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# Improving Nutritional Status of Malnourished Bedridden Patient Diagnosed with Deep Vein Thrombosis and Pulmonary Embolism: A Case Study Approach

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## Abstract

Malnutrition is common among hospitalized bedridden patients. Nutritional management of hospitalized patients is a necessity in order to improve their nutritional status and disease conditions. The objective of nutritional management of malnourished bedridden patient diagnosed with deep vein thrombosis and pulmonary embolism was to improve nutritional status of the patient through gradual provision of calorie and protein intake with viewed of improved body protein status and controlled muscle wasting. Nutritional status was assessed by anthropometric, biochemical, clinical and dietary information. SGA was used to assess the malnutrition status of the patient. Since the patient was severely malnourished, she was fed with NG feeds followed by PEG feeds by gradually increasing calorie and protein up to the target level mainly through nutritional supplements for the one and half months of hospital stay. Patient's serum protein, albumin levels and muscle mass were improved. According to the SGA, the patient was at normal/ well-nourished condition after nutrition management. Dietary management incorporating nutrition supplements indicated improvement of nutritional status of severely malnourished bedridden patient.

### Keywords

Bedridden patients; Malnutrition; Nutritional management; Nutrition supplements

## Abbreviations

ASPEN:  American Society for Parenteral and Enteral Nutrition
CRP:  C - Reactive Protein
DRM:  Disease Related Malnutriiton
DVT:  Deep Vein Thrombosis
GI:  Gastrointestinal
MNT:  Medical Nutrition Therapy
MUAC:  Mid Upper Arm Circumference
NG:  Nasogastric
PE:  Pulmonary Embolism
PEG:  Percutaneous Endoscopic Gastrostomy
RFS:  Refeeding Syndrome
SGA:  Subjective Global Assessment

## Introduction

Disease-related malnutrition (DRM) is a highly prevalent disease within the hospital environment (Morán López *et al.*, 2016). It is associated with a worse clinical outcome, longer hospital stay and higher costs (Bonilla-Palomas *et al.*, 2016). Malnutrition leads to a range of poor clinical outcomes (Charlton et al., 2012). Malnourished patients who did not receive any nutritional intervention experienced further deterioration in nutritional status in the seven days following admission (McWhirter & Pennington, 1994). Malnutrition increases the risk of developing infection and pressure ulcers (Banks *et al.*, 2010a).

Improving nutritional status of these patients is essential for rapid cure, reduce hospital stay and reduce the cost.

Deep vein thrombosis (DVT) is the formation of blood clots (thrombi) in the deep veins. It commonly affects the deep leg veins (such as the calf veins, femoral vein, or popliteal vein) or the deep veins of the pelvis (Emeka *et al.*, 2011). Despite adequate therapy, 1% to 8% of patients in whom pulmonary embolism develops will die, whereas others will experience long-term complications such as postphlebitic syndrome (40%) and chronic thromboembolic pulmonary hypertension (4%) (Scarvelis and Wells, 2006). Compared with DVT, pulmonary embolism is more often fatal, has a higher recurrence rate, and presents with less specific symptoms. Pulmonary embolism is usually a consequence of DVT (Wilbur and Shizan, 2012).

This case study focuses on nutritional management of hospitalized malnourished bedridden patient with DVT and PE.

## Materials and Methods

### Case details

A 59 years old woman was diagnosed with deep vein thrombosis in left calf and bilateral pulmonary embolism. She had past history of right side arterio-venous malfunction, bronchial asthma, ischemic heart disease. She was unconscious at the time of admission. Before admission to the hospital, she had been admitted to another hospital and on NG feeds for two months.

## Nutrition assessments

### Anthropometric Assessments

Estimated body weight and height were 50 kg and 153 cm, respectively and mid upper arm circumference (MUAC) was 23.0 cm. Changes of MUAC throughout the hospital stay is shown in table 1.

| Day | On admission | 2 weeks of admission | 3 weeks of admission | One month admission |
|---|---|---|---|---|
| MUAC | 23.0cm | 23.5cm | 24.5cm | 25.5cm |

**Table 1:** Mid upper arm circumference on the day of admission and throughout the hospital stay

### Biochemical Assessments

Biochemical parameters of the patient were taken before and during the nutritional management is shown in table 2.

| Parameter | Unit | Reference value | On admission | 15 days of admission | One month of admission | 1 ½ months of admission |
|---|---|---|---|---|---|---|
| Total protein | g/dl | 6.6-8.3 | 4.99 | 4.7 | 5.98 | 6.67 |
| Serum albumin | g/dl | 3.5-5.2 | 2.31 | 2.2 | 3.08 | 3.35 |
| S. creatinine | mg/dl | 0.66-1.09 | 0.41 | 0.45 | 0.43 | 0.48 |
| Sodium | mmol/l | 136-146 | 135 | 141 | 139 | 142 |
| Potassium | mmol/l | 3.5-5.1 | 4.04 | 4.56 | 4.84 | 4.1 |
| Chlorine | mmol/l | 101-109 | 103 | 109 | 104 | 107 |
| Hemoglobin | g/dl | 11.8-16.5 | 10.6 | 9.8 | 10.3 | 10.4 |
| CRP | mg/dl | <5 | 13.4 | 13.6 | - | - |

**Table 2:** Biochemical parameters of the patient on the day of admission and throughout the hospital stay.

### Clinical Assessments

The patient was unconscious. Edema was not present throughout the hospitalized period. Clavicle and Acromion bone region muscles and interosseous muscles of dorsal hand were wasted.

| | Units | NG Feed | 1st PEG feed | 2nd PEG feed | 3rd PEG feed | 4th PEG feed | 5th PEG feed |
|---|---|---|---|---|---|---|---|
| Total feed volume | ml | 2000 | 250 | 1000 | 1500 | 1750 | 2000 |
| Volume of one feed | ml | 150-200 | 50 | 100 | 150 | 175 | 200 |
| Energy density | Kcal/ml | 1 | 1 | 1 | 1-1.2 | 1-1.2 | 1-1.2 |
| Calorie | Kcal | 1500 | 200 | 1000 | 1500 | 1750 | 2000 |
| | Kcal/kg | 30 | - | 20 | 30 | 35 | 40 |
| Protein | g/kg | 1.2 | - | 1.2 | 1.4 | 1.7 | 2 |
| | g | 60 | 8.5 | 60 | 70 | 85 | 100 |
| | %from energy | 16 | 17 | 24 | ~19 | ~19 | 20 |
| CHO | % from energy | 54 | 53 | 46 | 51 | 51 | 47 |
| | g | 203 | 26.5 | 115 | 191 | 223 | 235 |
| Fat | % from energy | 30 | 30 | 30 | 30 | 30 | 33 |
| | g | 50 | 6.7 | 33 | 50 | 58 | 73 |

**Table 3:** Nutritional management plan of the patient through NG and PEG feeds.

## Dietary Assessments

She could not take food orally. She was on NG feeds at the time of hospitalization. She had recurrent vomiting and less food intake since two months.

## Medical management (Drugs)

Omeprazole, FeSO4, Warfarin, Meropenem, Metoclopramide

## Nutrition diagnosis

This patient was severely malnourished related to poor food intake for about two months as evidence by SGA nutrition assessment (annexure 1), reduced serum albumin and protein levels and reduced mid upper arm circumference which was closer to margins of cut off value (<22.0 cm). The patient is slightly anemic as seen by her hemoglobin levels.

## Goals of MNT

- To improve nutritional status of the patient through gradual provision of calorie and protein intake
- To improve body protein state and control muscle wasting
- To correct micronutrient deficiencies
- To improve immune functions

## Dietary management during the hospital stay

The patient was at risk of refeeding syndrome since she was in malnourished category and did not have adequate food intake for a long time. The targeted calorie and protein requirement was 2000kcal and 100g (2g per kilo gram of body weight), respectively. But, enteral nutrition was recommended starting with low amount of calorie and protein in order to prevent from refeeding syndrome. Gradually, energy and protein levels were increased up to the target. On the day of admission usual hospital NG feeds were given and patient specific NG feeds were started from second day. After one week of NG feed PEG feeds were started and continued by gradually increasing energy and macro nutrients as show in table 2.

Initially, the patient was fed with patient specific NG feeds with follow up supervision of the dietitian. Since she had tolerated usual hospital NG feed with 1000 kcal energy, 1g/kg of body weight protein, and 200 ml volume per feed, her NG feed contained 1500 kcal per day and volume per feed was 150-200ml. Energy density was maintained as 1 kcal /ml and protein given as 1.2 g/kg of body weight. Her normal energy requirement was given with higher protein content with this NG feed. Energy and protein intake was increased gradually, since she needs high energy and protein to recover from malnutrition.

She was fed with two hourly from 6.00 am to 12.00 pm with ten feeds. Fluid intake was decided by discussing with physician and observing her urine output. Around 2000 ml of fluid could be given to her from feeds and part of that fluid was given with the feeds and remaining was given as water.

After one week of admission, PEG feeding was started. 1st PEG plan was started with very low feed volume and energy level. Since PEG tube was inserted at around 12.00 pm, feeding was started after about 4 hours of insertion and only five feeds could be given on that day. Initial feeding volume was 50 ml and the patient was closely monitored to check the tolerability of the feed. From the 2nd day onwards of the PEG insertion, ten feeds were given for a day. Fluid volume was increased as 50ml, 100 ml, 150 ml, 175 ml and finally 200 ml. Along with increased fluid volume, calorie level was gradually increased as 200 kcal, 1000 kcal, 1500 kcal, 1750 kcal and finally 2000 kcal was continued until patient gets complete recovery. Energy density was maintained as 1kcal/ ml or less in initial feeds and it was 1-1.2 kcal/ml in last feeds. Initially protein was given as 1.2 g/kg of body weight with NG feed and 2nd PEG feed. Thereafter, it was increased gradually as 1.4 g/kg, 1.7 g/kg and finally 2g/kg was continued until the recovery.

Nutrition supplements were suggested as main food item in all the meal plans. Only two or three kitchen feeds were given for a day and rest were given by nutrition supplements.High energy formula (Pentasure (2.0) and sustacal) were suggested as nutrition supplements for the patient since they are specially produced for the patients who need high calorie amounts.

## Results (Clinical outcomes)

There was a negative nitrogen balance due to high protein catabolism than protein synthesis. Her CRP level was not much high (~13.6). Therefore serum albumin level was taken as an indicator of body protein status. Her serum albumin and total protein levels were lower than normal values on admission. Gradual increase of dietary protein level was effective to reach the target protein intake (2 g/kg). Her improvement could be observed by increased serum albumin levels and mid upper arm circumference in 15 days period (See 2). Serum albumin level was increased from 2.31 to 3.08 after one month and to 3.35 after 1 ½ months of admission as shown in figure 1.
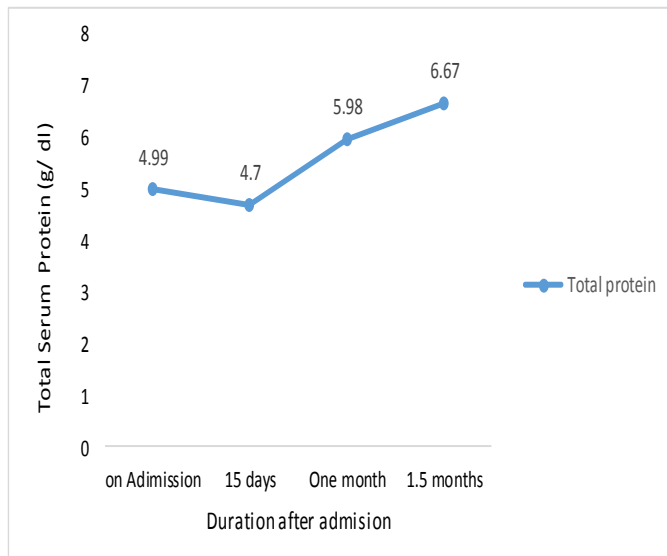


**Figure 1:** Changes in Total serum protein level during hospital stay with the provision of high calorie high protein diet.

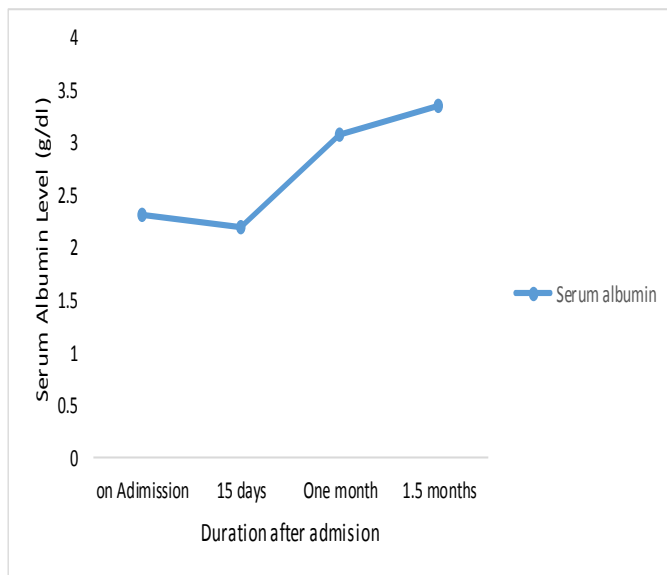Improvement of serum total protein level is shown in figure 2.



**Figure 2:** Changes in serum albumin level during hospital stay with the provision of high calorie high protein diet.

The mid upper arm circumference was increased from 23 cm to 25.5 cm after one month of admission through nutrition care process ( see table 1). This indicates that the patient's body protein level has been increased to normal range and muscle mass has been increased by provision of high protein and high calorie diet. Patient was in normal/ well-nourished category according to the SGA after nutrition management (annexure). Patient was conscious and started to take foods orally after one and half months nutritional care process.

## Discussion

Many studies have shown that patient outcomes can be improved with adequate nutrition support (Smedley *et al*., 2004). There is a large and growing body of evidence to show that nutrition support is effective and leads to improved nutritional status and clinical outcomes in malnourished patients. Adequate nutrition is essential to the bedridden malnourished patients to help anabolism and control catabolism to maintain proper immune system and speed up disease recovery. If dietary intake is not able to meet requirements, oral supplementation is the next line of treatment, followed by tube feeding and finally, if the gut is not working and there is contraindication to feed enterally, parenteral nutrition can be explored (Thomas, 2001). The patient was hemodynamically stable and had a functioning gastrointestinal tract. Thus enteral nutrition was best to provide adequate nutrition to her.

Subjective Global Assessment (SGA) is well accepted as an assessment tool in clinical practice (Lochs *et al.*, 2006). It has been regarded by ASPEN as the best nutrition assessment tool and one of the only two tools (the other one being MNA) recognised as an assessment tool (A.S.P.E.N. Board of Directors and the Clinical Guidelines Taskforce, 2002). It is an easy, non-invasive and inexpensive tool for widespread use by trained clinicians or dietitians (Keith, 2008). Subjective Global Assessment has been widely accepted and used as a diagnostic tool for malnutrition, to track clinical outcomes and as a reference standard to validate nutrition screening tools (Steenson *et al.*, 2013). Hence SGA was the tool that used to assess malnutrition of the patient. This patient did not have any chronic disease condition related to the diet but she was severely malnourished as assessed by subjective global assessment (SGA). Hence nutrition management was focused towards improvement of her nutrition to correct malnutrition condition, micronutrient deficiencies with improved immune system and improve body protein status.

Diet plans were prepared to avoid over feeding, provide adequate energy, protein, carbohydrates, vitamin, mineral and fluids as her requirements. All nutrients were provided gradually by observing her improvements of conditions and clinical features. She requires high amount of energy, protein and other macro and micronutrients. But, they cannot be given suddenly because of refeeding syndrome (RFS). RFS may occur usually in malnourished patients undergoing re-feeding after a period of under nutrition (Rio *et al*., 2013). Hospitalized patients with risk of malnutrition demonstrate significant risk of RFS (Pourhassan *et al*., 2017). As malnutrition is the main risk factor for RFS, routine malnutrition screening should also screen for risk of RFS (Boland *et al*., 2013). The syndrome is complex and may feature hypophosphatemia, abnormal sodium and fluid balance; changes in glucose, protein and fat metabolism' thiamine deficiency; hypokalemia and hypomagnesaemia (Mehanna *et al*., 2008). Therefore it was suggested that this patient is at risk of RFS anf energy and all the nutrients were provided gradually.

During feeding tolerance was determined by physical examination, passage of stool and vomiting conditions. GI intolerance is usually defined by vomiting, abdominal distention, complaints of discomfort, high NG output, high GRV, diarrhea, reduced passage of flatus and stool, or abnormal abdominal radiographs (ASPEN, 2016). If the patient do not tolerate the feed, diarrhea and vomiting can be occurred. Initially she had diarrhea, but after one- two days she tolerated the feed since she was given metoclopramide drug. Metoclopramide drug was very much important to tolerate the feed for the patient. Metoclopramide increases the lower oesophageal sphincter pressure, gastric tone, forward peristalsis of the stomach and the duodenum, while simultaneously decreasing pyloric sphincter pressure. These mechanisms accelerate gastric emptying, reduce gastric stasis and residual volume, and thus decrease gastroesophageal reflux (Warusevitane *et al*., 2014). This reduced the vomiting condition of the patient and helped to patient to tolerate the feed.

Protein is very important to increase the response of immune system, increase muscle mass which loss during illness and prevent from protein energy malnutrition. If patient do not receive adequate protein, she may be at risk of getting infections, increased synthesis of acute phase proteins (CRP, Fibrinogen), reduced gut functions muscle wasting and decreased functions of respiratory muscles (Hoffer & Bistrian, 2014).

In the final meal plan she was given 2 g/kg of protein and was continued without further increment. Protein requirements are expected to be in the range of 1.2–2.0 g/kg actual body weight per day in critically ill patients except in burn or multitrauma patients. Providing proteins higher than 2 g/kg per day do not give additional benefits unless in burn or multitrauma patients (ASPEN, 2016). Therefore final protein level was 2 g/kg/ day and continued until complete recovery by observing renal function. Serum creatinine, blood urea nitrogen, uric acid levels were assessed to know the protein metabolism in the body and to measure whether the protein intake is excessive for the patient. Carbohydrates and fat was given as normal requirements in initial meal plans. After that fat content was little increased with reduced carbohydrate level. Fat is a good source of energy dense foods. Energy dense foods are very important to patients who are fed with enteral nutrition in order to provide adequate nutrition along with given fluid amount.

Studies have shown that judicious use of nutrition supplements can improve weight, protein and energy intake, nutritional status, physical function, quality of life and length of stay in acute care (Dietitians Association of Australia, 2009)

Nutrition supplements are the best sources to provide adequate nutrition for tube feeding patients. Supplements contain almost all the macronutrients and micronutrients in correct proportions. The osmolality of supplements are similar to the blood osmolality value which is around 300 mOsm /kg and 300-350 mOsm /kg in supplements are considered to be iso-osmolar. As well as these products have been produced under hygienic conditions and it requires less contribution to be prepared and give to the patient. Then the risk of contamination is less when compared to kitchen feeds. The risk of getting infection is high with kitchen feeds since they are prepared under less hygienic conditions. Further the osmolality cannot be controlled and measured in those kitchen feeds and normally osmolality value is high in them. All the nutrients in the food cannot be extracted to the feed though it is blended and filtered. Hence the energy density and nutrient content is low in kitchen feeds and unable to provide required nutrition with given feed volume. With the consideration of all these reasons, supplements are the best source to provide adequate nutrition for patients.

## Conclusion

This is one of the few cases that reports the applying the nutrition care process for malnourished bedridden patient. Energy, protein, feeding mode, feeding volume, tolerability, refeeding syndrome, type of food sources were several factors to be considered when planning nutrition care process for these people. Nutritional status of malnourished patient of this case was improved along with high energy and high protein diets provided mainly by commercial nutrition supplements through enteral feeding.

## References

1. A.S.P.E.N (2016) Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of critical care medicine (SCCM) and American society for parenteral and enteral nutrition (A.S.P.E.N.). *Journal of Parenteral and Enteral Nutrition.* 40(2), 159-211.
2. A.S.P.E.N. (2002) Board of Directors and the Clinical Guidelines Taskforce  Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. *Journal of Parenteral and Enteral Nutrition*. 26,1SA-138SA.
3. Banks M, Bauer J, Graves N, Ash S (2010a). Malnutrition and pressure ulcer risk in adults in Australian health care facilities. *Nutrition*. 26, 896-901.
4. Boland K, Solanki D, O'Hanlon C (2013) Prevention and treatment of refeeding syndrome in the acute care setting; Irish society for Clinical nutrition and Metabolism.
5. Bonilla-Palomas JL, Amez-L-opez ALG, Castillo-Dom_ınguez JC, Moreno-Conde M, L_opez Ib_a~nez MC, Alhambra Exp_osito R, Ramiro Ortega E, Anguita-S_anchez MP and Villar-R_aez A (2016) Nutritional Intervention in Malnourished Hospitalized Patients with Heart Failure. *Archives of Medical Research.* 47,535-540.
6. Charlton K, Nichols C, Bowden S, Milosavljevic M, Lambert K, Barone L, Mason M and Batterham M (2012) Poor nutritional status of older sub-acute patients predicts clinical outcomesand mortality at 18 months of follow-up. *European Journal of Clinical Nutrition*. 66, 1224-1228.
7. Dietitians Association of Australia (2009) Evidence-based guidelines for the nutritional management of malnutrition in adult patients across the continuum of care. *Nutrition and Dietetics*. 66(3), S1-S34.
8. Emeka K, Chinenye K, Jebbinm N, Eshiobo I, Andrew D (2011) Deep vein thrombosis: a clinical review. *Journal of blood medicine*. 2, 59-69.
9. Hoffer LJ, Bistrian BR (2014) What is best nutrition support for critically ill patients? *Journal of hepatobiliary surgery nutrition.* 3(4), 172-174.
10. Keith JN (2008) Bedside nutrition assessment past, present, and future: a review of the Subjective Global Assessment. *Nutrition and Clinical Practice.* 23, 410-416.
11. Lochs H., Allison SP, Meier R, Pirlich M, Kondrup J, Schneider S, van den Berghe, G ,Pichard C (2006) Introductory to the ESPEN Guidelines on Enteral Nutrition: Terminology, definitions and general topics. *Clinical Nutrition*. 25, 180-186.
12. McWhirter JP, Pennington CR (1994) Incidence and recognition of malnutrition in hospital. *Biomedical Journal*, 308, 945-948.
13. Mehanna HM, Moledina J, Travis J (2008) Refeeding syndrome: what it is, and how to prevent and treat it. *British medical journal*. 336 (7659), 1495-1498.
14. Morán López JM, Beneítez Moralejo B, Piedra León M, Enciso Izquierdo FJ, Luengo Pérez LM, Amado Se˜naris, JA Benefits of early specialized nutritional support in malnourishedpatients. *Journal of Medicina Clinica.*
15. Pourhassan M, Cuvelier I, Gehrke I, Marburger C, Modreker MK, Volkert D, Willschrei, HP and Wirth R (2017). Risk factors of refeeding syndrome in malnourished older hospitalized patients. *Clinical Nutrition.*
16. Rio A, Whelan K, Goff L, Reidlinger DP, Smeeton N (2013) Occurrence of refeeding syndrome in adults started on artificial nutrition support: prospective cohort study. *Biomedical Journal*, 3.
17. Scarvelis D, Wells, PS (2006) Diagnosis and treatment of deep-vein thrombosis. *Canadian Medical Association Journal*.175(9), 1087-1092.
18. Smedley F, Bowling T, James M, Stokes E, Goodger C, O'Connor O, Oldale C, Jones P, Silk D (2004) Randomized clinical trial of the effects of preoperative and postoperative oral nutritional supplements on clinical course and cost of care. *British Jornal of Surgery*. 91, 983-990.
19. Thomas B (2001) Manual of Dietetic Practice: Undernutrition and principles of nutritional support. 3rd ed. Blackwell Science Ltd, Oxford.
20. Warusevitane A, Karunatilake D, sim J, Lally F, Roffe C (2014) Safety and effect of metoclopramide to prevent pneumonia in patients with stroke fed via nasogastric tubes. *Journal of American heart association*.46, 454-460.
21. Wilbur J, Shian B (2012) Diagnosis of deep venous thrombosis and pulmonary embolism. *American Family Physician*. Available at www.aafp.org/afp. Accessed on 27th May, 2018.