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Original/*Intensivos*

Giving a nutritional FAST HUG in the Intensive Care Unit

Enrique Monares Zepeda[1] and Carlos Alfredo Galindo Martín[2]

[1]MD. Medical Chief of the Intensive Care Unit at the Hospital San Ángel Inn Universidad, Mayorazgo 130, Xoco, México City.
[2]RD. Chief of the Nutrition Department at the Hospital San Ángel Inn Universidad, Mayorazgo 130, Xoco, México City.

Abstract

Implementing a nutrition support protocol in critical care is a complex and dynamic process that involves the use of evidence, education programs and constant monitoring. To facilitate this task we developed a mnemonic tool called the Nutritional FAST HUG (F: feeding, A: analgesia, S: stools, T: trace elements, H: head of bed, U: ulcers, G: glucose control) with a process also internally developed (both modified from the mnemonic proposed by Jean Louis Vincent) called MIAR (M: measure, I: interpret, A: act, R: reanalysis) showing an easy form to perform medical rounds at the intensive care unit using a systematic process.

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Key words: *Critical care*. *Nutritional support*. *Enteral*. *Parenteral*.

DANDO UN ABRAZO RÁPIDO (FAST HUG) NUTRICIONAL EN LA TERAPIA INTENSIVA

Resumen

Implementar un protocolo de soporte nutricional en cuidados críticos es un proceso complejo y dinámico que envuelve el uso de evidencia, uso de programas y monitoreo constante. Para facilitar esta tarea desarrollamos una herramienta nemotécnica llamada el FAST HUG ("Abrazo Rápido" en español) Nutricional (F: feeding, A: analgesia, S: stools, T: trace elements, H: head of bed, U: ulcers, G: glucose control) con un proceso también desarrollado internamente (ambos modificados de la nemotecnia propuesta por Jean Louis Vincent) llamada MIAR (M: measure, I: interpret, A: act, R: reanalysis) mostrando una forma fácil de realizar las visitas médicas en la unidad de cuidados intensivos usando un proceso sistemático.

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Palabras clave: *Cuidados intensivos*. *Soporte nutricional*. *Enteral*. *Parenteral*.

Abbreviations:
ACS: Abdominal Compartment Syndrome.
DB: Direct Bilirubin.
EN: Enteral Nutrition.
FODMAPS: Fermentable Oligo-, Di-, Mono-sacharides.
GRV: Gastric Residual Volume.
IAH: Intraabdominal Hypertension.
IAP: Intraabdominal Pressure.
ICQX: Interconsult with Surgery.
ICU: Intensive Care Unit.
PN: Parenteral Nutrition.
RRT: Renal Replacement Therapy.
SC: Subcutaneous.

Correspondencia: Carlos Alfredo Galindo Martín.
Mayorazgo 130, Xoco, Delegación Benito Juarez, CP. 03339.
México Distrito Federal.
E-mail: carlos.algalmar@gmail.com

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Introduction

Critically ill patients are commonly incapable of meeting their energy and protein needs by themselves, caused by an accumulation of factors like vital organ support and anorexia. Also, is known that during critical illness the metabolic pathways are directed mostly to muscular proteolysis in order to regulate the inflammatory and immunologic response to injury[1]. In the same way it has been related that the energy deficit accumulation results in worst outcomes in this kind of patients[2]. Every critical patient regardless of their previous nutritional status has a metabolic and immune response to injury or illness highly variable that could be attenuated with the focused and appropriate provision of nutritional therapy[3].

Multiple nutritional support guidelines in critical care have been published by different associations [4,5,6,7]. Even so the fact that there is evidence and literature does not ensures the use of such recommendations and strategies in the daily practice.

The use of evidence for the clinical practice encompasses a dynamic process and requires the evaluation of different characteristics with the purpose of adjusting the evidence to the daily practice. This evaluation may include the quality of the evidence, the implementation process, the systems characteristics (economic, the institution and the staff involved in the process) following of the protocols by the staff and the patient´s characteristics[8].

Multiple searches were conducted via PubMed, OVID and HINARI, recommendations were chosen from those articles that mentioned evidence-based recommendations and approaches for the clinical practice. The selection of these articles were performed and discussed by the two authors of the present work, extracting the information and placing it in the different stages of the protocol to implement. An internal guide of nutritional support was made and placed available to all staff.

The aim of the present work is to show one of the many ways to implement the evidence-based clinical practice, concerning in nutritional support at the Intensive Care Unit (ICU) following a sequential scheme with decisions based on objective data.

An internal clinical practice guide was obtained as a result, this guide is shown below.

Nutritional score.

The use of a scoring method to qualify nutrition risk at the ICU facilitates future decision-making, since it has been shown that those patients previously undernourished will benefit the most from an aggressive nutritional support than those who are previously well nourished[9,10].

Every newly admitted patient to the ICU is evaluated within the first 24 hours of admission once the required data it's available to complete the nutritional score index proposed by Heyland et al. "The NUTRIC score". (Figure 1.)

Those with a NUTRIC score of 0-5 are considered previously well nourished, while a score of 6 or more represent previous under nutrition or at nutritional risk[10].

Daily rounds

Nutrition school students at the ICU are assigned to monitor the follow of the established protocols, perform the nutritional risk scores and collect the relevant data for decision-making in relation to nutritional support.

At the moment of the daily round, which includes the Nutrition students, the ICU Medical Chief and the Nutrition Department Chief, all the decisions concerning nutritional support are made and documented in specific formats.

The use of mnemonics allows the following of the protocols without excluding important aspects, enhancing adherence, helping the methods of education and improving efficiency and effectiveness of the nutritional support in every patient. This is why we adapted the mnemonics of Jean Louis Vincent called FAST HUG from a nutritional point of view[11]. This adaptation is shown below:

F (Feeding):

Ensure that the patient receives a minimum of 80% of the established caloric goals assessing the start and the daily progression or tolerance to the enteral nutrition (EN)[7]. For this reason we evaluate the daily tolerance to the EN in a systematic way. A more detailed explanation is given in the section "Start and following of nutritional support" and in the Figure 3 and 4.

Also it is important to detect any signs of refeeding syndrome, since the principal sign is hyposphataemia (serum concentration bellow 2.5mg/dL), monitoring phosphorous (P) serum concentration along with the other electrolytes (Na, K, Cl, Mg and Ca) before, at the beginning and during nutritional support makes easier to alarm the medical guard and ensure a timely P reposition. When the reposition can't achieve goals (P>2.5mg/dL) its recommended to stop nutritional support until serum levels are normal, the nutritional support can be restarted after serum P correction[12].

A: (Analgesia):

Take into account the administration of opioid analgesics which may reduce intestinal motility[11]. If a patient is receiving opioid analgesics it should be considered if the dose can be reduced. If this is not possible it should be used a non selective μ-opioid receptor antagonist such as Naloxone, giving an enteral dose of 4mg every 6 hours, other approach is the use of a peripherally active μ-opioid receptor antagonist (metilnaltrexone) administered subcutaneously at a dose of 0.15mg/Kg, reassessing every 24 hours[13].

S (Stools):

Constipation is defined as the absence of evacuations for more than 3 consecutive days. Consequently any metabolic cause of ileus most be investigated and corrected, for example hypokalemia or hyperglycemia[13,14]. Simultaneously it has to be discarded a mechanical obstruction with a corresponding resolution and a reevaluation of EN possibility[13]. Finally if there is no objective cause of constipation the use of laxants should be started. It is important to rule out the effect of opioid analgesics in the previous step.

Nutrition risk socre: Intensive Care Unit.

Name:_____ Dato of birth.:_____

Age:_____ Gender: M ☐ F ☐ Weight:_____ Stature:_____ Date of admission:_____ Length of stay :_____

Alergies:_____ Privacy level:_____ Room:_____ Medical diagnosis:_____

Body Mass Index: _____Kg/m^2

Ideal weight (Robinson):_____Kg

Admission diagnosis:_____

_____

Comorbidities:_____

_____

NUTRIC score.			
Variable.	**Range.**	**Points.**	
Age (years).	<50	0	
	50 a <75	1	
	≥75	2	
APACHE II.	<15	0	
	15 a <20	1	
	20 a 28	2	
	≥28	3	
SOFA.	<6	0	
	6 a <10	1	
	≥10	2	
Number of comorbidities.	0 a 1	0	
	2+	1	
Hospitalization days before ICU admission.	0 a <1	0	
	1+	1	
TOTAL.			

Result.		
0-5 points	No risk.	
6-9 points	At risk.	

Fig. 1.—NUTRIC score format.
The risk score is obtained from the final sum of points from each variable. APACHE: Acute Physiology and Chronic Health Evaluation. SOFA: Sequential Organ Failure Assessment.

T (Trace elements):

Supplement 12mg of zinc for every liter of fluid loss from fistulas, ileostomy, intestinal drainages and diarrhea[15].

If cholestasis is present, defined by an elevation of direct billirubin equal or greater tan 2mg/dL the administration of manganese and cooper containing compounds should be stopped preventing toxicity. Principal sources of Mn and Cu are intravenous trace elements[16,17,18].

Readjustment of vitamin C dose should be done in those patients with renal failure in order to prevent exacerbation of the renal damage. In the patient who

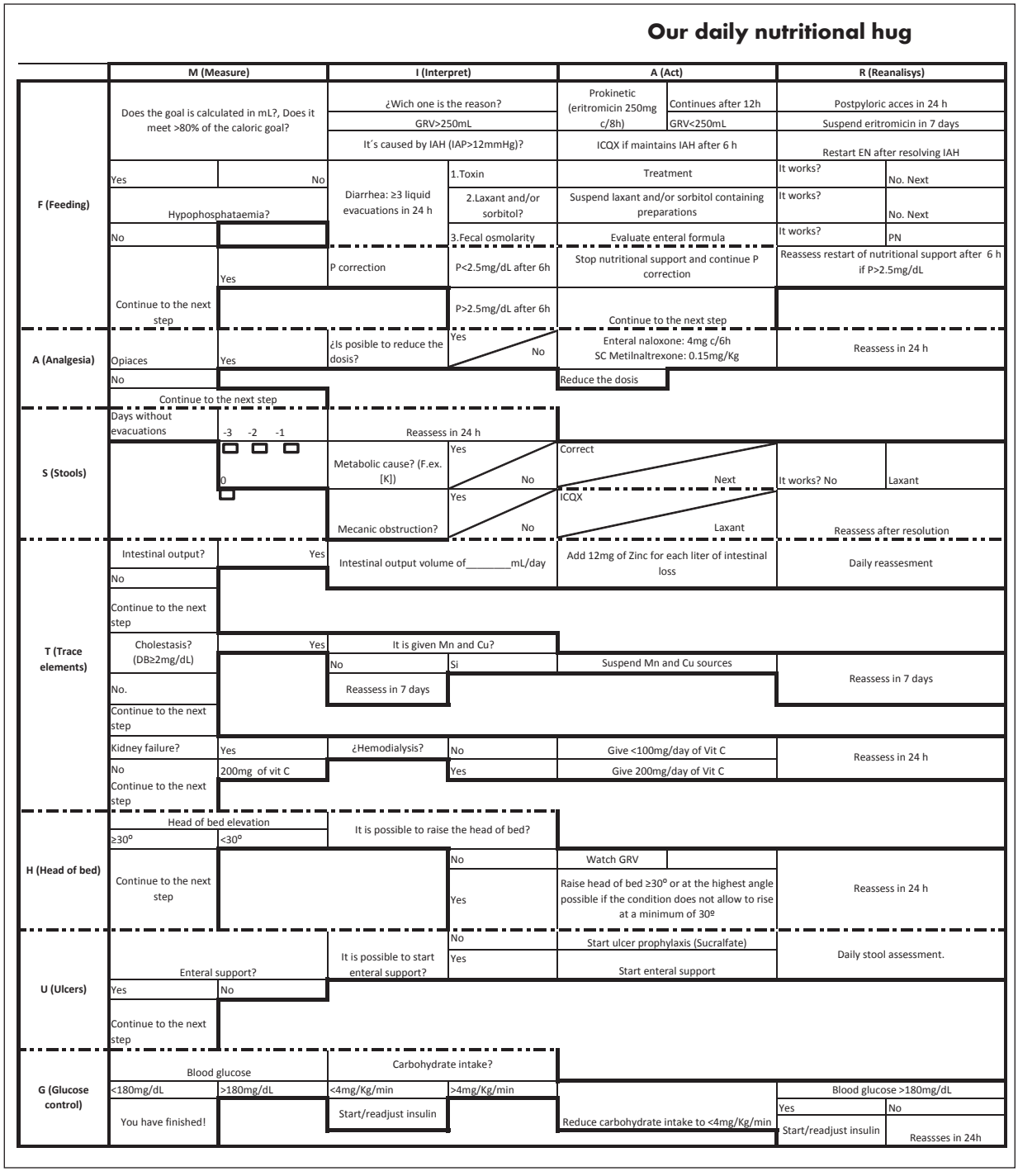

Fig. 2.—FAST HUG/MIAR format.
This format shows the fusion of the FAST HUG and MIAR processes. GVR: Gastric Residual Volume. EN: Enteral Nutrition. IAP: Intraabdominal Pressure. IAH: Intraabdominal Hypertension. ICQX: Interconsult Surgery Team. PN: Parenteral Nutrition. DB: Direct Bilirubin. Mn: Manganese. Cu: Cooper.

is not yet receiving renal replacement therapy (RRT) vitamin C should be reduced to less than 100mg for day. While patients receiving RRT vitamin C must be administrated in a dose up to 200mg for day[19].

These approaches are mostly considered in patients receiving parenteral nutrition (PN).

H (Head of the bed):

Verify the elevation of the head of bed maintaining a minimum angle of 30º. If the clinical condition of the patients does not allows this angle the goal is to maintain as higher as possible the head of bed[4,7,12].

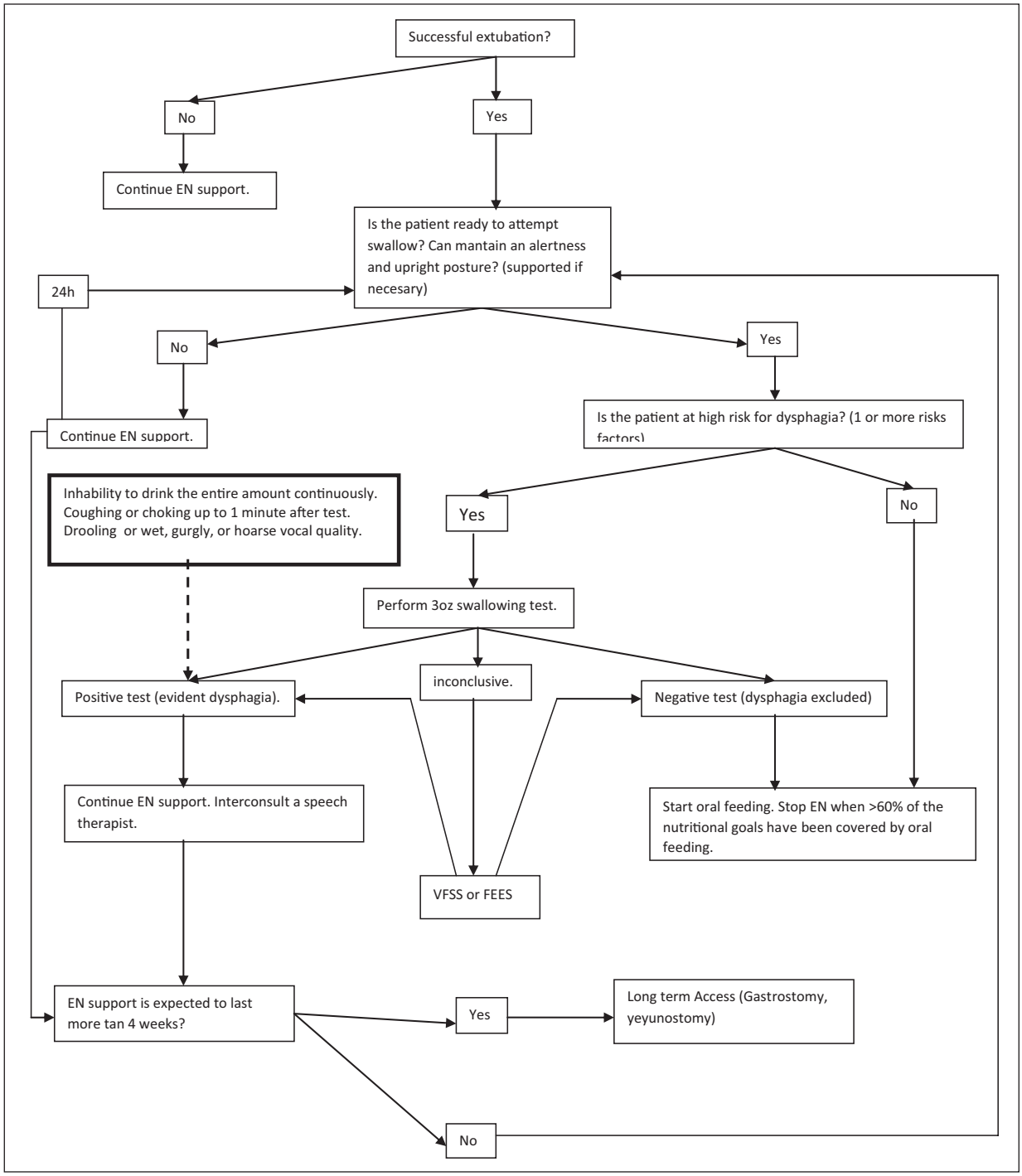

Fig. 3.—Bronchoaspiration preventing algorithm.
EN: Enteral Nutrition. VFSS: Videofluoroscopic Swallow Study. FEES: Fiberoptic Endoscopic Swallow Study.

U (Ulcer):

Stress ulcer prophylaxis is an important part of the medical management in those patients at risk of gastrointestinal bleeding such as patients receiving mechanical ventilation, steroid therapy, with coagulation abnormalities or history of gastrodudenal ulcer[12].

Early EN (within 48 hours of admission) has been proved to be an independent protective factor for gastrointestinal bleeding in patients who receive mechanical ventilation[20,21].

In order that with every mechanically ventilated patient who is not receiving EN it should be evaluated to start it, if this is not possible stress ulcer prophylaxis must start or be continued.

Table I
Risk factors for dysphagia

Dysphagia history.
Gastroesophagieal reflux history.
Tracheostomy.
>65 years old.
Cerebral vascular accident/stroke.
Cerebral lesion (stem and/or bilateral)
Multiple orotacheal intubations (>2 times)
Neuro-muscular dissease.
Intubated > 7 days.
Head, neck and/or esophagus cancer or surgery.
Delirium, sedation or dementia.
Paralysis or critical patient neuropathy.

G (Glucose control):

All the UCI team should consider the different carbohydrate sources to maintain glucose control, including any nutritional support (NE or PN)[22,23]. Aiming to a blood glucose bellow 180mg/dL during nutritional support[7].

Each point of the FAST HUG involves 4 steps adapted from the mnemonics used by Jean Louis Vincent called MIA (M: measure, I: Interpret, A: act) and our addition of the last letter R (Reanalysis) resulting in the mnemonics "MIAR", in order to maintain a logical sequence at a time span in all de decisions taken with respect of nutritional support at the ICU. The sequence is shown in the internal format (figure 2).

Nutritional support type

The type of nutritional support to be used depends on the possibility to use the gastrointestinal tract. Contraindications for EN are: mechanical obstruction, mesenteric ischemia o intestinal failure, which includes less than 150cm of remaining and functional bowel, radiation enteritis, high output (>2L/day) proximal fistula (duodenum or jejunum), active inflammatory bowel disease and splanchnic ischemia[24].

The first type of nutritional support to be considered is EN[4,5,6,7]. Even if PN has been started a daily assessment of EN start should be done[7].

Initiation and monitoring of nutritional support

Enteral nutrition support:

Early EN has been associated with less hospital stay, infectious complications and reduced mortality in several studies, review articles and meta-analisys[3, 25].

Following the available recommendations EN should be started once the patient is fully resuscitated and hemodynamically stable[4,6,7].

Due to the lack of a concrete definition of hemodynamic stability to start EN we internally defined as the absence of vasoactive amines (e.g. Vasopressin, norepinephrine) or if such drugs are being administered at any dose showing data of adequate perfusion (lactate<2mmol/L and/or bicarbonate>20mmol/L).

According to the result of the initial nutritional score, caloric goals (or at least 80%) should be meet within the first 72 hours after the initiation of nutritional support in patients at nutritional risk or remain for 7 days with hypocaloric EN in those patients previously well nourished or without nutritional risk[3,25,26]. Defining hypocaloric EN as 50% of the caloric goals.

Also, every patient at nutritional risk should receive an enteral multivitamin compound containing 200mg of thiamine, at less 30 minutes before starting EN, and continue such administration until day 3[27].

The type of enteral formula to be used in every patient will be the same at the beginning (standard polymeric) and the use of specialized formulas would depend on the clinical evolution.

Parenteral nutrition support:

PN is not recommended for all patients at the ICU or as a measure of routine use[7]. A previously well nourished patient will not be candidate for PN until after 7 days of admisión[4].

A patient at nutritional risk should receive 200mg of intravenous thiamine within a multivitamin compound, at a minimum of 30 minutes before starting EN, and continue with the same daily dose until day 3[27].

The carbohydrate (dextrose) administration of the first day of PN will not exceed 150mg. Furthermore, in any time during PN dextrose administration will be no more than 4mg/Kg/min[22,23].

Gastrointestinal Function:

Gastrointestinal function would be assessed with the index proposed by Reintam et al. which can be used as diagnostic criterion of gastrointestinal dysfunction and mortality predictor[28].

Diarrhea:

Defining diarrhea as 3 or more liquid stools in 24 hours makes more easy to differentiate between diarrhea and changes in the consistency or frequency of the stools[14]. A stool analysis searching for infectious cause must be performed, since in the majority of the cases it is caused by *Clostridium Difficile* and it requires immediate treatment[13,29,30,31]. Consequently every medication should be evaluated searching for laxants suspending their administration or sorbitol containing

preparations changing the administration route or preparation formula as soonest possible[13,29,31].

Also manipulation of the enteral formula may be a secondary cause of infection and diarrhea and will have to be taken into account[29].

Once all the non enteral formula related causes of diarrhea have been discarded an analysis of the enteral formula should be performed, being that if contains fermentable Oligo-, Di-. Mono-saccharides (FODMAPS) the formula must be changed for a FODMAP free presentation[12,27,29]. Persistent diarrhea will be awarded to another feature of the formula considering whether or not it contains fiber, assuming excess or lack of fiber. Finally as a last resource it is the use of elemental formulas and once this approximation has failed starting PN (supplementary PN preferably) should be considered[29].

Gastric Residual Volume:

All patients with EN in the ICU stay with preventive measures to gastrointestinal intolerance, vomiting, reflux and subsequent aspiration. Such measures are the elevation of the head of bed at 30º and monitoring of residual gastric volume (GRV)[4, 7].

GRV measures should be performed once a day considering as an intolerance marker a GRV greater than 250mL or the presence of vomiting and regurgitation. Similarly this measurement helps to detect trends in the GRV and to consider new preventive approaches[4,7].

By detecting intolerance data (GVR>250mL, vomiting or regurgitation) the first line of action is the use of prokinetic drugs such as eritromicin. Prokinetic should be ceased after 7 days of successful (>80% of the caloric goals) EN being elapsed or if diarrhea begins. After the persistent intolerance placing a postpyloric access should be the next step and PN must be the last resource[7,4, 32].

As time span we decided to place a postpyloric access after 24 hours of eritromicin administration with no successful results (GRV<250mL).

Intraabdominal Hypertension:

Increased intraabdominal pressure (IAP) it is often accompanied with signs of EN intolerance which is an indicator of gastrointestinal dysfunction. The presence of intraabdominal hypertension (IAH) grade I (IAP>12mmHg) with high GRV, vomiting, regurgitation, diarrhea or constipation it will be handled according to each of the before mentioned processes without being an indication for suspending EN, now with the measurement of the IAP every 6 hours. Being that if EN intolerance persists and IAP rises to a IAH grade II (15-20mmHg) consider the use of PN evaluating daily restart of postpyloric EN. By associating the IAH with any new onset of an organ failure, known as abdominal compartment syndrome (ACS), emergency measures must be done (i.e. colonic decompression and damage control laparotomy)[14].

When oral or enteral is initiated in a patient with PN, the discontinuation of PN should be done when more than 60% of the protein caloric needs have been covered[4].

Using this memory method is a simple way to teach and ensure the correct following of the internal nutrition protocol based on evidence. So every member of the team knows how to proceed in every situation.

From now on we give a nutritional FAST HUG to each patient in the ICU.

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Each author contributed by gathering information and using it for the development of the method (FAST HUG/MIAR).

Competing interest

The authors declare that they have no competing interests.

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