

# **Nutrition in the Paediatric Liver Patient**

**Cape Town Metropole Paediatric  
Interest Group**

**Annotated Chronic Liver Failure:  
Summary**

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## **1. Aim of annotated guidelines for children with chronic liver disease**

The aim of these guidelines is to outline a summary of appropriate nutrition care practices based on current evidence with respect to the dietary management of children with liver disease. They should be used as a guide with respect to best nutrition practice, however some individual cases may deviate from the nutrition guidelines based on the medical diagnosis.

Nutrition management usually aims to maintain glucose homeostasis, manage fat malabsorption including steatorrhoea, promote appropriate aminogenesis and prevent malnutrition.

The contents of this guideline should be reviewed in two years from the date of publishing, with a view to incorporating the latest developments and research findings and field experiences. The full referenced document is available providing supportive evidence for the recommendations outlined in the text below.

## 2. Glossary

Term	Definition
% EHA	Percentage estimated height for age
% EWA	Percentage estimated weight for age
% EWH	Percentage estimated weight for height
AA	Arachidonic acid
ALP	Alkaline phosphatase
ALT	Alanine aminotransferase
AMA	Arm muscle area [requires MUAC & TSF to calculate]
AST	Aspartate aminotransferase
CHC	Community Health Centre
CHO	Carbohydrate
DHA	Docosahexanoic acid
DRV's	Dietary reference values [Appendix 1]
EBM	Expressed breastmilk
EFA	Essential fatty acids
ESLD	End stage liver disease
FBC	Full blood count
FBDG	Food based dietary guidelines
GGT	Gamma glutamyltransferase
GIT/ GI tract	Gastro-intestinal tract
Gomez Classification	<p><i>Acute malnutrition: Weight for age</i></p> <ul style="list-style-type: none"> <li>• Obese &gt;120%</li> <li>• Normal &gt; 90%</li> <li>• Mild malnutrition 76 – 90%</li> <li>• Moderate malnutrition 61 – 75%</li> <li>• Severe malnutrition &lt; 60%</li> </ul>
Growth faltering (NSP Definition):	<ul style="list-style-type: none"> <li>▪ Birth – &lt; 6 months growth curve flattens or drops over two consecutive <b>visits</b> on his/her RthC.</li> <li>▪ 6 – 12 months growth curve flattens or drops over two consecutive <b>months</b> on his/her RthC.</li> <li>▪ 1 - 5 years: when an infant or child's growth curve flattens or drops over two consecutive visits on his/her RTHC.</li> <li>▪ &gt;5 - &lt; 18 yrs: when a child's growth curve flattens or drops over two consecutive months on his/her weight-for-age growth chart.</li> </ul>
HA	Height age
HFA	Height for age
Hb	Haemoglobin
HE	Hepatic encephalopathy
IBM	Inborn error of metabolism
IMCI	Integrated management of childhood illness
IMCI: Not Growing Well	<p><i>Severe Malnutrition:</i></p> <ul style="list-style-type: none"> <li>▪ Very low weight &lt; 60% EWA.</li> <li>▪ Visible signs of severe wasting</li> <li>▪ Oedema on the feet</li> </ul> <p><i>Not Growing Well:</i></p> <ul style="list-style-type: none"> <li>▪ Low weight &lt; 3<sup>rd</sup> centile</li> <li>▪ Poor weight gain - gaining weight but curve flattening or</li> <li>▪ Mother reports weight loss.</li> </ul> <p><i>Growing Well:</i></p> <ul style="list-style-type: none"> <li>▪ Not low weight</li> <li>▪ Good weight gain.</li> </ul>
INR	International normalisation ratio
IV	Intravenous
K+	Potassium
LCPUFA	Long chain polyunsaturated fatty acids
MAC	Mid arm area circumference
MCT	Medium chain triglycerides
Mg++	Magnesium
MUAC	<p>Mid upper arm circumference [6 months – 5 years of age]</p> <ul style="list-style-type: none"> <li>▪ &gt; 15cm normal</li> <li>▪ &gt;11.5cm - &lt;14.5cm moderately malnourished</li> <li>▪ &lt;11.5 cm [&lt;-3SD] severely malnourished</li> </ul>
Na+	Sodium
NG	Nasogastric
NPE	Non-protein energy
NPE	Non-protein energy
NSP	Nutrition supplementation programme

NSP: Entry Criteria	<ul style="list-style-type: none"> <li>▪ Supplementation must be continued for only 6 months if entered onto the Nutrition Supplementation Programme. However, chronic cases may be motivated for by a dietitian to remain on the programme.</li> <li>▪ <i>Infants: 0 – 12months</i> growth curve flattens or drops over two consecutive visits on his/her RTHC and the mother is <b>unable to breastfeed</b> because of the following reasons: <ul style="list-style-type: none"> <li>- Serious systemic disease, on long-term medication or treatment e.g. chemotherapy, hypothyroidism; is addicted to alcohol or drugs (condition must be formally documented/assessed); is mentally disabled and poses a threat to the baby; the infant is in foster care.</li> </ul> </li> <li>▪ <i>Children &gt; 5 years ≤ 18 years:</i> When child's growth curve flattens or drops over two consecutive months.</li> </ul>
NSP: Exit Criteria	<p>a) <i>Successful:</i></p> <ul style="list-style-type: none"> <li>• <i>Birth – 12 months</i> an adequate weight gain to attain a growth curve in relation to his/her birth weight and maintains the curve for <b>three</b> consecutive months on the scheme.</li> <li>• <i>1 - 5 years:</i> gained sufficient weight to attain a growth curve in relation to his/her normal growth curve and maintains the curve for three consecutive months.</li> <li>• <i>&gt;5 &lt; 18 years:</i> gained sufficient weight to attain normal growth curve according to the growth chart within the 6 months period on the scheme</li> </ul> <p>b) <i>Unsuccessful:</i></p> <ul style="list-style-type: none"> <li>• <i>Birth – 5 years:</i> Failure to attain growth curve in relation to his/her normal growth curve over a period of 6 months and if no underlying disease/condition is present e.g. Foetal Alcohol Syndrome</li> <li>• <i>&gt;5 - &lt; 18 years:</i> who do not attain a normal growth curve according to the growth chart with in the 6 months period.</li> </ul> <p>c) <i>Defaulter:</i></p> <ul style="list-style-type: none"> <li>▪ <i>Birth – 5 years:</i> Failure to attend the clinic for a period of three consecutive months.</li> <li>• <i>&gt; 5 - &lt;18 years:</i> Failure to attend the clinic for a period of three consecutive months within the 6 months period.</li> <li>• Client has a history of irregular clinic attendance (less than three visits in a 6 month period) with in the 6 months period.</li> </ul> <p>** <i>Re-entry:</i></p> <ul style="list-style-type: none"> <li>• <i>UNSUCCESSFUL</i> and <i>DEFAULT</i> cases <i>MAY NOT</i> be re-entered onto the programme.</li> <li>• <i>SUCCESSFUL</i> cases <i>MAY</i> be re-entered onto the programme according to entry criteria.</li> </ul>
PEG	Percutaneous endoscopic gastrostomy
PO <sub>4</sub>	Phosphate
RDA	Recommended daily allowance
RDI	Recommended daily intake
Schofield Equation	Predicting estimated energy requirements [Appendix 1]
SD	Standard Deviations used to determine moderate to severe malnutrition: <ul style="list-style-type: none"> <li>• 0 - &lt;-1 Z scores Normally Nourished</li> <li>• &gt;-2 – -3 Z scores Moderately Malnourished</li> <li>• &gt;-3SD Severely Malnourished</li> </ul>
TSF	Tricep Skinfold Thickness
U&E	Urea, creatinine, sodium, potassium
WA	Weight age
Waterlow Criteria (WHO)	Used to determine malnutrition: <p><i>Acute malnutrition: Weight-for-height/ length</i></p> <ul style="list-style-type: none"> <li>• Normal WH &gt;90%,</li> <li>• Mild 81% - 90%,</li> <li>• Moderate 70% - 80%,</li> <li>• Severe &lt;70%.</li> </ul> <p><i>Chronic malnutrition: Height-for-age</i></p> <ul style="list-style-type: none"> <li>• Normal &gt;95%,</li> <li>• Mild 90 –95%,</li> </ul>

	<ul style="list-style-type: none"><li>• Mild – moderate 85% to 89%</li><li>• Severe &lt; 85%</li></ul>
WCC	White blood cell count
WH	Weight for height

### 3. Summary of recommendations for nutrition management of infants and children with chronic liver disease

3. Summary Nutrition Recommendations: Chronic Liver Failure	
Overview	
<ul style="list-style-type: none"> <li>Biliary atresia is the most common cause of chronic liver failure with destruction of intra- and extrahepatic ducts leading to cholestasis, fibrosis and cirrhosis.</li> <li>Aims of medical management are to prevent progression of liver failure, prevent malnutrition and control or prevent complications.</li> </ul>	
Recommendations	Comments
Anthropometry	
<p><b>Measure</b> At least monthly:</p> <ul style="list-style-type: none"> <li>Head Circumference [&lt; 3 years of age]</li> <li>SFTT</li> <li>MUAC</li> <li>MAC</li> <li>AMA</li> <li>Plot growth velocity biannually.</li> <li>Plot parental heights and determine mid height to be used as an index for target height. [See Anthro Guideline]</li> <li>Medically stage sexual maturation using Tanner system [when appropriate] [See Anthro Guideline]</li> </ul>	<p><b>Calculate</b> At least monthly:</p> <ul style="list-style-type: none"> <li>HA/HFA</li> <li>WA</li> <li>WH</li> <li>% EWA</li> <li>% EWH</li> <li>% EHA/HFA</li> </ul>
<p><b>Classifications of malnutrition: Requiring Nutrition intervention:</b></p> <ul style="list-style-type: none"> <li>Immediate nutrition support should be commenced in all patients classified as having moderate malnutrition.</li> <li>In those with mild malnutrition their status should be the following month, if there is no improvement with respect to weight or height/length, nutrition support should be commenced immediately.</li> </ul>	<p><b>All children who are classified as malnourished in hospital using height for age, weight for height or nutrition risk score.</b></p> <p><b>Height for age: Chronic malnutrition; stunting</b></p> <ul style="list-style-type: none"> <li>Mild 90 – 95%</li> <li>Moderate 85 – 90%</li> <li>Severe &lt;85%</li> </ul> <p><b>Weight for Height: Acute Malnutrition; wasting</b></p> <ul style="list-style-type: none"> <li>Normal 90 – 110%</li> <li>Mild 80 – 90%</li> <li>Moderate 70 – 80%</li> <li>Severe &lt; 70%</li> </ul> <p><b>Weight for age: acute malnutrition; wasting</b></p> <ul style="list-style-type: none"> <li>Obese &gt;120%</li> <li>Normal &gt; 90%</li> <li>Mild malnutrition 76 – 90%</li> <li>Moderate malnutrition 61 – 75%</li> <li>Severe malnutrition &lt; 60%</li> </ul> <p><b>Nutrition Risk Screening Tool score:</b></p> <ul style="list-style-type: none"> <li>1 – 3 no current nutrition risk</li> <li>4 – 5 some nutrition risk</li> <li>&gt; 6 malnourished</li> </ul> <p><b>All children should be reviewed monthly. If post hospital discharge malnutrition occurs e.g.</b></p> <ul style="list-style-type: none"> <li>When child's growth curve flattens or drops over one consecutive month.</li> <li>Nutrition risk score of &gt; 6.</li> <li>&lt; 5<sup>th</sup> or 3<sup>rd</sup> centile</li> <li>&lt; 80% EWH</li> <li>&lt;-2 and - 3 ZD</li> <li>Downward crossing of 2 or more centiles</li> </ul>

<b>Biochemistry</b>		
<p><i>Monitor the following</i></p> <ul style="list-style-type: none"> <li>• Urea, creatinine, sodium, potassium</li> <li>• Magnesium, calcium and phosphate</li> <li>• Ammonia</li> <li>• Glucose</li> <li>• Albumin, ALT, AST, GGT</li> <li>• Bilirubin [conjugated, unconjugated]</li> <li>• INR &amp; Fibrinogen</li> <li>• FBC: Hb, platelets, WCC</li> <li>• Triglycerides</li> </ul> <p><i>Others</i></p> <ul style="list-style-type: none"> <li>• Insulin Like Growth Factor –1 [IGF-1]</li> <li>• Pre albumin</li> <li>• C – reactive protein</li> </ul>	<ul style="list-style-type: none"> <li>• If Ammonia &gt; 100mmol/l restrict protein or reduced amount by 0.25g – 0.5g/kg.</li> <li>• Increase again as soon as possible according to ammonia levels.</li> <li>• If Mg, PO<sub>4</sub> or K low provide IV supplementation as per Refeeding syndrome guideline.</li> <li>• If INR &gt; 1.5 and TPN required consider delaying commencement until INR &lt; 1.5</li> <li>• If triglycerides are high post transplant provide fat free parenteral nutrition – otherwise lipid-containing bag should be given as indicated.</li> </ul>	
<b>Entry Criteria for nutrition support during hospitalisation based on biochemistry</b>		
<ul style="list-style-type: none"> <li>• <b>Growth faltering, bilirubin &gt; 70umol/l or overfeeding on normal formula</b></li> </ul>	<p><b>Formula</b></p> <ul style="list-style-type: none"> <li>• Change to MCT containing milk &lt; 1-year age and nutrition complete supplement &gt; 1 year of age.</li> </ul> <p><b>Breastmilk</b></p> <ul style="list-style-type: none"> <li>• Alternate feeds between bottle and breast.</li> <li>• If poor weight gain continues maximise nutrient density with MCT containing feed.</li> <li>• Breastfeeding may be used as comfort feeding in those with persistent growth failure requiring more kcal.</li> </ul>	<p><b>Formula</b></p> <ul style="list-style-type: none"> <li>• High MCT oil content 50 – 60%</li> </ul> <p><b>Breastfeeding</b></p> <ul style="list-style-type: none"> <li>• Top up feeds with MCT containing milk providing ½ requirements per day e.g. 75 – 90ml/kg.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Cholestatis resolves, bilirubin &lt; 30 umol/l</b></li> </ul>	<ul style="list-style-type: none"> <li>• If bilirubin is &lt;30umol/l and the child is thriving, MCT containing feeds may be changed to a normal feed.</li> <li>• If child is not thriving consider provide energy dense RTU feed in infants 1kcal/ml and 1.5kcal/ml in children.</li> </ul>	<ul style="list-style-type: none"> <li>• Nasogastric feeds may be required in children especially if there is poor weight gain or linear growth is poor.</li> </ul>
<b>Clinical</b>		
<b>Clinical Signs usually present during liver disease in children:</b>		
<ul style="list-style-type: none"> <li>• Clubbing</li> <li>• Jaundice</li> <li>• Oedema</li> <li>• Large abdomen</li> </ul>	<ul style="list-style-type: none"> <li>• Hepatomegaly</li> <li>• Splenomegaly</li> <li>• Ascites &lt; Muscle bulk</li> <li>• &lt; Skinfold thickness</li> </ul>	
<p><b>There are many causes of chronic liver failure most of which are likely to present early in life.</b></p> <p><b>Cirrhosis</b></p> <ul style="list-style-type: none"> <li>• Cirrhosis represents ESLD occurring as a result of repetitive sequence of cell injury and repair.</li> <li>• Leads to cyclical necrosis and fibrogenesis leading to irreversible damage in addition to primary disease process.</li> <li>• Cirrhosis may be asymptomatic but can decompensate when damage to the liver causes blood flow to be impaired resulting in symptoms such as:</li> <li>• Portal hypertension</li> <li>• Ascites</li> <li>• Varices</li> </ul>		

**Symptoms that require nutrition intervention include:**

**Jaundice**

- Results in dark urine and pale stools.
- Occurs when there is an increase total bilirubin of which more than 20% is conjugated (normal = 5%).
- This may be significant hepatobiliary disease and cholestatic liver disease.
- May result in reduced bile flow from the liver into the gut.
- Decreased fat emulsification and digestion; malabsorption of fat, fat-soluble vitamins and some minerals.
- Steathorrea, growth failure and rickets are common.

**Fat malabsorption**

- Fat should not be restricted but given to tolerance.
- Infants require significant amounts of fat in their diet 40%.
- Of this it is important to provide a percentage of the total fat as MCT's e.g. 40 - 50%.

**Hypoglycaemia**

- Infants may require overnight continuous feeds with up to 6g/ 100ml CHO.
- In children a diet high in complex CHO should be given.

**Failure to thrive**

- A diet high in energy and protein.

**Ascites & hepatomegaly**

- Reduced abdominal capacity for food/ feeds - give smaller, frequent, energy dense meals/ snacks.
- In volume restriction may require lower sodium feed e.g. 1.2 – 1.5mmol/l.
- However, the use of diuretics is favoured.

**Portal hypertension & malabsorption**

- Cirrhosis can obstruct blood flow leading to portal hypertension with assoc. enteropathy and malabsorption secondary to pressure in the mesenteric venous system.
- Semi elemental and continuous feeds may help – if not TPN may be required.

**Oesophageal varices**

- Occasionally in ESLD a huge bleed will require TPN, otherwise 24 - 48 hours post sclero therapy clear fluids may be allowed followed by soft diet.
- Chronic encephalopathy – protein restrictions can < nutr status.
- Degree of encephalopathy should be determine level of restriction.
- Energy ratio should be > to < endogenous breakdown (sodium benzoate may allow for higher protein tolerance & or use of BCAA).
- May require restriction of protein to 1 – 2 g/kg infants and children 0.8 – 1.5g/kg.

**Dietary**

**Potential problems requiring nutrition intervention occur when there is a disturbance of normal metabolic functions of the liver including:**

- Glucose homeostasis
- Protein synthesis
- Bile Salt production
- Lipid metabolism
- Vitamin absorption and storage

**Diet therapy includes management of:**

- Hypoglycaemia for poor glycogen storage
- Fat malabsorption as a result of poor bile production or flow
- Reduced in protein synthesis especially albumin exacerbating ascites.
- Vitamin deficiencies due to malabsorption of fat soluble vitamins

**At each follow up a thorough nutrition history should be captured.**

**Components of a nutrition history include**

**Diet history**

- Review through 24-hour dietary recall quarterly or at each follow up, use in conjunction with food frequency.
- Many patients may eat < 65% of RDI.

- Weight Change
- Appetite
- Satiety Level
- Taste Changes/ aversions
- Nausea/ vomiting
- Bowel habits – constipation, diarrhoea
- Chewing/ swallowing ability
- Pain when eating

- Long-term disease(s) affecting absorption/use of nutrients
- Surgical resection or disease of GI Tract
- Dietary history – 24 hour recall/ food frequency
- Use of vitamin/ mineral or nutritional supplements
- Medications
- Level of activity/ exercise
- Ability to secure and prepare food
- Over the counter medications, vitamins and herbal remedies.

<b>Fluids</b>		
<ul style="list-style-type: none"> <li>It is important to note that on presentation some children will be consuming up to 2 – 3 x normal fluid requirements e.g. 200 – 300ml/kg and may demand frequent breastfeeds, this may be a compensation mechanism for fat malabsorption.</li> <li>Once feeds containing a higher amount of MCT's are introduced this phenomenon should resolve.</li> <li>Avoid excessive sodium (&lt;2mmol/kg/day)</li> <li>Ascites treat with: spironolactone, furosemide</li> </ul>		
<b>Fluid Range</b>		
<b>Age (years)</b>	<b>ml/kg actual body weight</b>	
Premature	180-200	
0-1	150	
1-3	100	
3-6	90	
7-10	70	
10-15	60	
<b>Energy Requirements</b>		
<ul style="list-style-type: none"> <li>Provide sufficient energy for linear growth and development.</li> <li>Infants use breastmilk or infant formulas ranging from 0.67 - 0.74 – 1kcal/ml</li> <li>Children &gt; 1 year: Use age-appropriate feeds with standard or energy dense calorie concentrations, ranging from 1 – 1.5kcal/ml respectively</li> </ul> <p><i>Infants:</i></p> <ul style="list-style-type: none"> <li>120 – 150kcal/kg</li> </ul> <p><i>Children:</i></p> <ul style="list-style-type: none"> <li>Schofield equation x 1.7 – 1.9 or WHO/FAO/UNU [Appendix 1:Table 2, 3 and 4]</li> </ul> <p><b>Or</b></p> <ul style="list-style-type: none"> <li>1.2 – 1.5 x DRV [Appendix 1: Table 1]</li> </ul>		
<b>Dietary Recommendations</b>		
<b>Infants</b>	<b>Discussion</b>	<b>Recommendations</b>
<p><b>Stage 1:</b> Growth Faltering, bilirubin &gt; 70mmol/l or over feeding on normal formula.</p>	<p><b>Formula</b></p> <ul style="list-style-type: none"> <li>Change to MCT containing feed.</li> </ul>	<p><b>Formula</b></p> <p>High MCT 50 – 60% 150 – 200ml/kg/day</p>
<p><b>Stage 2:</b> If poor growth persists</p>	<ul style="list-style-type: none"> <li>For infants with persistent cholestasis energy supplementation with glucose polymer and MCT oil is required to achieve weight gain.</li> <li>Add glucose polymer in 1 – 2% daily increments as tolerated, in conjunction with MCT oil 1- 2% to achieve an energy density of 1kcal/ml.</li> <li>Do not exceed 50% of total energy from fat.</li> </ul>	<ul style="list-style-type: none"> <li>Assess total daily feed intake to monitor protein intake.</li> <li>Consider use of RTU energy and protein dense feed.</li> </ul>
<p><b>Stage 3:</b> Cholestasis resolves &lt; 30 mmol/l</p>	<ul style="list-style-type: none"> <li>If bilirubin &lt;30 mmol/l and the child is thriving, MCT feeds may be changed to normal feed.</li> <li>If infant is not thriving provide energy dense RTU feed [1kcal/ml]</li> </ul>	<ul style="list-style-type: none"> <li>Standard formula or breastfeeds.</li> <li>Energy dense RTU feed 1kcal/ml</li> </ul>
<p><b>Stage 4:</b> If cholestasis does not resolve</p>	<ul style="list-style-type: none"> <li>Continue with MCT formula, energy supplements and diet.</li> <li>Frequent monitoring, review of growth, feed intake and tolerance.</li> </ul>	<ul style="list-style-type: none"> <li>Nasogastric feeds may be required especially if weight gain or linear growth is poor.</li> </ul>
<b>Older Children</b>		
<ul style="list-style-type: none"> <li>Older children usually tolerate a normal fat diet well and should be encouraged to have fat to tolerance.</li> <li>Some children will self regulate to avoid fatty foods.</li> <li>Children who are failing to thrive need to be on high calories and protein, which may require the use of supplements.</li> <li>Use of 1.5kcal/ml feeds should be encouraged.</li> </ul>		

<b>Enteral Feeding</b>
<ul style="list-style-type: none"> <li>• Bilirubin &lt; 30mmol/l</li> <li>• If patient cholestatic or has ascites.</li> <li>• Volume of feed given depends on growth failure – add daytime boluses in addition to overnight feeds if growth failure persists.</li> <li>• Patients with poor growth on high calorie MCT feeds should be followed up weekly via telephone, with monthly reviews.</li> </ul> <p><b>Infants:</b></p> <ul style="list-style-type: none"> <li>• 1kcal/ml</li> </ul> <p><b>Children:</b></p> <ul style="list-style-type: none"> <li>• 1 - 1.5kcal/ml RTU feed with fibre.</li> </ul> <p><b>Overall:</b></p> <ul style="list-style-type: none"> <li>• Lower sodium feed.</li> <li>• 50 –75% of energy requirements with the remainder made up from normal oral food intake.</li> </ul>
<b>Nutrition Support</b>
<p><b>To increase nutrition content of food.</b></p> <ul style="list-style-type: none"> <li>• Overnight NG feeds – MCT containing formula in those patients awaiting transplant.</li> <li>• PEG's relatively contraindicated</li> </ul>
<b>Growth failure</b>
<p><b>CHO:</b></p> <ul style="list-style-type: none"> <li>• 26 – 28% may be required in ESLD to maintain glucose homeostasis.</li> </ul> <p><b>Fat:</b></p> <ul style="list-style-type: none"> <li>• Not all ESLD will be cholestatic and LCT may be used.</li> <li>• For cholestatic disease proportions of 50:50 or 70:30 ratio is usually required.</li> <li>• Where there is low intake of LCT &lt; 2 – 3% of total energy walnut oil will be required 2% energy in cholestasis and 1% energy in non cholestatic.</li> <li>• Sodium chloride: 1.5mmol/kg should be used where majority of nutrition is coming from feed and 1mmol/100ml when the feed is used to supplement food.</li> <li>• Potassium chloride: If the patient is on frusemide may have increased requirements for potassium.</li> </ul> <p><b>Aim to provide</b></p> <ul style="list-style-type: none"> <li>• Protein: 3 – 4 g/kg protein [unless protein restricted]</li> <li>• CHO: up to 18%</li> <li>• Fat: 0.5% fat increments (1% emulsion) up to 5 – 8 % fat per 100ml.</li> <li>• Sodium Chloride: 1mmol/100ml feed or 1.5mmol/kg unless otherwise indicated.</li> <li>• Potassium Chloride: 2mmols/100ml feed or 3mmols/kg unless otherwise indicated.</li> </ul>
<b>Energy Supplementation</b>
<p><b>Infants:</b></p> <ul style="list-style-type: none"> <li>▪ Breastfeeding should be supported where possible.</li> <li>▪ If supplementation is required a carbohydrate and fat [MCT/LCT] containing powder should be added to a small amount of expressed breastmilk [5 – 10ml] and given to the infant prior to a feed as prescribed by a dietitian.</li> <li>▪ If additional calories are required in formula feeding a carbohydrate and fat [MCT/LCT] containing powder should be dissolved in a small amount of sterile water.</li> </ul> <p><b>Ready to use/ hang feeds:</b></p> <ul style="list-style-type: none"> <li>▪ No powders or liquids e.g. oil should be added to a sterile ready to use feed.</li> <li>▪ If additional energy is required then boluses of super soluble carbohydrate and fat powder should be administered prior to a drink or feed.</li> <li>▪ Recommendations regarding concentrations for fat, carbohydrate and protein per age category should not be exceeded. [See sections below]</li> </ul>

## Carbohydrate Recommendations

### Glucose requirements:

#### Infants

- 8-9mg/kg/min [11.5g –12.9g/kg/day]
- Max 12.5mg/min/kg [18g/kg/day]

#### Toddlers

- 7mg/kg/min [10g/kg/day]

#### Adolescents

- 4mg/kg/min [5.7g/kg/day]

**NB:** Always increase glucose gradually and according to tolerance.

### CHO Concentrations

The following concentrations of CHO per 100ml will be tolerated if a glucose polymer is used.

- Infants under 6 months: 10-12% carbohydrate concentrations (i.e. 7g from formula, 3-5g added)
- Infants 6months to 1 year: 12-15%
- Toddlers 1-2 years: 15-20%
- Older children > 2 years: 20-30%

### Format of CHO

- CHO's in the form of glucose polymer should be used instead of disaccharides as they have a lower osmotic effect.
- It is recommended that glucose polymer be added in increments of 1g per kg per 100ml per day until the goal amount is reached in order to decrease the risk of diarrhoea.

## Protein Recommendations

- Protein may appear in feeds in the form of amino acids, peptides or whole proteins.
- Protein supplementation is rarely required and addition of a protein powder and is not recommended in infants or children > 1 year of age due to the dangers of providing too much protein and sodium.
- Feeds with added protein should usually be accompanied with an increase in energy e.g. energy-enriched products, otherwise protein will be used for gluconeogenesis.

#### Infants:

- 3 – 4g/kg/day

#### Children:

- up to 2kg/day

### Protein-energy ratio of a feed should be kept within a range of:

- 7.5% - 12% for infants [i.e. 7.5% - 12% of total energy requirements from protein]
- However, for most infants an intake of between 9 – 10% is a practical ratio to aim for.
- 5 – 15% in older children.
- At least 9% of energy from protein for “catch up growth”

## Fat Recommendations

NB: Fat should not be restricted and a portion of fat should be in the form of MCT

### Ensure DHA and AA supplementation

- Long chain fat emulsions in the form of olive/ canola oil are often favoured over MCT's as they have a lower osmotic effect and provide EFA's.
- Where additional EFA are required provide 2ml per 100kcal walnut oil.
- If fat malabsorption, aim for the upper limit of DHA:AA

### EFA supplements:

#### Infants:

- DHA and AA supplement in the form of a LCPUFA enriched infant formula with the following ratio's:
  - Linoleic acid 10.2 – 12.5%
  - Alpha linolenic acid 1.2 – 1.5%
  - Arachidonic acid 0.3 – 0.4%
  - Docosahexanoic acid 0.04%

#### Children > 1 year of age:

- 4.5 – 10.8% Linoleic acid by means of a nutritionally complete feed or supplement drink.
- Linoleic: alpha linolenic ratio - 5:15
- Children have a higher tolerance of LCT than infants

### Additional Fat Sources:

- In those children with fat malabsorption or awaiting transplant provide nutritionally complete drinks, which have MCT's as part of the lipid profile.
- MCT oil can also be supplemented – 0.3ml/ kg:
  - Give as a medicine; as a bolus prior to feeds or add to food once the food has been cooked (Do not use MCT oil to cook or fry with as it has a low temperature threshold).
  - Excessive amounts of MCT's may also be neuro toxic.
  - Avoid providing more than 40% of total fat as MCT.
  - It will not be tolerated at higher concentrations and may cause abdominal cramps and osmotic diarrhoea.
- Fat emulsions or those in the form of a super soluble powder with carbohydrates are preferred for increasing calories and should be added in small increments until goal amount is reached
- Adding fat to feeds should be done as a last resort. Try to rather add extra oil/ margarine to food.
- Excess fat supplementation can lead to nausea, vomiting and delayed gastric emptying. The following goal amounts should not be exceeded:
  - Infants: 1% or 0.5g fat per 100ml per day up to 5 –6% per day (5 – 6g fat per 100ml feed).
  - Children > 1 year: 7% total fat (7g fat per 100ml feed).

## Fat Soluble Vitamins

Only oral preparations of fat-soluble vitamins are currently available in RSA. Use an aqueous preparation where possible.

- Supplement vitamins A, D, E and K in all children with cholestatic disease.
- Aqueous forms available as ADEK®

### ADEK® Dosage:

- **Liquid**
  - 0 – 12 months: 1 ml per day
  - 1 – 3 years: 2 ml per day
- **Tablet**
  - 4 – 10 years: 1 tablet per day
  - > 10 years: 2 tablets per day

### Vitamin A (aqueous)

- Plasma retinol/ RBP: 5, 000 – 10, 000 – 50, 000 IU

### 25-OH vitamin D or Alphacalcidol

- Plasma 25 – OHD: 2 – 4 ug/kg/day **or** 50 ng/kg/day

### Vitamin E

- Plasma E/ total lipids: 25 IU kg/d **or** 50mg – 200mg/day
- As d-alpha tocopheryl polyethylene glycol-1000 succinate:
  - 2 – 10mg/d o

### Vitamin K

- Check prothrombin time and for coagulopathy.

## Introduction of Complimentary Foods

- Normal complimentary foods may be commenced at 4 – 6 months age.
- Dried baby cereal may be made with formula or breastmilk rather than water.
- No foods need be avoided.
- For infants with poor growth high energy weaning advice should be given.
- Parents should be encouraged to sustain oral intake no matter how little to develop oral feeding skills.

### Addition of:

- Sugar/ glucose polymer
- Margarine, olive or canola oil, butter or MCT oil to foods.

<b>End stage liver disease Recommendations</b>		
<ul style="list-style-type: none"> <li>• Patients may be fluid restricted to 60 – 80% of maintenance fluid</li> <li>• Reducing fluid impacts on calorie, protein, vitamin and mineral intake.</li> </ul>		
<b>Ascites</b>	<ul style="list-style-type: none"> <li>• Fluid and salt restriction</li> <li>• Energy dense, low sodium feeds</li> <li>• Ice lollies useful way of making fluid last longer.</li> </ul>	<ul style="list-style-type: none"> <li>• No added salt diet, 1 – 1.5mmol/kg Sodium.</li> <li>• Negotiate with team for more volume!</li> </ul>
<b>Steatorrhea</b>	<ul style="list-style-type: none"> <li>• MCT: LCT feed – additional MCT may be required.</li> <li>• Low fat diet is rarely required.</li> </ul>	<ul style="list-style-type: none"> <li>• Skimmed milk with CHO: MCT powder may be useful.</li> </ul>
<b>Encephalopathy</b>	<ul style="list-style-type: none"> <li>• Unless acutely encephalopathic – protein restriction rarely required.</li> <li>• Enteral feeds will probably be required.</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary restriction of 0.5 – 1g/kg.</li> </ul>
<b>Hypoglycaemia</b> <b>NB:</b> If child is NPO provide 10 – 20% dextrose, as 5% will not maintain blood glucose.	<ul style="list-style-type: none"> <li>• Glucose homeostasis may be difficult.</li> <li>• Measure pre feed bloods.</li> <li>• Offer high CHO drinks and snacks.</li> <li>• Continuous feeds overnight.</li> </ul>	<ul style="list-style-type: none"> <li>• Feed 3 – 4 hourly or more frequently 2 hourly.</li> <li>• Diet should be offered for as long as possible.</li> </ul>
<b>Liver Transplant Recommendations</b>		
<b>Anthro</b>	<ul style="list-style-type: none"> <li>• Nutrition review pre surgery</li> <li>• Commence NG feeds if required pre surgery.</li> </ul>	
<b>Waiting period</b>	<ul style="list-style-type: none"> <li>• Reviewed monthly in OPD.</li> <li>• Infants may require more frequent review especially if on NG feeds.</li> </ul>	
<b>Post Transplant</b>	<ul style="list-style-type: none"> <li>• Oral fluids usually started 72 hours post surgery via NGT.</li> <li>• If after 72 hours feeds cannot be commenced consider PN until 50% of total energy requirements can be met enterally.</li> <li>• Feeds usually semi-elemental, started whilst child is fluid restricted e.g. 80% maintenance.</li> <li>• Feeds increased as fluids are liberalised.</li> <li>• Re start age appropriate diet as soon as possible – favourite foods may be used to tempt children.</li> <li>• Some children have may have developed food aversions – speech therapist or psychologist intervention may be warranted.</li> <li>• Majority of post transplant patients experience some loose stools once oral diet is commenced but this settles within in a few days.</li> <li>• Ongoing diarrhoea/ vomiting merits investigation.</li> <li>• Patients are usually on high doses of steroids for 3 months post surgery, which helps to improve their appetite.</li> <li>• As steroids are stopped appetite may deteriorate and energy supplementation may be required.</li> <li>• Anthropometry is essential during this time as weight gain may be rapid and excessive.</li> <li>• Children in whom significant catch up growth is required may benefit from over night feeding until this has been achieved.</li> </ul>	<ul style="list-style-type: none"> <li>• Clear fluids ½ dd introduced, as bowel sounds present or flatus/ stool passed.</li> <li>• Previously NG fed – start semi elemental feed e.g. &lt; 1 year 0.67kcal/ml RTU, 1kcal/ml powder/RTU &gt; 1 year.</li> </ul>
<b>Follow up</b>		
<ul style="list-style-type: none"> <li>• Patients with poor growth on high calorie MCT feeds should be followed up weekly via telephone.</li> <li>• Monthly reviews</li> </ul>		

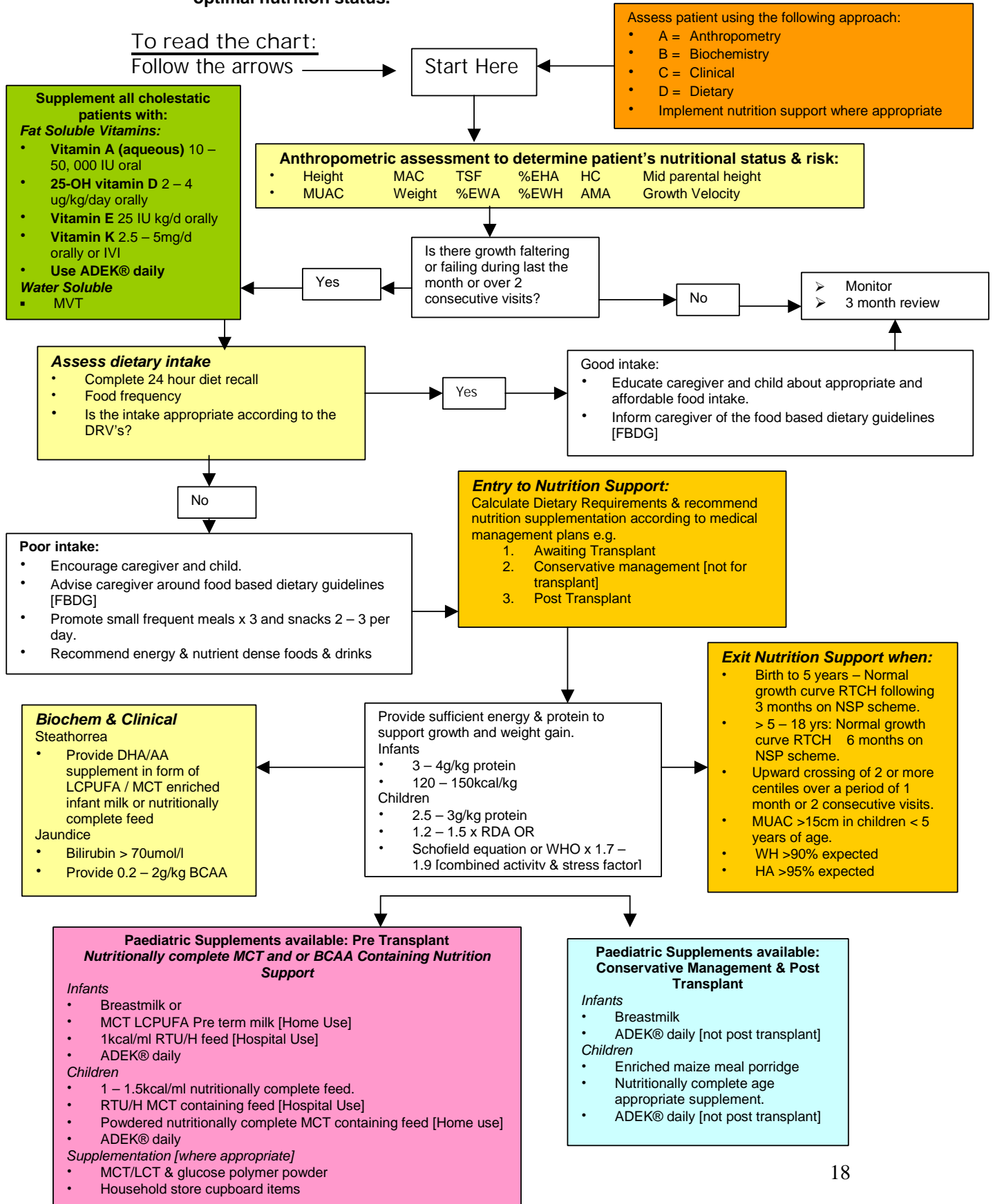
<b>Product Choices for patients with Chronic Liver Disease</b>
<p><b>Overall Recommendations</b></p> <ul style="list-style-type: none"> <li>• In infants a max of 1.2kcal/ml is recommended.</li> <li>• In children a max of 1.5kcal/ml is recommended.</li> </ul> <p><b>NB</b></p> <ul style="list-style-type: none"> <li>• Feeds enriched with modulars &gt; of 1.5kcal/ml in children and 1.2kcal/ml in infants may cause early satiety, nausea and vomiting.</li> <li>• Recommend utilising max 1kca/ml feeds in infants and 1.5kcal/ml children and liberalising volume of feed provided.</li> <li>• Encourage energy dense food providing advice to caregiver around enriching store cupboard options with an emphasis on favourite foods.</li> <li>• To enrich milk add 4 tablespoons (60g) full cream milk powder to 500ml ml milk/maas [605kcal &amp; 30.7g protein &gt; 1 year old.</li> </ul>
<b>Infants</b>
<p><b>Home use</b></p> <p><b>Feed of Choice: Breastmilk</b></p> <ul style="list-style-type: none"> <li>• If no weight gain top up with energy dense pre term formula MCT &amp; LCPUFA containing 0.74kcal/ml or alternate feeds e.g. breast then formula.</li> <li>• If still no weight gain enrich with duocal/ EBM flushes before each feed.</li> <li>• Provide 75 – 90ml/kg from formula feeds.</li> <li>• ADEK® daily</li> </ul> <p><b>Breast milk substitute: Pre Term infant feed</b></p> <ul style="list-style-type: none"> <li>• MCT &amp; LCPUFA containing 0.74kcal/ml</li> <li>• If no weight gain enrich with carbohydrate and MCT/LCT powder flushes</li> <li>• Ensure nutritional requirements are first being met from the feed e.g. 9 - 12% protein, 40% fat, 48 -51% CHO, before providing extra energy and that</li> <li>• All growth factors are within normal range e.g. sodium, potassium, haemoglobin etc.</li> <li>• ADEK® daily</li> </ul> <p><b>Hospital Use</b></p> <p><b>Ready to Hang/ Use 1kcal/ml infant formula</b></p> <ul style="list-style-type: none"> <li>• 1kcal/ml &amp; 2.6g protein per 100ml</li> <li>• Do not add energy supplements to sterile milk.</li> <li>• If additional energy is required provide as bolus flushes prior to feeds.</li> <li>• ADEK® daily</li> </ul>
<b>Children</b>
<p><b>Home Use</b></p> <ul style="list-style-type: none"> <li>• Nutritionally complete 1kcal/ml MCT containing powdered feed.</li> <li>• Try with 1kcal/ml first</li> <li>• Enrich up to max 1.5kcal/ml with carbohydrate and MCT/LCT powder.</li> <li>• ADEK® daily</li> </ul> <p><b>Hospital Use</b></p> <ul style="list-style-type: none"> <li>• 1.5kcal/ml Ready to use/ hang paediatric feed.</li> <li>• Do not add additional energy or protein supplement to feed.</li> <li>• ADEK® daily</li> </ul>
<b>Additional Specialised Products</b>
<p><b>Infants:</b></p> <ul style="list-style-type: none"> <li>• Caprilon [SHS]</li> </ul> <p><b>Children:</b></p> <ul style="list-style-type: none"> <li>• Generaid [SHS] BCCA Enriched</li> <li>• Poor palatability</li> </ul> <p><b>BCAA</b></p> <ul style="list-style-type: none"> <li>• A range of 0.2 – 2g/kg has been provided, however, efficacy appears to occur at 1g/kg.</li> <li>• Universal Nutrition BCAA powder 10g Powder contains:2.75g Glutamine, 2.5g Leucine, 1.25g Isoleucine, 1.25g valine.</li> <li>• Efficacy of supplementation not fully elucidated but some studies have shown some beneficial effect on Fisher ratio.</li> </ul>

<b>Entry Criteria for Nutrition Support in Hospital: Daily Dietetic Review</b>
<ul style="list-style-type: none"> <li>• Poor oral intake</li> <li>• Weight loss or growth failure during hospitalisation</li> <li>• Over feeding on normal formula</li> <li>• Growth failure classified as a downward crossing 2 or more centiles over a period of 1 month or 2 consecutive visits.</li> <li>• Nutrition risk score &gt; 6</li> </ul> <p><i>Moderate Malnutrition</i></p> <ul style="list-style-type: none"> <li>• MUAC &lt; 14.5 cm - &gt;11.5cm in children &lt; 5 years of age</li> </ul> <p><i>Severe Malnutrition</i></p> <ul style="list-style-type: none"> <li>• MUAC &lt; 11.5cm in children &lt; 5years of age.</li> </ul> <p>Acute Malnutrition: Weight for age</p> <ul style="list-style-type: none"> <li>• &lt;80%</li> </ul> <p>Acute malnutrition: Weight/ Height</p> <ul style="list-style-type: none"> <li>• &lt; 80%</li> </ul> <p>Chronic malnutrition: height for age</p> <ul style="list-style-type: none"> <li>• &lt; 89%</li> </ul>
<b>Entry Criteria for Nutrition Support on discharge from Hospital: Monthly Dietetic Review</b>
<p><i>Acute malnutrition: Weight/ Height</i></p> <ul style="list-style-type: none"> <li>• &lt; 80%</li> </ul> <p>Acute Malnutrition: Weight for age</p> <ul style="list-style-type: none"> <li>• &lt; 76%</li> </ul> <p><i>Chronic malnutrition: height for age</i></p> <ul style="list-style-type: none"> <li>• &lt; 89%</li> </ul> <p><i>Moderate Malnutrition</i></p> <ul style="list-style-type: none"> <li>• MUAC &lt; 14.5 cm - &gt;11.5cm in children &lt; 5 years of age</li> </ul> <p><i>Severe Malnutrition</i></p> <ul style="list-style-type: none"> <li>• MUAC &lt; 11.5cm in children &lt; 5years of age</li> </ul>
<b>Additional Entry Criteria for Nutrition supplementation programme (NSP): Monthly Dietetic Review</b>
<ul style="list-style-type: none"> <li>• Infants: 6 months – 1 year: when infants' growth curve flattens or drops over two consecutive visits.</li> <li>• Children &gt; 5 years ≤ 18 years: When child's growth curve flattens or drops over two consecutive months.</li> <li>• If nutrition supplementation must be continued for only 6 months patient can be re-entered with additional motivation from a dietitian.</li> <li>• It is possible to motivate for patients with chronic liver disease to remain on the NSP programme.</li> <li>• Home visits including assessment of food security and access should be completed with a referral to Social Welfare for available grants, food assistance where appropriate.</li> </ul>
<b>Entry Criteria for Nutrition Support in Private Medical Aid Patients: Monthly Dietetic Review</b>
<ul style="list-style-type: none"> <li>• Growth failure – flattening or down ward crossing of centiles.</li> <li>• Downward crossing of 2 or more centiles over a period of 1 month or 2 consecutive visits.</li> </ul> <p><i>Acute malnutrition: Weight/ Height</i></p> <ul style="list-style-type: none"> <li>• &lt; 80%</li> </ul> <p>Acute Malnutrition: Weight for age</p> <ul style="list-style-type: none"> <li>• &lt; 76%</li> </ul> <p><i>Chronic malnutrition: height for age</i></p> <ul style="list-style-type: none"> <li>• &lt; 89%</li> </ul> <p><i>Moderate Malnutrition</i></p> <ul style="list-style-type: none"> <li>• MUAC &lt; 14.5 cm - &gt;11.5cm in children &lt; 5 years of age</li> </ul> <p><i>Severe Malnutrition</i></p> <ul style="list-style-type: none"> <li>• MUAC &lt; 11.5cm in children &lt; 5years of age.</li> </ul>

Recommended Product Choice for Nutrition Support
<p><b>Conservative Management: Not for transplant</b></p> <ul style="list-style-type: none"> <li>• Aim maintain/ improve quality of life, providing sufficient energy for growth.</li> <li>• Enrich foods with household food sources.</li> <li>• Refer to NSP scheme for nutrition support, where appropriate.</li> <li>• Refer to medical aid for nutrition support, where appropriate.</li> </ul> <p><i>Use products such as:</i></p> <ul style="list-style-type: none"> <li>• Enriched maize meal porridges and or age appropriate nutritionally complete supplements.</li> <li>• Supplement fat Soluble vitamins</li> <li>• ADEK® daily</li> </ul>
<p><b>Awaiting Transplant</b></p> <ul style="list-style-type: none"> <li>• Aim maintain/ improve nutrition status, providing sufficient energy for growth.</li> <li>• Enrich foods with household food sources</li> <li>• Refer to NSP scheme for nutrition support, where appropriate.</li> <li>• Refer to medical aid for nutrition support, where appropriate.</li> </ul> <p><i>Use products such as:</i></p> <ul style="list-style-type: none"> <li>• Glucose or MCT/LCT/ glucose polymer duo product</li> <li>• MCT &amp; LCPUFA containing nutrition complete supplement/ infant feed.</li> <li>• Supplement fat-soluble vitamins.</li> <li>• ADEK® daily</li> </ul> <p><i>Additional Product Considerations:</i></p> <ul style="list-style-type: none"> <li>• Branched chain amino acids 1g/kg in those patients with bilirubin &gt;400mmol/l.</li> <li>• Source either age appropriate branched chain specialised amino acid feed e.g. Generaid or vitamin supplement powder [Health Food Shops].</li> </ul>
<p><b>Post Transplant</b></p> <ul style="list-style-type: none"> <li>• Improve nutrition status providing sufficient energy for catch up growth</li> <li>• Enrich foods with household food sources.</li> <li>• Refer to NSP scheme for nutrition support, where appropriate.</li> <li>• Refer to medical aid for nutrition support, where appropriate.</li> </ul> <p><i>Use products such as:</i></p> <ul style="list-style-type: none"> <li>• Use products such as Enriched maize meal porridges and nutritionally complete age appropriate supplements.</li> </ul>
NSP Scheme Product Motivation for Chronic Liver failure
<ul style="list-style-type: none"> <li>• Motivation required for MCT containing infant feeds [Pre term] and or nutritionally MCT containing complete drinks for those patients &gt; 1 year of age awaiting transplant.</li> <li>• Access Pre Term and nutritionally complete paediatric feed from local day hospital/ CHC.</li> <li>• Additional motivation will be required by the referring dietitian.</li> </ul>
Medical Aid Patients Product Motivation
<ul style="list-style-type: none"> <li>• A motivation by a dietitian may be required for MCT containing infant feeds [Pre term] and or nutritionally MCT containing complete drinks for those patients &gt; 1 year of age awaiting transplant.</li> <li>• If on Medical Aid scheme either access directly from company or from local pharmacy.</li> </ul>
Exit Criteria for nutrition support: Monthly Dietetic Review for first 3 months, if growing well consider quarterly review.
<p><b>NSP</b></p> <ul style="list-style-type: none"> <li>• Birth – 5 years: gained sufficient weight to attain a growth curve in relation to his/her normal growth curve and maintains the curve for three consecutive months.</li> <li>• &gt; 5yrs – 18 years who attain normal growth curve according to the growth chart within the 6 months period on the NSP scheme.</li> <li>• WH &gt;90%</li> <li>• HA &gt;95%</li> <li>• WA &gt; 90%</li> </ul> <p><b>Or Private Patients</b></p> <ul style="list-style-type: none"> <li>• Upward crossing of 2 or more centiles over a period of 1 month or 2 consecutive visits</li> <li>• MUAC &gt;15cm in children &lt; 5 years of age</li> <li>• WH &gt;90%</li> <li>• HA &gt;95%</li> <li>• WA &gt; 90%</li> </ul>

## 2.4 Summary: Establishing Nutrition Support in the Chronic Liver patient

**Goal:** To ensure that each patient with chronic liver disease attains/ maintains an optimal nutrition status.



## 4.1 Appendix 2: Energy Calculations

**Table 1: Selected Dietary Reference Values (DRV's) for Infants and Children requiring Oral/Enteral Nutrition <sup>1</sup>**

Age	Weight (kg)	KJ/kg/day	Kcal/kg/day	Protein g/kg/day
<b>Males</b>				
0 – 3months	5.1	420 – 480	100 – 115	2.1
4 – 6	7.2	400	95	1.6
7 – 9	8.9	400	95	1.5
10 –12	9.6	400	95	1.5
1 – 3 years	12.9	400	95	1.1
4 – 6	19.0	380	90	1.1
7 – 10		8240/day	1970/day	28.3g/day
11 – 14		9270/day	2220/day	42.1g/day
15 – 18		11510/day	2755/day	55.2g/day
<b>Females</b>				
0 – 3 months	4.8	420 – 480	100 – 115	2.1
4 – 6	6.8	400	95	1.6
7 – 9	8.1	400	95	1.5
10 –12	9.1	400	95	1.5
1 – 3 years	12.3	400	95	1.1
4 – 6	17.2	380	90	1.1
7 – 10		7280/day	1740/day	28.3g/day
11 – 14		7920/day	1845/day	42.1g/day
15 - 18		8830/day	2110/day	45.4g/day

**Table 2: Schofield Equation for Calculating Resting Metabolic Rate (RMR) – Kcal/day <sup>1,29</sup>**

Age (yr)	Male	Female
< 3	$0.167(W) + 1517.4(H) - 617.6$	$16.252(W) + 1023.2(H) - 413.5$
3 – 10	$19.59(W) + 130.3(H) + 414.9$	$16.696(W) + 161.8(H) + 371.2$
10 –18	$16.25(W) + 317.2(H) + 515.5$	$8.365(W) + 465(H) + 200.0$
> 18	$15.057(W) + 10.04(H) + 705.8$	$13.623(W) + 283(H) + 98.2$

**Table 3: FAO/WHO/UNU kcal/day <sup>1,29</sup>**

Age (yr)	Male	Female
3 – 10	$22.7 (W) + 495$	$22.5 (W) + 499$
10 - 18	$17.5 (W) + 651$	$12.2 (W) + 746$

PHYSICAL ACTIVITY FACTORS <sup>1</sup>	
ACTIVITY	ACTIVITY FACTOR (AF)
• Sleeping (ICU, Sedation and muscle relaxation)	1.0
Hospitalized	
• Non Ambulant	1.2
• Ambulant	1.3
At Home	
• Relatively inactive	1.4
• Very active	1.9
STRESS FACTORS	
DISEASE	STRESS FACTOR
Trauma	
• Little (long bone fracture)	1.2
• Central Nervous System	1.3
• Moderate to severe (multiple)	1.5
Sepsis	
• Moderate	1.3
• Severe	1.6

## 4.2 APPENDIX 2

# Nutrition Risk Score

Patients Name ----- Ward -----  
 Hospital Name ----- Date -----  
 Date of birth ----- Height/ Length -----

**Please circle relevant score. Only select one score from each section. Select the highest score that applies.**

COMPLETE ON ADMISSION AND WEEKLY IF PATIENTS CONDITION HAS CHANGED

### 1

**Paediatrics (0-17 years)    score**

**Adults (18 years)    score**

**Present Weight**

Expected weight for length	0
90-99% of expected weight for length	2
80-89% of expected weight for length	4
<79% of expected weight for length	6

**2**

**Weight loss in last 3 months (unintentional)**

No weight loss	1
0-3kg weight loss	2
>3-6kg weight loss	3
>6kg weight loss	3

Omit question 2  
For paediatrics

**BMI (Body Mass Index)**

20 or more	0
18 or 19	1
15-17	2
Less than 15	3

### 3

**Appetite**

• Good appetite, manages most of 3 meals/ day (or equivalent)	0
• Poor appetite, poor intake – leaving > half of meals provided (or equivalent)	2
• Appetite nil or virtually nil, unable to eat. NMB (No food for > 4 meals)	3

4

<b>Ability to eat/ retain food</b>		
•	No difficulties in eating, able to eat independently No diarrhoea or vomiting	0
•	Problems handling food e.g. needs special cutlery 1 Vomiting/ frequent regurgitation (or possetting)/ mild diarrhoea	
•	Difficulty swallowing, requiring modified consistency. Problems with dentures, affecting food intake. Problems with chewing affecting food intake. Slow to feed. Moderate vomiting and/or diarrhoea (1-2/day children) Needs help with feeding (e.g. physically handicap)	2
•	Unable to take food orally. Unable to swallow (complete dysphagia) Severe vomiting and/or diarrhoea (>2/ day for children). Malabsorption	3

5

<b>Stress Factor</b>		
•	<b>No stress factor</b> (includes admission for investigations only)	0
•	<b>Mild</b> Minor surgery. Minor Infection	1
•	<b>Moderate</b> Chronic disease. Major surgery/ infarctions Fractures. Pressure sore/ ulcers. CVA Inflammatory bowel disease. Other gastrointestinal disease	2
•	<b>Severe</b> Multiple injuries. Multiple fractures/burns Multiple deep pressure sores/ ulcers Severe sepsis. Carcinoma/ malignant disease	3

**Total**

## Nutrition Risk Score Results

Score	Action
0 – 3 Low Risk	No action necessary Check Weight weekly
4 – 5 Needs Monitoring	Check weight weekly Encourage eating & drinking Replace missed meals with Supplements. (Check with Dietitian if on special diet) Repeat scores after 1 week refer to dietitian if no improvement
6 – 15 High Risk	Refer to dietitian as soon possible

### ALSO REFER TO DIETITIAN IF:

- The patients needs a special diet not available on the normal menu
- The patient needs advice about a special diet