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MESSAGE FROM THE PRESIDENT

Medical science has developed so much to reduce the mortality after a critical illness. The deaths are prevented in the critical care units and most of them getting discharged from the hospital after their critical illness. But most of them are crippled with reduced mobility and couldn't go back to their pre illness activities for a longer period.

Prof. Paul Wischmeyer from Duke university use to describe this phenomenon as "Winning the battle but losing the war"! The main reason for the survivors taking that prolonged course to reach their ability to perform well is due to their loss of lean body mass and especially the skeletal muscle mass during their critical illness. This sarcopenia is going to be a pandemic when the mortality in critical illness are reduced and the survivors are going to be victim's!

When the auto catabolism eats their own fat free mass it's our duty to replenish it not only in their critical days but also during their recuperation. This sarcopenia is not only seen in critical illness but also in cancer and surgical patients.

This initiative of protein perception mapping by IAPEN INDIA is to address the protein requirements in these areas of illness.

It came out well which can help the physicians, surgeons and dietitians treating such patients to deliver this evidences for the recovery of them

Dr P C Vijayakumar
President

PERCEPTION OF PROTEIN IN CRITICALLY ILLNESS

Among hospitalized patients, critically ill subgroup is at increased risk of malnutrition due to underlying catabolic state which lasts for weeks to months even after patients survive the illness. Optimal Energy delivery with targeted protein intake along with adequate calories right from the early acute phase till the end of convalescence phase goes a long way in reducing adverse outcomes during hospital stay and post discharge.

Knowledge of optimal Protein targets and delivery methods in different disease states is important to achieve desired nutrition goals and to bridge the 'protein gaps' which exists in many patients despite best efforts.

In this summary, we have given a comprehensive overview of proteins in critically ill and incorporated the latest recommendations to help our clinical nutritionists, intensivists/physicians to understand the importance and deliver best practices in patient care for optimal outcomes from nutritional perspective.

On behalf of IAPENIndia Protein panel, I sincerely thank all for perceiving and publishing this protein summary to greater benefit of our clinical nutrition fraternity and patients.

Dr Harish Kumar Ambekar

Hon. President IAPENIndia - Bangalore Chapter
Panel head

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MALNUTRITION IN CRITICAL ILLNESSES

Malnutrition is a global area of concern as it often goes undetected or there is lack of awareness and trained personnel to deal with this problem.

It aggravates the primary disease process and the risks associated with it.

In India, although inpatients are screened in most tertiary care centres, **outpatients are often not subjected to a structured assessment due to below reasons:**



Lack of awareness regarding the **importance of a nutritional assessment**

Lack of **trained nutritionists**

Up to 30% of all patients in hospitals are recognised to have significant **hospital-acquired or disease-acquired protein malnutrition.**

Thus, assessment of malnutrition has been recommended by nutrition and medical societies worldwide.



NUTRITIONAL SCREENING TOOLS AND THEIR IMPORTANCE

40%-50% of ICU patients are malnourished, depending on the screening tool used and the patient population.

The most used screening tools are:

NRS-2002¹ and **MUST²** are used widely as they are a quick method relying on simple parameters like



Weight loss



Oral intake

NUTRIC score⁴ designed specifically for critically ill patients, takes into account severity of the disease, APACHE score (with or without inflammation).

Modified NUTRIC score⁵ can be used where IL-6 markers are not readily available.

SGA³ has a more functional approach when assessing a patient.

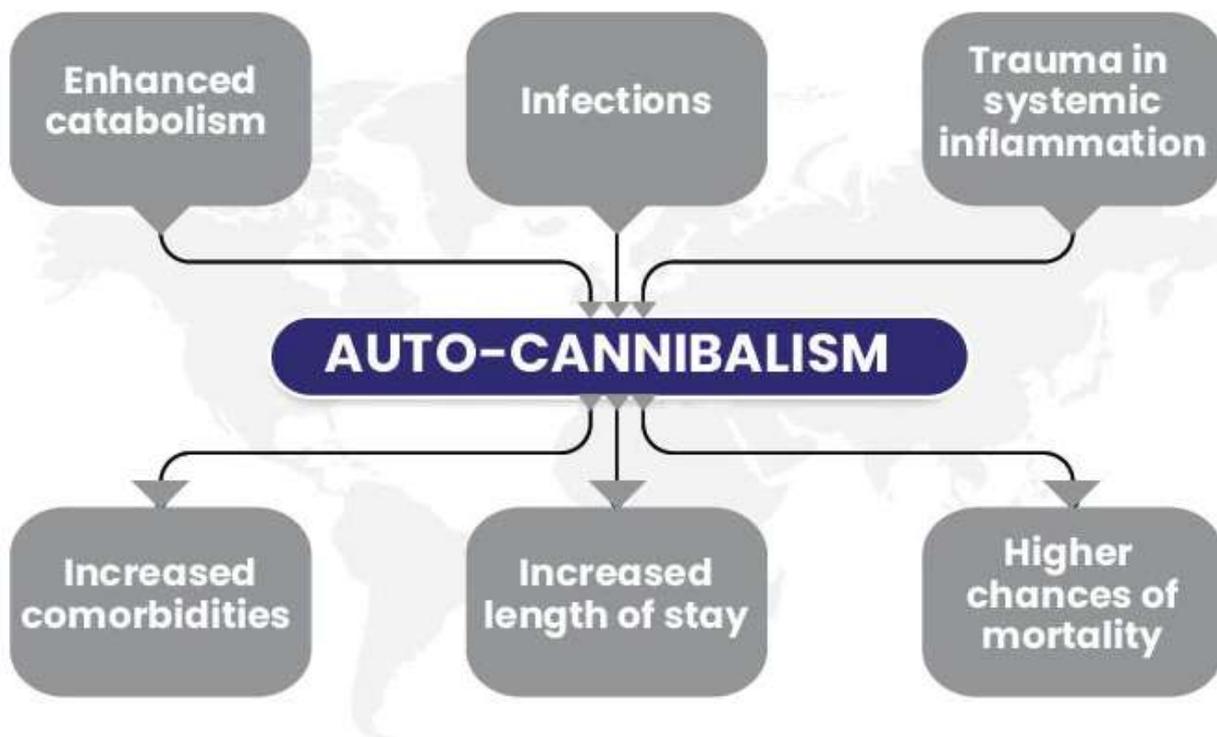
GLIM⁶ New tool developed in January 2016 considers phenotype and etiological factors.

To assess ICU patients, the focus is more towards functional and nutritional parameters and the percentage of fat free mass (FFM) – the most accurate measure being CT scan.

- Subjective Global Assessment (SGA)
- Nutrition Risk Screening (NRS-2002)
- Nutrition Risk in the Critically Ill (NUTRIC)
- Malnutrition Universal Screening Tool (MUST)²
- Modified NUTRIC score
- Global Leadership Initiative on Malnutrition (GLIM)

NUTRITION IN CRITICAL ILLNESS AND RECOVERY

Profound effect of malnutrition in the critical care setting



Medical Nutrition Therapy (MNT) is a comprehensive view of a patient's overall clinical condition and including the below mentioned, contributing to improved outcomes in treatment of critically ill



Micronutrients



Fluid management



Immunity boosting elements



Macronutrients, especially protein

Nutrition therapy focuses on



Reducing metabolic stress response



Modulating immunity



Controlling oxidative cellular damage

How does critical illness impact the protein status?

Early acute phase
(first 24-48 hours)
Overall decrease in metabolism

Glycogenolysis in the liver
(continues to late acute phase)

Severe muscle wasting

Prevents protein availability for cell regeneration

Severe muscle wasting increases the energy and protein requirement in the recovery phase



ROLE OF PROTEIN IN CRITICALLY ILL PATIENTS AND RECOVERY

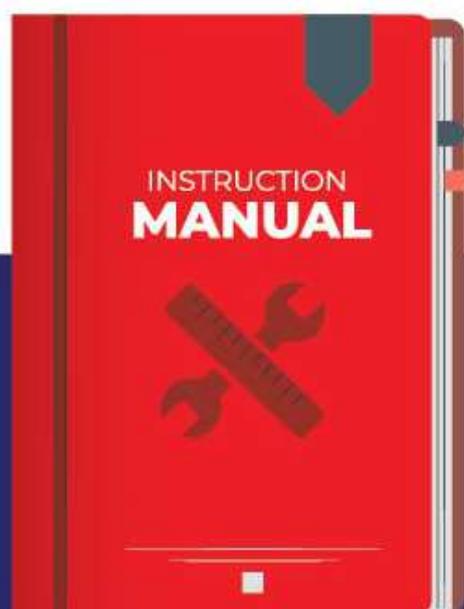
An additional 30 g protein per day, or 1000 Kcal per day delivered during the late acute and recovery phase of ICU stay would⁷⁻¹⁰

- Reduces infectious complications
- Decreases mortality
- Exerts a favourable anabolic response

Guidelines recommend delivery of oral protein supplement during recovery phase.

ASPEN 2021: 1.2-2 g/kg/day

ESPEN 2019: 1.3 g/kg/day



Protein in critically ill renal compromised patients

Patient	Recommendation
Hospitalised patient with <ul style="list-style-type: none">- AKI, AKI on CKD, CKD, with acute/critical illness	Start with 1 g/kg/BW/day, and gradually increase up to 1.3 g/kg/BW/d if tolerated
Critically ill patients with <ul style="list-style-type: none">- AKI or AKI on CKD or CKD with kidney failure (stage V of CKD) on conventional intermittent RRT	1.3-1.5 g/kg/d
Critically ill patients with <ul style="list-style-type: none">- AKI or AKI on CKD or CKD with kidney failure on CRRT- Prolonged Intermittent RRT	1.5 g/kg/d up to 1.7 g/kg/d

NEED FOR PROTEIN SUPPLEMENTATION IN CRITICALLY ILL PATIENTS

Patient nutritional needs change over the **course of illness**.^{11,12}

After ICU and hospital discharge, **achieving protein target is more difficult** than reaching caloric goals.¹³

Hence, **very high-dose protein and calorie feeding** for prolonged duration is necessary to optimise the outcome.¹³

High-protein oral nutrition supplements are likely essential in this period¹³

Meta-analyses in various hospitalised patients demonstrated that Oral Nutritional Supplementation (ONS) reduces¹⁴⁻¹⁷



Hospital complications



Hospital re-admissions



Length of stay



Hospital costs

A recent large RCT studied the role of high protein ONS and demonstrated mortality reduction at 90 days mortality.¹⁷



Post-ICU patients:

1.5–2.5 g/kg/day of proteins should be considered

Post-discharge patients:

35 kcal/kg/day energy intake should be considered

Recovery period:

2–2.5 kcal/kg/day protein intake should be considered

Convalescent protein intake

2.0–2.5 g/kg/day seems optimal



Conclusion:

During and after ICU care, optimal protein delivery is essential to improve the long-term outcome to reduce the likelihood of the patient having adverse outcomes.

Personalised nutrition therapy, while respecting different targets during the phases of the patient journey after critical illness, should be prescribed and monitored.

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PROTEIN USAGE PERCEPTION IN SURGERY

Protein is the building block of the body and its maintenance is vital for survival. In the perioperative period, protein homeostasis needs to be maintained to prevent catabolism. Less protein reserve will have significant consequences in post-operative complications, recovery and hospital stay. All surgical units should put sufficient efforts to make sure that nutritional advice is given keeping in mind the protein requirements

Dr Biju Pottakkat
Panel head

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PROTEIN MALNUTRITION IN INDIA

Indian consumes around 47 g of protein per day, which is the lowest as compared to other Asian and developed countries.¹

Thus, the average intake of protein is about 10% of total energy leading to poor quality intake and malnutrition (15% to 70% in hospitalised patients).²

Due to inadequate protein intake, during stress response, skeletal muscles serve as a primary source of amino acid for gluconeogenesis, wound healing, and immune function.³⁻⁵

Thus, major surgeries are followed by protein catabolism, **hypercortisolemia, immobility, and hyperglycemia, leading to⁶**



Delayed wound healing



Increased length of stay



Surgical site infections

Therefore, protein supplementation play a major role in muscle protein synthesis and maintaining blood sugar levels to help regulate surgical stress, and recovery.⁵

According to the European Society for Nutrition and Metabolism guidelines for clinical nutrition in surgery,

NUTRITION AND METABOLISM GUIDELINES

High-quality protein intake required to meet the need during perioperative phase

RECOMMENDED PROTEIN INTAKE
1.2 to 2.0 g/kg/day



RECOMMENDED PROTEIN QUALITY

To overcome the catabolic phase, increasing the protein quality is necessary.⁸

Animal protein being the highest quality of protein, ensures achievement of sufficient intake of all essential amino acids (EAAs).⁹ (Figure 1)

SLOW DIGESTION |-----| FAST DIGESTION

Days Pre-post Surgery

Plant protein



Animal foods

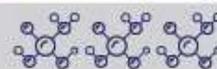


Plant foods



Hours Pre-post Surgery

Branch chain Amino Acid / Glutamine / Arginine



Essential Amino Acid



Whey protein



LOW EAA

HIGH EAA

The most common forms of protein in Oral Nutrition Therapy are¹⁰

Whey protein

(>50% EAAs): faster digestibility helps in maximizing muscle protein synthesis.



Casein

(~48% EAAs): slows digestibility, maintains anabolic response and reduces protein breakdown for prolonged phases like fasting periods during surgery.



Soy protein

(38% EAAs): highest quality protein among plant proteins.^{11,12}

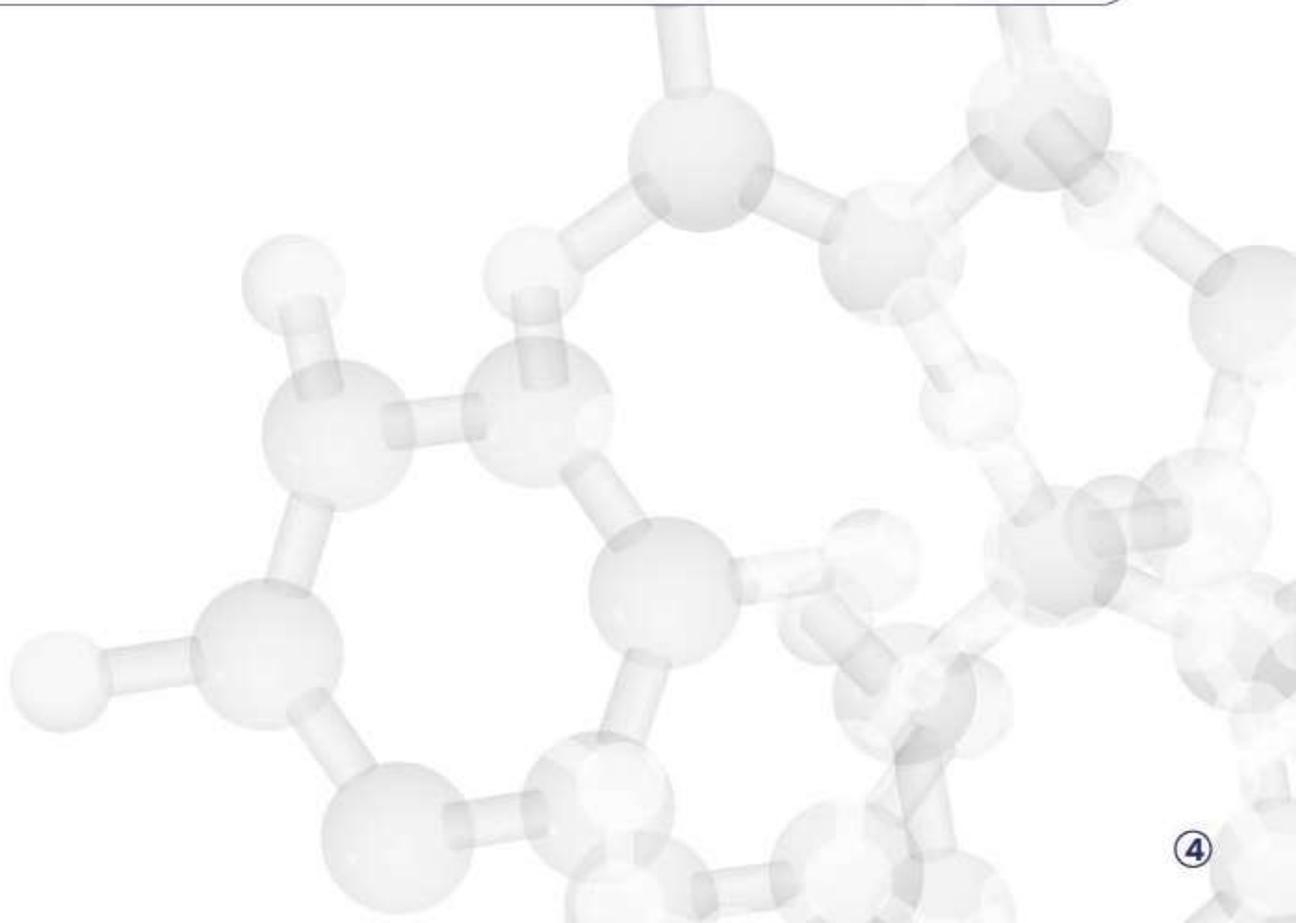


Combination of whey and casein provide better muscle protein synthesis and reduce anabolic resistance.¹³



Branch chain amino acids are rapidly utilised by skeletal muscles during the stress response.^{14,15}

Amino acid/ Peptide	Benefits
Glutamine	<ul style="list-style-type: none">- Metabolic fuel source for rapidly replicating cells.- In a highly catabolic state, helps in bacterial translocation, infection, and immunosuppression and may impact the wound healing process.¹⁶
Glutathione (Glutathione is a tripeptide comprising of cysteine, glutamic acid & glycine)	<ul style="list-style-type: none">- Crucial role in stress response.¹⁷- Potent antioxidant.¹⁷
Arginine	<ul style="list-style-type: none">- Substrate for protein synthesis.¹⁶- Reduction in infection, improved wound healing, and short length of stay.¹⁸

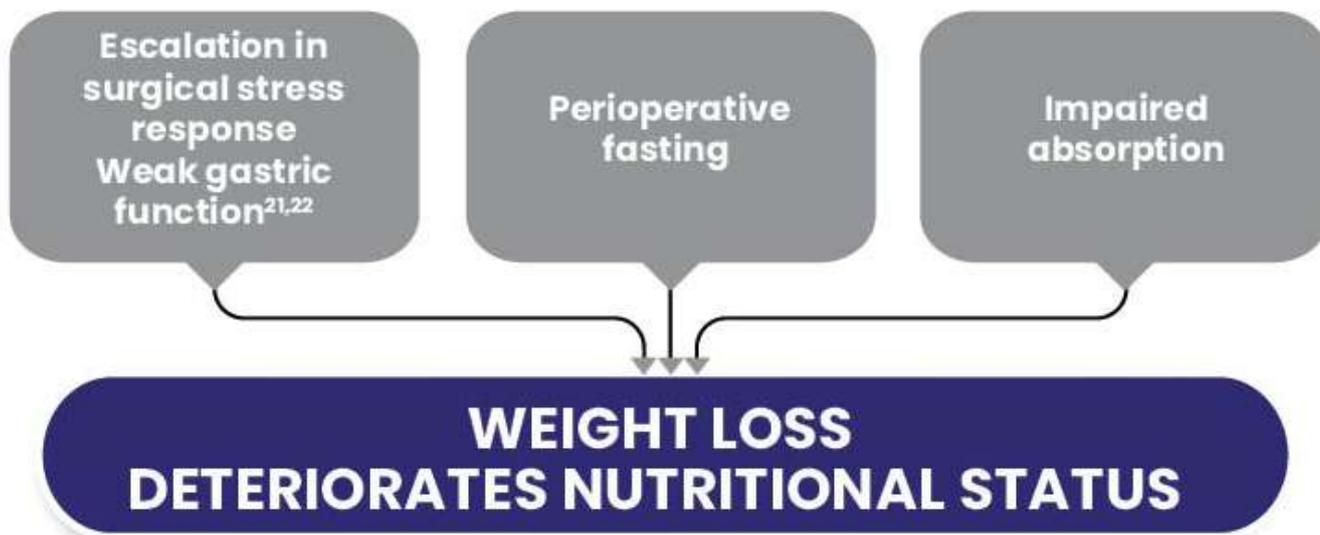


NUTRITIONAL NEEDS IN PERIOPERATIVE PHASE

- Various nutritional risk screening tools revealed **~47% risk of malnutrition in patients before surgery.**¹⁹



Factors affecting nutritional status²⁰



Maintaining lean mass before surgery is the key solution to avoid postoperative complications and improve wound healing as well as immunity.²¹

Pre-operative fasting should be avoided as^{22,23}



Escalates the surgical stress response



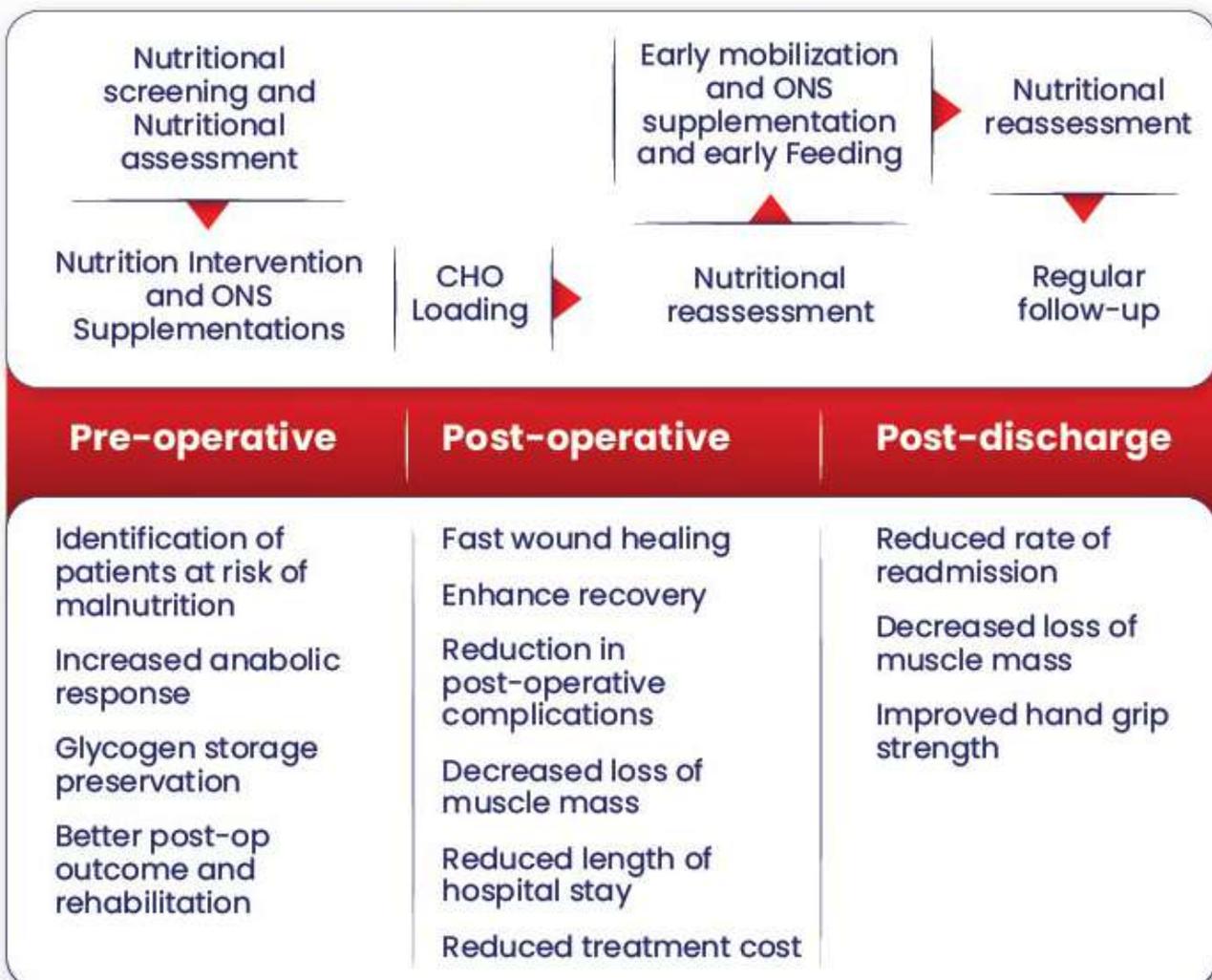
Weakens gastric function



Increases insulin resistance and protein loss

7 to 14 days of pre-operative nutritional support is recommended by ESPEN for severely malnourished patients undergoing elective surgery.⁷

Benefits of perioperative nutrition



EARLY FEEDING, MOBILISATION, REHABILITATION

Early feeding

Early oral feeding (within 24 hours of surgery) is **safe and significantly associated with**

- Enhancing recovery^{24,25}
- Reduction in postoperative complications like paralytic ileus in gastrointestinal surgeries^{24,25}
- Overall reduction in the length of stay (10% - 16% patients)²⁶
- Fewer hospital readmissions (46.1% in oncological patients)²⁶
- Reduced infection complications²⁶⁻²⁸
- Reduced treatment cost²⁶⁻²⁸

Starting with oral feeds is the most preferred mode of nutrition post-surgery.²⁹

Mobilisation and Rehabilitation

- Inactivity within 48 hours initiates loss of muscle tissue which can deteriorate in the next few days; resulting in **5% loss of lean mass and 30% reduction in isometric strength post two weeks.**^{31,32}



A RCT has shown ONS along with dietary advice for post-discharge patients at nutritional risk:³

- Reduces skeletal muscle loss
- Reduces chances of developing sarcopenia
- Improves chemotherapy tolerance



Conclusion:

Protein supplementation is essential in the perioperative phase as protein

- Promotes wound healing
- Improves muscle mass
- Improves immune response
- Less postoperative complications

Patients should be encouraged to inculcate first-class proteins in their diet. In case of vegetarians, or those with inadequate intake of high-quality protein, oral nutrition supplementation should be advised.

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PROTEIN USAGE PERCEPTION IN RECOVERY FROM CANCER

Protein is a vital nutrient for a cancer patient. It is required to build, repair and maintain muscle mass and to prevent sarcopenia. Cancer patients, having eating difficulties, lose weight. Primarily they lose muscle and not fat. Thus, adequate protein consumption is the key to prevent malnutrition leading to cachexia.

Dr Shivashankar

Panel head

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NUTRITIONAL STATUS OF CANCER PATIENTS VISITING HOSPITALS

40–80% cancer patients suffer from disease-related malnutrition during the course of their disease depending on the¹

- Type of cancer
- Stage of the disease
- Location of the tumor
- Treatment mode

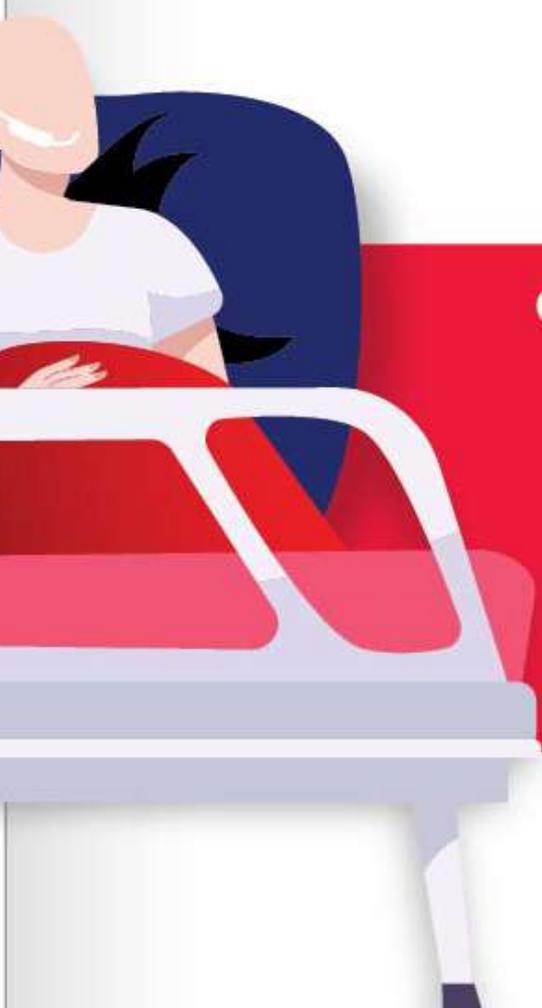


Cancer patients do not meet the recommended intake of protein.²
Thus, >50% cancer patients experience muscle wasting

HOW DOES CANCER IMPACT THE PROTEIN STATUS?³

Cachexia is hallmark of cancer, but in most cases it remains undiagnosed and untreated⁴

- Protein degradation with or without loss of adipose tissue⁵
- Muscle atrophy⁵
- Exceeds the rate of protein synthesis⁵
- Causes protein and energy imbalance⁵



Cachexia is associated with⁵

- Poor treatment outcome
- Reduced survival rate
- Poor quality of life with physical impairment

ROLE OF NUTRITION IN RECOVERY/ RESPONSE TO TREATMENT

Nutrition is the central factor which influences the development of the disease, tumor, inherent symptoms and recovery during and after the treatment

Nutrition intervention influences body composition which helps in:⁶

Improving the prognosis of cancer patients

Reducing nutrition-related symptoms

Improving health across the cancer treatment



Reducing oxidative stress
and inflammation

Improving quality of life

Beneficial impact on other
medical conditions



**Nutritional counselling
and Oral Nutritional
Support (ONS) helps with⁷**

Improvement in

- Energy intake and body weight
- Nutritional status

Reduces

- Toxicity related radiotherapy
- Weight loss, frequency and duration of treatment interruptions
- Rehospitalizations in head and neck cancer patients

WHAT IS THE ROLE OF PROTEIN IN RECOVERY?

Protein has an important role in body maintenance, growth and repair.

Majorly, body needs protein for the following functions:

Formation and preservation of muscles, connective tissues, red blood cells, enzymes and hormones.

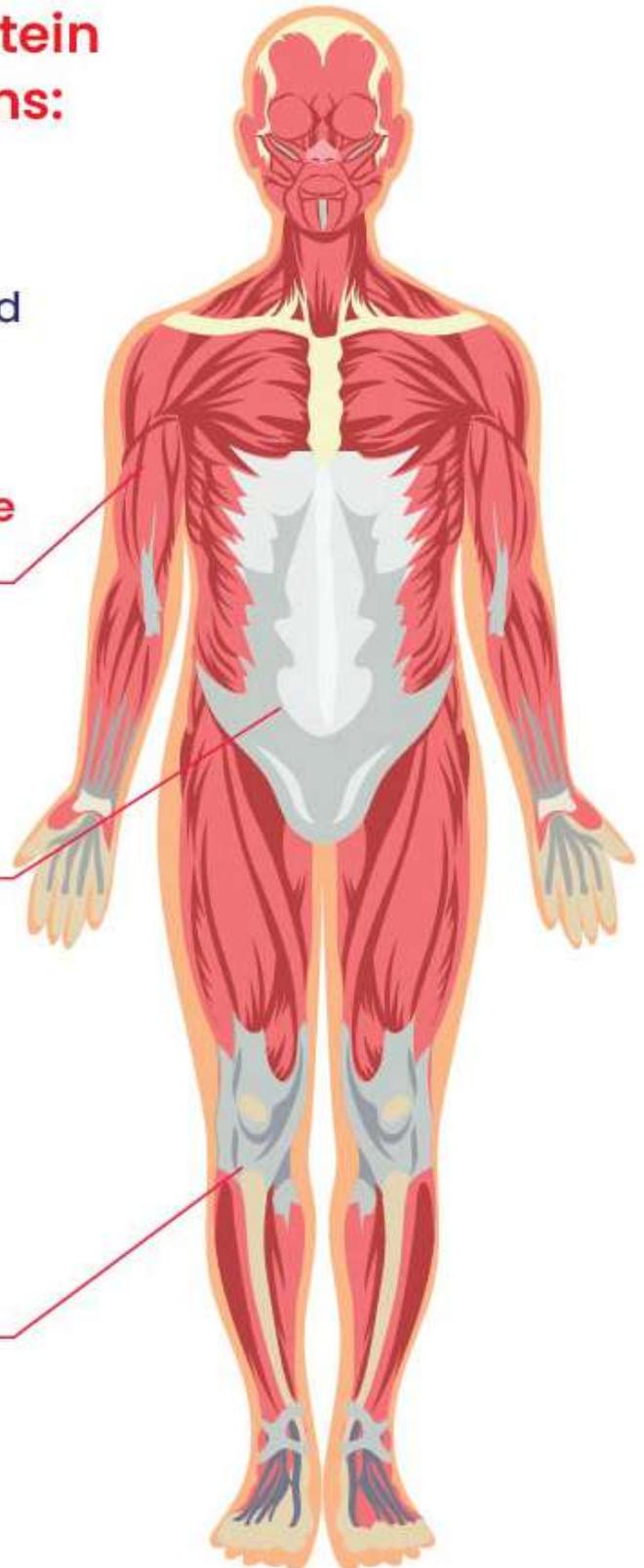
Maintaining body fluid balance

Maintaining and improving immunity

Fighting infection

Maintenance or gain of skeletal muscle mass⁸

Raised plasma levels of essential amino acids from dietary protein beneficial for anabolic stimulus⁹



ONS may improve nutritional status by maintaining body weight and alleviate fatigue symptoms^{11*}

The ESPEN guidelines on nutrition in cancer patients suggest a protein intake in the range of 1.0–1.5 g/kg/day¹⁰



Protein supplementation is an important nutritional strategy for optimal protein anabolism, as a measure to tackle cancer-associated loss of muscle-mass and strength.¹²

Including protein supplements in the daily routine of patients post ICU/surgery to bed and post discharge/consultation



*In pancreatic and bile duct cancer patients undergoing chemotherapy.
ESPEN: European Society for Clinical Nutrition and Metabolism.
ONS: Oral Nutrition Therapy.

Postoperative nutritional support is **recommended for 7-10 days** postoperation.

Nutritional supplementation post-hospitalization can



Lower the incidence of falls



Reduce inflammation



Increase hand-grip strength in the elderly

The positive effect of protein supplementation on skeletal muscle health has been shown to be achievable during a **2-3week timeframe**



12 weeks of essential amino acid supplementation has been shown to reduce muscle atrophy and enhance functional outcomes in low physical functioning older adults.



High-protein oral nutrition supplements is required for recovery and convalescence after ICU discharge and after hospital discharge.



Conclusion:

- Nutrition support is a long journey that can start even prior to the initiation of cancer treatment and can continue till the entire course of treatments are completed and beyond the hospital stay.
- Protein supplementation is the major contributor for better surgical outcomes and recovery.
- After the transition to bed or discharge, care should be taken to encourage proper protein consumption, as adequate nutrition during this high-risk timeframe has shown to have positive benefits.

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