Assessment of Nutrition In Severly Ill Surgical Patients in Intensive Care Units

Medical Science

KEYWORDS : Nutrition, Nutritional assessment, critically ill patient; Subjective Global assessment, Anthropometry, malnutrition; nutritional support

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ABSTRACT

Background and Objectives

Nutritional assessment of the critically ill is an accepted principal managing patients in the surgical intensive care units. Although various procedures are available to assess the nutritional requirements of individual patients there is no set protocol available to determine or predict the nutritional support of a critically ill surgical patient. This study addresses this issue of nutritional assessment in the critically ill patients.

Methods :

A prospective cohort study including patient who were admitted to the surgical intensive care unit. Nutritional assessment done for these patients using Subjective Global Assessment and anthropometry and those who received nutritional support were compared with those who have not receive nutritional support.

Results

Subjective Global Assessment (SGA) is more reliable as compared to Anthropometry in assessing nutritional status of critically ill surgical patients Malnourished patients who received nutritional support have a better outcome as compared to those who did not, with a trend towards normalization of biochemical parameters (serum albumin)

Conclusion :

Nutritional assessment is important especially in the critically ill patients sensitivity to nutritional risk on the part of the physician may lead to identification of patients at risk for developing nutrition related morbidity and mortality. Using tools already at the physicians disposal, patients can be identified who would benefit from nutritional intervention. The nutritional assessment must include the understanding of the difference between malnourishment and dysmetabolism and their different effects on the patient. In summarizing the evidence, it appears that moderate to severely malnourished patients are most likely to benfit from nutritional support intervention.

INTRODUCTION :

Nutritional assessments is defined as a comprehensive approach to defining nutritional status that uses nutritional history, physical examination anthropometric measurements, laboratory data and professional judgment Malnutrition has long been recognized as a potential source of increased morbidity and mortality in surgical patients malnutrition can be defined as a nutritional deficit associated with an increased risk of adverse clinical events such as morbidity or death and with a risk of such events when corrected. Since the development of total parenteral nutrition in 1968, the number of available assessment measures has been continually increasing. If a large number of test are used, almost all patients manifest some abnormalities. The difficulty is in deciding which subset of patients will benefit significantly from nutritional support and which will not.

In critically ill patients nutritional support is important because depleted lean body mass, which may be a consequence in a long term perspective, is associated with a poor outcome and further impaired organ function. Actual critically ill patients lose on average approximately 5-10% of skeletal muscle mass per week, during their initial intensive care unit stay. Complications such as septicemia in these patients are to a large extent caused by impaired immunological function as a result of malnutrition.

Studies have clearly shown an increased incidence of mosocomial infectons, longer hospital stay and increased mortality in patients with significant unintentional weight los (<10%) prior to their illness. Even in an individual with initially normal nutritional status, after 7 to 10 days of inanition, the body's ability to heal wounds and to support normal immune function begins to be impaired. Such deficits include dimmished complement and immunoglobulin production, poor cellular immunity, as impairment of various aspects of leukocyte actiona including chemotxies, phagocytosis and oxidative burst. Other consequence of inadequate nutrition in the post operative period include poor tissue repair wound healing and loss of muscle function.

Using indices of malnutrition, the prevalence of mild malnutrition has been estimated to be 48% among the hospital patients, and 31% severely malnourished. Many patients are already malnourished when admitted to the hospital. In addition, serial estimations have shown that patients ,ay become increasingly malnourished during their hospital stay.

Malnutrition is found among 2 groups of patients; those with uncomplicated starvation and those who are septic, injured or with active inflammation with a hyper catabolic state in addition to some degree of starvation. What should be done about malnutrition in the critically ill surgical patients ? First, measures to identify the patients on admission who are malnourished. Second, measures to provide nutritional support to these patients promptly, safely and effectively so as to prevent or minimize development of malnutrition in hospital.

Measurements such as anthropometrics, total body fat estimation, or delayed hypersensitivity skin testing either are liable to non- nutritional influences or lack accuracy and precision in individual patients. Plasma concentrations of hepatic proteins are affected significantly by the patient's underlying disease state and therapeutic interventions and therefore lck specificity. Although the measurements of these proteins is of little value in the initial nutritional assessment of the critically ill, serial measurement, particularly of plasma pre-albumin, may be useful in monitoring the response to nutritional support. While determination of nutritional status is often based on objective measurements such as biochemical parameters and anthropometric measurements, there is no single measurement that can reliably predict the risk for malnutrition or absolutely identify malnutrition. The ideal set of nutritional assessment that correlate with patient outcomes has not been identified. This study attempts to address this issue.

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Materials and Methods

Study Design	:	Prospective cohort study
Study Population	:	All patients admitted in the surgical intensive care unit needing nutritional support
Inclusion Criteria	:	All critically ill surgical patients needing ICU / ITU care beyond 5 days were included in the study.
Exclusion Criteria	;	Children or patients below the age of 13 years patients discharged or transferred of ICU / ITU before 5 days patients who have not given consent

Method of Collection of data :

- Collection of Basic data
- Questionnaire survey of illness, nur / tritional, comorbid conditions socioeconomic status of the study population (subjective Global Assessment)
- Nutritional assessment if need be serially

1. Clinically by recording body mass index.
2. Biochemical parameters like, Blood Urea, S.creat, Random blood sugar Serum electrolytes, liver function tests, calcium, serum phosphorus, Magnesium and arterial blood gas analysis.
3. Estimation of survival by severity of illness scoring system (APACHE II), in case of trauma, Injury severity scoring.
4. Estimation of Nutritional needs by Harris Benedict equation.

Study Design : A Prospective cohort study consisting of 36 critically ill surgical patients were evaluated for nutritional status and its outcome

Table : age Distribution of patients

Age groups in years	Number	Percentage
>20	2	5.6
21-30	4	11.1
31-40	10	27.8
41-50	7	19.4
51-60	8	22.2
>60	5	13.9
Total	36	100.0
Mean age	45.94 + 16.49	

Table 2 : Sex Distribution

sex	Number	Percentage
Male	21	58.3
Female	15	41.7
Total	36	100.00

Table 3 : Frequency Distribution of diagnosis

Diagnosis	Number	Percentage
Pancreatitis	9	25.0
Hollow Viscus perforation	9	25.0
Intestinal Obstruction	5	13.9
Gastric outlet obstructions	2	5.6
Enterocutaneous Fistula	2	5.6
Liver abscess / Hydatid cyst	2	5.6
Malignancy	3	8.3
Other (Ant abd wall nec faciatis, Empyrma GB, Blunt abd, Small bowel gangrene)	4	11.1

Table 4 : Frequency Distribution of Stay

Stay in days	Number	Percentage
< 7	4	11.1
7-14	12	33.3
14-28	10	27.8
> 28	10	27.8
Mean hospital Stay	19.36 + 11.5	

Table 5 : Frequency of duration of ICU / ITU stay

Stay in days	ICU	ITU
O days	8 (22.2)	2 (5.6)
< 7	20 (55.6)	19 (52.8)
7-14	5 (13.9)	11 (30.6)
> 14	3 (8.3)	4 (11.1)

Table 6: Association of SGA with serum albumin

SGA assessment	Presentation	Albumin		Significance Fisher Exact test (P<=0.05)	Odds Raion Low albumin)
		Normal	Low		
Normal	8 (22.2)	5 (62.5)	3 (37.5)	P=0.013	0.10
Moderate Malnutrition	10 (27.8)	3 (30.0)	7 (70.0)	P=0.686	0.70
Severe Malnutrition	18 50.0)	1 (5.6)	17 (94.4)	P=0.018	13.60
Total Number	36 (100.0)	9 (25.0)	27 (75.0)	-	-
Inference	Patients with normal SGA rating are significantly with normal albumin values (P<0.05). Patients with moderate malnutrition have higher percentage of hypoalbuminemia and patients with severe malnutrition have significantly increased hypoalbuminemia (P<0.05)				

Table 7: Association of BMI with serum albumin

BMI assessment	Presentation	Albumin		Significance Fisher Exact test (P<=0.05)	Odds Raion Low albumin)
		Normal	Low		
Obese >25	5 (13.9)	1(20.0)	4 (80.0)	P>0.005	1.39
Normal 19-24.9	13 36.1)	6 (46.2)	7 (53.8)	P=0.040	0.48

BMI assessment	Presentation	Albumin		Significance Fisher Exact test (P<=0.05)	Odds Raion Low albumin)
		Normal	Low		
Mild Malnutrition 17-18.9	9 (25.0)	-	9 (100.0)	P=0.076	-
Moderate Malnutrition 16-16.9	5 (13.9)	-	5 (100.0)	P=0.302	-
Severe Malnutrition <16	4 (11.1)	2 (50.0)	2 (50.0)	P=0.255	0.28
Total	36 (100.0)	9 (25.0)	27 (75.0)	-	-
Inference	BMI assessment of nutrition is not statistically correlating with the levels of serum albumin				

Table 8: Association of MAC with serum albumin

MAC assessment	Presentation	Albumin		Significance	Odds Raion Low albumin)
		Normal	Low		
Normal (Male >23 Female > 23)	21 (58.3)	7 (33.3)	14 (66.7)	P=0.252	0.30
Mal nourished Male <23 Female < 23)	15 (41.7)	2 (13.3)	13 (86.7)		3.25
Total	36 (100.0)	9 (25.0)	27 (75.0)		-
Inference	Patients rated as malnourished by MAC have increased proporation of hypoalbuminemia with p=0.252 and the Odds ration = 3.25, indicating the malnourished patients (MAC) 3.25 times more likely to have low albumin				

Table 9: Association of SGA with serum albumin

SGA Rating	BMI Rating			Total
	Normal (>19.0)	Mild – Moderate (16.0 – 18.9)	Severe (<16.0)	
Normal	7 (19.4)	1 (2.8)	0 (0.0)	8 (22.2)
Mild – Moderate	8 (22.2)	1 (2.8)	1 (2.8)	10 (27.8)
Severe	3 (8.3)	12 (33.3)	3 (8.3)	18 (50.0)
Total	18 (50.0)	14 (38.9)	4 (11.1)	36 (100.0)
Significance	X^2mn= 16.600, P=0.002 Only 30.5% of the total patients have similarly rated by both assessment tools. Around 64% of the total patients rated by SGA as moderate – severe malnutrition were significantly under rated by BMI and 5.6% are over rated by BMI.			

Table10 : Association of SGA rating with MAC rating

SGA	Normal	Mal nourished	Total
Normal	8 (22.2)	0 (0.0)	8 (22.2)
Moderate severe	13 (36.0)	15 (41.7)	28 (77.8)
Total	21 (58.3)	15 (41.7)	36 (100.0)
Significance	X^2mn= 13.000, P=0.005 Around 64% of the total patients are similarly rated by both the assessments and another 36% of the patients rated as malnourished by SGA were significantly (P<0.05) under rated by MAC.		

Table11 : Comparison of nutritional assessment tools with serum albumin

Nutritional Assessment tools	Comparison with Albumin				Kappa Coefficient (P Value)
	Sensitivity	Specificity	PPV	NPV	
SGA	88.9	55.6	85.7	62.5	K=0.46 (P=0.003)
BMI	59.3	77.8	88.9	38.9	K=028 (P=0.0027)
MAC	48.1	77.8	52.0	33.3	K=0.18 (P=0.086)
Inference	SGA has significantly better diagnostic value compared BMI and MAC in assessing the nutritional status as per diagnostic statics and Kappa agreement coefficient. The Second best is BMI and MAC has the least diagnostic value				

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Table 12: Association of SGA with the Outcome

SGA assessment	Presentation	Outcome		Significance Fisher Extract test (P<=0.05)	Odds Ratio (bad outcome)
		Normal	Low		
Normal	8 (22.2)	8 (28.6)	0 (0.0)	P=0.156	-
Moderate Malnutrition	10 (27.8)	8 (28.6)	2 (25.0)	P>0.05	0.83
Severe Malnutrition	18 (50.0)	12 (42.9)	6 (75.0)	P=0.228	4.00
Total Number	36 (100.0)	28 (100.0)	8 (100.0)	-	-
Inference	Patients with severe malnutrition are 4.0 times more more likely to have bad outcome with OR=4.00				

Table 13: Association of Apache II with the Outcome

Apache II	Presentation	Outcome		Significance Fisher Extract test (P<=0.05)	Odds Ratio (bad outcome)
		Good	Bad		
≤ 7	10 (27.8)	9 (32.1)	1 (12.5)	P=0.397	0.30
8-15	6 (16.7)	14 (50.0)	0 (0.0)	P=0.013	-
16-20	6 (16.7)	3 (10.7)	3 (37.5)	P=0.109	5.0
> 20	6 (16.7)	2 (7.1)	4 (50.0)	P=0.014	13.0
Inference	Patients with higher Apache score have significantly worse outcome Patients with Apache score > 15 are 32.2 times more likely to have worse prognosis as compared to the patients with score < 15 with p=0.001				

Table 14: Association of SGA with the Nutritional support

SGA Assessment	Presentation	Nutritional Support	
		Yes	No
Normal	8 (22.2)	0 (0.0)	8 (100.0)
Moderate Malnutrition	10 (27.8)	5 (50.0)	5 (50.0)
Severe Malnutrition	18 (50.0)	14 (77.8)	4 (22.2)
Total Number	36 (100.0)	19 (52.8)	17 (47.2)
Inference	Patients with normal nutritional status have not received nutritional support patients who received nutritional support are in moderate – server malnutrition group.		

Table 15: Association of SGA with the Nutritional support and outcome

SGA Assessment	Nutritional support	Outcome		Significance Fisher Extract test (P<=0.05)	Odds Ratio (bad outcome)
		Good	Bad		
Moderate severe malnutrition	Yesr	15 (78.9)	4 (21.1)	P=0.371	3.0
Total number (n=28)		20 (71.4)	8 (28.6)	-	-
Inference	Patients in moderate – server malnutrition group who have not received nutritional support had 3.0 times more bad prognosis compared to the those who received nutritional support.				

Table 16: Parameters contributing to the SGA rating in the rating in the present study

Parameters	Contribution to SGA rating (Regression analysis)		
	Beta weight	Student t	P value
Weigh change	0.502	2.297	0.032*
Weigh change at 2 weeks (unadjusted)	0.428	2.2763	0.009 R^2=18.3%
Muscle wasting	0.476	2.489	0.194
Duration of Dietary intake change	0.319	1.340	0.194
Loss of Subcut fat (Unadjusted)	0.842	9.103	P<0.001 R^2=70.9%
Anorexia	0.254	1.825	0.082
Type of Dietary Intake change	0.116	0.758	0.457
Inference	Loss of subcutaneous fat significantly and independently explains The maximum variation in SGA rating (71%)		

Table 17: Effect of providing nutritional support on the parameters assessed

Parameters	With Nutritional Support		Students t value	P value
	Day 1	Day 5		
Albumin	2.79 + 0.59	3.12 + 0.49	3.187	0.005**
CRP	211.05 + 75.21	196.58 + 82.26	1.737	0.101
BMI	18.45 + 2.98	18.26 + 3.01	0.821	0.423
MAC	23.29 + 3.24	22.84 + 3.09	2.111	0.049
Inference	Albumin significantly increased in patients with nutritional support With moderate Cohen's d effect d=0.61 CRP reduced considerably in patients with nutritional suppor			

Table 18: Effect of providing nutritional support on the parameters assessed

Parameters	With Nutritional Support		Students t value	P value
	Day 1	Day 5		
Albumin	3.05 + 0.69	2.88 + 0.62	2.384	0.030*
CRP	203.88 + 66.77	202.24 + 82.26	0.193	0.850
BMI	21.16+ 3.82	20.61+ 3.91	8.125	<0.05
MAC	25.79 + 4.28	24.65 + 4.16	6.628	<0.05
Inference	Patients without nutritional support had significant deterioration in Albumin, BMI and MAC values and there is no significant change in CRP			

Conclusion

- APACHE II scoring is fairly accurate in predicting outcome in critically ill surgical patients with a worse outcome being associated with a higher score.
- Subjective Global Assessment (SGA) is more reliable as compared to Anthropometry in assessing nutritional status of critically surgical patients.
- Malnourished patients who received nutritional support have a better outcome as compared to those who did not, with a tread towards normalization of biochemical parameters (serum albumin).

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