Addressing the challenges and optimizing nutrition therapy in trauma

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Case study:

- Gender – male
- Age – 31
- Status – married
- Nationality – Nepal
- Occupation – electrician
- Place of work – Dubai , UAE
- Admission details: Head trauma, diagnosed as right SDH acute with brain edema and midline shift.
- Secondary illness – nil
- Economic factors - He was living with his co workers in the staff accommodation where the food supplied by the contracting company.
- Physical status - He was not muscular.
- Diet history - He was not responding to verbal commands so not able to get any diet history.
- Conclusion of nutritional status - Lean and malnourished.

Pathophysiology:

- Surgery was done by decompressive craniotomy duraplasty with evacuation of hematoma, Burring bone flap in the abdominal wall.

- Length of stay - ICU – For 6 months.

- Prevalence -A patient with SDH and post op craniotomy is at high risk of malnutrition and aspiration pneumonia.

- Almost all bed-ridden patients easily become malnourished even if they were fed energy and protein with approximate calculated predicted values.

Nutrition risk assessment:

Patient in ICU , Patient admitted of head injury – trauma – post op craniotomy …….nutrition risk score = 3 (NRS 2002)

ESPEN guideline for nutritional screening:

- All patients should be screened on admission to hospital.
- If the patient is at risk, a nutrition plan is worked out by the staff.
- Monitoring and defining outcome has to be organized.
- Communication of results of screening, assessment and nutrition care plans should be communicated to other healthcare professionals when the patient is transferred.
- Audit of outcomes which may inform future policy decisions.

Nutrition screening 2002, Clin Nutr 2003

www.espen.org ⟶ Education ⟶ Guidelines

Nutrition risk assessment:

- As per the protocol the respective patient was in ICU after surgery and dietitian does nutritional assessment within 24hrs.

- BMI (as per approximate values) was around 22 on admission.

- Patient was on ventilator.

- His nutritional requirement needs to overcome the malnutrition and meet current energy expenditure.

A.S.P.E.N. ADULT NUTRITION CARE PATHWAY

(Age 18+ years)

ADMISSION

- Obtain actual, measured height/weight and BMI and document on admission
- Validated screening tool completed
  - Screen completed in 24 hours
  - Results documented in EMR
- Physician consult on admission

SUSPECTED MALNUTRITION?

YES

NO

GENERATE NUTRITION CONSULT

Via EMR, automatic trigger, or documented in MR

FOLLOW-UP/RESCREEN
[RD, NST, DT, OR DESIGNEE]

- Every 3-7 days to prevent hospital-acquired malnutrition
- Based on length of stay
- Upon transition of care

NUTRITION ASSESSMENT
[RD, NST]

Completed within 24 hours of consult

- Food and Nutrition History
- Anthropometrics
- Biochemical data/Medical Tests & Procedures
- Nutrition Focused Physical Exam (NFPE)
- Clinical and Medical History

NO

MALNUTRITION IDENTIFIED?

AND/A.S.P.E.N. malnutrition characteristics

YES

MALNUTRITION DIAGNOSIS/RISK DOCUMENTED
[RD, NST, RN, MD/NP/PA]

- RD documents malnutrition risk status
- RD documents supporting evidence of malnutrition severity
- MD documents malnutrition and severity in progress note and adds to problem list

CODE MALNUTRITION DIAGNOSIS

- *Coder notified of diagnosis*
- *Adult Malnutrition Codes*

MORE ON NEXT PAGE

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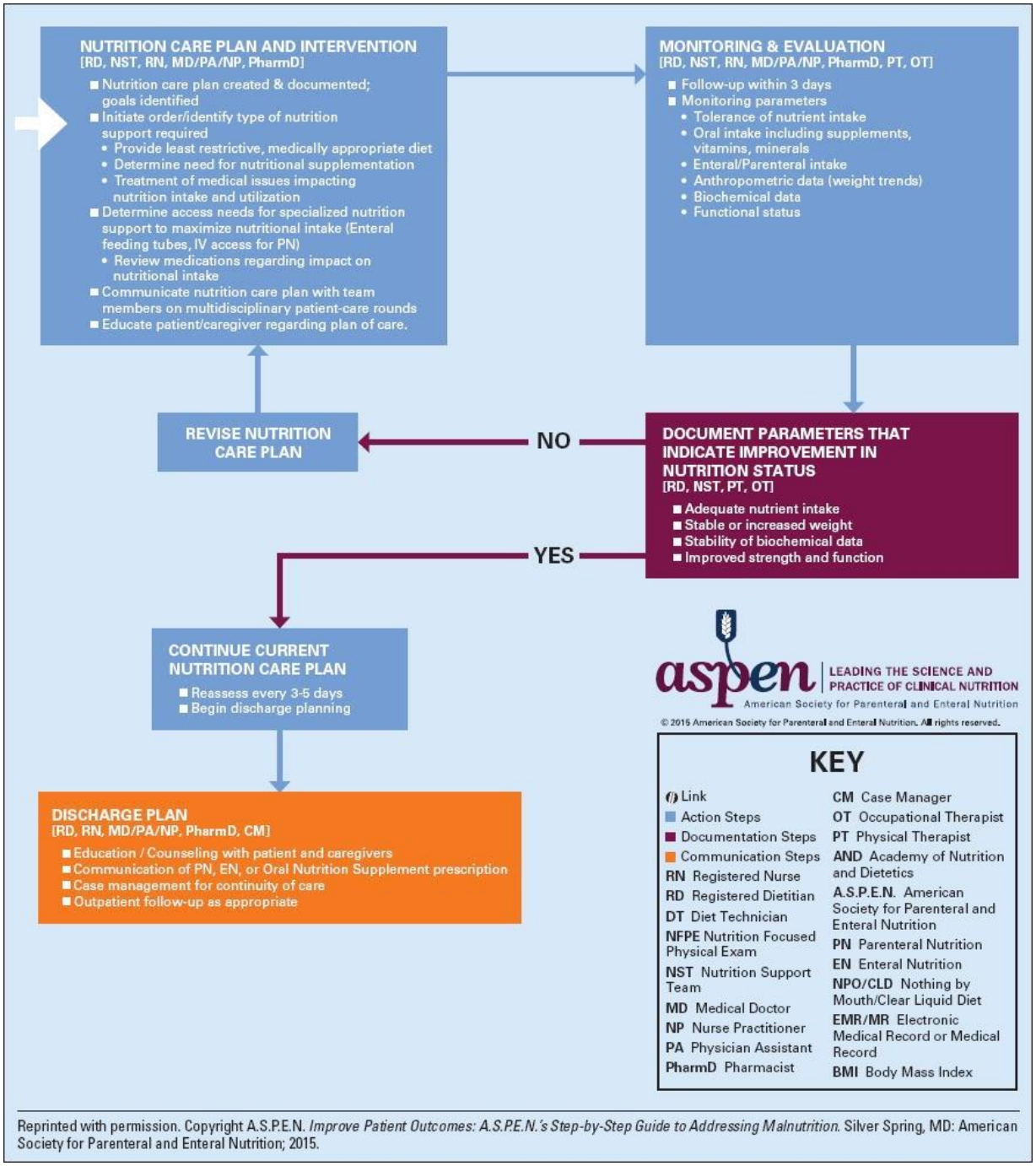
American Society for Parenteral and Enteral Nutrition

KEY

- Link
- Action Steps
- Documentation Steps
- Communication Steps

RN Registered Nurse
RD Registered Dietitian
DT Diet Technician
NFPE Nutrition Focused Physical Exam
NST Nutrition Support Team
MD Medical Doctor
NP Nurse Practitioner
PA Physician Assistant
PharmD Pharmacist
CM Case Manager
OT Occupational Therapist
PT Physical Therapist
AND Academy of Nutrition and Dietetics
A.S.P.E.N. American Society for Parenteral and Enteral Nutrition
PN Parenteral Nutrition
EN Enteral Nutrition
NPO/CLD Nothing by Mouth/Clear Liquid Diet
EMR/MR Electronic Medical Record or Medical Record
BMI Body Mass Index



Nutrition bundle based on the top guidelines

- Assess patients on admission to the intensive care unit (ICU) for nutrition risk, and calculate both energy and protein requirements to determine goals of nutrition therapy.
- Initiate enteral nutrition (EN) within 24–48 hours following the onset of critical illness and admission to the ICU, and increase to goals over the first week of ICU stay.
- Take steps as needed to reduce risk of aspiration or improve tolerance to gastric feeding (use prokinetic agent, continuous infusion, chlorhexidine mouthwash, elevate the head of bed, and divert level of feeding in the gastrointestinal tract).
- Implement enteral feeding protocols with institution-specific strategies to promote delivery of EN.
- Do not use gastric residual volumes as part of routine care to monitor ICU patients receiving EN.
- Start parenteral nutrition early when EN is not feasible or sufficient in high-risk or poorly nourished patients.

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.)

Initiate Enteral Feeding .

- Traditional nutrition assessment tools (albumin, prealbumin, and anthropometry) are not validated in critical care.
- Before initiation of feedings, assessment should include evaluation of weight loss and previous nutrient intake prior to admission, level of disease severity, co morbid conditions, and function of the gastrointestinal (GI) tract.

ESPEN Guidelines Enteral Nutrition: Intensive care (Elsevier Clinical Nutrition (2006) 25, 210-223

- Guidelines are intended to give evidence-based recommendations for the use of EN in patients who have a complicated course during their ICU stay.

- EN should be given to all ICU patients who are not expected to be taking a full oral diet within three days. It should have begun during the first 24 h using a standard high-protein formula.

Enteral nutrition

- Enteral nutrition generally refers to any method of artificial feeding that uses the gastrointestinal (GI) tract to deliver part or all of caloric requirements. It includes the use of oral nutritional supplements or delivery of part or all of the daily requirements by use of nasogastric/enteral or percutaneous (gastric or jejunal) tube (tube feeding)

"Although nutritional support is therapy in most cases it is exactly what it says - supportive rather than specific treatment of the underlying disease."

Routes of Nutritional Support:

- **Oral route**– preferred route unless contraindicated.

- **Enteral tube feeding** – the delivery of a feed directly into the gut via a tube:

  Types: nasogastric, nasoduodenal, nasojejunal, orogastric, oroduodenal, orojejunal, feeding *gastrostomy/jejenostomy*

- **Parenteral nutrition** – the delivery of nutrition intravenously.

Enteral feeding should be started early within the first 24-48 hours following admission.

The feedings should be advanced toward goal over the next 48-72 hours

Feedings started within this time frame (compared to feedings started after 72 hours) are associated with less gut permeability, diminished activation, and release of inflammatory cytokines (ie, tumor necrosis factor [TNF] and reduced systemic endotoxemia).

Is early EN (<24–48 h after admission to ICU) superior to delayed EN in the critically ill?

The expert committee, however favors the view that critically ill patients, who are haemodynamically stable and have a functioning gastrointestinal tract, should be fed early (<24 h), if possible, using an appropriate amount of feed .

Enteral tube feeding

Initiation and Check

- People requiring enteral tube feeding should have their tube inserted by Physician.

- Check the position of all nasogastric tubes after placement and before each use, using aspiration , air push auscultation and with X-ray if necessary.

- Periodic tube position check : each nursing shift and/or signs of intolerance(vomiting, significant aspiration from tube).

- Confirm initial placement of post-pyloric tubes with an abdominal X-ray (unless placed radiologically).

Enteral tube feeding

Route of access

- Feed people in general medical, surgical and intensive care wards via a tube into the stomach unless there is upper gastrointestinal dysfunction.

- In people with upper gastrointestinal dysfunction (or an inaccessible upper gastrointestinal tract) consider post-pyloric (duodenal or jejunal) feeding.

- Consider gastrostomy for long-term (4 weeks or more) enteral tube feeding.

- Percutaneous endoscopic gastrostomy (PEG) tubes placed without apparent complications can be used 4 hours after insertion.

There is no significant difference in the efficacy of jejunal versus gastric feeding in critically ill patients .

Enteral Feeding per Pump

- Store your formula in a cool, dry place.
- Wash hands thoroughly with soap and water.
- With a damp paper towel clean the top of the formula can.
- Shake contents of the can before opening. Fill the feeding bag with enough canned formula for up to 8-12 hours of infusion. Discard any unused formula.
- Close the top of the feeding bag.
- Load the tubing into the feeding pump. Turn the power on the pump and Set rate of infusion (Adjust feed).
- Set desired rate then press “enter”.
- Flush feeding tube 4th hourly.

Pump and sets

Open set

Pump

Closed set

Cap

775762
Screw Spike
Adapter Cap

Set

Feed and flush set

FLUSHING YOUR FEEDING TUBE

- Place lukewarm water in a bowl. (Cold water may cause cramping).
- Fill feeding syringe with desired amount of water.
- Pinch or fold the feeding tube to prevent stomach content from running out, and then open the cap.
- Place the tip of the syringe into the feeding port, unclamp/unfold the feeding tube and gently push down on the plunger (of syringe) to flush water through your tube.
- After flushing your tube, remove the syringe then close the cap on your feeding port.

Caring For Feeding Tube Site

- Wash your hands thoroughly with soap and water.
- If dressing is in place, carefully remove old dressing from around the tube.
- Using warm saline soaked gauze clean the skin around your tube .
- Be sure to check tube site daily for sign and symptoms of infections such as redness, soreness, drainage, or swelling.
- Inform your physician if any of these symptoms occur.

Which feed to start?

- During ventilator dependency period, continuous Ryle's tube feeding on a formula which is low CHO (26%of total calorie) (helps to reduce CO2 production and respiratory quotient), calorie rich (1.5kcals/ ml) which will help to meet elevated energy requirements in a low volume.

- Protein (18%of total calorie) (the elevated protein to support lean body mass).

How much EN should critically ill patients receive?

- No general amount can be recommended as EN therapy has to be adjusted according to the progression/course of the disease and to gut tolerance.
- During the acute and initial phase of critical illness an exogenous energy supply in excess of 20–25 kcal/kg BW/day may be associated with a less favorable outcome .
- During recovery (anabolic flow phase), the aim should be to provide 25–30 total kcal/kg BW/day.

How Much and What Type of Protein Should a Critically Ill Patient Receive?

Depletion of muscle mass is associated with impaired function and poor outcomes. In extreme cases, protein malnutrition is manifested by respiratory failure, lack of wound healing, and immune dysfunction. Protecting muscle loss focused initially on meeting energy requirements.

Over a dozen observational studies in critically ill patients suggest that higher protein delivery is beneficial at protecting muscle mass and associated with improved outcomes (decrease in mortality).

Society of Critical Care Medicine/American Society for Parenteral and Enteral Nutrition guidelines and expert recommendations suggest higher protein delivery (>1.2 g/kg/d) for critically ill patients.

Nutr Clin Pract. March 1, 2017

Implementation of an Aggressive Enteral Nutrition Protocol and the Effect on Clinical Outcomes

Study: Enrolled adult surgical intensive care unit (ICU) patients receiving >72 hours of EN from July 2012 to June 2014. Intervention consisted of increasing protein prescription (2.0–2.5 vs 1.5–2.0 g/kg/d) and compensatory feeds for EN interruption.

Conclusions: In surgical ICU patients, implementation of an aggressive EN protocol resulted in greater macronutrient delivery and fewer late infections.

Nutrition in Clinical Practice, First Published January 20, 2017

Patient – off ventilator …. Peg feed initiated After 4 weeks post op

- Blood test results – normal
- Not gained weight
- Not gained muscles
- Patient – GCS status remains less than 5

Nutritional intervention:

- During this period we have seen intolerance as diarrhoea couple of times, still the feed was continued irrespective of loose stools but the rate of feed administration and cycle of feed was adjusted in between to combat the intolerance.

- Even though the feed was started slowly initially, within a week's time was able to reach the target.

- The patient was fed semi recumbent rather than supine position is associated with reduced aspiration pneumonia and pharyngoesophageal formula reflux.

Enteral tube feeding

Motility agents

- Consider a motility agent in intensive care patients who have delayed gastric emptying and who are not tolerating enteral tube feeding, unless there is a pharmacological cause that can be rectified or you suspect gastrointestinal obstruction.

- Consider post-pyloric enteral tube feeding and/or parenteral nutrition if delayed gastric emptying is severely limiting feeding, despite the use of motility agents.

Contraindications to EN

- **Gastrointestinal** –
  - Intestinal obstruction / ileus
  - Intestinal ischemia
  - Severe peritonitis
  - Nausea / vomiting
  - Malassimilation
- **Metabolic** –
  - Diabetic keto acidosis
  - Diabetic coma
  - Hepatic coma
- **Circulatory** –
  - Severe acute heart insufficiency
  - shock of any origin

Gastrointestinal complications of EN

• **Problem**	• **Frequency**
Compliance	10-40 %
Tube malposition/ displacement	Up to 50 %
Nausea / vomiting	10-15 %
Diarrhoea	25 – 50 %
Infections	Rare
Severe metabolic complications	Very rare
Aspiration	?

Diarrhoea

Reasons of diarrhoea during enteral nutrition:

- Bolus applications
- High Delivery rate
- High Osmolalilty
- Bacterial contamination of the formula diet
- Formula diet is too cold
- Gastrointestinal infections
- Malabsorption

What to do??

The work up for diarrhoea occurring during EN should include the following issues:

- From bolus to continuous feed using an electronic pump. Continuous feed is better tolerated than bolus.
- Decrease the delivery rate for few days and then increase as per tolerance.
- Change the set as per manufacture's instructions. Open feed should not be in the bag more than 6-10 hrs.
- Review patient's prescriptions regarding diarrhoea inducing drugs.
- Exclude gastro intestinal infections
- If mal absorption is suspected change to low molecular feeds.
- If diarrhoea persists change to soluble fiber formula containing enteral feeds.

Nausea and vomiting

Reasons for impaired gastric emptying during Enteral Nutrition:

- **Pre existing diseases-**
  - DM
  - Vagotomy
  - Systemic scleroderma
  - Myopathies
- **Acute disease related** –
  - Pain and stress
  - Pancreatitis
  - Spinal cord injury
  - Extensive, abdominal surgery, burn injury
- **Medication** –
  - Opioids
  - Anticholinergics

What to do??

The work up of nausea/ vomiting occurring during EN should include the following issues:

- In case of cancer / antineoplastic therapy: initiate adequate antiemetic/ analgesic therapy
- Exclude obstruction (auscultation, x-ray abdomen)
- Review patient's prescriptions regarding nausea inducing drugs
- If delayed gastric emptying is considered: reduce delivery rate, try prokinetic

Constipation

The work up of constipation occurring during EN should include the following issues:

- Review Patient's EN prescription
- Increase fluid intake, reduce density of formula or switch to fiber containing formula if for some reason these have not been the first line of choice.
- Exclude obstruction (auscultation, x-ray abdomen)
- If these fails, consider stool softener (eg: lactulose or bowel stimulants)

Aspiration

In order to prevent aspiration in high risk patients the following issues to be considered:

- Prefer a semi recumbent position (30°- 45°)

- Prefer nasojejunal instead of nasogastric tube feeding.

- In the presence of clinical changes measure gastric residual volume, adjust the delivery rate (prolong delivery period)

Monitoring of EN

Feed administration……Daily

Fluid balance……Daily

Laboratory tests:

Na, K, Glucose……Initially daily

P, Ca, Urea, Creatinine, ALT, Blood count….Initially twice / week

Nutritional status:

Weight, albumin, BIA…..Weekly / every second week

Functional status:

Hand grip strength…..weekly

Should EN nutrition be supplemented with glutamine?

There was a low frequency of pneumonia, sepsis, and bacteraemia in patients with multiple trauma who received glutamine-supplemented enteral nutrition. Larger studies are needed to investigate whether glutamine-supplemented enteral nutrition reduces mortality.

Houdijk AP, Rijnsburger ER, Jansen J, et al. Randomised trial of glutamine-enriched enteral nutrition on infectious morbidity in patients with multiple trauma. Lancet 1998;352: 772–6

Glutamine supplementation for critically ill adults

This review found moderate evidence that glutamine supplementation reduced the infection rate and days on mechanical ventilation, and low quality evidence that glutamine supplementation reduced length of hospital stay in critically ill or surgical patients.

It seems to have little or no effect on the risk of mortality and length of ICU stay, however. The effects on the risk of serious side effects were imprecise.

The strength of evidence in this review was impaired by a high risk of overall bias, suspected publication bias, and moderate to substantial heterogeneity within the included studies.

Cochrane Database Syst Rev. 2014 Sep 9: Tao KM[1], Li XQ, Yang LQ, Yu WF, Lu ZJ, Sun YM, Wu FX.

Nutritional monitoring and evaluation:

- Once the patient was out of ventilator dependency, he was fed on an advanced recovery formula for a week.

- He was fed 2000kcals (30kcals x actual body / day) and 120gm protein (1.8 x actual body weight) with adequate nutrients and minerals from the ready to feed formula.

Enteral nutrition target:

- The respective patient was fed on standard formula with fiber. The feed was well tolerated.

- These intakes are generally considered to be optimal for bed-ridden patients receiving tube feeding. He was on continuous peg feed.

Feed chart summary

Feed progress	Rate	Total Volume - Flush water every 4th hourly	Continuous Feed - Monitored daily	ENERGY	PROTIEN
21 hrs feed	30ml/ hr	630 ml feed + 150 ml water	HN Fibersource	770.84 kcals	33.88 gm protein
Advanced recovery formula 13 hrs feed	125ml/ hr	1625ml feed + 150 ml water	IMPACT	2275 kcals	123 gm protein
Target – 18 hrs feed	125ml/ hr	2250 ml feed + 250 ml water	HN Fibersource	2753 kcals	121 gm protein

Final status:

- Once the patient improved by his gag reflex he was allowed for oral thick liquids, we fed him on nutrient rich thick liquids, eventually he takes orally all food.
- He does have normal bowel movement.
- He doesn’t have any muscle wasting.
- His BMI improved to 24.
- His biochemical results are all normal.
- He never had any infection related or caused by feed all throughout this period.
- He is able to do physiotherapy in an effective way as he doesn’t have muscle wasting.
- Under the rehabilitation therapy, he improved day by day with the presence of his family.
- He can walk now with help.
- He left hospital after 1 year with his family from Nepal.

References:

- **ESPEN Guidelines on Enteral Nutrition: Intensive care**
- **LLL ESPEN Clinical nutrition Module**
- **A.S.P.E.N. Enteral Nutrition Practice Recommendations:**
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THANK YOU

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