

## Original article

# Combating hospital malnutrition: Dietitian-led quality improvement initiative



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## SUMMARY

**Background & aim:** Malnutrition is serious but under-diagnosed problem among hospitalized patients as approximately one-third patients may become malnourished during their stay. We audited our clinical nutrition practice (CNP) to understand the gaps and planned quality improvement initiatives to strengthen CNP through early delivery of oral nutrition supplement (ONS) prescribed.

**Method:** A prospective study was conducted in a tertiary care hospital in three phases between Dec'15 and Feb'17. Phase-1(P1): To assess the prevalence of malnutrition on admission and CNP; Phase-2(P2): Sensitization of Clinical Dietitians' to improve the nutrition care process; Phase-3(P3): Coalition of Multidisciplinary Team (MDT) to improve the timely delivery of ONS. Patients' demographics, baseline nutritional status (Subjective Global Assessment (SGA)), details of nutrition intervention and outcomes were recorded. Data were analyzed using SPSS version 20.0.

**Results:** Out of 1443 patients (P1-500; P2-428; P3-515) enrolled, 63% were men and 37% women with mean age of  $53.6 \pm 15.49$  y. A significant improvement in the nutritional diagnosis as per SGA (0.031) and increasing trend in ONS prescription (P1:10(2%); P2:56(13%); P3:83(16%) ( $p = 0.000$ ) was evident, which was attributed to the sensitization of Dietitians. Early delivery of ONS within 6 h from the time of prescription (EDONS) was progressively higher in P3 (P1:10%; P2:16.1%; P3:44.6%) and notable reversal of delayed delivery (>24 h) (P1:40%, P2:16%, P3:8.4%) ( $p = 0.000$ ). Remarkable decline in the Length of Stay (LOS) was shown between the phases (P1: $6.82 \pm 10.3$ d; P2: $5.68 \pm 4.07$ d; P3: $5.60 \pm 4.74$ d) ( $p = 0.010$ ). Vegetarians (6.54d) had a longer stay compared with non-vegetarians (5.88d) ( $p = 0.036$ ). Lower BMI correlated negatively with LOS ( $p = 0.026$ ). Univariate analysis showed a significant increase in LOS with admission history on weight loss (No weight loss = 5.52d, <10% loss = 7.74d, 10–15% = 7.51d, >15% = 8.32 d) ( $p = 0.001$ ), severe malnutrition (12.67d) and EDONS in shortening the LOS (<6 h = 6.11, 6–12 h = 7.97, 12–24 h = 6.83, >24 h = 17.3 days) ( $p = 0.000$ ). Multiple Linear regression analysis using ANOVA indicated that EDONS was the only major contributing factor in lowering the LOS ( $p = 0.002$ ). Re-admission was higher in non ONS group (72%: non ONS; 26%: ONS group) ( $p = 0.000$ ).

**Conclusion:** Dietitian-Led multi-professional inter-disciplinary Coalition, bridging the knowledge gap among MDT with regular sensitization about the importance of hospital malnutrition and EDONS, has led to the early identification and intervention of nutrition risk which enhanced progressive decrease in LOS and healthcare cost.

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## 1. Introduction

Despite hospital malnutrition being identified over four decades ago [1], it's still overlooked today in many developing countries.

Thus, malnutrition – a state of inadequate or unbalanced nutrition - can often be unrecognized in clinical settings. Research consistently demonstrates that malnutrition is a hidden cause of poor health outcomes, rising health care costs, increased utilization of resources, increased length of hospital stay, increased re-admission rates, and contributes to higher morbidity and mortality [2].

The disease-related malnutrition is defined as “undernutrition as a result of a disease process,” which may be present on

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admission or acquired during a hospitalization with the prevalence of 20%–50%, although data vary considerably due to differences in study populations, ascertainment methods, and hospital setting [3]. Therefore, malnutrition seen in hospitalised patients is often a combination of cachexia (disease-related) and malnutrition (inadequate consumption of nutrients) as opposed to malnutrition alone [4].

Hospitalized patients, regardless of their Body Mass Index (BMI), typically suffer from undernutrition because of reduced nutrient intake due to illness-induced poor appetite, gastrointestinal symptoms, reduced ability to chew or swallow, or nil by mouth for diagnostic and therapeutic procedures. In addition, they may have increased energy, protein, and essential micronutrient needs because of inflammation, infection, or other catabolic conditions [5]. It is estimated that at least one third of patients in developed countries are malnourished on admission to the hospital, and if left untreated, approximately two thirds of those patients will experience a further decline in their nutrition status during their hospitalization [5–7].

With the average LOS (ALOS) at only 4.5 days, the standards and systems of care need to drive the process such that a patient identified to be “at nutrition risk” or who is in fact malnourished, receives an intervention(s) as rapidly as possible. In addition, nutrition must be addressed early in discharge planning so that it is identified in the transition from hospital to home or alternate care setting [8].

Hence, it is very important to combat hospital malnutrition by combined effective medical therapy along with intensive nutrition intervention. In many hospitals, malnutrition continues to be managed in silos, with knowledge and responsibility provided predominantly by the dietitian. However, the new era of quality care will require a deliberately more holistic and interdisciplinary process to address this critical issue. To do this, a systematic approach must be taken to create awareness and educate the multidisciplinary team (MDT), on the rationale for an inter-professional focus on, detection, prevention and treatment of malnutrition, in hospitalized patients.

We aimed to audit our clinical nutrition practice (CNP) to understand the gaps leading to increased malnutrition and implement Dietitian-Led quality improvement initiatives (DQII) to strengthen CNP through Dietitian-led oral nutritional support (ONS) prescription and early delivery to combat hospital malnutrition.

## 2. Methods

A prospective study was conducted in a tertiary care hospital at Chennai, India in three phases between December 2015 and February 2017. Patients' demographics, baseline nutritional status (Subjective Global Assessment (SGA)), details of nutrition intervention and outcomes were recorded. Data were analyzed using SPSS version 20.0.

An inter-professional MDT, which included the Clinical Dietitians (Clinical Dietitian: Patients ratio – 1:25 in critical areas and 1:40 in non-critical areas), treating Physicians and their teams, and the nurses, were involved in this initiative. We planned this audit in three phases as given below:

Phase 1 (P1) - We assessed the prevalence of our hospital malnutrition in December 2015 to understand the gaps in our CNP leading to the increase in malnutrition which lead to the DQII.

Phase 2 (P2) (January 2016 to June'16) – After understanding the lacunae in CNP, the Clinical Dietitians (CDs) were sensitized by the Lead Dietitian with twice a week training sessions, daily discussion about difficult cases, and daily departmental huddles which improved their clinical judgement and ONS prescription. The

following triggers for ONS prescription was implemented and reiterated as part of CDs sensitization:

- Baseline weight loss
- Insufficient energy intake
- Loss of muscle mass/Subcutaneous fat stores
- Localized/Generalized fluid accumulation – Ascites/Odema

Data collection was done in July 2016 after sensitization of CDs. Phase 3 (P3) (August 2016 to January 2017) - The MDT was involved to improve the early initiation and delivery of the ONS within 6 h of prescription (EDONS). The following measures were taken for successful implementation:

1. Improving the interaction between the CDs and Physicians by sensitizing the CDs.
2. Sensitization of the nurses regarding the importance of ONS in combating hospital malnutrition. Regular sessions were conducted by the Lead Clinical Dietitian for the nursing leadership team with the learnings from phase 2 data.
3. Interaction between Clinical Dietitian and Nurse to reiterate the EDONS
4. Regular nutritional monitoring using food and fluid chart by the Clinical Dietitians to facilitate EDONS
5. Daily ward huddles
6. Weekly meetings to update with nursing leads regarding the lacunae in EDONS

Data collection was done in February 2017 after sensitization of MDT.

All members of the clinical team were involved, including physicians who performed initial nutrition screening on admission. The CDs completed the nutrition assessment using Subjective Global Assessment (SGA) within 24 h of nutrition screening and developed evidence-based intervention(s) including ONS as per the nutritional requirements and triggers of ONS prescription with the dosage and time of delivery. The physicians who re-evaluated the medical decisions and care plans in light of the CD's recommendations and documented the ONS prescription including the dosage and time of delivery in the drug chart. The nurses administered the ONS as prescribed and developed innovative strategies to facilitate patient compliance. The nurses documented the patient's compliance of ONS in the drug chart regularly. During daily ward rounds the CDs verified the drug chart for patient's ONS compliance and if non-compliant, then educated the patient on the importance of ONS. A team of eleven CDs were involved in collecting data with a standard proforma developed for this study in all three phases.

Recognition of this problem and the opportunity to improve patient care were the impetus behind this coalition. Nutrition intervention for malnourished patients is a low-risk; cost-effective strategy to improve quality of hospital care, but it requires interdisciplinary collaboration (Fig. 1). This in turn depends on the awareness, commitment, and understanding of all the caregivers and support services involved.

### 2.1. Nutritional assessment

SGA is a method for evaluating nutritional status based on practitioner's clinical judgment rather than objective, quantitative measurements. Encompassing historical, symptomatic, and physical parameters, SGA aims to identify an individual's initial nutrition state and consider the interplay of factors influencing the progression or regression of nutrition abnormalities. This method of assessment has been successfully used to assess nutritional status

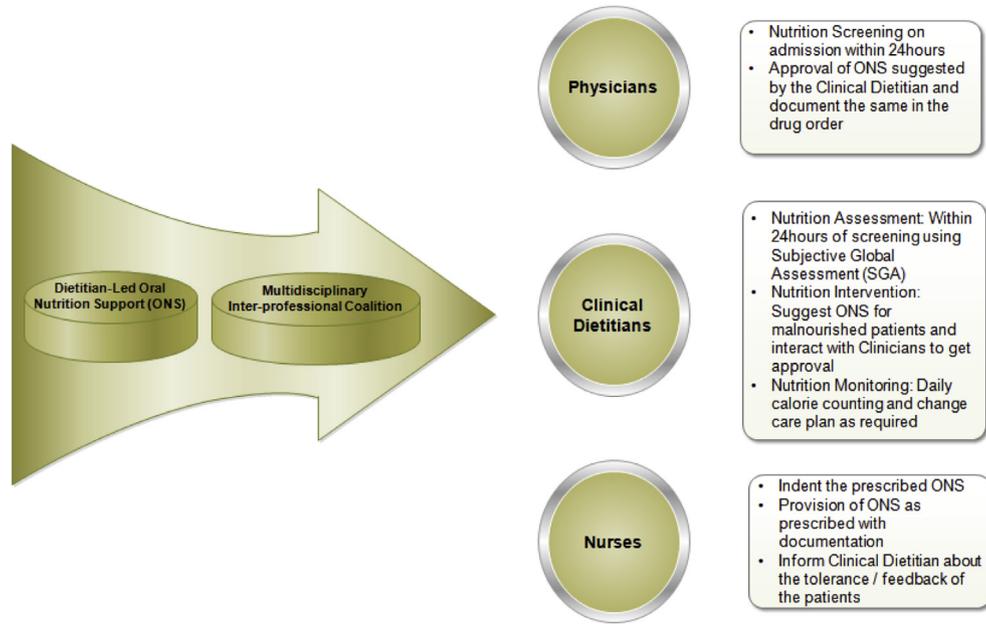


Fig. 1. Role and responsibilities of MDT.

Table 1  
Patient characteristics.

Patient Characteristics	Phase-1 (N = 500)	Phase-2 (N = 428)	Phase-3 (N = 515)
	Mean ± SD/Percentage		
Age (yrs)	52.5 ± 15.3	65.1 ± 15.6	53.7 ± 15.9
Sex			
Male	61%	65%	64%
Female	39%	35%	36%
Height (Cm)	161.7 ± 8.9	161.9 ± 8.5	161.1 ± 16.5
Weight (Kg)	67.0 ± 13.4	67.1 ± 13.5	67.9 ± 13.1
Body Mass Index (Kg/m <sup>2</sup> )	25.6 ± 4.7	25.5 ± 4.5	25.7 ± 4.5
Food Habits			
Veg	31%	30%	24%
Non-Veg	68%	68%	74%
Ova-Veg	1%	2%	1%
Outcome			
ALOS	6.8 ± 10.4	5.7 ± 4.1	5.6 ± 4.7
Discharge	100%	99.8%	99.8%
Deceased	0%	0.2%	0.2%

in general medical and surgical patients, it shows good to excellent inter observer reproducibility and good convergent validity [9].

2.2. Dietary intake and assessment

For patients who were malnourished and whose spontaneous dietary intake was inadequate, the CDs evaluated the patients' spontaneous dietary intake, with regard to nutrition requirements, using calorie count during hospitalization on a daily basis. The amounts consumed of each portion of food/beverage were visually assessed and recorded in quartiles (0%, 25%, 50%, 75%, and 100%) by the nursing staff. This is a validated method to assess food intake [10]. If necessary, the CDs encouraged and provided nutrition guidance to patients or the nursing staff to support patients' chances of obtaining an adequate nutrition intake. An average intake of estimated energy and protein intakes were recorded in calories and grams per day respectively by the CDs daily and change in care plan was suggested accordingly. The objective was to determine the adequacy of calorie and protein intake per patient with minimum reporting bias. The calculation of calories and

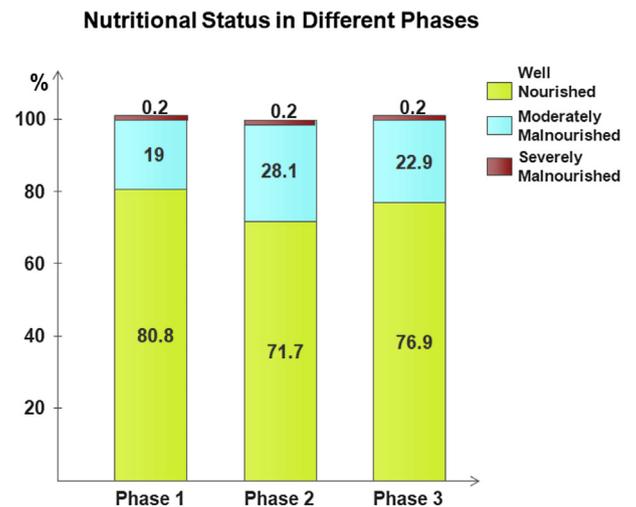


Fig. 2. Nutritional status in different phases.

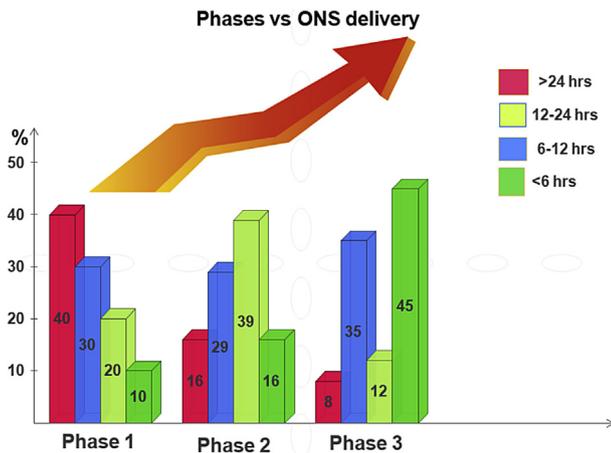


Fig. 3. ONS delivery in different phases.

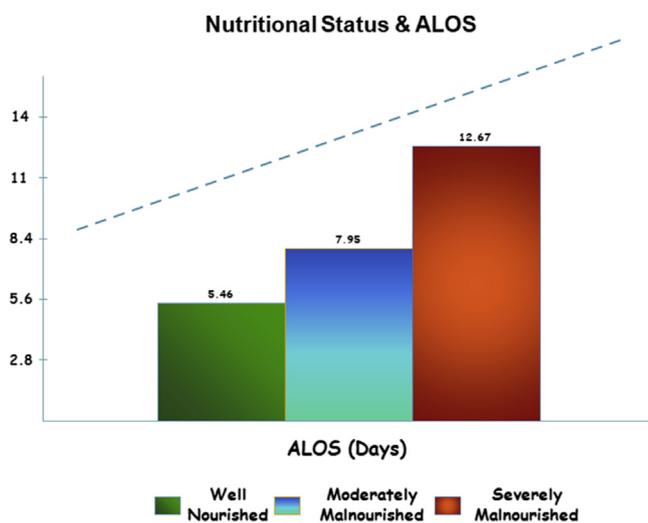


Fig. 4. Nutritional status and ALOS.

protein of food and beverages (composition of the diet) were based on local reference data [11]. Patients on special nutritional support (EN/PN) were monitored daily for nutritional adequacy, interruptions etc., and modification in the nutritional intervention were planned accordingly.

**Table 2**  
Predictors of length of hospital stay (LOS): ANOVA<sup>a</sup>.

Model		Sum of Squares	Degree of freedom	Mean Square	F	Sig.
1	Regression	1359.984	4	339.996	3.331	.012 <sup>b</sup>
	Residual	14699.734	144	102.081		
	Total	16059.718	148			

#### Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.632	4.278		-.849	.397
	SGA Rating	2.699	2.245	.114	1.202	.231
	Diagnosis	.409	.263	.125	1.554	.122
	EDONS Delivery	2.365	.803	.239	2.943	.004
	% Weight loss	-.207	.769	-.025	-.269	.788

\* p-value: <0.05 (significant).

\*\* p-value: <0.01 (highly significant).

<sup>a</sup> Dependent Variable: LOS.

<sup>b</sup> Predictors: (Constant), % Weight loss, Diagnosis, EDONS Delivery, SGA Rating.

### 2.3. Statistical analysis

All data were statistically analyzed using statistical package for social science (SPSS) software version 20.0. Descriptive Data were expressed numerically and as percentiles for categorized data, mean and SD for parametric data.

Analytical Data:

Paired test: for comparing between 2 dependent means.

Mann Whitney U test: for two-group comparisons in nonparametric data.

Pearson's correlation was used to understand the association between predictors of the LOS.

Analysis of variance (ANOVA) was used to analyze the predictors of LOS.

### 3. Results

A total of 1443 patients (P1-500; P2-428; P3-515) were enrolled, of which 63% male and 37% female with mean age of  $53.6 \pm 15.49$  years. Majority of the patients were non-vegetarians P1:68%; P2:68%; P3:74% in all the phases (Table 1). As per SGA, 19–28% had some degree malnutrition on admission across the 3 phases. Declining nutritional status on admission was more prevalent in hepatic disorders (74%), respiratory conditions (49%) and kidney diseases (40%) ( $p = 0.000$ ). Weight loss of 2–35% in the past six months was noted in 23% of the study population and >10% weight loss was evident in 16% especially with primary diagnosis of gastrointestinal diseases, kidney and hepatic disorders.

A significant improvement in the nutritional diagnosis as per SGA ( $p = 0.031$ ) (Fig. 2) and increasing trend in ONS prescription (P1:10(2%); P2:56(13%); P3:83(16%) ( $p = 0.000$ ) was evident, and attributed to regular sensitization of CDs. Early delivery of ONS within 6 h from the time of prescription (EDONS) was progressively higher in P3 (P1:10%; P2:16.1%; P3:44.6%) and notable reversal of delayed delivery (>24 h) (P1:40%, P2:16%, P3:8.4%) ( $p = 0.000$ ) (Fig. 3).

Remarkable decline in ALOS was shown between the phases (P1:6.82  $\pm$  10.3d; P2:5.68  $\pm$  4.07d; P3:5.60  $\pm$  4.74d) ( $p = 0.010$ ). Patients with cardiac (9.73d) and respiratory (9.53d) diagnosis had a longer hospital stay ( $p = 0.027$ ). Vegetarians (6.54d) had a longer stay compared with non-vegetarians (5.88d) ( $p = 0.036$ ). Lower BMI correlated negatively with ALOS ( $p = 0.026$ ). Univariate analysis showed a significant increase in ALOS with history of weight loss in the past 6 months (No weight loss = 5.52d, <10% loss = 7.74d, 10–15% = 7.51d, >15% = 8.32 d) ( $p = 0.001$ ), severe

malnutrition (12.67d) (Fig. 4) and EDONS in shortening the ALOS (<6 h = 6.11, 6–12 h = 7.97, 12–24 h = 6.83, >24 h = 17.3 days) (p = 0.000). Multiple linear regression analysis using ANOVA indicated that EDONS was the only major contributing factor in lowering the ALOS (p = 0.012) (Table 2). Re-admission was higher in non ONS group (72%: non ONS; 26%: ONS group) (p = 0.000).

Malnutrition (p = 0.036) and hepatology and respiratory diagnosis (p = 0.020) were found to have an impact on increasing mortality. There was a marked increase in the 30-day re-admission of cardiology, hepatology, nephrology and general medicine patients compared to other diagnosis (p = 0.013). Patients on ONS had lesser 30-day re-admission compared to patients without ONS (p = 0.000).

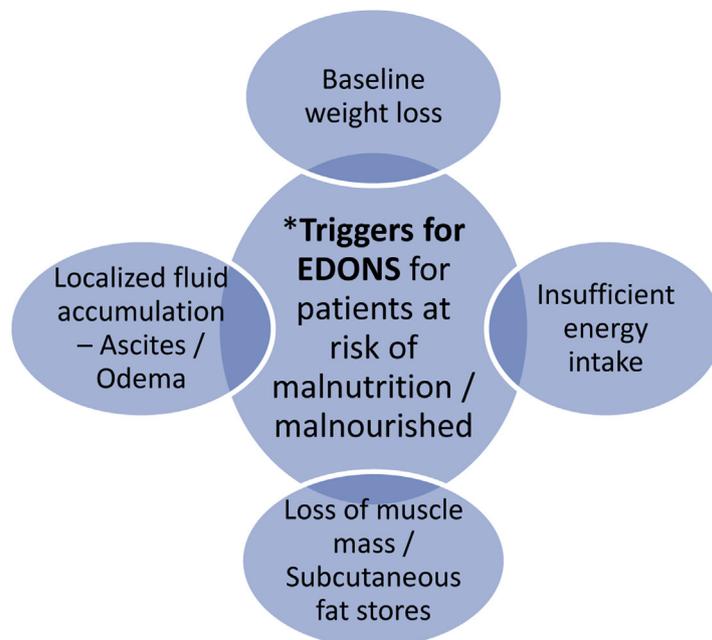
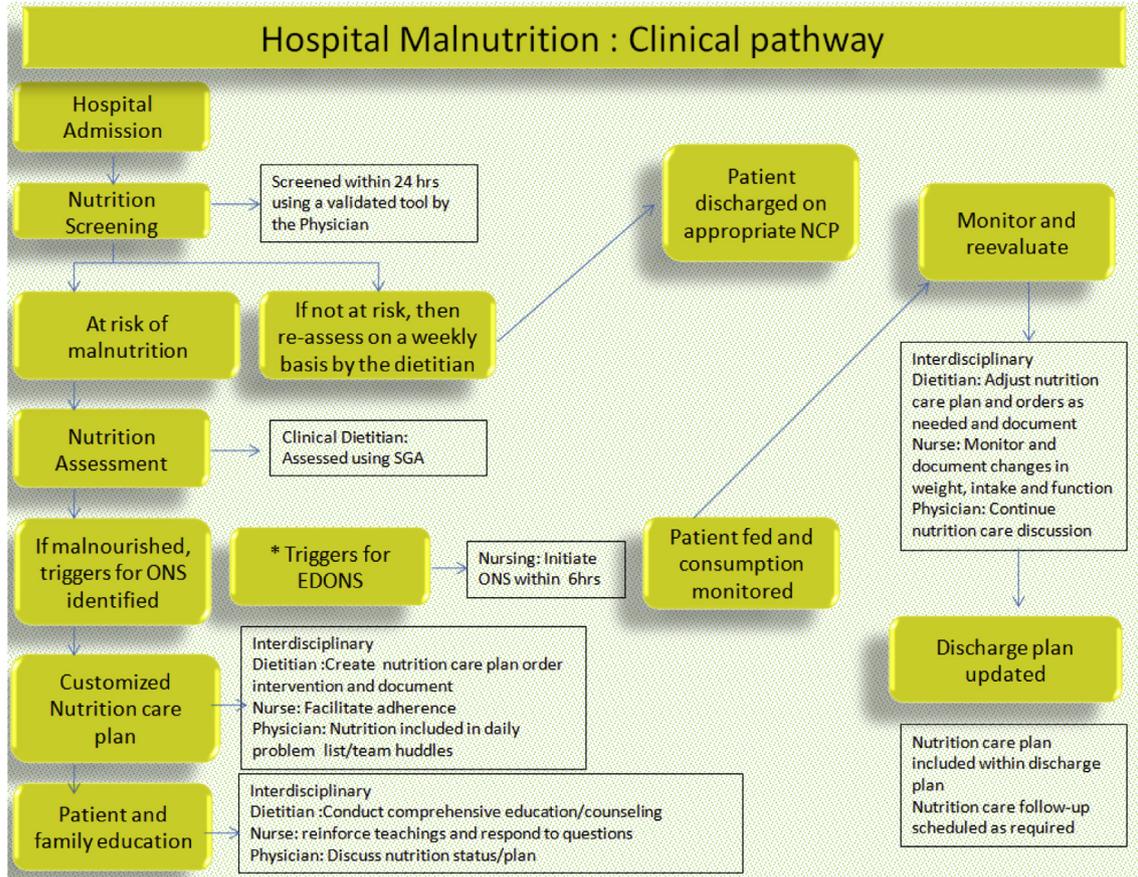


Fig. 5. Hospital malnutrition: Clinical pathway.

#### 4. Discussion

One evident reason for non-optimal nutrition care appears to be poor communication and coordination between the interdisciplinary healthcare professionals. We planned to succeed and overcome this difficulty using MDT coalition which includes physicians, dietitians, nurses and pharmacists.

While the prevalence of malnutrition in hospitalized patients has been reported to be between 16 and 68% [7,12–16], our study found it to be 19–28% across the 3 phases as per SGA.

Regardless of the definition used, malnutrition is associated with poorer outcome [17], specifically: longer hospital length of stay [7,14–23], more readmissions within 30 days [23–38], more nosocomial infections [25–28], and more pressure injuries [33–36]. In this study, there was a significant increase in ALOS with history of weight loss in the past 6 months, severe malnutrition (SGA), and lower BMI.

There is growing evidence that nutrition intervention is an effective strategy for prevention of healthcare-acquired malnutrition and associated complications [39–41]. Nutritional interventions using food-first strategy often remain the first line of treatment for malnutrition in many clinical settings because they are considered to offer greater variety and are tailored-made to an individual's eating habits while remaining more economic [42,43]. However, the nutritional value and palatability of diets using ordinary foods may be variable.

Therefore, diet modification strategy does not always ensure adequate delivery of nutrients on a daily basis. ONS contain a known composition of macronutrients and micronutrients thereby minimising variability. Recently, a systematic review of compliance to oral nutritional supplements showed that compliance to ONS is good with the mean percentage compliance to ONS prescription is  $\geq 75\%$  in almost two-thirds of studies included in this review, resulting in improvements in patients' total energy intakes [44]. There could be a number of reasons for explaining the high compliance with ONS including the convenience and palatability of the supplement, as well as encouragement or education given to patients [44].

The significant reductions in LOS observed in our patient population are supported by previous studies suggesting that ONS consumption by malnourished patients can also reduce LOS [7,45–47]. Though the ONS is proven factor for improving clinical outcomes, the time of delivery, which has an impact was lacking. In phase 3 of our study, through several steps including sensitizing MDT, there was an improvement in the time of delivery of ONS, which proved that EDONS was an important factor in predicting outcomes when compared with other markers through regression analysis.

In our study, lack of multidisciplinary approach evidenced in phase 2, was an impetus behind the coalition of interdepartmental MDT in phase 3 as noted by Pannick et al., in 2015 [48]. In this study, we also analyzed the effect of food habits in the outcomes, where non-vegetarians were found to have a shorter stay and recurrent admissions were observed in non-ONS group.

The only limitation of this study was the timeframe of intervention from Dec'15 to Feb'17 leading to other changes within the health care system and improved treatment techniques.

This DQII supported in the progression of EDONS (within 6 h) which improved the patient care and clinical outcomes. The strength of this study is that it analysed the importance of EDONS and improved the awareness of nutrition intervention among the MDT. These findings were the stimulating factor for the development of Hospital malnutrition - Clinical pathway to standardise the nutrition care process in our hospital (Fig. 5).

#### 5. Conclusion

Dietitian-Led multi-professional inter-disciplinary coalition, bridging the knowledge gap among MDT with regular sensitization about the importance of hospital malnutrition and EDONS has led to the early identification and intervention of nutrition risk. This resulted in enhanced progressive decrease in ALOS and healthcare cost. The outcome of the project was an impetus towards creating a clinical pathway for combating hospital malnutrition.

Clinical Dietitians are essential in the creation and implementation of an effective nutrition care plan. Dietetic care, delivered as part of multidisciplinary approach, is both clinically effective [49] and cost effective in the management of malnutrition [50]. In short, Dietitian led evidence-based oral nutrition support is essential to value-add medical therapy and tackles malnutrition to improve patient care and thereby reduce healthcare costs.

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