J Prima Med Sains (2025) 7(1):84-91
doi.org/10.34012/jpms.v7i1.6235

CASE REPORT

Optimizing nutritional status with nutritional therapy in malnourished patient post whipple's procedure: A case report

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ABSTRACT

The prevalence of malnutrition is considerably high among patients with pancreatic cancer and that Whipple procedure is associated with high morbidity and mortality rates. Post-Whipple procedure nutritional therapy can help to preserve nutritional status, accelerate recovery of functional capacity, and improve patient's quality of life. A 65-year-old malnourished woman underwent Whipple procedure for adenocarcinoma of ampulla of Vater. Oral pre-operative nutrition was given in the form of normal food and oral nutritional supplement (ONS). Eight hours before surgery, the patient received ONS containing 30 g carbohydrate. The patient was given early enteral nutrition at <48 hours post-operatively and was given oral nutrition as soon as she regained consciousness. The patient experienced post-operative pancreatic fistula (POPF) grade A. Post-operative in-hospital and homecare nutritional therapy included supply of energy, macronutrients, micronutrients, and nutritional education adjusted to the patient's clinical condition and intake tolerance. Energy intake during hospitalization attained 109% of the estimated total energy requirement that consisted of up to 1.9 g/kg/day protein. Homecare nutritional intake reached almost 2 times basal energy requirement with 2.2 g/kg/day protein intake. The patient experienced improvement of clinical symptoms, POPF, intake tolerance, glycemic control, and functional capacity. The patient was allowed to be discharged and treated in the outpatient clinic, without readmission in the next 2 months. Adequate hospital and homecare medical nutritional therapy in post-Whipple procedure may improve nutritional status and functional capacity, improve clinical outcome, and prevent readmission of patients.

Keywords: malnutrition, medical nutritional therapy, nutritional status, pancreatic cancer, Whipple procedure

INTRODUCTION

Pancreatic cancer is the 11th most common cancer according to an international survey, with approximately 338,000 new cases annually and 55.5% of the incidence occur in developing countries.[1] Eventhough surgery is a potential curative measure for pancreatic cancer, only 15-20% of pancreatic cancer patients can undergo surgical resection.[2] Whipple procedure is one of the most challenging surgery performed in patients with cancer of pancreatic head. Whipple procedure is associated with high morbidity and mortality rates accounted for 47.5% and 2.5%, respectively. The high rates of post-operative complications contribute to post-operative mortality, increased length of hospital stay, hospital costs, and delay in administration of adjuvant therapy.[3] The prevalence of pre-operative malnutrition in pancreatic cancer patients is 88%. Malnutrition is also associated with post-operative recovery time and increases the risk of post-operative complications which inhibits oral intake and results in a more severe nutritional deficit and increases the length of hospital stay as well as readmission to the hospital.[4] A cohort study of 6216 patients who underwent Whipple surgery showed that as many as 22% of patients were readmitted within 30 days, with a mortality rate of 3.7%.[5] Another study by Calderon, et al.[6] showed that 60.6% of pancreatic cancer patients experienced weight loss within 6 months post-operatively. Malnutrition and inadequate caloric administration in post-Whipple procedure patients may be associated with 90-day hospital readmission.[7] Patients who receive home

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visits have a lower risk of readmission within 30 and 90 days following hospital discharge,[8] unfortunately no significant differences are observed in terms of anthropometric parameters and quality of life.[9] Current studies offer minimal insight into how post-discharge nutritional care influences functional recovery, anthropometric outcomes, or quality of life. This case demonstrates the potential role of structured nutritional therapy, initiated in the hospital and continued through homecare, in mitigating post-operative complications, preventing further nutritional deterioration, and reducing hospital readmission following the Whipple procedure. More targeted research is needed to evaluate the long-term impact and clinical implementation of such interventions.

CASE REPORT

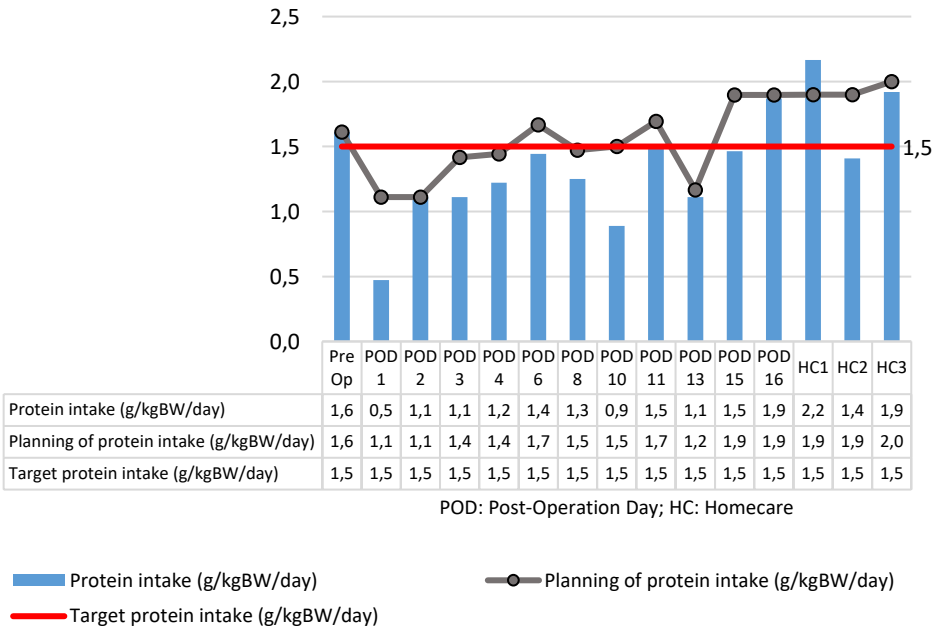
A 65-year-old woman was hospitalized for 26 days from January 7 to February 1, 2020. The patient came to the hospital to undergo elective Whipple's operation for adenocarcinoma of the ampulla of Vater. The patient reported intermittent abdominal bloating since 4 months prior to hospital admission. Three months prior to admission, the patient started to experience vomitting which occurred with every meal and jaundice that was accompanied by pale putty-like stool. Abdominal ultrasound and CT scans were performed showing a malignant tumor of the pancreas, and hence bile duct stent placement were performed accordingly followed by biopsy. The biopsy results indicated a well-differentiated adenocarcinoma of the ampulla of Vater and the patient was planned for surgical resection. The patient has a history of long-standing hypertension for more than 10 years and routinely took 5 mg amlodipine once daily. The patient liked to eat salty foods and sweet drinks, and all of the patient's families ate beef almost every day. She did not eat fruit regularly, but she admitted to eat vegetables. She denied any history of smoking and alcohol consumption. She rarely did exercise but she reported to engage with daily household chores such as washing, cooking, and cleaning the house. The patient's body weight decreased from 45 kg to 36 kg (9 kg or 20%) in 4 months.

The patient was treated for 10 days in a regular ward and underwent serial blood tests and preparation for surgery. She reported no complaints during the pre-operative treatment and neither intravenous infusion nor medications were given. Her appetite was good and she could finish all the meals provided by the hospital. Eight hours before surgery, the patient received ONS containing 30 g carbohydrate. The patient underwent surgery to remove the tumor on the 10th day of hospital care and was transferred to the intensive care unit (ICU) following surgery. The patient's operation lasted for 6.5 hours with the total bleeding of 400 mL. Intraoperative hemodynamics was unstable, the patient received a 500 mL packed red cell transfusion, 500 mL colloid infusion, 600 mg/24 hours intravenous amiodarone, 0.5 mcg/kg/minute intravenous norepinephrine, and 3 mcg/kg/minute intravenous dobutamine.

Postoperatively, the patient was admitted to the ICU and received ventilatory support. The patient was admitted to the ICU for 4 days, high care unit for 1 day before being transferred to regular ward. On the second day in the ICU, the patient was extubated and started to be given 30 mL/hour clear liquid enterally via nasogastric tube (NGT). Early oral nutrition was started after she regained full consciousness at 3 days post-operatively and the nutritional intake was increased to liquid food combined with parenteral nutrition. At 4 days following surgery, the patient complained of nausea when taking 50 ml oral liquid food for the first time after surgery, but did not vomit. The highest gastric residual volume was 390 ml/24 hours observed at 4 days following surgery, but it was minimal on day 5. The patient received metoclopramide at a dose of 3 x 10 mg IV until post-operative day (POD) 7. The patient experienced melena at 5-8 days post-operatively and recurred at POD 12–14, hence omeprazole drip of 8 mg/hour for 4 days was administered and continued with oral omeprazole of 1x20 mg until the patient was discharged. At 10 days, there was yellowish seepage on the patient's surgical wound cover which increased in volume and she was diagnosed with post-operative pancreatic fistula on POD 12.

In the initial laboratory examination in the ICU at POD 1 showed hyponatremia (131 mEq/L), hypokalemia (3.3 mEq/L), and hypoalbuminemia (2.68 g/dL). She received sodium correction therapy through administration of 0.9% NaCl at a dose of 20 mL/hour for 2 days and potassium correction with 50 meq KCl in 6 hours. On the following day, the post-correction laboratory results showed normal sodium and potassium levels. The patient's latest albumin level on POD 13 was 3.07 g/dL which increased from of 2.68 g/dL on POD 0 as a result of administration of 100 mL 20% Albumin transfusion for 2 doses and Vip albumin® supplementation of 3x1 cap/day which was given since POD 10. The patient's blood sugar was increased to 304 mg / dL on POD 1, but improved to normal values on POD 2 without insulin therapy or other hypoglycemic drugs.

Pre-hospital admission nutritional intake was 1500 kcal (42 kcal/kg), 53 g protein (14%; 1.5 g/kg), 25% fat, and 61% carbohydrates. In the initial 24 hours post-operatively, the patient only received parenteral Nutriflex lipid peri® at a dose of 1250 ml/24 hours. The patient's basal (Harris Benedict equation) and total energy requirements were 971 kcal and 1457 kcal, respectively, with a target protein requirement of 54–72 g (1.5–2 g/kg; 16–20%), 36–50 g (25–30%) fat, 182–219 g (50–60%) carbohydrates, and 1000–1500 mL/day fluid. At the initial examination, the patient was given 955 kcal (27 kcal/kg/day) caloric intake, protein 40 g (1.1 g/kg, 17%), 50 g (47%), carbohydrate and 80 g (36%) fat from Nutriflex lipid peri® 1250 mL/24 hours. Post-operative intake was increased gradually as seen in Figure 1 and 2. The patient was initiated to have oral intake with semisolid food on POD 7 and was changed to rice starting from POD 10. Nutrition intake was increased gradually until it reached total energy requirement on the last day of hospital treatment, which was 1606 kcal (44 kcal/kg, 110% total energy requirement), 75 g protein (19%, 2 g/kg), 43 g (24%) fat, and 232 g (57%) carbohydrates. Dietary prescription given for ambulatory care was adjusted to the patient's last intake of 1600 kcal (43 kcal/kg), 65 g (1.9 g/kg, 16%) protein, 49 g (27%) fat, and 220 g (57%) carbohydrates given in the form of solid diet and ONS.



	Pre Op	POD 1	POD 2	POD 3	POD 4	POD 6	POD 8	POD 10	POD 11	POD 13	POD 15	POD 16	HC1	HC2	HC3
Protein intake (g/kgBW/day)	1,6	0,5	1,1	1,1	1,2	1,4	1,3	0,9	1,5	1,1	1,5	1,9	2,2	1,4	1,9
Planning of protein intake (g/kgBW/day)	1,6	1,1	1,1	1,4	1,4	1,7	1,5	1,5	1,7	1,2	1,9	1,9	1,9	1,9	2,0
Target protein intake (g/kgBW/day)	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5

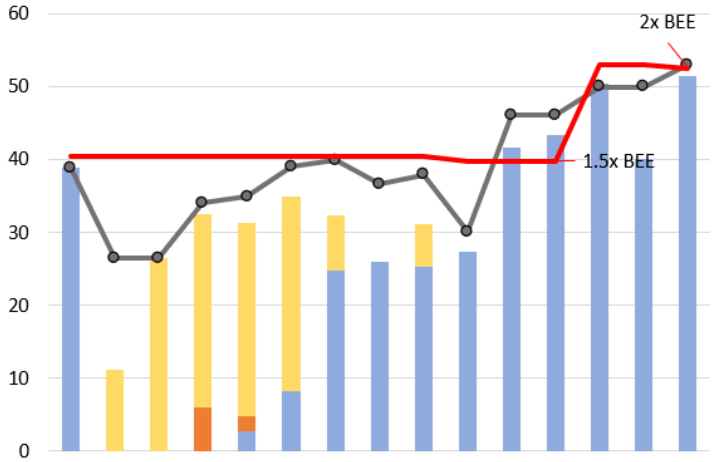
POD: Post-Operation Day; HC: Homecare

Figure 2. Analysis of the patient's protein intake and planning

Initial anthropometric data obtained from follow-up medical interview showed body weight of 36 kg, the same as the estimated weight of 36 kg calculated from the arm circumference of 23 cm and body height of 140 cm, so that the patient's body mass index (BMI) was 18.4 kg/m^2. The patient's weight on POD 12 was 36.9 kg (BMI 18.8 kg/m^2) showing an increase of 0.9 kg from the last body weight measurement during hospitalization. The patient also showed increased grip strength during post-operative care even though the baseline value of the grip strength was within normal limits since the first examination. The initial nutritional assessments included clinical severe malnutrition, cachexia, hypoalbuminemia, well-differentiated adenocarcinoma of the ampulla of Vater post-Whipple surgery. At the end of treatment, the patient's nutritional status based on BMI had increased from mild malnutrition to normal weight, even though she was still considered severely malnourished from clinical examination.

In the hospital, patient was given postoperative micronutrient supplementation which included 1 tablet vitamin B complex tid, 250 mg vitamin C bid, 20 mg zinc bid, and single dose of 0.5 mg folic acid. The patient was also advised to engage with physical activity or sports as well as routine sunbathing in order to get sun exposure. Home visits were carried out 3 times at 1, 3, and 5 weeks after returning from the hospital for anamnesis, physical examination, intake analysis, and nutrition-related education. At the third visit, the patient's body weight was 37.5 kg which indicated an increase of 1.5 kg gained within 2 months post-operatively, so that the patient's BMI was 19.1 kg/m^2. At the third home visit, surgical wound healing and closure of the post-operative pancreatic fistula (POPF) were observed as well as increased grip strength from

25.5 kg to 26.9 kg, muscle mass from 23.2% to 27.3%, and fat-free mass index (FFMI) from 11.7 kg/m^2 to 15.2 kg/m^2, and decreased fat mass from 36.3% to 20.7% compared to the first home visit.



	Pre Op	POD 1	POD 2	POD 3	POD 4	POD 6	POD 8	POD 10	POD 11	POD 13	POD 15	POD 16	HC1	HC2	HC3
Energy intake (kcal/kgBW/day)	39	11	27	33	31	35	32	26	31	27	42	43	50	40	51
Planning of energy intake (kcal/kgBW/day)	39	27	27	34	35	39	40	37	38	30	46	46	50	50	53

BEE: Basal Energy Expenditure; POD: Post-Operation Day; HC: Homecare

Figure 2. Analysis of the Patient's Protein Intake and Planning

DISCUSSION

A 65-year-old woman with adenocarcinoma of the ampulla of Vater underwent Whipple surgery and was treated by a nutrition specialist since day one post-operatively. A study conducted at Dr. Mohammad Hoesin Hospital Palembang showed that the total number of pancreatic cancer patients hospitalized between 2009–2013 was 78 patients accounting for 0.05% of the total hospitalized patients. The highest prevalence is found between the age of 55–64 years.[10] Whipple surgery and pylorus preserving pancreatico–dudodenectomy (P3D) procedure are the most common surgical procedure performed in patients with pancreatic cancer and chronic pancreatitis.[11] The etiology of pancreatic cancer itself is still uncertain, but inflammation may play a role in the development of malignant cells.[12, 13] Risk factors, such as alcohol and red meat consumption, ionizing radiation exposure, and infection may be associated with an increased risk of pancreatic cancer, whereas physical activity and fruit consumption may be associated with a lower risk of pancreatic cancer; however, there is no clear evidence on the associated between these factors and the incidence of pancreatic cancer.[14] Our patient reported a high rates of red meat consumption and low rates of fruit consumption. She did not engage with routine exercise, but still managed to do daily household chores.

The patient experienced a weight loss of 9 kg or 20% within 4 months. Based on her BMI, the patient was considered to have mild malnutrition but she rather was diagnosed with severe malnutrition using GLIM criteria. The GLIM criteria are the newest criteria that have been approved for global use which includes ESPEN and ASPEN. Studies show that nutritional interventions does not have significant effects on patient's clinical outcomes, but the combination of nutritional interventions and other treatment modalities such as the Enhanced Recovery After Surgery (ERAS) program may correlate significant benefits.[15, 16]

Our patient received additional liquid food 8 hours before surgery through administration of 200 mL low lactose milk with a total carbohydrate of 30 g and was fasted afterwards. This is not in accordance with the recommendation of ERAS. Patient preparation with preoperative administration of carbohydrates 2–3 hours prior to surgery can help to reduce insulin resistance.[15] The deviation occurred due to institutional protocol restrictions, as ERAS has not been fully implemented in all departments. Currently in Cipto Mangunkusumo General Hospital, ERAS is only implemented for research purposes and that there are currently no ERAS guidelines applicable for patients planned for elective surgery, besides that it is unlikely

to have additional high-carbohydrate liquid drinks provided by the hospital nutrition installation beyond the meal-time schedule.

The patient complained of having nausea and vomiting following procedure up to 9 days post-operatively. This patient was a woman who underwent major abdominal surgery, and received post-operative opioids, all of which precipitated her risk for developing post-operative nausea and vomiting (PONV).[17, 18] Metoclopramide is the preferred antiemetics given to postoperative patients, and hence the patient was given 3x10 mg metoclopramide therapy until POD 7. The patient also experienced melena from day 4–7 and hence the NGT was maintained for evaluation of active bleeding in the upper gastrointestinal tract, and the patient received omeprazole injection. Melena in this patient may occur due to marginal ulcers caused by changes in GIT anatomy after pancreaticoduodenectomy procedure.[19] PONV and melena in our patient resulted in decreased nutritional tolerance.

The patient did not experience any complications of diabetes or a period of hypoglycemia after pancreatectomy. This is probably because the remaining parts of the pancreas can still meet the daily insulin and glucagon requirements. In this patient, the preoperative ERAS protocol was not implemented, but postoperative glycemic control can be managed with nutritional therapy. The patient was diagnosed with grade A POPF and low output fistula based on the presence of drain fluid production with an increase in amylase levels of more than 3 times compared to the serum amylase level on POD 11 without any other complications and that the daily drain production was <200 mL/day. Patients with malnutrition possess a higher risk of postoperative complications following pancreaticoduodenectomy, one of which being POPF.[20] International Study Group for Pancreatic Surgery recommends that grade A POPF patients can still receive oral nutrition, while grade B and grade C POPF patients are recommended to delay oral intake.[21]

Early enteral nutrition was given to patients within <48 hours after surgery. The amount of nutrition given was adjusted to the condition and function of GIT, as well as patient's tolerance.[15] Patient's intake during ICU stay was around 27–80% of the total energy requirement. ESPEN recommends to provide hypocaloric nutrition that is <70% of the requirement in the first 72 hours of critical illness. The amount of calories can be increased up to 80–100% of the requirement after the third day.[22] SCCM and ASPEN recommendations for critically ill include 25–30 kcal/kg/day administration of caloric intake.[23] Our patient received 33 kcal/kg/day or 80% of the total requirement on POD 2. This is because the other parenteral nutrition which contains less macronutrients and fluids was not available at that time, so the patient was given Nutriflex lipid peri® instead. The patient experienced mild hypokalemia that was corrected through administration of 50 meq KCl as well as spontaneously resolved hypomagnesemia. The patient reported no symptoms of refeeding syndrome,[24] and referring to her pre-operative intake, the patient consumed around 39–42 kcal/kg/day in the last 2 months. This fact was our consideration for providing nutritional support for up to 33 kcal/kg/day for this patient.

Parenteral nutrition was shifted gradually to enteral and oral nutrition and increased gradually in accordance with the patient's tolerance. Early parenteral nutrition may be of benefits to this group of patients, but current evidence is still lacking.[25] Early administration of total parenteral nutrition followed by administration of enteral nutrition will reduce postoperative weight loss and accelerate the metabolic transition to anabolic metabolism which is beneficial for recovery.[25] During treatment the patient was given gradual nutrition and reached 43 kcal/kg/day or 109% of the requirement upon discharge.

ESPEN recommendations for protein administration in postoperative patients is a minimum of 1.5 g/kg/day.[15] During treatment, our patient received protein intake of up to 1.9 g/kg/day. Post-pancreatectomy patients be given fat for 30% of the total calories.[26] Fat intake in post-operative patients was 18–47% of the total calories. The recommendation for fat intake in patients with cancer is 20–35% of the total energy requirement.[27] The high percentage of fat intake only occurs at the initial post-operative days due to the high fat content in parenteral nutrition. The mean percent of post-operative carbohydrate intake was 50% of the total calories. Carbohydrates can be given for a total of 50%-60% of the total energy.[15] The recommended fiber intake to prevent metabolic disease and insulin resistance is 20–35 g/day.[28-30] At the end of treatment, the patient's fiber intake was 22 g/day. Fiber intake was prioritized in post-Whipple patients to support gut motility, which is essential for preventing complications such as delayed gastric emptying, constipation, and bacterial overgrowth. Adequate fiber also contributes to glycemic control and overall metabolic stability—an important consideration given the increased risk of endocrine insufficiency and insulin resistance following pancreatic surgery.[31, 32] The patient received post-operative micronutrient supplementations, that aimed to help promote wound healing needs to be given along with adequate energy and protein intake.[33] This patient was only given supplementation covered by our National Health Coverage.

This patient experienced postoperative PONV and POPF, but there was no signs of surgical wound infection upon observation and the wound healed well except for the POPF section. The patient experienced an increase in body weight of 0.9 kg in 16 post-operative days. A study by Siervo et al.[34] performed on healthy subjects found an increase in body weight of 0.7 kg with nutritional support for as much as 20% above the energy requirements given for 3 weeks. The energy requirement calculated in this study was 1.5 times of the basal energy requirement.

During post-operative care the patient experienced improvements in functional capacity and grip strength. Administration of optimal nutrition with the ERAS protocol accompanied by physical exercise has a positive impact on postoperative functional capacity in gastrointestinal cancer patients.[35] Van Beijsterveld et al.[36] found that the median time needed to restore functional capacity following pancreatic resection is 6.5 days, with a recovery period ranging from 1–49 days. Our patient was able to sit alone on POD 3, stand unaided on POD 12, and walk unaided on POD 13.

The patient was hospitalized for 26 days with 4 days at the ICU and a total of 16 days of post-operative care. The length of stay of this patient was shorter than reported previous studies. Probst et al.[37] studied 69 post-pancreaticoduodenectomy patients and found a mean length of stay in the ICU was 6.8 days. Jiang et al.[3] performed a study in patients undergoing Whipple surgery and reported that the average length of stay was 11,9 ± 0,9 days, and length of stay of patients with postoperative complications was reach up to 30 days. In a cohort study involving 6,216 patients who undergo Whipple surgery found 22% incidence of readmission within 30 days with a mortality rate of 3.7%.[5] This patient was to be discharged and had no readmission within 2 months. Carey et al.[38] demonstrated that patients undergoing upper GIT surgery experienced a decrease in body weight of around 9.8 kg in 6 months postoperatively, and therefore nutritional education when returning home is also needed.

At the third home visit, the patient's scar and POPF had completely closed. Previous studies showed that the interval time needed for complete closure of the pancreatic fistulas varies between 1 week and 11 months.[39] The patient could follow the dietary guide and initiated normal daily activities. Upon home visit, the reported dietary intake was around 40–50 kcal/kg/day (almost 2 times basal energy requirement) with 1.4–2.2 g/kg/day protein. Recommendations from the ESPEN expert group and ERAS guidelines include a protein intake of 1.5–2.0 g/kg of body weight per day in the postoperative period to support maintaining muscle mass during recovery and to promote optimal healing.[40, 41] During the rehabilitation period, protein intakes of at least 1.6 g/kg/day, and up to 2.0–3.0 g/kg/day, are generally recommended. Distributing this intake evenly throughout the day—approximately 20–40 g per meal—can help optimize muscle protein synthesis. This approach supports increases in lean body mass, strength, and functional capacity, ultimately facilitating a faster return to activities of daily living.[42, 43] The patient reached the normal BMI at the third visit, experienced a decrease in fat mass and an increase in muscle mass starting from the second home visit, and an increase in FFMI at the third visit. The RCT study by Pedersen et al.[8, 9] performed in 208 patients aged 75 years or older with malnutrition found that patients who received home visits for nutritional counseling and consultation by dietitians have a lower risk of readmission to hospital after 30 and 90 days post-discharge,[8] and maintained or increased functional capacity as assessed by the Barthel score, but there were no differences in physical measures, quality of life, and emotional health status compared to patients who did not receive follow-up after discharge from hospital.[9] As a single case report without a control group, the findings may be influenced by natural recovery or other supportive care. Generalizability is limited, and confounding factors like patient motivation and baseline status cannot be ruled out. Controlled studies are needed to confirm these results.

CONCLUSION

In conclusion, comprehensive nutritional medical therapy in the hospital and homecare given to patients with adenocarcinoma of the ampulla of Vater who undergo Whipple surgery and are diagnosed severe malnutrition has a positive role in improvement of clinical complaints and post-operative morbidity, intake tolerance, blood glucose control, wound healing, functional capacity, as well as nutritional status, thereby reducing length of hospital stay and preventing readmissions. Clinical implications highlight the importance of integrating personalized nutrition as part of routine perioperative care in high-risk surgical oncology patients, especially Whipple surgery. Early screening, targeted nutrient support, and post-discharge monitoring may improve recovery and reduce healthcare costs. Future research should assess long-term outcomes of tailored nutrition post-Whipple—such as quality of life, treatment tolerance, and readmission rates—and compare standard care with structured interventions like home-based nutrition support.

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