Renastart™

A practical guide to the use of **Renastart**™ as part of the dietary management of paediatric kidney disease

Vitaflo in Association With You

Supporting education in the dietary management of rare diseases

Important information

This practical guide is for the use of **Renastart**. It should be read in conjunction with the Kidney Disease Outcome Quality Initiative (KDOQI) Clinical Practice Guidelines for Nutrition in Children with CKD: 2008 Update[1] and the Clinical Practice Recommendations published by the Pediatric Renal Nutrition Taskforce (PRNT)[2,3].

Information contained within this guide is based on the most recent scientific evidence available regarding the dietary management of paediatric kidney disease.

This practical guide is for use by healthcare professionals working with children and young people diagnosed with kidney disease.

- It is not for **parents/caregivers** of children with kidney disease or **patients with kidney disease**.
- **It is for general information only and must not be used to replace professional medical advice.**

Product information

Renastart is a Food for Special Medical Purposes and must be used under medical supervision.

Renastart is a high energy, powdered formula with low levels of protein, potassium, phosphorus, calcium, chloride and vitamin A. It is suitable from birth to 10 years of age. It is not suitable as a sole source of nutrition. Regular monitoring of nutritional status and electrolyte levels is required. **Renastart** contains **milk** (milk protein). **Renastart** is Halal certified.

Children with allergies or severe intolerances to cow's milk proteins should not use Renastart as it is a cow's milk protein based formula.

Any product information contained in this practical guide, although accurate at the time of publication, is subject to change. The most current product information may be obtained by referring to product labels and **www.vitafloweb.com**.

Introducing and adjusting **Renastart** is dependent on the individual patient. Practical examples are given in this guide; however, it is the responsibility of the managing healthcare professional to use clinical judgement to introduce and adjust **Renastart** in the most appropriate way for individual patients. It may not always be appropriate to refer to this practical guide.

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Disclaimer

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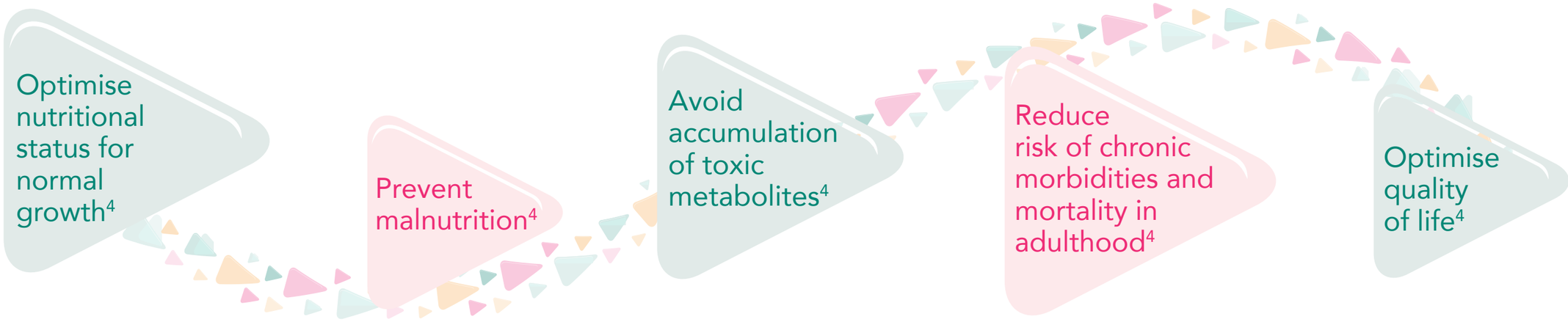
1.0 The importance of nutrition in the management of paediatric kidney disease

The main aims of the dietary management of paediatric kidney disease are as follows:



Balancing the challenges of growth, meeting individual nutritional requirements and managing electrolyte levels can prove difficult in the dietary management of paediatric kidney disease[1].

Optimising nutritional intake for growth is critical especially in the first 3 years of life. Nutrition has a significant effect on growth and can impact final adult height and neurocognitive development[5]. Metabolic, electrolyte and fluid abnormalities contribute to neurocognitive concerns, growth impairment, cardiac anomalies and/or bone damage, increasing morbidity and mortality risk[1,6,7].

There is no single, enteral product for the dietary management of paediatric kidney disease since the primary renal condition may greatly influence biochemical markers and other possible complications associated with the condition. Consequently, infants and children have very individualised nutritional needs.

The treatment of kidney disease in children is multifaceted therefore the use of **Renastart** should be carried out in conjunction with appropriate members of the Paediatric Renal Team including a renal dietitian, nephrologist and dialysis nurse.

Energy

Infants and children with kidney disease often struggle to meet their nutritional requirements due to:

i) symptoms such as nausea, vomiting, taste changes and reduced appetite;
ii) multiple dietary restrictions (potassium, phosphorus, salt, fluid) often in place to manage plasma biochemistry[1,4].

Poor nutritional intake can lead to malnutrition, poor growth and consequently a negative impact on quality of life[1]. Many children with chronic kidney disease (CKD) require nutritional support including oral supplements or tube feeding to meet nutritional requirements[6]. Optimising nutrition can improve growth and reduce mortality for children with CKD[2,8].

Protein

Protein requirements for children with CKD vary[2]. The Pediatric Renal Nutrition Taskforce (PRNT), a group of paediatric renal dietitians and paediatric nephrologists from across the world, suggest that the target protein intake in children with CKD stage 2 to 5 and on dialysis (CKD 2-5D) is at the upper end of the Suggested Dietary Intake (SDI)[2]. However, they also note that children with persistently high blood urea levels may require protein intakes closer to the lower end of the SDI[2].

Potassium and Phosphate

Management of hyperkalaemia and hyperphosphatemia will consist of medical management which may include the use of medications and possibly dialysis. This is done in conjunction with diet and/or feed modification[1,4].

Potassium

Hyperkalaemia is common in patients with CKD 4-5. Due to the risk of cardiac arrest, the management of serum potassium levels is critical. Dietary management plays a key role in this. Extracellular potassium influences muscle function and hypokalaemia or hyperkalaemia can cause fatal cardiac arrhythmias[9]. The KDOQI Work Group (2009) recommend that potassium should be restricted in children with CKD 2-5D who have or are at risk of hyperkalaemia[1].

Phosphate

Hyperphosphatemia can present at CKD stage 3 onwards and needs to be avoided to reduce the risk of Chronic Kidney Disease - Mineral Bone Disorder (CKD-MBD) and cardiovascular disease[4].

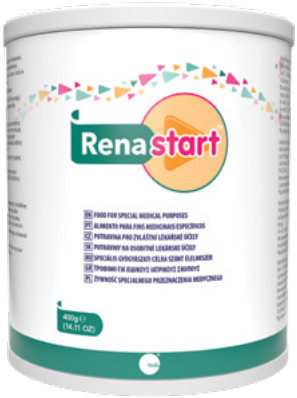
Dietary phosphorus is also an important factor in the severity of hyperparathyroidism even in the early stages of CKD[1].

The PRNT suggest that children with hyperphosphatemia or hyperparathyroidism will require dietary restriction of phosphorus, potentially to the lower limit of the SDI, without compromising adequate nutrition[3].

2.0 What is Renastart?

Renastart is a powdered formula with low levels of protein, potassium, phosphorous, calcium, chloride and vitamin A. It is for use in the dietary management of children with kidney disease, including those on dialysis, from birth to 10 years of age. **Renastart** is low in key renal specific nutrients, such as potassium and phosphorus, which is important as these electrolytes are often elevated in the blood of children with kidney disease.

Renastart can be used in Acute Kidney Injury (AKI) and Chronic Kidney Disease (CKD). In both AKI and CKD, it can be used alone **(for a short period of time only)** to reduce potassium intake and thus manage high serum potassium levels. It can also be used in combination with breast milk, standard infant formula, standard paediatric enteral feeds and/or oral diet to ensure that intakes remain within a typical dietary potassium restriction. This means that energy and protein intakes can be met whilst managing serum potassium and phosphate levels.



2.1 An overview of the main clinical uses of Renastart

Dietary management of hyperkalaemia

Renastart can be used:

- Alone initially for a **short time** to decrease an acutely elevated serum potassium level.
- Over a longer period of time in combination with breast milk, standard infant formula or standard paediatric enteral feeds to reduce overall dietary potassium intake.
- To replace high potassium drinks in the diet (for example cow's milk) when a child has elevated serum potassium levels.

The low potassium content of **Renastart** allows for flexibility with the use of other age appropriate enteral formulas, feeds and diet.

a) Use as a tube feed

Renastart is low in key renal specific nutrients. **Renastart** can be used with other formulas and products to make a bespoke enteral tube feed, meeting the needs of the individual patient.

b) Use as an oral nutritional supplement

The mild flavour of **Renastart** has been shown to be well tolerated by children with CKD when taken orally as a drink[10]. Including **Renastart** as a nutritional supplement can promote greater flexibility with other oral intake, which may be beneficial for increasing variety, subsequently helping to reduce oral aversions which are common in CKD[11].

3.0 Specific nutritional features of Renastart

Renastart has several nutritional features which may support the dietary management of children with kidney disease as outlined in Table 1.

Table 1. Specific nutritional features of Renastart and practical implication for the management of paediatric kidney disease.

Key Feature	Practical implication for the management of paediatric kidney disease
Low in potassium	**Renastart** is formulated with a lower level of potassium compared to mature breast milk, standard infant formula, standard paediatric enteral feeds and whole cow's milk as shown in table 2, on page 8. Elevated serum potassium levels are common in children with CKD[1] and may be related to multiple issues such as the disease origin (especially tubular disorders), medications, constipation, cell or tissue breakdown, and diet, including the use of standard formulas[12]. **Renastart's** low potassium content makes it ideal to be used in conjunction with with other age appropriate formulas, creating a custom feed, enabling serum potassium levels to be managed[13]. Additionally, the use of **Renastart** may provide clinicians with a method of managing serum potassium levels through dietary measures rather than through the use of medications such as potassium binding medications which have been associated with negative side effects such as losses of other nutrients[14-17].
Low in phosphorous	**Renastart** is formulated with a lower level of phosphorus compared to standard infant formula, paediatric enteral feeds and cow's milk to enable dietary phosphate restrictions to be adhered to whilst meeting energy and protein requirements. Using a supplementary feed, which is low in phosphorus, can enable a more liberal oral diet. Hyperphosphatemia and mineral bone disease are significant problems in many CKD and dialysis patients, and are one of the major causes of cardiovascular mortality[18]. In children, bone deformities and poor growth are additional concerns[19]. Young children who are taking diet orally commonly exceed phosphorus recommendations[20]. **Renastart** can be used as an alternative to cow's milk to provide extra energy without excessively increasing potassium and phosphate intake.
Specifically tailored protein content	**Renastart** has been formulated to have a lower level of protein per 100kcal compared to standard infant formula. This ensures that it can be used in conjunction with standard infant formula or oral diet without exceeding protein requirements, and to meet the varying nutritional requirements of infants and children at the various stages of CKD. Many children with CKD meet their protein requirements with standard formula alone. Adding solid foods can provide additional protein which exceeds requirements and may contribute to uraemia[1]. Using a lower protein formula such as **Renastart**, enables children with CKD to have more flexibility with their oral intake, without exceeding protein requirements. If the child progresses to dialysis, the additional protein requirement can be met using oral diet alongside **Renastart**, or a protein modular can be added to the feed recipe. **Renastart** can be used flexibly throughout the progression of CKD.

3.0 Specific nutritional features of Renastart

Key Feature	Practical implication for management of paediatric kidney disease
Low in calcium	**Renastart** has a lower calcium content when compared to standard infant formula, standard paediatric enteral feeds and cow's milk. Some renal medications enhance calcium absorption, for example the use of vitamin D therapy[21]. Calcium-based phosphate binders also provide an additional source of calcium. The low calcium content of **Renastart** enables the use of calcium-based phosphate binders without exceeding the upper limit of calcium intake. **Renastart** also allows for flexibility with intakes of high calcium foods. However, if calcium intake falls below the daily recommended intakes for healthy children, a calcium supplement may need to be considered[1].
Tailored level of sodium	**Renastart** has a **higher** level of sodium when compared to breast milk or standard infant formula. Several of the most common causes of CKD in infancy are associated with sodium wasting, for example infants and children with tubular disorders often have high urine sodium losses. Low serum sodium has serious implications for neurological damage, poor growth and blindness[22, 23]. The use of **Renastart** in these cases can help replace sodium losses particularly in infants who are primarily formula fed, and may lessen the need for additional sodium based supplemental medications. In infants who do not require a higher sodium intake, the use of **Renastart** may be contraindicated. **Renastart** has a **lower** level of sodium compared to standard paediatric enteral feeds when made at a dilution of 1kcal/ml. The lower level of sodium may be beneficial for those who need a lower sodium intake, for example, if hypertensive. However, children over the age of 1 year with a salt wasting condition may need sodium supplements. **Note:** Sodium requirements vary according to type of kidney disease in children[24]. Growth in children with CKD caused by polyuric, salt wasting diseases may be hampered if ongoing sodium and water losses are not corrected[22].
Low in chloride	**Renastart** has a lower level of chloride compared to standard infant formula and standard paediatric enteral feeds. Children with CKD are often acidotic; a frequent and early symptom of CKD[25]. Acidosis may impair growth and accelerate the progression of CKD[26]. Data indicates that children with serum bicarbonate levels <18 mEq/L have poor growth and progress faster to end stage kidney disease[12]. This was demonstrated in the CKiD study where it was seen that a bicarbonate level of <18 mEq/L resulted in rapid acceleration of CKD. This was corrected upon treatment of the acidosis[25]. Despite the cause of CKD, acidosis is associated with a decline in kidney function[25]. Due to this, KDOQI recommend that children with CKD maintain a bicarbonate level of >22 mEq/L [1]. **Renastart's** low chloride content may be beneficial in the dietary management of CKD patients with acidosis.
Low in vitamin A	**Renastart** is low in vitamin A compared to breast milk, standard infant formula and standard paediatric enteral feeds to enable the avoidance of excessive vitamin A intakes and potential risk of hypervitaminosis A. Studies of children with CKD stage 2-5D[27] and those on dialysis[28] showed that 77% and 94%, respectively, had elevated retinol levels. Vitamin A is not cleared well when the kidneys are impaired. Children within these studies often had elevated levels even though they were consuming less vitamin A than the recommended amounts for healthy children of the same age. Elevated retinol levels have been associated with hypercalcemia[27].

3.1 Additional benefits of Renastart

Flexible energy density

Renastart's powdered format enables it to be concentrated or diluted to meet specific nutritional requirements.

- A lower concentration may be beneficial for children with poor gastrointestinal tolerance of concentrated, energy dense feeds[29].
- A higher energy concentration may be beneficial (at 1 - 2 kcal/ml depending on age and tolerance) as fluid restriction is often necessary in CKD[1].

Table 2. Nutritional comparison of Renastart with enteral products suitable for infants and children.

	Protein g	Energy kcal	Na mg/mmol	K mg/mmol	P mg/mmol	Ca mg/mmol	Vit A IU/µg
In infancy Per 100 ml							
Infant formula (standard dilution[1])	1.2	67	21 / 0.9	85 / 2.1	24 / 0.8	43 / 1.1	193 / 58
Mature breast milk[2]	1.3	69	15 / 0.6	58 / 1.5	15 / 0.5	34 / 0.9	205 / 62
Renastart 13.5% dilution[3]	1.0	67	32 / 1.4	15 / 0.4	13 / 0.4	16 / 0.4	60 / 18
Renastart 15% dilution[3]	1.1	75	36 / 1.5	17 / 0.4	14 / 0.4	18 / 0.5	67 / 20
Renastart 20% dilution[3]	1.5	100	48 / 2.1	22 / 0.6	19 / 0.6	24 / 0.6	87 / 26
For over 1 year of age Per 100 ml							
Renastart 20% dilution[3]	1.5	100	48 / 2.1	22 / 0.6	19 / 0.6	24 / 0.6	87 / 26
Renastart 30% Dilution[3]	2.3	150	72 / 3.1	33 / 0.8	28 / 0.9	36 / 0.9	130 / 39
Renastart 40% Dilution[3]	3.0	200	96 / 4.1	44 / 1.1	38 / 1.2	48 / 1.2	173 / 52
Standard paediatric enteral feed[4]	2.8	100	60 / 2.6	110 / 2.8	53 / 1.7	56 / 1.4	150 / 45
Whole cow's milk[2]	3.4	63	42 / 1.8	157 / 3.9	96 / 3.1	120 / 3.0	128 / 38

1 Source: Calculated from manufacturers data on a standard infant formula widely available in the UK.

2 Source: McCance and Widdowson's The Composition of Foods Integrated Data Set PHE publications gateway number: GW-285.2019.

3 Renastart dilution relates to the amount of powder that is added to make up to a final volume of 100ml with water. e.g. 15% Dilution: 15g Renastart made up to 100ml with water. Renastart 20% Dilution: 20g Renastart made up to 100ml with water and so on.

4 Source: Calculated from manufacturer's data on a standard paediatric enteral feed (1.0kcal/ml) widely available in the UK.

Whey based formula

Renastart is a whey based formula. The benefits of a whey based formula include:

- Easier digestibility, compared with casein based formulas, which may aid with delayed gastric emptying and reflux – common symptoms associated with paediatric CKD[29].
- Lower aluminum content; whey based formulas have a lower aluminum content when compared to other types of formula[30]. It is important to prevent aluminum accumulation in children with CKD due to the negative effect aluminum accumulation has on bone and mental health[30].

4.0 Commencing a child on Renastart - clinical considerations

Before commencing Renastart, it is important to eliminate non-dietary causes of elevated serum potassium levels to ensure that Renastart is the appropriate management approach.

All decisions regarding each step and monitoring should be made on an individual patient basis by the Paediatric Renal Team.

Step 1.

Decide initial proportion of Renastart in the total daily enteral feed/oral intake.

Consideration should be given to the diagnosis, previous and current intake of potassium, methods of feeding and trends in serum potassium level.

The decision on whether to initially **fully replace feed/oral intake with Renastart or partially replace feed/oral intake with Renastart** will depend upon the individual's serum potassium levels and nutritional requirements. See flow chart on page 10.

Step 2.

Decide dilution and volume of Renastart.

This will be based on age, individual nutritional requirements, fluid allowance and nutritional contribution of other foods/feeds.

Energy and protein intakes should meet KDOQI Work Group (2009) and PRNT guidelines[1-3].

The concentration of **Renastart** can be adjusted to ensure that protein and energy requirements are met in conjunction with varying fluid intakes or restrictions.

At lower concentrations protein intake should be closely monitored and adjusted as necessary to ensure guidelines and individual needs are being met. This will depend on the volume of feed taken. See Table 2 on page 8 for comparison.

In infants under 1 year of age:

Renastart is typically used in dilutions providing between:

- 0.74kcal/ml (15g of Renastart made up to 100ml with water, 15% dilution)

  and
- 1kcal/ml (21g or 3 scoops of **Renastart** added to 90ml water, 20% dilution).

Where feed volume intake is restricted, the higher concentration of **Renastart**, at 1kcal/ml, may be appropriate to ensure nutritional requirements are met[1, 4].

In children over 1 year of age:

Renastart is typically used in dilutions providing between:

- 1kcal/ml (21g or 3 scoops of **Renastart** added to 90ml water, 20% dilution)

  and
- 2kcal/ml (40g of Renastart made up to 100 ml with water, 40% dilution).

Where feed volume intake is restricted, the higher concentration of **Renastart**, at 2kcal/ml, may be appropriate to ensure nutritional requirements are met[1, 4].

Monitor serum potassium DAILY or at regular intervals as agreed by the Paediatric Renal Team.

4.1 Example of when and how to use Renastart as part of the dietary management of infants and children with Chronic Kidney Disease (CKD) with Hyperkalaemia

Please use your facility's lab protocols for appropriate serum potassium ranges. However, the typical normal paediatric range for serum potassium is 3.5-5.0 mmol/L*.

Hyperkalaemia can be life-threatening. Severe hyperkalaemia will require rapid medical intervention.

Please note that it is important to look at trends in serum potassium levels rather than basing management on one single measurement. Please ensure all non-dietary causes of hyperkalaemia are corrected before using a low potassium feed such as Renastart.

Each patient should be assessed on an individual basis using clinical judgment.

* Please note that the normal range for serum potassium in neonates is 3.5-5.5 mmol/L.

Renastart is typically used in conjunction with breast milk, standard infant formula, standard paediatric enteral feeds and / or mixed diet. However, it can be used alone initially (in the short term) to decrease a very high serum potassium level.

Is the patient's serum potassium level between 3.5-5.0 mmol/L?

Yes: The patient's serum potassium level is within the normal reference range. Therefore, you should use breast milk, standard infant formula, standard paediatric enteral feeds and / or oral diet rather than a low potassium feed such as Renastart.

Is the patient's serum potassium level between >5.0-6.0 mmol/L?

Yes: Change to a ¼ Renastart and ¾ breast milk / standard infant formula / standard paediatric enteral feed ratio.

Example: 25ml Renastart to 75ml breast milk / standard formula / standard paediatric enteral feed - extrapolate to individual volume needs.

Check serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels within 24 hours of the feed change.

Is the serum potassium level now within normal range? (Feed change should result in a serum potassium level of between 3.5-5.0 mmol/L).

No: If the serum potassium level continues to be >5.0 mmol/L increase the ratio of Renastart in the feed to ½ and have ½ breast milk / standard infant formula / standard paediatric enteral feed.

If the serum potassium level has dropped to 3.5 mmol/L or less, re-introduce breast milk, standard infant formula or a standard paediatric enteral feed according to serum potassium levels.

Monitor serum potassium levels within 24 hours

If the serum potassium level continues to be >5.0 mmol/L increase the ratio of Renastart in the feed to ¾ and have ¼ breast milk / standard infant formula / standard paediatric enteral feed.

Is the serum potassium level now within normal range? (Feed change should result in a serum potassium level of 3.5-5.0 mmol/L).

Yes: Continue to monitor - however if the serum potassium levels drop to 3.5 mmol/L or less, reduce the proportion of Renastart in the feed.

No: Ensure all non-dietary causes of hyperkalaemia are corrected. If deemed appropriate, consider using Renastart for all feeds **(short term only)** and closely monitor serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels. Renastart, when used alone, can result in hypokalaemia. Breast milk, standard infant formula or a standard paediatric enteral feed should be gradually reintroduced according to serum potassium levels.

Yes: Continue current dietary management and continue to monitor serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels at least every 24 hours. The proportion of Renastart in the total feed can be adjusted depending upon the serum potassium levels.

Is the serum potassium level now within normal range? (Feed change should result in a serum potassium level of between 3.5-5.0 mmol/L).

Yes: According to serum potassium levels, gradually reintroduce breast milk, standard infant formula or a standard paediatric enteral feed.

Continue to monitor serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels at least every 24 hours and adjust proportion of Renastart accordingly.

No: Continue current dietary management and monitor serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels every few hours. If serum potassium level is not decreasing to within the normal range re-check that all non-dietary causes of hyperkalaemia have been corrected and seek further appropriate medical management.

Is the patient's serum potassium level ≥ 6.0 mmol/L?

Yes: Ensure all non-dietary causes of hyperkalaemia are corrected with medical management as appropriate.

If deemed appropriate, consider using Renastart for all feeds **(short term only)** and closely monitor serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels within a few hours of starting the feed. Please note that Renastart, when used alone, can result in hypokalaemia.

See page 12 for additional important considerations when using **Renastart.**

4.2 Introducing Renastart in the preterm infant

For the preterm infant with kidney injury and a raised serum potassium level, Renastart can be introduced orally or as a tube feed.

Before commencing Renastart, it is important to eliminate non-dietary causes of elevated serum potassium levels to ensure that Renastart is the appropriate management approach.

Please use your facilities lab protocols for appropriate serum potassium ranges for preterm infants.

The flow charts on the previous page can be used to plan how to introduce **Renastart**.

Additional considerations for the preterm infant include:

- Ideally use expressed breast milk (EBM) where available alongside **Renastart**.
- **Renastart** can be started at a dilution of 15% depending on the nutritional requirements of the individual patient.
- Introduction must be gradual and in line with the neonatal unit standard for enteral feeding.

If EBM is not available:

- For the infant <2000g and <35weeks gestation a preterm formula should be used[31].
- For the infant >2000g and >35 weeks gestation a standard infant formula can be titrated alongside **Renastart**.

Check serum potassium, phosphate, calcium, bicarbonate, sodium and urea several times a day initially.

For infants remaining on a restricted fluid intake (<75ml/kg body weight) and tolerating the feed, **Renastart** can be gradually built up to a concentration of 20% by increasing at a 1% increment every 2 days (for example, by 1g of **Renastart** powder per 100ml final volume).

Depending on the urine output and clinical management plan, fluids may be increased in line with the local neonatal unit recommendations for premature infants.

4.3 Additional important considerations when using Renastart

Monitor potassium levels:

- **Renastart** should only be used as part of the dietary management of hyperkalaemia.
- The potassium content of **Renastart** is low.
- Monitor serum potassium levels closely when introducing and adjusting **Renastart**.

Monitor bicarbonate levels closely:

- Do not exceed upper limit of the normal serum bicarbonate range.
- The chloride content of **Renastart** is low.
- Raised bicarbonate and a low chloride intake may lead to alkalosis.
- If a child has high serum bicarbonate levels, **Renastart** should only be used with caution and with close medical management of the alkalosis.

Assess protein intake:

- The protein content of **Renastart** is lower than standard formulas. This is usually beneficial for the nutritional management of CKD.
- Aim to meet protein requirements for age and stage of kidney disease.
- If not meeting requirements, encourage higher protein foods or choose a higher protein formula/feed in conjunction with **Renastart**.

Assess calcium and phosphorus intake:

- The calcium and phosphorus content of **Renastart** is low.
- Ensure calcium intake meets at least 100% of Suggested Dietary Intake (SDI) for age.
- Consider intake from calcium based phosphate binders.
- If not meeting SDI consider calcium supplementation.
- Ensure phosphorus intake meets requirements for age and stage of kidney disease.

Infants only:

Monitor sodium levels and intake:

- **Renastart** has a high sodium content compared to standard infant formula.
- Is the patients serum sodium level elevated or does the patient have a condition in which excess sodium intake may cause hypertension? If so, **Renastart** should only be used with caution and with very close monitoring.

Children over 1 year:

Monitor sodium levels and intake:

- **Renastart** has a lower sodium content compared to standard paediatric formulas at 1kcal/ml.
- Sodium supplementation may be required for those with a salt wasting condition.

Regular monitoring of serum potassium, phosphate, calcium, bicarbonate, sodium and urea levels is essential.

5.0 Nutritional comparison tables when adjusting the volume of Renastart

5.1 Using Renastart alongside standard infant formula

Renastart is often used in conjunction with breast milk / standard infant formula (SIF). The following tables illustrate the content of specific nutrients in 100ml feed containing differing proportions and concentrations of **Renastart** combined with a standard infant formula. This illustrates how the substitution of **Renastart** into the infant's feed, as described in the flow diagram in section 4.1, can alter the intake of potassium, phosphorus, calcium, sodium, protein and energy.

When using **Renastart** the infant's requirements should be individually assessed and intakes of specific nutrients calculated using manufacturer's data for the actual enteral feed used.

Table 3. Specific nutrients analyses* in 15% Renastart mixed with SIF where Renastart 15% comprises 15g Renastart made up to 100ml with water.**

Renastart 15% ml	SIF ml	Protein g	Energy kcal	Na mg/mmol	K mg/mmol	P mg/mmol	Ca mg/mmol
100	0	1.1	75	36 / 1.5	17 / 0.4	14 / 0.4	18 / 0.5
75	25	1.2	73	32 / 1.4	34 / 0.9	17 / 0.5	24 / 0.6
50	50	1.2	71	29 / 1.2	51 / 1.3	19 / 0.6	31 / 0.8
25	75	1.2	69	25 / 1.1	68 / 1.7	22 / 0.7	37 / 0.9
0	100	1.2	67	21 / 0.9	85 / 2.1	24 / 0.8	43 / 1.1

Table 4. Specific nutrients analyses* in 20% Renastart mixed with SIF where Renastart 20% comprises 20g Renastart made up to 100ml with water.**

Renastart 20% ml	SIF ml	Protein g	Energy kcal	Na mg/mmol	K mg/mmol	P mg/mmol	Ca mg/mmol
100	0	1.5	100	48 / 2.1	22 / 0.6	19 / 0.6	24 / 0.6
75	25	1.4	92	41 / 1.8	38 / 0.9	20 / 0.5	29 / 0.7
50	50	1.4	84	35 / 1.5	54 / 1.3	22 / 0.7	34 / 0.8
25	75	1.3	75	28 / 1.2	69 / 1.7	23 / 0.7	38 / 1.0
0	100	1.2	67	21 / 0.9	85 / 2.1	24 / 0.8	43 / 1.1

*** All analyses are per 100ml.**

**** SIF figures calculated from manufacturers data on a standard infant formula widely available in the UK.**

5.2 Using Renastart alongside standard paediatric enteral feeds

Renastart is often used in conjunction with standard paediatric enteral feeds (SPEF). The following tables illustrate the content of specific nutrients in 100ml feed containing differing proportions and concentrations of **Renastart** combined with a SPEF (1kcal/ml).

These recipes are for illustration only and show how the substitution of **Renastart** into the child's feed, as suggested in the flow diagram in section 4.1, can alter the intake of potassium, phosphorus, calcium, sodium, protein and energy.

When using **Renastart** the child's requirements should be individually assessed and intakes of specific nutrients calculated using manufacturer's data for the actual enteral feed used.

Table 5. Specific nutrients analyses* in 20% Renastart mixed with standard paediatric enteral feed (SPEF) where Renastart 20% comprises 20g Renastart made up to 100ml with water.**

Renastart 20% ml	SPEF ml	Protein g	Energy kcal	Na mg/mmol	K mg/mmol	P mg/mmol	Ca mg/mmol
100	0	1.5	100	48 / 2.1	22 / 0.6	19 / 0.6	24 / 0.6
75	25	1.8	100	51 / 2.2	44 / 1.1	28 / 0.9	32 / 0.8
50	50	2.2	100	54 / 2.3	66 / 1.7	36 / 1.2	40 / 1.0
25	75	2.5	100	57 / 2.5	88 / 2.2	45 / 1.4	48 / 1.2
0	100	2.8	100	60 / 2.6	110 / 2.8	53 / 1.7	56 / 1.4

Table 6. Specific nutrients analyses* in 30% Renastart mixed with SPEF where Renastart 30% comprises 30g Renastart made up to 100ml with water.**

Renastart 30% ml	SPEF ml	Protein g	Energy kcal	Na mg/mmol	K mg/mmol	P mg/mmol	Ca mg/mmol
100	0	2.3	150	72 / 3.1	33 / 0.8	28 / 0.9	36 / 0.9
75	25	2.4	138	70 / 3.0	52 / 1.3	34 / 1.1	41 / 1.0
50	50	2.5	125	66 / 2.9	72 / 1.8	41 / 1.3	46 / 1.2
25	75	2.7	113	63 / 2.7	91 / 2.3	47 / 1.5	51 / 1.3
0	100	2.8	100	60 / 2.6	110 / 2.8	53 / 1.7	56 / 1.4

*** All analyses are per 100ml.**

****SPEF figures calculated from manufacturers data on a standard paediatric enteral feed (1.0kcal/ml) widely available in the UK.**

6.0 Examples of how Renastart can be used in clinical practice

Problem Identified	Possible Solution
Child on a fluid restriction and is finding it difficult to achieve energy (calorie) requirements. Serum potassium level is raised.	**Renastart** has a higher energy content compared to mature breast milk, standard paediatric enteral feeds and cow's milk at a standard concentration of 20% (1kcal/ml). **Renastart's** powder presentation allows flexibility with dilutions to enable more energy to be delivered in a specific volume if needed. **Renastart** can be concentrated to provide an energy content of up to 2kcal/ml. Use in conjunction with breast milk, standard infant formula, standard paediatric enteral feeds and / or oral diet.
Child has an elevated serum potassium level and non-dietary causes have been ruled out.	**Renastart** has a low level of potassium. Use in conjunction with breast milk, standard infant formula, and standard paediatric enteral feeds to enable potassium intake to be limited.
Child has an elevated serum potassium level and an elevated serum phosphate level.	**Renastart** has a low level of phosphorus. Can be used as an alternative to cow's milk to help reduce serum phosphate levels for a child consuming oral diet.
Child has a history of protein-energy wasting, tiring when eating and early satiety. Serum potassium level is raised.	Offer **Renastart** as an oral supplement after regular food is consumed to increase energy intake. This can help to reduce stress related to the effort of eating, as consuming a drink is often easier for children who tire quickly. **Renastart** can be concentrated to above 1kcal/ml to enable more energy to be given in a smaller volume. Enteral tube feeding may need to be considered.
Family wish to breast feed however the child's serum potassium level is high.	Encourage breast feeding due to the known positive benefits. Use **Renastart** alongside breast milk to enable additional energy and protein to be given whilst limiting potassium and phosphate intake.
Diet restrictions mean that energy requirements cannot be met using a standard infant formula or standard paediatric feed. Serum potassium level is raised.	Use **Renastart** alongside breast milk, standard infant formula, standard paediatric enteral feeds and / or oral diet to enable energy requirements to be met whilst limiting potassium and phosphate intake.
Child likes flavoured milk-based drinks but has a high serum potassium and phosphate level	Offer **Renastart** as an oral drink in replacement of one or more of the milk based drinks per day depending upon serum electrolyte levels. Try making flavoured drinks using **Renastart** and suitable ingredients (see the **Renastart** drinks sheet for ideas).

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