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Laporan Kes/*Case Report*

Nutritional Management Of A Patient With An Obstructive Thyroid Tumor Complicated By Chronic Kidney Disease : A Case Report

Pengurusan Pemakanan Bagi Pesakit Dengan Tumor Tiroid Yang Obstruktif dan Penyakit Buah Pinggang Kronik : Laporan Kes

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ABSTRACT

This case presents the nutritional management of a 74-year-old Malay male, Mr. Y with a complex medical history, including multinodular goiter with obstructive symptoms, hypercalcemia, chronic kidney disease (CKD) stage 4, morbid obesity, obstructive sleep apnea, and several other comorbidities. The patient, hospitalized for elective thyroidectomy and impaired oral intake, was referred to the dietitian for enteral nutrition support via Nasogastric tube. Patient had significant 33.3% (40 kg) weight loss over 6 months and poor oral intake due to swallowing difficulties. An individualized nutrition intervention was designed, targeting a calorie intake of 1620 kcal/day and 51-68g protein/day, using an ideal body weight approach to avoid over- or underestimating requirements. Enteral feeding was started with a nutritionally complete enteral formula and gradually advanced, with adequate tolerance and no gastrointestinal symptoms manifested upon full feeding. However, due to progression of CKD and electrolyte imbalances, the formula was later switched to a lower electrolyte content and higher energy density formula. Over the course of the patient's hospitalization, follow-up assessments showed improvements such as in lab values like electrolytes and nutritional adequacy, but challenges remained with meeting energy requirements, especially as the patient transitioned to palliative care. The case highlights the importance of tailored enteral nutrition interventions, ongoing monitoring and adjustments in the face of evolving medical conditions in patients with complex needs.

Keywords: Chronic Kidney Disease; Electrolyte Imbalance; Enteral Feeding; Obstructive Symptoms; Thyroid Tumor

ABSTRAK

Laporan kes ini membincangkan pengurusan nutrisi pemakanan bagi seorang pesakit yang berusia 74 tahun, Encik Y, dengan sejarah perubatan kompleks, termasuk goiter yang terdiri dengan beberapa nodul dengan gejala obstruktif, hiperkalsemia, penyakit buah pinggang kronik tahap 4, obesiti, apnea tidur obstruktif, serta beberapa komorbiditi lain. Pesakit dimasukkan ke hospital untuk menjalani pembedahan tiroidektomi secara elektif dan mengalami masalah pengambilan makanan secara oral yang terjejas. Beliau telah dirujuk kepada pakar dietetik untuk sokongan pemakanan enteral melalui tiub Ryles. Pesakit telah mengalami penurunan berat badan yang ketara sebanyak 33.3% (40 kg dalam tempoh 6 bulan) dan kadar pengambilan makanan secara oral yang rendah akibat kesukaran menelan. Satu intervensi pemakanan disesuaikan secara individu telah direka, dengan sasaran pengambilan kalori sebanyak 1620 kcal/hari dan protein sebanyak 51-68g/hari, menggunakan pendekatan berat badan ideal bagi mengelakkan anggaran keperluan yang berlebihan atau tidak mencukupi. Pemakanan secara enteral dimulakan dengan produk formula enteral yang lengkap dan ditingkatkan secara beransur-ansur. Hasil klinikal yang positif telah diperhatikan, termasuk toleransi yang baik dan ketiadaan gejala gastrousus terjadi.

Walau bagaimanapun, disebabkan oleh perkembangan penyakit buah pinggang semasa dan ketidakseimbangan elektrolit, produk tersebut kemudian ditukar kepada formula enteral khas untuk pesakit buah pinggang, iaitu produk renal dengan kandungan elektrolit lebih rendah dan ketumpatan tenaga lebih tinggi. Penilaian rawatan susulan menunjukkan hasil yang baik seperti dalam ujian darah iaitu elektrolit dan nutrisi enteral yang secukupnya, tetapi masih terdapat cabaran dalam memenuhi keperluan tenaga, terutamanya apabila pesakit beralih kepada penjagaan paliatif. Kes ini menekankan kepentingan intervensi pemakanan secara enteral yang disesuaikan, pemantauan berterusan, serta penyesuaian pemakanan mengikut perubahan keadaan perubatan untuk pesakit yang mempunyai keperluan kompleks.

Kata Kunci: Ketidakseimbangan Elektrolit; Penyakit Buah Pinggang Kronik; Pemakanan Enteral; Simptom Obstruktif; Tumor Tiroid

BACKGROUND

The thyroid is a butterfly-shaped gland located in the neck, below the Adam's apple. It plays a key role in regulating metabolism, growth, and body temperature by producing thyroid hormones mainly thyroxine (T4) and triiodothyronine (T3) which are made from iodine and tyrosine (Sentis et al. 2021). It also produces calcitonin, which helps control calcium levels by reducing bone resorption (Khan & Farhana 2022). The thyroid is regulated by the hypothalamic-pituitary-thyroid axis and supports the breakdown of fats, proteins, and carbohydrates (Damiano et al. 2017). Iodine is essential for thyroid hormone production as deficiency can cause hypothyroidism and goiter. Goiter or an enlarged thyroid, may also result from autoimmune conditions like Hashimoto's thyroiditis or Graves' disease (Zimmermann & Boelaert 2015). Thyroid tumors are abnormal growths in the gland and can be benign or malignant. Diagnosis usually involves imaging, fine-needle aspiration, and tissue analysis. Benign tumors may cause swelling or hormone issues, while malignant tumors can invade nearby tissues and spread. Treatment depends on the tumor type and stage and may include observation, hormone therapy, surgery, radioactive iodine, or targeted drugs (Guo et al. 2024). With better early detection and treatment, outcomes for many thyroid cancers, especially differentiated types, are generally good.

Elective thyroidectomy is a planned surgery to remove part or all of the thyroid, often done for benign conditions, low-risk cancers, or goiter with symptoms (Del Rio et al. 2023). Unlike emergency surgery for life-threatening issues, elective procedures allow for thorough preoperative evaluation. Common reasons for surgery include large goiters causing pressure symptoms, Graves' disease that doesn't respond to medication, and thyroid cancer. The surgery can be total or partial, depending on the case. Pre-surgery checks include hormone tests, imaging, and sometimes biopsy to rule out cancer. New surgical methods, like minimally invasive or robotic-assisted techniques, have reduced risks like low calcium or nerve injury. After surgery, patients might need hormone replacement (Del Rio et al. 2023). With good planning and care, elective thyroidectomy is a safe and effective option for many thyroid conditions. In summary, the thyroid is essential for controlling metabolism, energy, growth, and development, and its activity is managed through signals from the hypothalamus and pituitary.

As thyroid condition involves the upper gastrointestinal tract, it would disrupt a patient's ability to consume orally safely especially when the growth manifests obstructive features which possess risk of aspiration. In the case of the patient with unsafe oral intake, nutrition delivery via Ryles tube is the most viable option to optimize the nutritional status. Hence, dietitians play a crucial role in adjusting, monitoring, and ensuring adequate nutrition for patients throughout their treatments. They assess individual dietary needs, manage nutrient intake, and address deficiencies to support healing and overall well-being. Proper nutrition is essential for recovery, strengthening the immune system, and maintaining energy levels. It also helps prevent nutrition-related complications and by providing personalized dietary guidance, dietitians contribute to better treatment outcomes and improved quality of life for patients.

CASE REPORT

CLIENT HISTORY

74-year-old Malay gentleman, retired police officer, married and blessed with 4 children, currently living with family, first time referred to dietitian by the surgery department. He was hospitalized due to multinodular goiter with obstructive symptoms as well hypercalcemia secondary to dehydration with underlying gout, chronic kidney disease stage 4, benign prostate hyperplasia, morbid obese with obstructive sleep apnea, dyslipidemia and hypertension. The patient was admitted electively for thyroidectomy. He also had undergone a right nephrotomy in 2016. The patient was referred for dietary management via Ryles Tube which was recently inserted due to poor oral intake and current medical condition which obstruct the upper gastrointestinal pathway. He was taken care of by his wife during admission.

ANTHROPOMETRY

During the first visit on 6th November 2024, his recorded weight was 85 kg. The patient's measured height was 161 cm and the calculated body mass index (BMI) using the latest recorded weight was 32.8 kg/m^2, which indicated obesity (CPG Obesity 2023). Calculated ideal body weight (IBW) is 64.8kg at a BMI of 25 kg/m^2 (normal BMI) (Dickerson et al. 2022). Upon assessment, Mr. Y reported 40kg weight loss in 6 months as previous weight history was 125kg. This was a 33.3% of weight loss in 6 months which is considered as severe weight loss (Hall & Kahan 2018).

BIOCHEMICAL DATA

The available latest biochemical data was on 6th November 2024 which showed an increasing trend compared to previous data on 5th November 2024. This included sodium (142 mmol/L), potassium (5.3 mmol/L), urea (33 mmol/L), creatinine (219 mmol/L), uric acid (495 mmol/L), calcium (3.65 mmol/L), magnesium (1.32 mmol/L). Meanwhile, the biochemical parameters such as phosphate (1.1 mmol/L) and eGFR (17 mL/min/1.73m^2) are decreasing in trend. This data is presented as in Table 1.

NUTRITION-FOCUSED PHYSICAL FINDINGS

Mr. Y had poor oral intake in a month, had pain during swallowing as well as shortness of breath and often stayed in bed or chair in the past month. The physical activity level also decreased as Mr. Y became less active due to lethargy and shortness of breath despite being able to ambulate by himself. Currently no signs of edema noted.

FOOD AND NUTRITION HISTORY

The current diet order for this patient at ward is a soft diet which is a mixed porridge diet. The home diet recall revealed that previously, Mr. Y had a good appetite but the intake declined in a month due to the patient's complaint of swallowing difficulty and shortness of breath as reported by the wife. As his intake became less, the patient was given powdered milk at home as suggested by his daughter who is a medical doctor. The feeding regime is 2 scoops with 200ml of water 3 hourly, 5 times a day and patient was tolerating well to the regime orally. However, the intake of the powdered formula decreased in a few days before the hospitalization as the patient had shortness of breath. The 24 hour diet recall revealed that the latest intake was very minimal which is only 2 scoops of powdered milk, with the estimation of 74 kcal energy (4.5% of energy requirement) & 4.55g protein (8.9% of protein requirement).

NUTRITION DIAGNOSIS

[New] Swallowing difficulty related to mechanical causes due to multinodular goiter with obstructive symptoms as evidenced by swallowing pain and reduced oral intake for l month as reported by family with estimation of 74 kcal energy (4.5% of energy requirement) & 4.55g protein (8.9% of protein requirement).

NUTRITION INTERVENTION

An individualized nutrition intervention was given to the patient. Dosing weight of 64.8 kg at BMI 25 was used for the calculation of energy and protein requirement. This weight was used as a dosing weight to calculate energy and protein requirements in order to avoid overestimation that could occur if the patient's actual body weight classified as obese were used. The patient's energy requirements are 1620 kcal when calculated using a quick method, 25 kcal per kg body weight. This energy requirement is chosen as the patient is obese and currently not in any ongoing aggressive treatment which requires high energy (KDIGO 2020 ; Heden & Saeed 2016 ; Weltman & Garvey 2002). Based on the Mifflin St Jeor formula, the estimated energy requirement for Mr. Y is 1968kcal with activity factor 1.1 as patient is confined to bed and stress factor chosen is 1.2 due to current underlying medical condition. However, since the feeding will be initiated slowly and the patient has low intake in a month, the lower end estimated energy requirement 1620 kcal was chosen as for the current feeding plan.

Meanwhile, for protein requirement, it was calculated based on 0.6 g/kg to 0.8 g/kg protein which is between 51g to 68g daily (KDIGO 2020; Kovesdy & Kalantar-Zadeh 2017, Koppe & Kalantar-Zadeh 2019). This is due to current underlying chronic kidney disease stage 4 which requires a protein restriction. Despite the patient currently having underlying renal disease, renal formula was not chosen for the patient as currently there are no restriction of fluid declared and biochemical data assessment also found that his current electrolytes value falls within normal range. In lieu of these requirements, an enteral feeding regime following the current protein limit was started with a nutritionally balanced enteral formula. The full regime is 6 scoops of the chosen formula with 200ml water, 3 hourly and 6 times per day with flushing 50 ml water. The feeding was initiated slowly with few feeding steps before proceeding towards full regime to monitor patient toleration. The first step is 2 scoops of the enteral product with 100ml, gradually increasing 50ml & scoops upon 2 times each time until reaching full regime. Mr. Y tolerates those initial feeding steps before proceeding to the full feeding regime. The planned regime was documented and informed to the nurse incharge in the ward.

Primary things to be monitored included biochemical data (renal profile), toleration to the feeding (GI symptoms & aspiration) and I/O chart. Monitoring renal profile could help to determine the status of renal function and nutritional status. Other than that, monitoring any GI symptoms arising upon the feeding and the aspiration volume were important to evaluate the tolerance of the feeding. GI symptoms like diarrhea, abdominal distension, flatulence, stomachache, vomiting and high aspiration volume are some key points that highlight the product might not be suitable for patients (Yahyapoor et al. 2021). Intake and output record is also vital to see current volume received by the patient from feeding and as well from intravenous drip at the same time to see output volume from bowel open, urine and vomit if any. The input and output volume especially, will help to assess the hydration status of the patient as well to indicate if the feeding needs to be modified.

OUTCOME & FOLLOW UP

A follow-up was done on 7th November 2024, which was 1 day after the case referred. Upon diagnostic tests, it revealed that the obstructive mass was thyroid tumor with retrosternal extension. Acute kidney injury secondary to chronic kidney disease also arises as a new issue. During the first follow up, there is currently no latest biochemical data and the patient was currently afebrile, breathing under nasal prong at SPO2 98%. The grand total for input was 3050cc & estimated output was 750cc which is a positive balance of +2300cc for the past 24 hours. The patient tolerated well with the enteral formula product (feeding) as mentioned by the nurse with no gastrointestinal symptoms noted such as absence of vomiting as well no abdominal distension and minimal aspiration. Currently, the patient tolerated all 3 steps of feeding as outlined in table 3.0 and just started on a full feeding regime.

Second follow up was on 11th November 2024 which is 4th days after the first follow up. The patient was confined to bed with the presence of mild edema noted on both legs. The available latest biochemical data on 11th November 2024 (Table 2.0) showed an increasing trend compared to previous data on 6th November 2024. The values of biochemical data for current follow up are shown in Table 2.0. The previous nutrition diagnosis was resolved and no new diagnosis identified for the current follow up. Currently, the feeding was established on full regime and Mr Y tolerated it well. The regime provided estimated 1573.2 kcal energy (97% of energy requirement) and 63g protein (100% of protein requirement) as well supplying 1500ml fluid per day. No gastrointestinal symptoms and normal stool pattern reported by the nurse. However, current urine output is minimal with 30-50cc every hour. Input & output charts are also still in positive values since the last follow up. Upon talking with the doctor incharge, the patient planned for sustained low-efficiency dialysis (SLED) in a few days if the urine output is consistently low and depending on renal profile but no restriction of fluid yet for now. For the current follow up, the Ryles Tube feeding regime using nutritionally balanced enteral feeding remained the same but subjected to change in view of persistence electrolyte imbalance.

Third follow up was done on the next day, 12th November 2024. Based on medical records, it was noted that the current stage 4 chronic kidney disease progressed to stage 5. Patient also have restriction of fluid of 1000 ml per day. Urine output also decreased with a range 20cc-35cc every hour with total input 2010 ml & output 635 ml resulting in 1375 ml of total positive balance in the last 24 hours. Mild edema on both legs were also still noted. The biochemical data as shown in table 4.0 revealed that urea (38.7 mmol/L), calcium (2.73 mmol/L), magnesium (1.2 mmol/L), creatinine (337 ummol/L) and C-reactive protein (158.5) elevated from normal value. Meanwhile, other biochemical parameters such as sodium (143 mmol/L), potassium (5.0 mmol/L), phosphate (0.93 mmol/L), total protein (80 g/U), bilirubin (9 ummol/L), alanine transaminase (9 u/L) remained in normal range but increasing trend meanwhile albumin (19 g/dL) and e-GFR (15 mL/min/1.73m^2) remained below normal value decreasing in trend. These data are aligned in table 4.0. Based on the follow up findings, a new nutrition diagnosis identified which is enteral nutrition composition inconsistent with needs related to physiological causes/disease progression as evidenced by elevated lab value and poor urine output.

In view of progression of current kidney condition which resulted in poor urine output and electrolyte imbalance (magnesium and calcium), the enteral product was changed into renal enteral formula. This product was chosen as its electrolyte content is much lower and relatively low in free water content compared with the previous product. This was to reduce burden to the kidney at the same time to supply sufficient protein and energy as this is an energy dense product with 1.8kcal/ml concentration. The new regime for the enteral feeding was 120ml of the renal enteral product with 40ml flush 6 times in a day. This provides 1275 kcal (78.7% of energy requirement) and 57.3g protein (within range of requirement) and the total volume is 960ml fluid including flushing which is still not yet exceeding restriction of fluid. Upon calculation, estimated volume of free water content for the regime was 612ml with electrolytes content such as potassium 607.5mg, sodium 571.1mg, magnesium 212.65mg, phosphate 546.8mg and calcium 607.5mg. The planned regime was informed to the nurse incharge in the ward. For the upcoming follow up, the toleration to the feeding, input/output chart,

total feeding and biochemical data especially renal profile will be evaluated and monitored.

Subsequent follow up took place on 15 November 2024, which was also the fourth follow up, 3 days after previous follow up. Patient was moved (transferred out) to the other ward which is a first class ward. From the medical record, the patient now was under palliative care as NAR (no active resuscitation) was declared. Doctor also informed that the scheduled sustained low-efficiency dialysis (SLED) was canceled as it will burden the patient and the current patient condition was not suitable for the procedure. As the patient was on comfort care and no active aggressive treatment at the moment, Mr. Y will be discharged as requested by his family. For the input and output chart for the past few days, it remained in positive balance but reduced in amount ranging around 500-850cc compared to the previous chart which recorded above 1000cc of positive balance as the patient was reduced in output. Mr. Y also tolerated well with the current regime using renal enteral formula with no gastrointestinal symptoms noted by the nurse with minimal aspiration. The urine output also increased as the patient currently on a drug via intravenous drip which is IV Lasix that induced the urine output to get rid of fluid faster. Current nutrition diagnosis was inadequate enteral nutrition infusion related to current infusion volume not reached as evidenced by only 78.7% energy requirement fulfilled for the current enteral feeding regime.

The enteral feeding was adjusted to 140ml of the same renal enteral formula with 20ml flush 6 times in a day. This provides 1512 kcal (93.3% of energy requirement) and 67.7g protein (within range of requirement) and the total volume remains the same as previous which was 960ml fluid including flushing. Upon calculation, estimated volume of free water content for the regime was 556ml with electrolytes content such as potassium 708mg, sodium 666.3mg, magnesium 248mg, phosphate 637.9mg and calcium 708.8mg. The planned regime informed the nurse incharge and to the caregiver as a discharge plan. Total summary for feeding progress is as shown in table 5.0 (based on requirement 1620 kcal energy & 51g to 68g for protein).

DISCUSSION

This case study involves a critically ill elderly patient with an obstructive thyroid tumor, chronic kidney disease and morbid obesity. These conditions complicate the patient's medical care, especially their nutrition therapy, which needs to be tailored to meet their energy and protein requirements. Hence in this particular case, enteral feeding via a Ryles tube (nasogastric or nasoenteric tube) is crucial for providing nutrition (Vadivelu et al. 2023). The thyroid tumor can alter metabolic function and nutrient needs by affecting thyroid hormone levels, which complicates nutritional management. Initially diagnosed as a goiter, the tumor grew large enough to obstruct the respiratory and upper gastrointestinal tracts, making enteral feeding necessary. The nutritional management of this particular case involved a careful adjustment of energy and protein requirements based on the patient's current condition.

To calculate nutritional requirements for Mr. Y, dosing weight was based on ideal weight at BMI 25, which is 64.8kg. For energy requirements, it was calculated based on 25kcal every kilogram body weight at BMI 25 as this patient is obese with a total energy requirement of 1620kcal calculated via quick method. 1620kcal were chosen over energy requirements calculated based on Mifflin St. Jeor formula which is 1968kcal (30.3 kcal/kg) as the feeding will be initiated step by step and the patient has low intake in a month. Hence lower end estimated energy requirement was chosen as for the current feeding plan to prevent overfeed as patient is obese. Protein requirement for patient was prescribed 0.6 g/kg to 0.8 g/kg based on the same dosing weight upon considering his current underlying conditions of chronic kidney disease stage 4. The restriction of the protein for this particular disease is to reduce the kidney load and prevent further disease progression (Obeid, Hiremath & Topf 2022).

In ESRD, nutrient metabolism and renal clearance are impaired, requiring careful monitoring of fluids and electrolytes. Considering current kidney condition, protein intake is limited to 0.6g to 0.8g per body weight. Poor urine output and electrolyte imbalances are common in ESRD, demand ongoing adjustments in nutrition to balance sodium, potassium and other electrolytes (Otis, Parker & Busch 2025). The enteral feeding regime for this patient also considers amounts of electrolytes it delivers which are monitored closely in lieu of the patient's requirements. The patient's limited ability to excrete waste products from protein metabolism increases the risk of metabolic acidosis and fluid retention, which leads to edema (Khan et al. 2016).

The absence of updated body composition data, particularly current body weight, presents a significant challenge in this case. Although several predictive equations are available to estimate energy requirements, caloric needs based on weight (kcal/kg) remain a fundamental component in nutritional assessment. Accurate determination of energy needs often relies on the clinical judgment of dietitians, who tailor recommendations based on the patient's current clinical condition. In this case, energy requirements were estimated using an assumed body weight relevant to patient current condition and previous latest weight, which introduces potential for error. Such estimations

should be interpreted with caution and adjusted accordingly by the healthcare team particularly by dietitians to ensure appropriateness and accuracy in nutritional management.

Despite initial improvements, ongoing clinical deterioration led to the transition into palliative care, requiring a shift in nutritional goals from disease management to comfort-focused care. The role of the dietitian evolved to prioritize symptom control, hydration, and quality of life, rather than strict aggressive nutritional optimization, making accurate yet compassionate dietary planning even more complex. Nutritional interventions were tailored to reduce feeding-related distress, minimize discomfort, and align with the patient's wishes with overall care plan. The case highlights the importance of adaptable nutrition strategies, demonstrating how dietitians play a critical role in ensuring compassionate, patient-centered care during end-of-life stages.

LEARNING POINTS

Nutrition therapy must be personalized to meet each patient's specific needs, especially in cases like this one, involving conditions such as ESRD, obesity and thyroid disorders. As the patient's condition changed, so did their nutritional diagnosis, requiring continuous reassessment to ensure effective dietary interventions. The dietitian played a key role in adjusting nutrition care plans based on the patient's clinical and biochemical data. This flexible approach ensured the patient received appropriate support, promoting recovery and health. In critically ill obese patients, accurate energy and protein management is essential. While obese patients have more energy reserves, critical illness increases energy expenditure and reduces the ability to use fat stores (Ayalon, Bodilly & Kaplan 2021). Predictive energy calculations and clinical judgment are necessary to avoid both underfeeding and overfeeding (Ndahimana & Kim 2018). For kidney management in ESRD, protein intake need to be restricted to prevent nitrogen waste buildup, but critically ill patients may need more protein to prevent muscle wasting and support healing (Zha & Qian 2017). Balancing these needs without worsening kidney function is crucial. Fluid and electrolyte balance is also critical, especially for ESRD patients with poor urine output. Careful monitoring is needed to avoid dehydration or overload and to manage electrolyte imbalances, such as hyperkalemia and hyponatremia (Shrimanker & Bhattarai 2023).

For patients who have difficulty eating orally due to conditions like an obstructive thyroid tumor, Ryles Tube feeding is often necessary. Choosing the right feeding formula, volume and rate of administration is essential to meet nutritional needs and prevent complications. Enteral nutrition (EN) is recommended for cancer patients with difficulty eating, supported by guidelines from the Malaysian Dietitian Association (2017) and ESPEN (2021) to maintain nutritional status and quality of life (Chien et al. 2013). However, careful assessment of comorbidities and contraindications is necessary to avoid nutritional related complications (Arends et al. 2006). Ongoing monitoring and reassessment of the patient's nutritional status, clinical condition, and lab values are essential. Adjustments to the feeding regimen may be necessary depending on changes in the patient's condition. A collaborative approach among nephrologists, endocrinologists, dietitians, speech pathologists, and nursing staff ensures optimal care and recovery. Effective interdisciplinary communication within such teams represents a critical strength in coordinating care for complex cases in the ward. It enables shared decision-making, promotes continuity of care, and ensures that interventions are both timely and aligned with the patient's evolving clinical condition. This synergy among disciplines not only reduces the risk of fragmented care but also enhances patient outcomes and overall healthcare efficiency.

CONCLUSION

Managing nutrition in critically ill patients with multiple comorbidities such as an obstructive thyroid tumor, end-stage chronic kidney disease, morbid obesity and electrolyte imbalance requires a comprehensive, patient-centered approach. Properly balancing energy and protein intake, adjusting feeding and monitoring fluid with electrolyte status are critical components of the care plan. Ryles tube feeding can provide an effective route for delivering essential nutrition, but it must be carefully managed in the context of the patient's unique clinical challenges. While interventions such as Ryles tube feeding can support essential nutritional needs, they must be continually reassessed in light of the patient's clinical progression. In long-term enteral feeding, continuous reassessment plays a critical role in ensuring that nutritional support remains appropriate, effective, and aligned with the patient's evolving clinical condition and goals of care. Regular evaluation allows for timely adjustments in feeding regimen, route, and nutrient composition, particularly in patients with declining function or shifting toward palliative management. This approach helps prevent over- or underfeeding, supports symptom control, and upholds the ethical principles of patient-centered care. As care priorities shift from curative to palliative intent, the emphasis moves toward comfort, symptom management, and

TABLE 1 Patient's Biochemical Data 6th November 2024

Test	6 Nov	Normal Value	Indication
Sodium (mmol/L)	142	138-145	Normal
Potassium (mmol/L)	5.3	3.5-5.1	High potassium may suggest impaired renal excretion, dehydration or potentially influenced by medications.
Magnesium (mmol/L)	1.32	0.66-1.07	High magnesium may suggest impaired renal excretion and dehydration.
Calcium (mmol/L)	3.65	2.1-2.55	High calcium may suggest impaired renal excretion, dehydration and as well due to current thyroid condition.
Phosphate (mmol/L)	1.1	0.74-1.52	Normal but increasing
Urea (mmol/L)	33	2.5-6.7	High urea may suggest impaired renal excretion, dehydration or potentially influenced by medications.
Creatinine (µmol/L)	219	50-98	High creatinine may suggest impaired renal excretion, dehydration or potentially due to high muscle breakdown.
Uric Acid (mmol/L)	495	154.7-357	High uric acid may suggest impaired renal excretion, dehydration or as well underlying gout
e-GFR (mL/min/1.73m 2)	17	95-100	Low EGFR due to current kidney disease

TABLE 2 Patient's Biochemical Data 11 November 2024

Test	6 Nov	11 Nov	Trend	Normal Value	Indication
Sodium (mmol/L)	142	141	Decreased	138-145	Normal
Potassium (mmol/L)	5.3	5.1	Decreased	3.5-5.1	High potassium may suggest impaired renal excretion, dehydration or potentially influenced by medications.
Magnesium (mmol/L)	1.32	1.2	Decreased	0.66-1.07	High magnesium may suggest impaired renal excretion and dehydration.
Calcium (mmol/L)	3.65	2.73	Decreased	2.1-2.55	High calcium may suggest impaired renal excretion, dehydration and as well due to current thyroid condition.
Phosphate (mmol/L)	1.1	0.93	Decreased	0.74-1.52	Normal but decreasing
Urea (mmol/L)	33	38.7	Increased	2.5-6.7	High urea may suggest impaired renal excretion, dehydration or potentially influenced by medications.
Creatinine (µmol/L)	219	-	-	50-98	High creatinine may suggest impaired renal excretion, dehydration or potentially due to high muscle breakdown.
Uric Acid (mmol/L)	495	-	-	154.7-357	High uric acid due to underlying gout and might be due to impaired renal excretion, dehydration.

e-GFR (mL/min/1.73m^2)	17	15	Decreased	95-100	Low EGFR due to current kidney disease
Albumin (g/dL)	-	20	-	35-50	Low albumin levels may reflect protein malnutrition, poor nutritional status, or chronic inflammatory conditions.
Hemoglobin (g/dL)	-	8.2	-	12.0-15.0	Low hemoglobin suggests anemia, which is consistent with iron deficiency anemia due to low intake of iron rich foods.
White Cell Count (10^9/L)	-	16.81	-	4.0-11.0	Elevated value of white cells count indicates infection and inflammation
C-Reactive Protein	-	196.7	-	0.0-0.02	Elevated CRP indicates inflammation or infection, potentially related to the patient's chronic condition

TABLE 3 Step by step feeding progress for early feeeding using complete balance enteral formula

Step	Regime	Energy (kcal)	Protein (g)	Volume (ml)
1	2 scoops + 100ml + 50ml flush	524	21.0	900
2	3 scoops + 100ml + 50ml flush	786	31.5	900
3	4 scoops + 150ml + 50ml flush	1048	42.0	1200
4	6 scoops + 200ml + 50ml flush	1573	68.0	1500

TABLE 4 Patient's Biochemical Data 12 November 2024 & Summary Of All Biochemical Data

Test	6 Nov	11 Nov	12 Nov	Trend	Normal Value	Indication
Sodium (mmol/L)	142	141	142	Increased	138-145	Normal
Potassium (mmol/L)	5.3 ↑	5.1 ↑	5.0	Decreased	3.5-5.1	Borderline high
Magnesium (mmol/L)	1.32 ↑	1.2 ↑	1.2 ↑	No changes	0.66-1.07	High magnesium may suggest impaired renal excretion, dehydration or potentially influenced by medications.
Calcium (mmol/L)	3.65 ↑	2.73 ↑	2.73 ↑	No changes	2.1-2.55	High calcium may suggest impaired renal excretion, dehydration or potentially influenced by medications.
Phosphate (mmol/L)	1.1	0.93	0.93	No changes	0.74-1.52	Normal but decreasing
Urea (mmol/L)	33 ↑	38.7 ↑	38.7↑	No changes	2.5-6.7	High urea may suggest impaired renal excretion, dehydration or potentially influenced by medications.

Creatinine (µmol/L)	219 ↑	-	337 ↑	Increased	50-98	High creatinine may suggest impaired renal excretion, dehydration or potentially due to high muscle breakdown.
Uric Acid (mmol/L)	495 ↑	-	-	-	154.7-357	High uric acid due to underlying gout and might be due to impaired renal excretion, dehydration.
e-GFR (mL/min/1. 73m^2)	17 ↓	15↓	-	-	95-100	Low EGFR due to current kidney disease
Albumin (g/dL)	-	20 ↓	19 ↓	Decreased	35-50	Low albumin levels may reflect protein malnutrition, poor nutritional status, or Chronic inflammatory conditions.
Hemoglobin (g/dL)	-	8.2 ↓	-	-	12.0-15.0	Low hemoglobin suggests anemia, which is consistent with iron deficiency anemia due to low intake of iron rich foods.
White Cell Count (10^9/L)	-	16.81 ↑	-	-	4.0-11.0	Elevated value of white cells count indicates infection and inflammation
C-Reactive Protein	-	196.7 ↑	158.5 ↑	Decreased	0.0-0.02	Elevated CRP indicates inflammation or infection, potentially related to the patient's chronic condition
Total Protein (80 g/U)	-	-	80	-	64-83	Normal
Bilirubin (ummol/L)	-	-	9	-	3.4-20.5	Normal
Alanine Transamin ase (u/L)	-	-	9	-	0-55	Normal

TABLE 5 Feeding Progress

Date	6 Nov	7 Nov	11 Nov	12 Nov	15 Nov
Product	Powdered Milk	Complete Balance Enteral Formula	Complete Balance Enteral Formula	Renal Enteral Formula	Renal Enteral Formula
Volume (cc)	200	1000	1500	960	960
Regime	2 scoops + 200cc	Step 1-3	6 scoops + 200cc + 50cc flush	120cc + 40cc flush 6x/day	140cc + 20cc flush 6x/day
Energy (kcal)	74 (4.5% requirement)	874 (53.9%. requirement)	1573 (97% requirement)	1275 (78.7% requirement)	1512 (93.3% requirement)
Protein (g)	4.55 (8.9% requirement)	35 (68.6% requirement)	68g (100% requirement)	57.3g (100% requirement)	67.7g (100% requirement)

quality of life. In this context, the role of enteral nutrition must be regularly evaluated to ensure it remains appropriate, proportionate, and aligned with evolving goals of care. Regular assessment and collaboration among healthcare professionals are key to achieving optimal outcomes.

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