	7.6
17% Cow & Gate 1 + Maxijul to 12% CHO + Calogen to 5% fat	100	420	1.6	12.0	5.0	0.9	2.3	–	6.4
Ready-to-feed formulas									
SMA High Energy (SMA Nutrition)	99	415	2.6	10.0	5.4	1.2	2.6	377	10.5
Similac High Energy (Abbott)	100	420	2.6	10.1	5.4	1.1	2.3	333	10.4
Infatrini (Nutricia)	101	420	2.6	10.3	5.4	1.6	2.4	360	10.3

PE, protein–energy ratio; EBM, expressed breastmilk.
The Scientific Advisory Committee on Nutrition used an energy density for breastmilk of 0.67 kcal/g (2.8 kJ/g) rather than 0.69 kcal/g (2.9 kJ/g) in the revised *Dietary Reference Values for Energy*, 2011 [49].
*Calculated value.
†Holland *et al.* [59].

Electrolyte supplementation

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Electrolyte supplementation
Patients with cyanotic lesions have a higher fractional excretion of Na vs acyanotic lesions / healthy individuals and may be at higher risk of depletion.
Gold standard = 24 hour urine sample – not practical
Spot urine sample - <30mmol/L associated with poor growth (120)

RNI for Na for infant (0-3months) = 1.5mmol/kg/day
150ml/kg
Std infant formula = 1.0-1.3mmol Na/kg
Nutrient dense formula = 1.4-1.65mmol Na/kg
Supplementation – 2-3mmol/kg may be required

Iron deficiency

Children with cyanotic lesions need to have optimal 02 delivery to tissues
Ensuring adequate haemoglobin concentration is vital to help with tissue saturation and maintaining iron status is important (123)

Zinc
↑ pulmonary blood flow can = pulmonary hypertension = ↑risk of bronchopneumonia – often low serum zinc recorded in these patients
Oral or IV supplementation

Vitamin D
Supplementation with vit D containing multivitamin from birth
Low vitamin D associated with

- > post op cardiovascular dysfunction
- ↑ post op fluid requirements
- Longer duration of mechanical ventilation