SMALL TALK

PAEDIATRIC NUTRITION UPDATE INTENDED FOR HEALTHCARE PROFESSIONALS ONLY | SUMMER 2020

SPOTLIGHT ON **COVID-19**

• Breastfeeding during COVID-19 • PIMS-TS • Managing Remote Allergy Services
• A Dietitian's Diary

EDITORS

Left - **Sophie Andrews**, Medical Affairs Manager (Preterm), Nutricia

Centre - **Vicky Furmidge-Owen**, Freelance Nutritionist/Director, VFO Nutrition Limited

Right - **Jacqui Lowdon**, Clinical Specialist Paediatric Dietitian, Cystic Fibrosis at Leeds Children's Hospital

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CONTACT POINT

If you would like to contribute to the next edition of Small Talk, please contact:

Nutricia Resource Centre: **01225 751098**

email: **resourcecentre@nutricia.com**

or write to: Small Talk, Nutricia Resource Centre, White Horse Business Park, Trowbridge, Wiltshire BA14 0XQ

WELCOME

To our special edition: spotlight on **COVID-19**

The past four months have seen a seismic shift in every aspect of our lives. From our work and social lives to our priorities and plans for the future, there is little that has not been affected by the COVID-19 global pandemic. Despite all the challenges faced, healthcare professionals have continued to find new and resourceful ways to support their patients throughout this time. If there are any positives to come out of this awful situation, it is the reinforced respect and gratitude that has been generated towards those that dedicate their lives to caring for others when they are at their most vulnerable.

As we begin to make small, hopeful steps out of this crisis and towards a 'new normal', we hope you will find this COVID-19 special edition of Small Talk interesting, informative and practical.

Inside you will find case studies of patients with paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS) - including the latest clinical guidelines for its management, as well as a range of original articles highlighting the profound effects COVID-19 has had on all areas of dietetic practice; from remote working and virtual clinics to breastfeeding on the neonatal intensive care unit. As scientists around the world work to better understand this virus, we have also seen a rapid acceleration in the publication of new research. In our Up$_2$ Date section we take a look at some of the key studies that have emerged in the past few months.

We are undoubtedly moving into a new era of healthcare, with changes to our ways of working and learning, and your feedback is more important than ever to ensure Small Talk continues to meet the needs of its readers. Therefore, we would greatly appreciate two minutes of your time to complete a brief survey to help us shape the future of Small Talk at https://www.surveymonkey.co.uk/r/FC6DTP5 or use the QR code above.

If you would be interested in contributing to a future edition of Small Talk please don't hesitate to get in touch.

Keep safe,

Sophie

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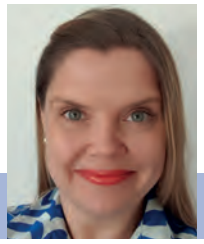

Provision of human milk in neonatal settings during the COVID-19 pandemic

Satu Ravenscroft Specialist Neonatal Dietitian, Royal London Hospital - Barts Health NHS Trust

Human milk is considered the optimal form of nutrition for most newborns and is particularly valued in neonatal units looking after some of the most vulnerable infants. The emergence of the COVID-19 pandemic has raised some questions around the safety of human milk and breastfeeding, making the provision of human milk more challenging. This article summarises the current recommendations for the use of expressed breast milk (EBM) and breastfeeding in neonatal units and provides an insight into some of the challenges units are likely to face.

BENEFITS OF HUMAN MILK

The World Health Organisation (WHO) recommends exclusive breastfeeding from birth until six months of age due to the associated health benefits[1]. Human breast milk is a complex solution of nutrients and hundreds of bioactive compounds[2]. In addition to macronutrients, vitamins and minerals, it provides hormones, live cells, trophic factors and a vast range of immune-modulating agents (Table 1). Breastfeeding has been shown to reduce the risk of diarrhoea and urinary and respiratory infections during infancy[3]. Benefits later in life include reduced risk of childhood asthma, leukaemia, obesity, high cholesterol, hypertension and diabetes, reduced risk of some cancers for mother, as well as improved mother/infant bonding and mental health for both[4].

Table 1. Selected human milk bioactive compounds and their functions[2,3,5]

Human milk bioactive compounds	Functions
Epidermal Growth Factor	- Aids maturation and healing of intestinal mucosa
Lactoferrin	- Acts as an antimicrobial agent - Modulates immune response - Aids gut growth and maturation - Contributes to beneficial gut microbiota
Leucocytes	- Protect against pathogens via macrophagic and T cell stimulating activity
Human Milk Oligosaccharides	- Inhibit pathogen binding to gut wall - Act as substrate for fermentation for beneficial bacteria - Attenuate inflammatory responses to pathogens
Secretory IgA	- Inhibits pathogen binding to gut wall - Neutralises microbial toxins

Infants born prematurely (<37 weeks of gestation) are susceptible to infections due to an immature immune system[5] and, hence, greatly benefit from the properties of human milk. Intake of human milk has also been associated with improved neurocognitive development[3,6]. Risk of late-onset sepsis and necrotising enterocolitis, a condition with high morbidity and mortality among the smallest preterm infants, is reduced with the use of mother's own and donor milk compared with formula intake, the impact being dose-dependent[3,7]. Research is now being carried out into the presence of maternal antibodies to SARS-CoV-2 in human milk[8], as it is thought this may provide some protection against the virus.

IS HUMAN MILK SAFE DURING COVID-19?

Several national and international bodies have issued guidance on breastfeeding and use of EBM during the COVID-19 pandemic[9,10]. There is a lack of evidence to show SARS-CoV-2 is transmitted to infants via breast milk or breastfeeding and research in the area consists mainly of case reports of COVID-positive mothers and studies on other viral illnesses[10,11].

A recent communication in the Lancet reports a finding of SARS-CoV-2 RNA in the breast milk of a COVID-19 positive mother of a COVID-positive infant[12]. However, it is not clear whether the transmission of the illness to the infant was via breast milk. There has subsequently been no change in UK guidance. The health benefits of breastfeeding are currently thought to outweigh the risks. COVID-19 positive mothers can therefore continue to express and breastfeed[10]. However, individual risk assessment is recommended for ill and premature infants[10]. Key recommendations for neonatal units (NNUs) by the Royal College of Paediatrics and Child Health/ British Association of Perinatal Medicine (RCPCH/BAPM) and the UNICEF Baby Friendly Initiative are listed on the next page.

RCPCH/BAPM key recommendations for neonatal units (NNUs)[10]

- *"Current national advice for well babies of COVID-19 suspected or confirmed mothers is that the benefits of breastfeeding outweigh any theoretical risks. For unwell or preterm babies in the NNU the evidence is less clear.*
- *Breastfeeding and formula feeding by the mother is permissible, but mothers should be advised regarding hand washing and should wear a fluid-resistant (Type IIR) surgical mask (FRSM) while handling the baby.*
- *Practitioners need to make a balanced decision around provision of expressed milk to babies in the NNU. This decision should be informed by factors including the gestation and clinical condition of the baby, the availability of donor breast milk and parental choice. Other coronaviruses are destroyed by pasteurisation. Further information is available in the European Milk Bank Association position statement[13].*
- *COVID-19 positive mothers who are expressing milk must be facilitated to practise excellent hand hygiene, and care must be taken to ensure that bottles containing EBM are not externally contaminated. EBM of COVID-19 suspected or positive mothers should not be stored with EBM from non-infected mothers. Mothers should have a designated breast pump for exclusive use. NNUs should have clear guidelines around handling, storage and use of EBM in these circumstances.*
- *If it is decided to withhold mother's own breast milk, the mother should be encouraged to express and discard her milk, to maintain lactation until she is no longer infectious (7 days after onset of symptoms). Repeat testing of mother is not necessary."*

UNICEF Baby Friendly Initiative recommendations[9]

"Everyone should be encouraged to:

- *wash their hands before touching the baby, breast pump or bottles*
- *clean the breast pump thoroughly following local infection/COVID-19 control procedures*
- *clean and sterilise all feeding equipment thoroughly following local infection/COVID-19 control procedures*
- *express, label and store EBM as per unit guidance*
- *transport EBM to the neonatal unit in a clean freezer bag and an insulated bag that is thoroughly cleaned between use*
- *practice respiratory hygiene during cares, including when feeding, for example by avoiding coughing or sneezing on the baby and by wearing a FRSM if applicable*
- *in addition, when the mother (or family member) has suspected or confirmed COVID-19 infection:*
  - *the mother should be provided with an effective breast pump to use while she cannot be with her baby on the unit*
  - *a plan should be put in place to transport her EBM safely to the neonatal unit*
  - *care should be taken to ensure that the external surface of the container is thoroughly cleaned by the person receiving the EBM in line with local infection/ COVID-19 control procedures*
  - *the EBM should be stored separately."*

BARRIERS AND SOLUTIONS

Parental self-isolation and stricter visiting policies can reduce the amount of parent/infant contact. Visiting should not be unnecessarily restricted and mothers and babies should be encouraged to stay together as much as possible[9,10]. Considering admission to a neonatal intensive care unit is often a stressful experience for parents in itself[14], it can be assumed isolation and fears over viral transmission may further negatively impact on parental wellbeing as well as on expressing and breastfeeding. Parents should be signposted to appropriate psychological/emotional support[10]. Additional support outside the NNU is offered by charities such as Bliss[15]. Skin-to-skin care should also be encouraged as an effective way of reducing parental stress, as well as promoting parent/infant bonding and enhancing milk production[9,16].

Ongoing support with expressing and breastfeeding is recommended[9] but there may be less support available due to reduced staff levels resulting from illness/self-isolation/shielding or re-deployment. Teams on adult COVID-19 wards looking after COVID-positive mothers may also require further training to ensure expressing commences as early as possible and that the amount of expressed milk is maximised. This support may need to be provided over the phone or via video call or, at times, may require an experienced infant feeding specialist to express on behalf of consenting sick mothers. Local feeding and infection/COVID-19 control protocols should be put in place[10,17] and having adequate expressing equipment and a separate fridge and freezer for safe storage of expressed breast milk will help to deal with challenges associated with the transport and storage of milk.

ROYAL LONDON HOSPITAL NEONATAL BREASTFEEDING TEAM EXPERIENCE

In response to the current pandemic, infant feeding specialists, Rebecca Buckley and Joanne Newham from the Royal London Hospital, developed COVID-19 breastfeeding starter boxes. The boxes contain useful information and equipment to get started with expressing from day one, when mothers are unable to see an infant feeding specialist in person due to concerns over possible COVID-19 infection. Mothers are directed to a UNICEF website for a video on hand expressing. The box also provides a hand pump with instructions for later use, a face mask, alcohol gel, sterilising bags, milk bottles and plastic bags for the transport of milk to the unit. Information on safety of breastfeeding/use of expressed breast milk and precautions to be taken to avoid transmission of the virus are included, alongside details of the unit visiting policy and how to contact the breastfeeding team for further support. The boxes have been well received and the team is considering using them beyond the pandemic.

SUMMARY

Human milk and breastfeeding confer many health benefits to infants. Current recommendations support continuing milk expression and breastfeeding. Further guidance is likely to emerge during the pandemic. Barriers to expressing and breastfeeding can be overcome by robust infection control protocol and changes to practice.

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Nutrition support in critically ill children with COVID-19 and paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS)

Dr Luise Marino Clinical Academic Paediatric Dietitian/Paediatric Intensive Care, University Hospital Southampton NHS Foundation Trust & Programme Lead, Nutrition & Dietetics, Winchester University

INTRODUCTION

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified in Wuhan-China, December 2019[1]. The World Health Organization (WHO) declared the outbreak of SARS-CoV-2 disease (COVID-19) a pandemic in March 2020. Of the nearly 150,000 confirmed cases of COVID-19 in England, 1.6% (2,300) have been in people less than 20 years old, of which 0.7% (1,028) cases were in children less than 10 years of age[2]. In recent weeks, there have been reports of children presenting to hospital with COVID-19 or COVID-19 like symptoms with hyperinflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS) and atypical Kawasaki disease.

CLINICAL PRESENTATION OF CRITICALLY ILL CHILDREN WITH SEVERE SARS-COV-2 DISEASE OR PIMS-TS

The Royal College of Paediatrics and Child Health (RCPCH)[3] has provided a case definition for PIMS-TS as being children presenting with:

1. Fever (>38.5) which persists, inflammatory response (elevated CRP, neutrophilia and lymphopaenia) and evidence of multi- or single organ dysfunction (e.g. shock, respiratory, cardiac, renal, gastrointestinal, neurological) and additional features which may meet some or all of the criteria for Kawasaki disease
2. Exclusion of other microbial causes including bacterial sepsis
3. SARS-CoV-2 PCR test positive or negative.

The commonest feature reported in critically ill children with COVID-19 and COVID-19 PIMS-TS is shock, along with fever and abdominal symptoms, including pain, vomiting and diarrhoea, which may be as a result of a faeco-oral route of transmission[4]. Respiratory failure is uncommon and children with severe disease who require admission to a Paediatric Intensive Care Unit (PICU) may require mechanical ventilation to aid central line insertion for inotropes, e.g. adrenaline, noradrenaline and, amongst others, to support cardiac function. The clinical presentation may be dissimilar to those commonly reported amongst adults, e.g. fever, cough and shortness of breath (Table 1)[3,5,6].

Table 1. Common clinical and biochemical features at presentation[3,5,6]

Clinical presentation	Features
Respiratory involvement	Striking absence
Persistent fever	>38.5
Abdominal symptoms	Pain, vomiting, diarrhoea
Laboratory markers	CRP >250 Ferritin >500 Troponin – may be elevated BNP – may be elevated
Coagulation abnormalities	Elevated d-dimers
Shock	Vasodilated shock
Rash / Conjunctivitis	Variable features
Effusions	Pleural / pericardial
Coronary arteries	Dilated – features of Kawasaki
Hypoalbuminaemia	Occasionally
Nutritional status	Overweight

NUTRITION SUPPORT IN CHILDREN WITH COVID-19 AND COVID-19 PIMS-TS

The European Society of Pediatric and Neonatal Intensive Care – Metabolism, Endocrine and Nutrition group (ESPNIC-MEN) section published nutrition support recommendations for critically ill children in January 2020[7] to which COVID-19 recommendations have been added[8]. The supplemental nutrition recommendations for COVID-19 and COVID-19 PIMS-TS can be summarised as follows[8]:

1. Although early enteral nutrition can be provided within 24 hours of admission, for children with gastrointestinal or cardiac manifestations, along with inotrope resistant toxic shock, this may not be possible for up to 7 days or more, particularly if there are signs of inadequate perfusion (e.g. rising lactate).
2. Energy requirements should not exceed resting energy expenditure (calculated using Schofield equation) during the acute phase (e.g. escalating organ support).
3. Some of these children are reported to have body mass index >+2 scores; energy requirements should be calculated using ideal body weight[9].
4. Parenteral nutrition to be withheld during the first 7 days of admission.
5. Insertion of naso-enteric tubes in awake and non-sedated children is considered an aerosol generating procedure, so appropriate personal protective equipment (PPE) should be worn.
6. Where children are nursed prone, who are heavily sedated with large doses of opioid medication or who have high gastric residual volumes (GRV), post-pyloric enteral feeds may be better tolerated.
7. Children may be prescribed corticosteroid and high dose aspirin, increasing the risk of gastritis, as such they may benefit from prophylactic treatment to prevent upper gastrointestinal bleeding[10].
8. The measurement of GRV is not recommended except if there is repeated vomiting. As SARS-CoV-2 virus has been found in the gastrointestinal lumen[6], extra care should be taken if measuring GR and health care professionals should ensure PPE is worn.
9. Vitamin D insufficiency or deficiency (<50nmol/l) should be corrected[11], however, there is no evidence to support micronutrient supplementation including zinc or vitamin C[12,13].
10. Children may have undergone a prolonged period of nil by mouth or rapidly lost a significant amount of weight, as such, nutrition support may be required well into the recovery period. Enteral or oral nutrition supplement support should continue after discharge from PICU until children are able to consume >75%[14] of their nutrition requirements from food alone. During recovery, higher energy and protein intake may be required up to twice the resting energy expenditure depending on age[15] until nutritional deficits are replete.

CASE STUDY 1: Boy A

A 13-year-old boy (A) is usually fit, well and healthy, with no underlying medical problems. His body mass index was on the 9th centile. Prior to admission he had a 6-day history of fever and diarrhoea and a 48-hour history of increased work of breathing and cough. Boy A was admitted to PICU with toxic shock and was profoundly unwell requiring mechanical ventilation and high doses of noradrenaline, milrinone and adrenaline to support cardiovascular function. He also needed an infusion of amiodarone to control fast atrial fibrillation. On admission, an echocardiogram showed a normally structured heart with moderately impaired left ventricular function, however, by day 3 of admission he had developed coronary artery aneurysm with features of atypical Kawasaki disease. As part of the clinical surveillance his vitamin D levels were measured. He had a multi-organ inflammatory syndrome with no known cause and was SARS-CoV-2 PCR negative. However, he was treated for PIM-TS as his symptoms at presentation were in keeping with the case definition provided by the RCPCH[3]. All other tests for known bacteriological and virology pathogens were negative. He was mechanically ventilated for 6 days and was successfully extubated by day 7 to low flow oxygen, which was rapidly weaned and on discharge he no longer required any respiratory support including supplemental oxygen.

On day 3 of admission he was commenced on intravenous immunoglobulins, in addition to 3 days of high dose pulsed methylprednisolone for atypical Kawasaki disease. On day 8, when he was able to tolerate enteral feeds, this was changed to oral steroid tablets of 100mg per day for 3 weeks. Boy A experienced medication side effects, including elevated urea and hyperglycaemia, as a result of the catabolic effects with increased muscle loss and insulin resistance. As part of the management for Kawasaki disease, he was commenced on unfractionated heparin, which was converted to high dose aspirin (3mg/kg/day) on day 9 of admission.

A nutrition review was completed on the day of admission. Resting energy expenditure (REE) was estimated using body weight and Schofield, and was estimated to be 1,543kcal (body weight 50kg). Protein requirements were estimated to be 1.0g/kg. The nutrition plan was to cautiously commence enteral feeds, increasing in a stepwise fashion until a goal rate of 75ml/hr over 20 hours (with a four-hour feed break) was reached. As per the unit's protocol, enteral feeds were started within 12 hours of admission using an extensively hydrolysed peptide enteral feed, commenced at 15ml/hr. However, this was discontinued after 3 hours of feeding due to concerns about abdominal distention and bile stained aspirates, which were thought to be as a result of an ileus. During the evening and night of day 2 of admission, a rising serum lactate and increasing cardiovascular instability were also a cause of concern regarding a primary gastrointestinal pathology. Boy A underwent an emergency laparotomy during the night after an ultrasound showed grossly dilated loops of bowel, with possible inflammatory changes in the right iliac fossa. The laparotomy was negative but 500ml of purulent transudate was found in the peritoneal cavity and washed out.

He remained nil by mouth with a naso-gastric tube on free drainage for the next 6 days, spending a total period of 8 days nil by mouth. Six days following admission he also developed diarrhoea and a sample was sent for faecal pathogens (although this was subsequently negative). Parental nutrition was not commenced and was only to be considered if he remained nil by mouth for longer than 8 days. On day 8 of admission, his nutrition requirements were recalculated, as he was now in the stable phase of critical illness, and based on resting energy expenditure x 1.5 he was estimated to require 2,300kcal and 2g/kg of protein. Enteral feeds were recommenced at 10ml/hr over 20 hours using an extensively hydrolysed peptide feed, with a stepwise increase of 30ml/hr every 12 hours towards a goal rate of 125ml/hr over 20 hours. A multivitamin was commenced along with a 7-day course of 100mg/day thiamin. He was found to be vitamin D deficient (30nmol/l) and 10,000IU of cholecalciferol was commenced as per treatment recommendations[11]. Although Boy A was now able to eat food orally, he was unable to feed himself and was too drowsy to eat. Prophylactic treatment to prevent upper gastrointestinal bleeding was also commenced in light of the high dose steroids and aspirin.

He was discharged to the Paediatric High Dependency Unit (PHDU) on day 10 of admission. Post PICU discharge he was found to have poor mobility, weakness and lethargy, which improved with physiotherapy. His energy requirements were re-estimated, accounting for increased needs to support recovery, with REE x 2 of around 2,700kcal per day and 2.5 - 3g/kg protein.

SUMMARY

Boy A presented to PICU profoundly unwell with PIMS-TS. Enteral feeds were commenced early but discontinued for 8 days. He was discharged home after spending almost three weeks in hospital and will require life-long cardiac monitoring as a result of the atypical Kawasaki disease. He lost 6kg from admission to discharge. He was eating 3 meals and 3 snacks per day, in addition to micronutrient supplementation and his mobility and strength were returning.

Table 2. Anthropometry, biochemical, clinical and dietary considerations

	Day 0	Day 4	Day 8	Discharge
Weight kg	50	50	50	44.6
Weight centile	50 – 75th	50 – 75th	50 – 75th	25th
Weight z score	0.33	0.33	0.33	-0.24
Height cm	170	170	170	170
Height centile	91st	91st	91st	91st
Height z score	1.24	1.24	1.24	1.24
BMI centile	-0.6	-0.6	-0.6	-1.24
BMI z score	9th	9th	9th	0.4th – 2nd
Biochemistry (range)				
Sodium mmol/l (133-146)	136	150	134	136
Potassium mmol/l (3.5-5.0)	3.5	4.1	4.3	4.0
Urea mmol/l (2.5-6.5)	15.7	17.2	6.6	10.4
Creatinine µmmol/L (35-95)	127	52	32	72
Creatine kinase U/L (40-320)	221	5654	1284	45
Calcium (corrected) mmol/l (2.2-2.6)	2.29	2.09	1.98	2.25
Phosphate mmol/l (0.9-1.80)	1.19	1.3	0.99	1.47
Magnesium mmol/l (0.7-1.0)	1.2	1.2	0.6	0.7
Albumin g/l (32 -50)	26	19	20	31
Lymphocytes 10*9/L (1.5-4.0)	0.4	2.3	0.4	3.6
Lactate mmol/l (0.5-2.0)	6	5.8	0.9	-
Glucose mmol/l (3.0-7.0)	7.1	7.2	10.8	-
Ferritin µg/l (23.9-336)	1530	601	313	-
Lactate dehydrogenase U/L	629	820		
D-dimer µg/l (0-243)	1536	>5000	>5000	-
INR (0.8-1.2)	1.5	1.8	1.4	-
C-reactive protein mg/l (0 – 7.5)	336	251	55	5
Vitamin D (>50nmol/l)	30			
Clinical				
Medication	Vasopressin Adrenaline Noradrenaline Dopamine	Adrenaline Noradrenaline Dopamine Aspirin Prednisolone Omeprazole	Dopamine Aspirin Prednisolone Omeprazole Gabapentin	Aspirin Prednisolone Omeprazole Gabapentin
Dietary requirements				
Energy requirements (Schofield equation) Kcal (total) Kcal (kcal/kg) Actual intake (kcal/kg)	<REE 1,543 30 0.9	<REE 1,543 30 0	REE x 1.3 – 1.5 2,300 46 11	REE x 2 2,750 60 60
Protein requirements (g/kg/day) Actual total intake (g) Actual intake (g/kg)	1-2 0 0	1-2 0 0	2-3 17.6 0.4	3-4 108 2.4
Micronutrients	Nil	Nil	Multivitamin once daily Vitamin D 10,000IU - 8 weeks Thiamin 100mg/day for 7 days Vitamin C 1000mg/day for 2 weeks Zinc sulphate 45mg/day for 2 weeks	Multivitamin once daily for 2 weeks Vitamin D 10,000IU - 8 weeks Food fortification and oral nutrition supplements for 8 weeks

CASE STUDY 2: Boy B

A 14-year-old boy (B) is usually fit, physically very active sports player and healthy, with no underlying medical problems. His body mass index on admission was the 75th- 91st centile. He had a five-day history of fever >40 degrees Celsius, diarrhoea and vomiting, with a muculopapular rash on presentation and profound cardiovascular instability. Blood cultures and COVID-19 PCR were negative from the referring hospital and on day 2 of admission COVID-19 PCR swabs were positive. He had severe inotrope resistant shock on admission, requiring 4 vasoactive drugs in addition to a calcium infusion to maintain cardiovascular stability. An echocardiogram showed poor ejection fraction with severe left ventricular impairment, with abnormal coronary arteries, and he was considered to have Kawasaki disease.
As part of the clinical surveillance his vitamin D levels were measured. He was commenced on pulsed methylprednisolone and unfractionated heparin, which was converted to high dose aspirin when he was able to tolerate oral intake. Prophylactic omeprazole was commenced to provide gastric protection.

A nutrition review was completed on the day of admission. REE was estimated using body weight and Schofield, and was estimated to be 1,843kcal (body weight 67kg). Protein requirements were estimated to be 1.0g/kg. The nutrition plan was to cautiously commence enteral feeds, increasing in a stepwise fashion until a goal rate rate of 90ml/hr over 20 hours was reached. As per the unit's protocol, the aim was to commence enteral feeds within 12 hours of admission using an extensively hydrolysed peptide enteral feed. However, Boy B was considered to have poor systemic perfusion with a rising lactate and high inotrope requirements and enteral feeds were withheld for 72 hours. On day 4 of admission, enteral feeds were started and increased in a stepwise fashion towards a goal rate of 120ml over 20 hours. Once discharged to PHDU, Boy B requested his enteral tube be removed and he ate sufficient oral intake in addition to oral nutrition supplements. During his admission he lost almost 7kg but had regained some weight prior to discharge.

Table 3. Anthropometry, biochemical, clinical and dietary considerations

	Day 0	Day 6	Discharge
Weight kg Weight centile Weight z score	67 91st 1.5	60.4 75-91st 0.9	61.3 75-91st 1.0
Height cm Height centile Height z score	175 91st 1.4	175 91st 1.4	175 91st 1.4
BMI centile BMI z score	75-91st 1.2	50th-75th 0.4	50th-75th 0.5
Biochemistry (range)			
Sodium mmol/l (133-146)	135	145	133
Potassium mmol/l (3.5-5.0)	3.4	4.7	4.7
Urea mmol/l (2.5-6.5)	6.4	11.2	6.5
Creatine µmmol/L (35-95)	146	143	134
Calcium (corrected) mmol/l (2.2-2.6)	2.05	2.28	2.15
Phosphate mmol/l (0.9-1.80)	0.8	1.2	0.9
Magnesium mmol/l (0.7-1.0)	0.92	0.81	0.82
Albumin g/l (32 -50)	24	22	30
Lymphocytes 10*9/L (1.5-4.0)	0.7	0.7	1.5
Lactate mmol/l (0.5-2.0)	3.8	3.8	1
Glucose mmol/l (3.0-7.0)	11.6	8.2	4.5
Ferritin µg/l (23.9-336)	976	528	-
D-dimer µg/l (0-243)	2173	3401	-
INR (0.8-1.2)	1.4	1.3	1.3
C-reactive protein mg/l (0 – 7.5)	392	468	55
Vitamin D (>50nmol/l)	54		
Clinical			
Medication	Vasopressin Adrenaline Noradrenaline Dopamine Calcium	Aspirin Prednisolone Omeprazole Senna	Aspirin Prednisolone Omeprazole Senna
Dietary requirements			
Energy requirements (Schofield equation) Kcal (total) Kcal (kcal/kg) Actual intake (kcal/kg)	<REE 1,843 28 0	REE x 1.3 – 1.5 2,300 35 19	REE x 2 3,300 55 50
Protein requirements (g/kg/day) Actual total intake (g) Actual intake (g/kg)	1-2 0 0	2-2.5 17.6 0.8	2-3 108 2.4
Micronutrients	Nil	Nil	Nil

DISCUSSION

There is very little evidence relating to physical and nutritional rehabilitation in paediatric critical care survivors[16]. In the recovery phase, energy and protein intake may be required up to twice the REE depending on age[15] and nutrition support may be required for a number of weeks until nutritional deficits are replete. Close monitoring of nutritional status may be necessary following discharge from the hospital as longer term functional outcomes have been associated with duration of mechanical ventilation, use of vasoactive medications and duration of PICU stay[17]. In addition, the impact of critical illness on feeding and feeding difficulties post-discharge remains unknown[18]. In adult ICU survivors, a reduced ability to eat, with poor appetite, altered taste and food preferences lasting up to three months post ICU discharge has been reported, which may also affect older children[19]. In these individuals the use of nutrition support during the recovery phase is recommended, e.g. food fortification, oral nutrition supplements or enteral feeds[20,21]. It is suggested that similar recommendations should be considered for children. As such, enteral nutrition support should be continued in PHDU or the ward until children are able to consume >75% of their nutrition requirements from food alone[14]. Micronutrient supplementation may also be required to support catch up growth and muscle mass deposition, and serum levels should be measured once the inflammatory response has resolved and CRP is within normal range[13,14].

CONCLUSION

The cornerstone of nutrition support in paediatric critical illness is enteral feeding. However, in children with COVID-19 and COVID-19 like symptoms who have significant gastrointestinal dysfunction or inotrope resistant shock this may not be possible for a number of days. Energy requirements in the acute phase should not exceed REE and postponing parenteral nutrition for 7 days may be considered in the absence of enteral nutrition. As children may have had a prolonged admission to PICU, nutrition support may be required well into the recovery period to ensure adequate and appropriate nutrition recovery.

CPD Questions

1. What are common presenting features in critically ill children with COVID-19 and COVID-19 PIMS-TS?
2. What are the estimated energy requirements of critically ill children with COVID-19 and COVID-19 PIMS-TS during the acute phase?
3. What procedures are considered aerosol generating and how should health care professionals protect themselves?
4. What may be important nutrition considerations for survivors post discharge from paediatric intensive care?

See answers on page **22**

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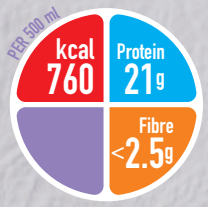
WHEN CALORIES COUNT AND SO DOES TOLERANCE



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NUTRICIA
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*Data on file (2016). ACBS trial, n=(7), Nutricia Ltd.
†Gastrointestinal

Nutrition support in critically ill children with paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS)

Dr Graeme O'Connor Specialist Paediatric Intensive Care Dietitian at Great Ormond Street Hospital for Children

INTRODUCTION

PIMS-TS is an exaggerated defence response of the body to SARS-CoV-2 as it multiplies in the tissues, also known as septicaemia or sepsis. It results in the release of acute-phase reactants which are direct mediators affecting the autonomic, endocrine, haematological and immunological systems and are common overlapping features of toxic shock syndrome and atypical Kawasaki disease[1].

The body's purpose is defensive, but the dysregulated cytokine storm can severely damage lungs and lead to acute respiratory distress syndrome and death - the misdirected fire from the immune system[2].

Septic shock is defined as one or more end-organ failure with haemodynamic instability despite intravascular volume repletion. Sepsis is the leading cause of mortality in children in paediatric intensive care with an approximate worldwide incidence of 8%[3].

METABOLIC CHANGES DURING SEPSIS

During sepsis the body undergoes a number of metabolic changes in response to inflammatory markers (cytokines and interleukins):

- An increase in glycogen breakdown and insulin resistance - resulting in hyperglycaemia. Hyperglycaemia impairs the function of innate immune system that further impairs the ability of the patient to combat infection.
- Accelerated muscle and protein breakdown - leading to a net negative nitrogen balance and skeletal muscle wasting. The goal of exogenous supplementary protein is to mitigate protein catabolism, although the utility of protein admission remains controversial as a strategy to curtail muscle loss[4].
- During sepsis and trauma the body shifts from glucose to fat metabolism, as fat yields more energy than glucose, and increased lipolysis. Lipids become the primary source of energy in patients with infection, resulting in increased serum triglycerides and decreased levels of circulating lipoproteins.

TREATMENT OF SEPSIS

After initial fluid resuscitation to treat sepsis[5], the treatment is aggressive fluid restriction to optimise respiratory function[6]. Excessive fluid administration contributes to oedema and organ dysfunction. A positive fluid balance in critically ill ventilated patients is associated with morbidity and mortality[7]. Complications associated with fluid overload (hypervolemia) include pulmonary oedema and subsequent oxygenation failure and prolonged mechanical ventilation

Obesity is a strong SARS-CoV-2 risk factor, as are co-morbidities, including diabetes, cardio-vascular disease and sedentary lifestyle. During critical illness, the respiratory system is unable to support the excessive amount of metabolically active fat cells. Therefore, fat cells die due to oxygen deprivation causing serum lactate levels to rise[1,8].

Between 18th March and 4th May, there were 31 patients admitted with COVID-19. PIMS-TS case definition was met in 23 cases; of which, 70% were male, 72% were from a black Afro-Caribbean/Asian ethnic background and in 30% of patients weight was over the 98% percentile (weight Z-score 1.4, SD 0.5-2). The mean number of ventilation days was 4 (IQR 2-17 days) and the mean age was 8 years old (IQR 1-15years). Here is a detailed overview of one of these children who was admitted to our paediatric intensive care:

CASE STUDY: SAM - 9-year-old male

History of illness

7th April: Mother spoke to GP – Sam had a fever. GP prescribed penicillin-V but the family didn't collect it as he was feeling better. One week later (13th April) he presented to the GP with worsening fever. Prescribed Penicillin-V again, but it was not started until 19th April as fever came back and now with abdominal pain.

21st April: No improvement - advised to go to A&E. Discharged from A&E with continued Penicillin.

25th April: Re-presented at A&E with worsening fever and abdominal pain symptoms. Admitted with concerns re: meningitis – signs of photophobia and neck stiffness so treated as sepsis.

26th April: Transferred to GOSH. Routine COVID test at GOSH admission - result was positive for COVID-19 (Adenovirus also isolated). Nasal flaring, distressed. Intubated and sedated.

On admission there was evidence of PIMS-TS: worsening metabolic acidosis, blood gas: pH 7.14. A summary of Sam's anthropometric measurements can be seen in Table 1.

Table 1. Anthropometrics

	Metrics	Percentile	Z-score
Weight	41kg	98th	2 SD
Height	135cm	50th	0.1 SD
BMI	22.5	95%	2 SD
Status	Clinically obese		

Day 1 treatment: Fluid bolus therapy is a first-line treatment for resuscitation of septic shock. Sam was commenced on 70 ml/kg fluid bolus for the next 48 hours. Prophylactic antibiotics commenced: cefotaxime, clindamycin, meropenem and metronidazole. Inotropes and hydrocortisone also started.

Sam's basal metabolic rate (BMR)

In light of Sam being clinically obese and accounting for the energy supply from his catabolic state, I re-calculated his BMR based on his height percentile to avoid over-feeding (Table 2). Sam's reported height falls onto the 50th percentile which equated to 30kg on his weight percentile. Protein requirements were calculated on 1.5g/kg/day[9,10]. Of note, there are obese adolescent specific equations available that take into account pubertal stage[11].

Table 2. Comparison of energy requirements for actual and corrected weight

	Actual requirements on current weight (98th)	Re-adjusted requirements (50th)
Weight (kg)	41	30
BMR (kcal/day)	1430	1185
Protein (g/day)	61	45

Days 1-4: First line treatment of sepsis is 48hrs of fluid therapy (70ml/kg/day). Sam was also commenced on intravenous immunoglobulins. Worsening metabolic acidosis was noted over the next few days – lactate dehydrogenase levels increased (Table 3). IV Dextrose was given to maintain serum glucose level: no nutrition for four days.

Evidence of lipolysis and muscle breakdown, with rising triglycerides and creatine kinase respectively (Table 3).

Table 3. Highlights key biochemical markers and fluid intake during the acute septic phase

Biochemistry (range)	Day 1	Day 2	Day 3	Day 4
Lactate dehydrogenase (420-750 U/L)	617	720	809	917
CRP (<20 mg/L)	442	448	-	261
Creatine kinase (60-365 U/L)	256	583	702	-
Urea (2.5 - 6 mmol/L)	16	20	23	24
Fluid intake (ml/day)	3000	3144	1145	1500
Triglycerides (0.3-1.5 mmol/L)	1.65	1.65	-	1.5
Ventilation	Intubated	Intubated	CPAP	CPAP

ENERGY CALCULATIONS IN VENTILATED CHILDREN

When children are intubated and sedated, Schofield equation should be used to calculate basal metabolic rate (BMR). The use of Harris-Benedict equation or Estimated Average Requirements (EAR) are not recommended and these will over-estimate requirements and contribute to over-feeding, which can exacerbate hyperglycaemia and increase CO_2 production.

Medical overview at this point

- Abdominal imaging reports suspected abdominal sepsis.
- Splenomegaly with nephromegaly (obesity related).
- Small left sided pleural effusion.
- Bilious NG aspirates – considered for delayed parenteral nutrition as per PePANIC guidelines. However, the team agreed to trial trophic oral rehydration solution (ORS) on day 4.

Day 4-8: Trophic ORS was well tolerated and increased to 1000ml on day 5. 1000ml was all the fluid available for nutrition after medication (total fluid allowance 1500ml). In light of abdominal imaging reporting evidence of inflammation, an extensively hydrolysed formula (Nutrini Peptisorb) was commenced on day 6. An initial target of 1/3 of fluid allowance was set. Thereafter, feed volume was limited again to 1000ml due to medication requirements. However, this fluid restriction and limited nutritional intake was advantageous for renal function and protein restriction, resulting in rapid urea normalisation (Table 4).

Failed extubation on day 4. Chest X-ray showed bilateral moderate pleural effusions with left-sided collapse. This also coincided with lactate dehydrogenase levels peaking - Sam was re-intubated. He was successful extubated on day 8.

Serum triglyceride levels continued to rise, demonstrating ongoing lipolysis and fat metabolism.

Table 4. Outlines key biochemistry and nutrition from day 4 to 8

	Day 4	Day 5	Day 6	Day 7	Day 8
Feed	Dioralyte	Dioralyte	Nutrini Peptisorb	Nutrini Peptisorb	Nutrini Peptisorb
Volume (ml/day)	320	1000	560	720	960
Kcal/kg	-	-	560	720	960
%TEI (1185kcal)	0	0	47	60	80
Protein (grams/kg)	-	-	0.3	0.4	0.5
Urea (2.5-6mmol/L)	24	20	21	18	7
CRP (<20mg/L)	261	170	77	35	-
Lactate dehydrogenase (420-750units/L)	917	1010	988	-	828
Triglycerides (0.3-1.5mol/L)		3.79	4.1	4.0	3.9
Ventilation status	CPAP	Room Air	Re-intubated	Intubated	Extubated-BiPAP

Day 9: Discharged to the COVID respiratory ward, self-ventilating in air. A 2kg weight loss occurred during Sam's 9 day stay on PICU – attributed to his catabolic state and minimal nutrition.

- Re-calculation of nutritional requirements – bedbound EAR (SACN) (75-80%) – 1380kcal.
- Started to eat and drink – no restrictions in regard to abdominal sepsis: symptom management.
- Focus on gut flora re-colonisation (immune function) in light of antibiotics. Promote prebiotic intake – fruits and vegetables.

SUMMARY POINTS

- Metabolic changes in energy metabolism: shift to fat from glucose
- Lactate dehydrogenase key biomarker of medical stability in multi-organ septic shock
- Energy requirements are based on ventilation status: BMR, Bedbound EAR – NIV (obesity - consider correcting weight to height centile)
- Consider a high energy formula if severely fluid restricted – monitor renal function
- Protein requirements: ESPNIC/ASPEN not RNI
- Fibre as default feed: fructo-oligosaccharides – prebiotic soluble fibre to re-colonise gut flora
- If using ORS, be mindful of the high sodium content – monitor serum levels

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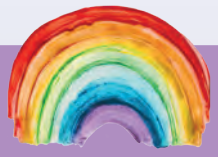
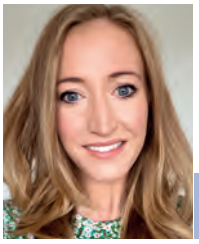


CPD Questions

1. Why is a higher protein intake recommended in patients with sepsis?
2. Why is the use of Harris-Benedict equation or Estimated Average Requirements (EAR) not recommended to calculate energy requirements in ventilated children?
3. What's the body's preferred energy source during sepsis?

See answers on page **22**

Impact of COVID-19 on paediatric food allergy: including reflections of a Specialist Dietitian

Jacqui Cotton Senior Medical Affairs Manager (Allergy), Nutricia (left)
Lucy Upton Specialist Paediatric Dietitian, Birmingham Children's Hospital (right)

The coronavirus disease 2019 (COVID-19) has had an immense impact on healthcare provision across the world, including that in the United Kingdom. Organisations and key opinion leaders have had to respond rapidly, often with limited information and resources, to provide guidance and advice for healthcare providers on how best to support patients and caregivers at this time. It is currently understood that the incidence and severity of COVID-19 is less pronounced in children and, specifically, children with food allergy are not at increased risk of contracting the disease or increased risk of severe disease[1]. However, the management of paediatric food allergies has been affected by the current situation. It has been a challenging time for healthcare professionals and a very anxious time for patients and their caregivers.

The British Society for Allergy and Clinical Immunology (BSACI) provided a clear guideline to support the management of paediatric allergy services very early into lockdown (March 23rd)[2]. Within this guidance, they highlighted that most paediatric allergy services are elective and therefore can be managed without a face-to-face consultation or can be deferred for a short period of time. The BSACI suggested a quick move to telephone or virtual consultations for the immediate period and potentially beyond. The guideline recognised that many children with allergies are generally healthy overall, notwithstanding other co-morbidities, and suggested children with non-severe stable conditions can be managed very well remotely. The BSACI was also very clear to emphasise the exceptions where face-to-face consultations would continue to be necessary, for example for patients with severe asthma.

They also provided information on prioritisation and contingency plans, whilst acknowledging that everyone's clinical environment will vary. Their position was that diagnosis, advice regarding ongoing management and medication reviews could all be done over the phone. They suggested deferment of allergy testing and food challenges but advised colleagues that infants who have a critical nutritional need for allergen re-introduction should be prioritised in a hospital setting when it would be unsafe to do so at home.

In April, the European Academy of Allergy and Clinical Immunology (EAACI) also published a statement on 'Managing childhood allergies and immunodeficiencies during respiratory virus epidemics'[1]. They noted that, in children, allergy and asthma are among the most prevalent non-communicable diseases and recognised that healthcare providers require clear guidance to help with current situation. They agreed with the view that children, so far, have had less severe symptoms and that food allergy has not been identified as an additional risk factor or as increasing the risk of contracting severe disease. Although there are a range of different published figures, it is believed that that children make up 1-6% of those diagnosed with COVID-19, with <1% under 10 years[3,4]. The EAACI position paper made six recommendations, three of which were directly relevant to food allergy[1]:

Recommendation 1: Paediatric allergists should seek to obtain the best control of allergic symptoms; they should provide advice and instruct patients on current recommendations for hygiene and social distancing to reduce the risk of infection with COVID-19. They should recognise anxiety levels will be high and therefore guidance and support are necessary for patients and care givers.

Recommendation 4: There has been no scientific evidence that allergy treatments either increase susceptibility to SARS-CoV-2 or the severity of COVID-19 disease. Patients should be treated according to usual allergy guidelines and without reducing the use of any specific medicine (with the exception of biologics).

Recommendation 5: As the numbers of COVID-19 cases increase, so will the numbers of allergic children with the disease and consequently new information will emerge. Although paediatric patients are not currently understood to be at high risk, recommendations may need to change over time as a result of new evidence and allergists will need to be flexible and adjust practice accordingly.

Lucy Upton, Specialist Paediatric Dietitian, from Birmingham Children's Hospital shares her experience of their allergy service so far and her top ten tips for successful remote management.

Over the past three months, the delivery of paediatric allergy services has been forced to transform as the healthcare landscape around us has changed dramatically. As a health service, this has presented an inimitable opportunity to evolve and innovate, with a necessary move to 'digital first' services and telemedicine becoming the primary consultation method for many practitioners, including Dietitians.

Whilst this way of working has been accelerated due to necessity to ensure ongoing access to services, provision of care and waiting list management, this model of care presents the dietetic profession with an equal measure of opportunities and challenges, with some unique to different dietetic specialities.

Within paediatric allergy services, often already stretched to capacity, remote working has presented us with specific barriers to care provision. Essential elements of assessment or management cannot be easily replicated remotely, such as allergy testing (skin prick tests or specific-IgEs), hospital-led food challenges, adrenaline autoinjector (AAI) training and multi-disciplinary team (MDT) clinics. This has understandably led to increased parental anxiety and concern regarding their child's longer-term allergy management or delays to treatment. Specific challenges to navigate with families have emerged including:

- reduced food availability, e.g. milk alternatives
- concerns about delaying the introduction of common allergens during complementary feeding
- reservations about completing home re-introduction ladders due to fear of hospital admission.
- more limited access to professionals or testing to support decision making about food re-inclusion and allergy management.

Despite these issues, for many families having initial or ongoing contact with a Paediatric Dietitian has been reported as hugely beneficial in addressing their questions, concerns, reservations and anxieties during a challenging time. As one mother recently said to me; "whilst so many other aspects of life have changed or ground to a halt, as a parent I don't get a day off from food allergies, feeding my child and keeping them safe - it's been great not to have to do it all alone".

Alongside healthcare providers, allergy charities have also been at the forefront of support for patients and their caregivers. They have uploaded and created useful information on their websites, as well as supporting individuals through their helpline services. This has been a particularly challenging time for charities; when demand for their support is extremely high whilst their income streams have been negatively impacted due to the cancellation of fund-raising activities. See allergyuk.org and anaphylaxis.org.uk.

From a company perspective, our primary initial and ongoing concern is to focus on ensuring the secure supply of our medical nutrition products to all who need them. Also, looking at ways to best support healthcare professionals to be able to support their patients without compromise. Companies have also looked to adapt the delivery of relevant education to support healthcare professionals in new ways. As we move forward through this pandemic, the future is still not at all clear and healthcare professionals delivering allergy services will certainly face further challenges. Organisations, such as the BSACI, have begun to provide support and advice on stepping allergy services back up.

We will continue to work hard to learn how best to support our health care professionals and we look forward to hearing from you with any ideas.

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TOP 10 TIPS
FOR REMOTE WORKING AND TELEHEALTH CONSULTATIONS

Lucy Upton

1 Don't forget your 'webside' manner

Achieving a positive telephone or video consultation requires considerations to ensure patients, parents and professionals get the most out of the consultation. Don't forget to:

- Find a quiet and suitable location – not only to avoid disturbances, but to ensure you are considerate of confidentiality requirements. Use a neutral background for video calls wherever possible, being mindful to keep any personal information (including family photos or personal items) out of the frame. Ask families to consider the same too.
- Carefully consider confidentiality and security of any information or photos sent electronically to you by parents. Encourage parents to share only necessary and appropriate photos with consideration of keeping the child anonymous and covered appropriately – ensuring anything opened on your computer is not stored unnecessarily. All information from parents that does need saving should be saved and stored securely.
- Check communication is clear, e.g. if family can hear and/or see you.
- Don't dismiss the need for your normal niceties - remember families are not used to this consultation method either!
- It can be harder to respond to parental cues – look (if able) for body language changes and listen for changes in tone of voice, pace or engagement to support communication.

2 Keep the child involved

Showing an interest in the child - asking to speak to them, see them and directing questions to them not only supports rapport building but also ensures the child has a chance to share their views, thoughts and concerns. It can also be really helpful to see the child to support the assessment of growth and relevant atopic manifestations, such as eczema severity.

3 Consider individual needs ahead of time

It's important to consider that not all families will have access to the resources required to achieve the optimum outcome from remote consultations. Consider access to telephone lines, internet, interpreters, literacy, learning needs and even parents' time prior to appointments where possible.

4 Be prepared

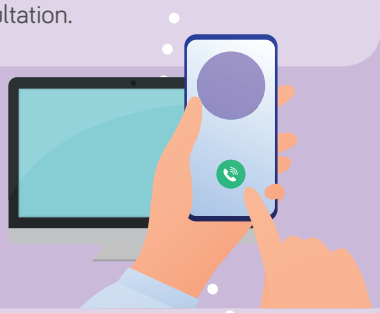
Try to have prepared: referral letters, a copy of growth charts, previous letter/notes and recommendations and resources you're likely to need. If input from a paediatrician, nurse or dermatologist is required, arrange this ahead of time where possible. Consider how and where your notes are documented, saved and shared, particularly if you don't yet have an electronic system!

5 Use the opportunity to have eyes at home and in cupboards

All so often parents describe foods, meals or allergy alternatives they are utilising but cannot recall brands, product specifics or the detail about certain foods. I've found many parents are very willing to share their cupboard contents and seek advice and clarity by sharing products they are using over the screen at home. The same applies to multivitamin and mineral preparations, emollients, medications and even mealtimes too!

6 Consider the opportunity for education for all family members involved in food procurement, provision and preparation

Due to the current climate, many families have changed their patterns around who is buying, preparing and providing meals – all of which have implications for allergy management. In addition, there may be other parents or family members available who often cannot attend clinic. Make use of this time (and technology) to support first-hand education and advice giving for multiple family members – this can even be across households via video consultation.



7 Screen sharing for education

Having the opportunity to share your computer screen within certain video-based telehealth platforms can be invaluable to support remote consultations. In the absence of our beloved paper resources, screen sharing reference materials, such as food reintroduction ladders, advice leaflets, websites and online applications (e.g. Food Maestro) can be essential to support advice giving.

8 Always leave (extra?) time for questions

This goes without saying, however, experience over the past three months has identified that parents are often asking more questions or seeking reassurances about aspects of allergy management – some of which may need signposting or action. Consider leaving a little longer than normal for questions!

9 Provision of follow-up and resources

At the end of a remote consultation it can be important to address how and when you anticipate the next appointment will be provided, and ensure families are aware of how to get hold of you in the meantime – particularly if you're working at home. Shared email addresses or voicemail for specific dietetic or allergy teams can be helpful. Emailing parents resources or advice sheets is often well received (if able), ensuring consent for use of email addresses and confidentiality considerations.

10 Group working and meetings

Video conferencing for multiple professionals and/or parents is a fabulous way of maintaining key elements of allergy care provision, including milk allergy groups, MDT clinics, training or weekly professional Allergy MDTs.

RESOURCE HUB

So many organisations and companies have produced valuable resources to support healthcare professionals throughout the pandemic, here are a few that we have found:

BDA – some great best practice sharing to support remote working etc: https://www.bda.uk.com/resource/covid-19-best-practice-sharing-to-support-paediatric-dietitians.html

CDC – general COVID-19 info with some specific areas for breastfeeding mothers: https://www.nih.gov/coronavirus

EMBA – position statement on milk donation: https://europeanmilkbanking.com/covid-19-emba-position-statement/

EFSA – no evidence that COVID-19 is transmitted via foods: https://www.efsa.europa.eu/en/news/coronavirus-no-evidence-food-source-or-transmission-route

MYNUTRIWEB – offer a range of free webinars for healthcare professionals, including an excellent immunity series looking at nutrition and the immune system: https://mynutriweb.com/free-webinars/

NIH – general info on COVID-19: https://www.nih.gov/coronavirus

RSM – learning hub for healthcare professionals, including an excellent webinar series: https://www.rsm.ac.uk/resources/covid-19-learning-hub/

WHO – a wide range of info from symptoms to evidence, and a worldwide dashboard of cases: https://www.who.int/health-topics/coronavirus#tab=tab_1

Here are a range of particularly relevant pre-recorded webinars and interviews that we've found or hosted:

- **Applying a behavioural approach to a virtual world** - expert dietitians from Sunlight Nutrition provide some helpful hints and tips to support Dietitians apply their behaviour change skills: https://www.youtube.com/watch?v=ZzPyqHrfAj8&feature=youtu.be
- **Nutrition, immunity and COVID-19** - webinar from the Nutrition Society with Prof. Philip Calder: https://www.nutritionsociety.org/events/nutrition-immunity-and-covid-19 (free registration from an NHS email account)
- **COVID-19 - why the interest in vitamin D?** - webinar from the Nutrition Society: https://www.nutritionsociety.org/events/covid-19-why-interest-vitamin-d (free registration from an NHS account)
- **How can we offer nutrition support to clients at home during self-isolation?** - MyNutriWeb interview with dietitian Sue Baic: https://mynutriweb.com/how-can-we-offer-nutrition-support-to-clients-at-home-during-self-isolation/

NUTRICIA RESOURCES

- **Nutritional management of patients with COVID-19: what dietitians need to know** - hosted by Dietitian Connection with support from Nutricia: https://dietitianconnection.com/product/nutritional-management-covid-19/
- **Nutritional management of paediatric COVID-19 on intensive care: experiences from Great Ormond Street Hospital, London with Dr Graeme O'Connor.** Hosted by Nutricia: https://nutricia.wavecast.io/nutritional-management-for-paediatric-covid-19-on-intensive-care/live (sign up required)

We have also gathered a range of information for parents and healthcare professionals to support you at this time: https://www.nutricia.com/covid-19.html

Diary Dates

UPCOMING CONFERENCES & EVENTS
(please note these are subject to change)

7th International Conference on Nutrition and Growth
27-29 August
Virtual event

43rd European Cystic Fibrosis Conference
24-25 September
Virtual event

BSACI Annual Conference 2020
1-2 October
Harrogate – socially distanced physical conference

EAPS 8th Congress
16-20 October
Virtual event

Nutricia Paediatric Expert Meeting
November
Virtual event

MOVED TO 2021:

Nutricia Paediatric Food Allergy Symposium
3 March 2021
Birmingham

7th Global Symposium on Medical Ketogenic Dietary Therapies
19-23 October 2021
Brighton

BAPEN Annual Conference
30 November-1 December 2021
Brighton

The life of the paediatric dietitian in lockdown and where do we go from here?

Lisa Cooke Head of Paediatric Nutrition, Dietetics and SALT, AHP Lead for Women's and Children's, Bristol Royal Hospital for Children

CAPTAINS LOG (PAEDIATRIC DIETITIAN) - STARDATE 11/03/2020

I travelled to Birmingham for the BDA education and workforce study day. At this stage, the coronavirus was just starting to appear in the UK and I wondered if coming to Birmingham on the train was such a good idea. I arrived at the venue and realised that quite a few people had taken the decision not to travel to the meeting. In-between what was an extremely positive and forward-thinking study day, there was lots of talk around what was happening, what would happen and how life might be somewhat different to the way we were living at the time.

The irony, on reflection, was the event was extremely positive regarding the opportunities for Dietetics in the emerging direction of the NHS, using allied health professionals to extend scope of practice and develop advanced clinical practice roles.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 16/03/2020

Today was a sombre and confusing day going through the divisional risk register with our patient safety lead and raising questions as to how we should meet and work as a department.

In the afternoon I attended my regular clinic and saw some of my chronic patients and wondered if I should really have been there seeing them.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 17/03/2020

I felt it was really important to meet with my team and discuss what was feeling extremely uncomfortable for me as a paediatric dietetic manager. I called a team meeting and talked quite candidly about how I was feeling; that I felt that I was putting my team, our professional capacity and patients at risk by working in the way we routinely do. We discussed what was going on in China and Italy and the pattern the virus was following. As a team, we decided that we would split the department so that half were working from home and half working in the hospital. We decided that a two-week rotational basis seemed to be the most pragmatic approach given the 14-day incubation period suggested by the science.

We were fortunate that we had plenty of IT equipment to enable us to work from home. We introduced paperless systems two years previously, when the hospital was going paper light. So, now all our notes were available electronically and, so long as we had the IT kit, we could work from home.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 20/03/2020

The government announced the new slogan, "Stay home, protect the NHS, save lives". We had decided that we needed to do this the week before so we felt really supported with our decisions. Another concern, as a manager, was whether we would have enough specialised paediatric dietitians available to manage the workload and that, if we didn't self-isolate and protect the staff, it would possibly mean that the whole of the team would be off work self-isolating or ill with the virus. It was a troubling and highly pressurised period.

We decided to change all our clinics over to telephone clinics. This was a mammoth task in itself, with the volume of clinics that we normally run, specialist and general. We had the help of the clinical co-ordinating team and one of our admin team who was shielding but still working from home. I ran my first telephone clinic for patients; they were absolutely overwhelmed with appreciation that we were still going to be in touch with them and support them through their illnesses.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 27/03/2020

I met with all the team leads, which we jokingly called our "Cobra" meeting. We were working in unknown territory, looking at strategy, planning, and second guessing what might happen but, at the same time, our priority was always to make sure our patients got the care that they needed. Many questions were raised regarding university placements and running and attending masters' modules. Everything was cancelled, all non-essential meetings and, suddenly, a very busy diary had emptied out with blank pages. How were we going to fill the time? In reality, there has never been a problem filling the time. What has overtaken the face-to-face meetings has been: Webex, Zoom, Whatsapp and general telephone calls. Paediatric managers have come together virtually, sharing good practice, difficulties and ways forward.

Upskilling

We all thought at the start that we would need to help the adult team's out; that they would be inundated with COVID-19 patients and that we would need to be able to support them by upskilling with some of the excellent webinars that have taken place. As the weeks have gone on, we realise that we have been cocooned in the South West and, fortunately, numbers of COVID-19 positive and critical patients have been extremely low. We have seen little effect of the virus on our paediatric population, similar to Italy's experiences. Unfortunately, what we have seen is the wider impact of the virus: the lack of patients coming to the paediatric Emergency Department (ED), the inability to run elective surgery. PICU, NICU and cardiology have continued to run with the same volume of patients coming through the door but general medicine has been extremely quiet.

Home tube feeding challenge

The contract company that we were using had no PPE initially. Frightened to go into families' homes, it was going to be difficult to support them. Strategic planning around how we could manage this was set in place and our community nursing team stepped up to offer input. A new SOP was drawn up and new guidelines were agreed with the involvement of ED. Out of hours care was redesigned and off we went, everything sorted, within a few days! Usually this would have taken months.

Dietetic assessments - when not seeing a patient

A lot of questions were raised on how to manage patients in the absence of anthropometry and face-to-face contact. The BDA Paediatric Group Committee came together and agreed to produce a go-to page for frequently asked questions and resolutions. This was pulled together and uploaded to the website extremely early on during the pandemic outbreak. The guidance includes best practice on gathering anthropometry measurements from caregivers, templates for nutrition assessments and food diaries, advice on calculating requirements remotely and a guideline and video on how to manage remote consultations safely and effectively. What an unbelievable profession we have! It never ceases to amaze me how people just get on and do it and provide the rest of our profession with lots of positive support and guidance.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 10/04/2020

Easter weekend. Did people want annual leave? Did people want to be away from work? There were certainly mixed emotions in the team. Those who lived alone were frightened to be at home on their own, self-isolating, not being able to go out. Other people were exhausted, realising the benefit of resting and taking stock, the need to just be at home with their families. As the days have gone on, this has become much easier for people and they realise the value of having some down time.

Easter passed....

We had phone calls from general paediatricians asking how we were coping with telephone clinics? They were struggling because they felt that they needed to do physical assessments. We reminded them that 80% of any good consultation is good history taking. We shared our dietetic consult resources and explained that we were keeping a running list of patients who we felt were at risk (safeguarding and blood monitoring) if we didn't give a physical assessment or a face-to-face appointment to. The specialist areas like metabolics were managing this because blood results are so important to their adjustments of dietetic care and they were working closely within their multidisciplinary team.

Remote consultations presented other challenges not initially anticipated, such as when requiring an interpreter. It was taking up to 15 mins to get hold of one at the start of each appointment, but systems were put in place and this is now working well. We have also learnt that you need to be very clear regarding the consultation time, what is going to be covered and give a 5 minute warning for the end of the session - otherwise they take about 1/3 longer.

THE AFTERNOON OF 27/04/2020

I took a call regarding our student placements. The students were booked to teach in our local school in June and July. We discussed how we could perhaps still make this work. The students were keen to actually do something during the pandemic and we are taking this forward as a trial. The results will be rich with information to support what is probably going to be a new way of working moving forward.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 28/04/2020

I met with the ketogenic team as waiting lists were growing. How are we going to manage to start new patients on the ketogenic diet when they live in our huge geographical area of the South West and South Wales? We discussed priorities, such as blood testing, and agreed with the Outpatient department that the phlebotomists would run a clinic and the patients would come up through our non-COVID-19 area, being asked the same questions that were being asked at ED to prevent the transmission of COVID-19.

We have found that video clinics have been really useful in metabolics and ketogenics, so you can see into the home and get families to retrieve foods. Some have shown how they prep and cook things. People appear generally more relaxed in their own home. Some teenagers have actually been happier to chat on video and seem more honest. We are also setting up support group webinars for new patients on ketogenic diets to save travelling, providing an opportunity to be in a forum with others.

PAEDIATRIC DIETITIAN'S LOG - STARDATE 04/05/2020

I met with our research colleagues. After discussion, it was felt we could make some adjustments to the way that we manage things and potentially we could consider restarting our clinical trials supported by the new electronic systems. We hope to get this going again in the near future.

Moving Forward
Questions we have asked:

- What has changed to date?
- What have been positive changes?
- How can we make it work and keep our team and our patient's safe but keep business moving forward?
- When things settle further, how are we going to manage?
- How can we utilise our time efficiently and effectively?

As horrendous as the virus is, some positives have come out of it: a quick turnaround for us to put IT systems in place, and to get virtual and telephone clinics up and running, which we have wanted to do for a long time. We are now doing most of our out-patients by telephone clinics and just starting some face-to-face clinics, while some areas are using virtual clinics. We are triaging and ringing people up to see if they want an appointment when it is necessary. This is really helping in deciding when phlebotomy, anthropometry, a face-to-face appointment, or attendance for other diagnostic purposes is essential. This has really reduced the amount of face-to-face time potentially needed.

There have been benefits for patients too. They appreciate not having to travel and wait around in the hospital, and they can show or check things that they can't always remember or access in a clinic setting, i.e. food/product name. They have also been extremely grateful that their appointment has gone ahead and our DNA rates have dropped significantly.

We travel from the hospital outreaching far and wide within our large geographical area. This has always been time consuming, costly and impacts the environment. The new way of working will reduce our need for this. We are now looking into setting up webinar support; running group sessions from afar supported by dietetic support workers who can then triage appropriately and accordingly.

In summary, the challenges the past few months have raised have allowed a substantial move forward in our practice into the 21st century. The future offers great opportunities to share good practice and change the way we work positively. Although we have a long way to go, we must look back and reflect on the speed and direction we have travelled; 'to boldly go where no paediatric dietitian has gone before!'

REFERENCE: 1. The Firm -'Star Trekkin'

CPD Answers

PAGE 10

1 What are common presenting features in critically ill children with COVID-19 and COVID-19 PIMS-TS?

A The main feature reported is shock, along with fever and abdominal symptoms, including pain, vomiting and diarrhoea, which may be as a result of a faeco-oral route of transmission.

2 What are the estimated energy requirements of critically ill children with COVID-19 and COVID-19 PIMS-TS during the acute phase?

A Energy requirements should not exceed resting energy expenditure (calculated using Schofield equation) during the acute phase (e.g. escalating organ support).

3 What procedures are considered aerosol generating and how should health care professionals protect themselves?

A Placement of NJT/NGT in awake children, as well as being aware gastric content in the form of gastric aspirates may contain SARS-CoV-2 virus. Appropriate PPE should be worn during such procedures.

4 What may be important nutrition considerations for survivors post discharge from paediatric intensive care?

A During recovery, higher energy and protein intake may be required up to twice the resting energy expenditure, depending on age, until nutritional deficits are replete.

PAGE 14

1 Why is a higher protein intake recommended in patients with sepsis?

A To mitigate muscle loss in response to stress hormones.

2 Why is the use of Harris-Benedict equation or Estimated Average Requirements (EAR) not recommended to calculate energy requirements in ventilated children?

A These will over-estimate requirements and contribute to over-feeding, which can exacerbate hyperglycaemia and increase CO_2 production.

3 What's the body's preferred energy source during sepsis?

A The body switches from glucose to fat metabolism to yield higher endogenous energy during catabolism.

Up$_2$ Date ...

Epidemiology of COVID-19 in children

Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults

Ludvigsson JF *Acta Paediatr* 2020;**109**(6):1088-95.

Aim: The coronavirus disease 2019 (COVID-19) pandemic has affected hundreds of thousands of people. Data on symptoms and prognosis in children are rare.

Methods: A systematic literature review was carried out to identify papers on COVID-19, which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), using the MEDLINE and Embase databases between January 1 and March 18, 2020.

Results: The search identified 45 relevant scientific papers and letters. The review showed that children have so far accounted for 1%-5% of diagnosed COVID-19 cases, they often have milder disease than adults and deaths have been extremely rare. Diagnostic findings have been similar to adults, with fever and respiratory symptoms being prevalent, but fewer children seem to have developed severe pneumonia. Elevated inflammatory markers were less common in children, and lymphocytopenia seemed rare. Newborn infants have developed symptomatic COVID-19, but evidence of vertical intrauterine transmission was scarce. Suggested treatment included providing oxygen, inhalations, nutritional support and maintaining fluids and electrolyte balances.

Conclusions: The coronavirus disease 2019 has occurred in children, but they seemed to have a milder disease course and better prognosis than adults. Deaths were extremely rare.

COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study

Götzinger F et al. *Lancet Child Adolesc Health* 2020;25 June. doi: 10.1016/S2352-4642(20)30177-2.

This is a very interesting article which summarises the data on children and adolescents with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections across Europe utilising a well-established collaborative paediatric tuberculosis research network. The researchers included all individuals aged 18 years or younger with confirmed SARS-CoV-2 infection between April 1 and April 24, 2020. They looked at risk factors for admission into intensive care units (ICUs) and the initiation of drug treatments.

Patients were all from hospital admissions and, thus, represented the more severe end of the disease spectrum. Data from 582 patients were analysed with a median age of five years and a female to male ratio of 1:15. 25% of patients had pre-existing medical conditions, in line with other data. The study observed that children were less likely to be severely affected than adults; although fever and cough remained the predominant symptoms, nearly a quarter of patients had gastrointestinal symptoms (some without respiratory symptoms) and a large number were asymptomatic. Younger age (<one month), male sex, pre-existing medical conditions and presence of lower respiratory tract infection signs or symptoms at presentation were all found to be significant risk factors for ICU admission. The disease was fatal in less than 1% of patients and only 4% were still symptomatic or requiring respiratory support by the end of the study period. A range of drug treatments were used, with the most frequent anti-viral drugs being hydroxychloroquine (7% of patients), followed by remdesivir (3%). Some patients received immunomodulatory drugs, most commonly corticosteroids (4% of patients).

The study concluded that COVID-19 is usually mild in children. Although a small number do develop severe disease, it is rarely fatal. There are many uncertainties in the best drug treatment to use and more data are urgently required.

Coronavirus disease (COVID-19) and the gastrointestinal system in children

Matthai J et al. *Indian Pediatr* 2020;**57**(6):533-5.

Whilst the respiratory system is the main organ involved in COVID-19, gastrointestinal manifestations in children, including nausea, vomiting, diarrhoea and abdominal pain, have also been reported and a possible faecal-oral route of transmission. Similar to the lungs, the virus attaches to angiotensin converting enzyme-2 (ACE2) receptors in the intestine and the co-expression of transmembrane serine protease 2 is critical for the virus to enter the cell. Less than 10% of infected children experience diarrhoea and vomiting. Elevated transaminases are common in severe cases.

This article outlines the current evidence on this topic and concludes that children with inflammatory bowel disease, chronic liver disease and post liver transplant do not appear at increased risk.

Nutrition and COVID-19

Optimal nutritional status for a well-functioning immune system is an important factor to protect against viral infections

Calder PC et al. *Nutrients* 2020;**12**(4):1181.

Public health practices including handwashing and vaccinations help reduce the spread and impact of infections. Nevertheless, the global burden of infection is high, and additional measures are necessary. Acute respiratory tract infections, for example, were responsible for approximately 2.38 million deaths worldwide in 2016. The role nutrition plays in supporting the immune system is well-established. A wealth of mechanistic and clinical data show that vitamins, including vitamins A, B_6, B_{12}, C, D, E, and folate; trace elements, including zinc, iron, selenium, magnesium, and copper; and the omega-3 fatty acids eicosapentaenoic acid and docosahexaenoic acid play important and complementary roles in supporting the immune system. Inadequate intake and status of these nutrients are widespread, leading to a decrease in resistance to infections and as a consequence an increase in disease burden. Against this background the following conclusions are made: (1) supplementation with the above micronutrients and omega-3 fatty acids is a safe, effective, and low-cost strategy to help support optimal immune function; (2) supplementation above the Recommended Dietary Allowance (RDA), but within recommended upper safety limits, for specific nutrients such as vitamins C and D is warranted; and (3) public health officials are encouraged to include nutritional strategies in their recommendations to improve public health.

Evidence that vitamin D supplementation could reduce risk of influenza and COVID-19 infections and deaths

Grant WB et al. *Nutrients* 2020;**12**(4):988.

The world is in the grip of the COVID-19 pandemic. Public health measures that can reduce the risk of infection and death in addition to quarantines are desperately needed. This article reviews the roles of vitamin D in reducing the risk of respiratory tract infections, knowledge about the epidemiology of influenza and COVID-19, and how vitamin D supplementation might be a useful measure to reduce risk. Through several mechanisms, vitamin D can reduce risk of infections. Those mechanisms include inducing cathelicidins and defensins that can lower viral replication rates and reducing concentrations of pro-inflammatory cytokines that produce the inflammation that injures the lining of the lungs, leading to pneumonia, as well as increasing concentrations of anti-inflammatory cytokines. Several observational studies and clinical trials reported that vitamin D supplementation reduced the risk of influenza, whereas others did not. Evidence supporting the role of vitamin D in reducing risk of COVID-19 includes that the outbreak occurred in winter, a time when 25-hydroxyvitamin D (25(OH)D) concentrations are lowest; that the number of cases in the Southern Hemisphere near the end of summer are low; that vitamin D deficiency has been found to contribute to acute respiratory distress syndrome; and that case-fatality rates increase with age and with chronic disease comorbidity, both of which are associated with lower 25(OH)D concentration. To reduce the risk of infection, it is recommended that people at risk of influenza and/or COVID-19 consider taking 10,000 IU/d of vitamin D_3 for a few weeks to rapidly raise 25(OH)D concentrations, followed by 5000 IU/d. The goal should be to raise 25(OH)D concentrations above 40-60 ng/mL (100-150 nmol/L). For treatment of people who become infected with COVID-19, higher vitamin D_3 doses might be useful. Randomized controlled trials and large population studies should be conducted to evaluate these recommendations.

COVID-19 and maternal and child food and nutrition insecurity: a complex syndemic

Pérez-Escamilla R et al. *Matern Child Nutr* 2020;**16**(3):e13036

Globally, the COVID-19 pandemic has already led to major increases in unemployment and is expected to lead to unprecedented increases in poverty and food and nutrition insecurity, as well as poor health outcomes. Families where young children, youth, pregnant and lactating women live need to be protected against the ongoing protracted pandemic and the aftershocks that are very likely to follow for years to come. The future wellbeing of the vast majority of the world now depends on reconfiguring the current ineffective food, nutrition, health, and social protection systems to ensure food and nutrition security for all. Because food, nutrition, health, and socio-economic outcomes are intimately inter-linked, it is essential that we find out how to effectively address the need to reconfigure and to provide better intersectoral coordination among global and local food, health care, and social protection systems taking equity and sustainability principles into account. Implementation science research informed by complex adaptive systems frameworks will be needed to fill in the major knowledge gaps. Not doing so will not only put the development of individuals at further risk, but also negatively impact on the development potential of entire nations and ultimately our planet.

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CMA = cow's milk allergy, AAF = amino acid formula

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