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Servicio de Anestesia, Reanimación y Tratamiento del Dolor
Consorcio Hospital General Universitario de Valencia
PROTOCOLO DE CUIDADOS CRÍTICOS SARTD: NUTRICIÓN
NUTRICIÓN PARENTERAL
Dra Verónica Planelles Naya - Dra. Marta Londoño Parra

La nutrición parenteral es una de las alternativas para proporcionar nutrientes esenciales a los pacientes que no pueden ser alimentados de manera regular.

Las indicaciones de la nutrición parenteral han sido muy controversiales, y numerosos estudios se han realizado acerca de cuando y en que pacientes iniciarla, sin llegar a conclusiones muy claras.

En el siguiente protocolo intentaremos analizar un poco las guías mas importantes existentes, cono son la ESPEN y la ASPEN en nutrición parenteral, haciendo énfasis en el paciente de unidades de cuidados críticos.

En estas guías son pocas las recomendaciones grado A, y abundan las recomendaciones apoyadas en opinión de expertos, por lo que consideramos que aún queda mucho por profundizar en el tema de la nutrición parenteral, sobre todo a nivel de indicaciones mas claras, y sobre sus beneficios en el paciente crítico.

Nutrición enteral vs nutrición parenteral

Las comparaciones entre nutrición enteral y nutrición parenteral se han hecho desde hace 30 años. A pesar de la gran cantidad de estudios dirigidos a este aspecto , la pregunta acerca de cual es mejor aún permanece sin responder, sobre todo por la heterogenicidad de los estudios, además de que han cambiado el manejo del paciente crítico, incorporando un estricto control glucémico, mejor profilaxis y control de infecciones, mejoría de las formulaciones tanto parenterales como enterales, por lo que la aplicabilidad de estos estudios hoy en día queda en duda.

Mientras el tiempo de inicio de la nutrición enteral en el paciente crítico está bastante establecido, no así para la nutrición parenteral, y sobre si la combinación de NE y NP son beneficiosas para el paciente es otro punto que queda en duda.

En cuanto a la comparación de ambas nutriciones se pueden resumir los estudios en 3 meta análisis principales, 2 de los cuales son sobre el paciente crítico. Estos estudios fueron hechos antes de la implementación del control glucémico estricto en el paciente crítico, además de ser heterogéneos en cuanto al diseño, estrategia de nutrición y población.

En ninguno de los estudios se encontró diferencias en mortalidad entre pacientes que recibieron NE versus los que recibieron NP, pero los pacientes que recibieron NP si tuvieron una mayor incidencia de infecciones.

Son claras las desventajas que se le atribuyen a la NP, básicamente aumento de las infecciones relacionadas con el catéter central, y aumento de las cifras de glucemia; pero a nivel de pacientes en cuidados críticos, lo cuales la mayoría necesitan una vía central para la infusión de diferentes drogas y tras la implementación del control glucémico estricto tal vez modifique un poco estos resultados.

Por el momento lo que queda claro en las guías es que el retrasar la nutrición en un paciente que no tolera vía oral aumenta la mortalidad y la incidencia de infecciones de forma importante, por lo que la nutrición de estos pacientes es esencial y debe iniciarse en poco tiempo.

Las nutrición parenteral se puede administrar mediante vía central o periférica. La vía central es preferible para NP completas, ya que por su osmolaridad pueden producir daño a venas periféricas, pudiendo producir tromboflebitis.

La NP periférica se puede utilizar durante un periodo limitado de tiempo (tromboflebitis) y con nutriciones cuya osmolaridad no exceda 850 mOsm/L (con importante proporción de calorías en forma de lípidos).

Las guías de ESPEN hacen un apartado importante acerca de las colocación y cuidados de los catéteres venosos centrales, como que la posicion de la punta esta deberá encontrarse entre el tercio inferior de la vena cava superior y la parte sup de la AD, por ser los lugares con menor incidencia de complicaciones mecánicas y de trombosis, y esto deberá verificarse o inmediatamente mediante ECG o fluoroscopia, o posteriormene mediante RX.

Tambien se habla acerca de cuales son las intervenciones que han demostrado disminuir la incidencia de infecciones relacionadas al catéter, y entre estas se encuentran el uso de catéteres tunelizados, el uso de catéteres recubiertos por antibióticos, catéteres de una luz, uso de acceso periférico cuando sea posible, lugar de inserción adecuado, venopunción guiada por ecografía, adecuada asepsia y antisepsia durante su colocación, educación del personal que va a trabajar con las vías centrales, lavado de manos antes y después de su manipulación, cambio de los sets de administración, etc. En el caso en que se utilicen vías de mas de una luz, una de las luces debe ser reservada exclusivamente para la NP.

El uso de catéteres centrales de inserción periférica es recomendada para pacientes con traqueotomía, alteraciones anatómicas del cuello y tórax que puedan dificultar la inserción, plaquetopenia importante.

La elección del lugar de punción dependerá de la técnica, el riesgo de complicaciones mecánicas, la facilidad para la correcta manipulación por enfermería, entre otros, estando relativamente contraindicada la vena femoral y el abordaje alto de la vena yugular interna, por su mayor incidencia de infecciones.

El material del catéter también es importante, siendo los de teflon, silicona y poliuretano los menos relacionados con infecciones, siendo actualmente los únicos disponibles.

Finalmente para el diagnóstico de sepsis por catéter central se deberán tomar cultivos del catéter cuando éste se retira o hemocultivos extraídos por el catéter y por venopunción.

El catéter deberá retirarse en caso de signos de infección local, clínica de sepsis, cultivo positivo de un catéter intercambiado sobre una guía, 2 hemocultivos positivos (de sangre periférica y del catéter). Tras la retirada debemos administrar tratamiento ATB adecuado.

La trombosis relacionada con el catéter se evitará tomando precauciones para evitar lesionar la vena: inserción guiada por ecografía, posición...

Table (*continued*)

Summary of statements: Central Venous Catheters

Subject	Recommendations	Grade	Number
Treatment of catheter-related sepsis (short-term lines)	A short-term central line should be removed in the case of (a) evident signs of local infection at the exit site, (b) clinical signs of sepsis, (c) positive culture of the catheter exchanged over guide wire, or (d) positive paired blood cultures (from peripheral blood and blood drawn from the catheter). Appropriate antibiotic therapy should be continued after catheter removal.	B	8
Treatment of catheter-related sepsis (long-term lines)	Removal of the long-term venous access is required in case of (a) tunnel infection or port abscess, (b) clinical signs of septic shock, (c) paired blood cultures positive for fungi or highly virulent bacteria, and/or (d) complicated infection (e.g., evidence of endocarditis, septic thrombosis, or other metastatic infections). In other cases, an attempt to save the device may be tried, using the antibiotic lock technique.	B	9
Routine care of central catheters	Most central venous access devices for PN can be safely flushed and locked with saline solution when not in use. Heparinized solutions may be used as a lock (after flushing with saline), when recommended by the manufacturer, in the case of implanted ports or opened-ended catheter lumens which are scheduled to remain closed for more than 8 h.	C	10
Prevention of line occlusion	Intraluminal obstruction of the central venous access can be prevented by appropriate nursing protocols in maintenance of the line, including the use of nutritional pumps.	C	11
Prevention of catheter-related central venous thrombosis	Thrombosis is avoided by the use of insertion techniques designed to limit damage to the vein, including • Ultrasound guidance at insertion • choice of a catheter with the smallest caliber compatible with the infusion therapy needed • position of the tip of the catheter at or near to the atrio-caval junction Prophylaxis with a daily subcutaneous dose of low molecular weight heparin is effective only in patients at high risk for thrombosis.	B	12

Summary of statements: Central Venous Catheters

Subject	Recommendations	Grade	Number
Choice of route for intravenous nutrition	Central venous access (i.e., venous access which allows delivery of nutrients directly into the superior vena cava or the right atrium) is needed in most patients who are candidates for parenteral nutrition (PN). In some situations however PN may be safely delivered by peripheral access (short cannula or midline catheter), as when using a solution with low osmolarity, with a substantial proportion of the non-protein calories given as lipid. It is recommended that peripheral PN (given through a short peripheral cannula or through a midline catheter) should be used only for a limited period of time, and only when using nutrient solutions whose osmolarity does not exceed 850 mOsm/L. Home PN should not normally be given via short cannulas as these carry a high risk of dislocation and complications. Peripheral PN, whether through short cannulas or midline catheters, demands careful surveillance for thrombophlebitis.	C	1
Choice of PN catheter device	Short-term: many non-tunneled central venous catheters (CVCs), as well as peripherally inserted central catheters (PICCs), and peripheral catheters are suitable for in-patient PN. Medium-term: PICCs, Hohn catheters, and tunneled catheters and ports are appropriate. Non-tunneled central venous catheters are discouraged in HPN, because of high rates of infection, obstruction, dislocation, and venous thrombosis. Prolonged use and HPN (>3 months) usually require a long-term device. There is a choice between tunneled catheters and totally implantable devices. In those requiring frequent (daily) access a tunneled device is generally preferable.	B	2
Choice of vein for PN	The choice of vein is affected by several factors including venepuncture technique, the risk of related mechanical complications, the feasibility of appropriate nursing of the catheter site, and the risk of thrombotic and infective complications. The use of the femoral vein for PN is relatively contraindicated, since this is associated with a high risk of contamination at the exit site in the groin, and a high risk of venous thrombosis. High approaches to the internal jugular vein (either anterior or posterior to the sternoclavicular muscle) are not recommended, since the exit site is difficult to nurse, and there is thus a high risk of catheter contamination and catheter-related infection.	C	3
Insertion of CVCs	There is compelling evidence that ultrasound-guided venepuncture (by real-time ultrasonography) is associated with a lower incidence of complications and a higher rate of success than 'blind' venepuncture. Ultrasound support is therefore strongly recommended for all CVC insertions. Placement by surgical cutdown is not recommended, in terms of cost-effectiveness and risk of infection. In placement of PICCs, percutaneous cannulation of the basilic vein or the brachial vein in the midarm, utilizing ultrasound guidance and the micro-introducer technique, is the preferred option	A B	4 4
Position of CVC tip	High osmolarity PN requires central venous access and should be delivered through a catheter whose tip is in the lower third of the superior vena cava, at the atrio-caval junction, or in the upper portion of the right atrium (Grade A). The position of the tip should preferably be checked during the procedure, especially when an infraclavicular approach to the subclavian vein has been used. Postoperative X-ray is mandatory (a) when the position of the tip has not been checked during the procedure, and/or (b) when the device has been placed using blind subclavian approach or other techniques which carry the risk of pleuropulmonary damage.	C, B	5
Choice of material for CVC	There is limited evidence to suggest that the catheter material is important in the etiology of catheter-related sepsis. Teflon, silicone and polyurethane (PUR) have been associated with fewer infections than polyvinyl chloride or polyethylene. Currently all available CVCs are made either of PUR (short-term and medium-term) or silicone (medium-term and long-term); no specific recommendation for clinical practice is made.	B	6
Reducing the risk of catheter-related infection	Evidence indicates that the risk of catheter-related infection is reduced by: • Using tunneled and implanted catheters (value only confirmed in long-term use) • Using antimicrobial coated catheters (value only shown in short-term use) • Using single-lumen catheters • Using peripheral access (PICC) when possible • Appropriate choice of the insertion site • Ultrasound-guided venepuncture • Use of maximal barrier precautions during insertion • Proper education and specific training of the staff • An adequate policy of hand washing • Use of 2% chlorhexidine as skin antiseptic • Appropriate dressing of the exit site • Disinfection of hubs, stopcocks and needle-free connectors • Regular change of administration sets Some interventions are not effective in reducing the risk of infection, and should not be adopted for this purpose; these include: • in-line filters • routine replacement of central lines on a scheduled basis • antibiotic prophylaxis • the use of heparin	B	6
Diagnosis of catheter-related sepsis	Diagnosis of CRBSI is best achieved (a) by quantitative or semi-quantitative culture of the catheter (when the CVC is removed or exchanged over a guide wire), or (b) by paired quantitative blood cultures or paired qualitative blood cultures from a peripheral vein and from the catheter, with continuously monitoring of the differential time to positivity (if the catheter is left in place).	A	7

Indicaciones de Nutrición Parenteral

Según las guías de la ESPEN los pacientes que ingresan en UCI en los que se sospecha que no podrán iniciar dieta oral en 3 días tras su admisión se deberá iniciar NE temprana (en las primeras 24-48 horas), y en caso de que esta no pueda realizarse (obstrucción intestinal, sd compartimental abdominal, etc) se iniciará NP. Esto es una recomendación basada en opinión de expertos ya que como hemos dicho no hay estudios que evalúe el mejor momento para iniciar NP.

También está indicada en pacientes como suplemento de la NE, en casos en los que la última tras 2 días de administración no es suficiente para satisfacer las necesidades energéticas.

En pacientes en cuidados críticos la vía de administración preferida será mediante un catéter central, a nivel de subclavia o yugular interna, con punción guiada por ecografía, tomando todas las precauciones de asepsia y antisepsia. Es necesario comprobar la posición de la punta, la cual deberá encontrarse a nivel del tercio inferior de vena cava superior o parte inicial de aurícula, esta comprobación se puede realizar durante el procedimiento o posteriormente mediante Rx.

En casos en los que se prevea nutrición parenteral durante poco tiempo, entonces se podrá utilizar una nutrición parenteral por vía periférica, teniendo en cuenta que esta nutrición deberá tener una osmolaridad menor (<850 mOsm/L), con menor contenido de carbohidratos y aminoácidos y mayor contenido de lípidos, lo cual probablemente no permita alcanzar los requerimientos calóricos necesarios.

En cuanto a la cantidad indicada se recomienda un aporte energético lo mas cercano al gasto energético del paciente, evitando el balance energético negativo. Lo ideal sería realizar un cálculo lo mas aproximado posible al real, mediante calorimetría indirecta, pero en su ausencia todos los pacientes en UCI deberán tener un aporte mínimo de 25 kcal/kg/día, el cual se puede aumentar hasta alcanzar el objetivo. La gran mayoría de los pacientes en UCI se encuentran en un estado de mayor gasto energético, por lo cual los requerimientos suelen ser mayores que en un pacientes sano.

Los requerimientos energéticos de carbohidratos son de 2 g/kg de glucosa al día. Pero esto puede producir hiperglucemia importante, no solo por la cantidad del aporte exógenos de glucosa, sino porque muchos pacientes críticos aumentan la producción endógena de glucosa, mediante gluconeogénesis, produciendo así hiperglucemia.

Es por esto que es importante un control estricto de la glucemia, pero el control estricto ha sido muy criticado en varios estudios en los cuales se ha visto una tendencia importante de hipoglucemias y en algunos estudios aumento de la mortalidad. Las guías de ESPEN no hacen una recomendación por falta de más evidencia.

En cuanto a los lípidos estos permiten disminuir la cantidad de carbohidratos como fuente de energía y tener un mejor control glucémico. Los ácidos grasos pueden influenciar la respuesta inflamatoria e inmune actuando sobre la estructura y función de membrana celular y alterando la expresión de genes.

Las soluciones lipídicas pueden ser de aceite de soja, o mezclas de aceite de soja con triglicéridos de cadena mediana, aceite de oliva, aceite de pescado. Algunos estudios han demostrado ventajas de LCT/MCT sobre LCT, pero se necesitan mas estudios para poder concluís sobre su beneficio renal en los enfermos críticos. El aceite de oliva es bien tolerado para NP, aunque no se han demostrado ventajas relevantes.

Lo que parece ser prometedor es EPA y DHA que se encuentra en soluciones enriquecidas con aceite de pescado ya que parece disminuír la estancia hospitalaria en pacientes críticos.

Las soluciones de lípidos pueden ser administradas de 0,7 g/kg-1,5 g/kg en 12-24h, y no producen daño a los venas cuando son administrados por vías periféricas ya que son hipo o isosmolares.

En cuanto a las proteínas, el objetivo de la administración de aminoácidos es administrar precursores para la síntesis de proteínas y proteger la función y estructura músculo-esquelética.

En el paciente crítico las hormonas de estrés y los mediadores inflamatorios inhiben el efecto anabólico de la insulina y aminoácidos, por lo que la formación de proteínas y masa muscular está disminuída, con posterior pérdida de masa muscular.

En trauma o sepsis la cantidad óptima de aminoácidos es mayor, ya que estos pacientes se encuentran en un estado hipercatabólico, por lo que el aporte no debe ser menor de 1,3-1,5 g/kg/día

La glutamina a 0,2-0,4 g/kg/día es una indicación grado A en el paciente crítico, ya que niveles bajos de la misma se han asociado con peor pronóstico. Aún cuando no es un aminoácido esencial, se ha demostrado una disminución de los niveles séricos en pacientes críticos.

Se ha demostrado que muchos micronutrientes son esenciales proviniendo el estrés oxidativo al cual están sometidos los pacientes críticos. Durante NP prolongadas se deben realizar analíticas una vez al mes para la determinación de niveles de cromo, cobalto, selenio, manganesio, hierro, etc.

Summary of statements: Intensive Care			
Subject	**Recommendations**	**Grade**	**Number**
Indications	Patients should be fed because starvation or underfeeding in ICU patients is associated with increased morbidity and mortality	C	1.1
	All patients who are not expected to be on normal nutrition within 3 days should receive PN within 24 to 48 h if EN is contraindicated or if they cannot tolerate EN.	C	1.2
Requirements	ICU patients receiving PN should receive a complete formulation to cover their needs fully.	C	1.3
	During acute illness, the aim should be to provide energy as close as possible to the measured energy expenditure in order to decrease negative energy balance.	B	2.1
	In the absence of indirect calorimetry, ICU patients should receive 25 kcal/kg/day increasing to target over the next 2–3 days.	C	2.1
Supplementary PN with EN	All patients receiving less than their targeted enteral feeding after 2 days should be considered for supplementary PN.	C	3
Carbohydrates	The minimal amount of carbohydrate required is about 2 g/kg of glucose per day.	B	4
	Hyperglycemia (glucose >10 mmol/L) contributes to death in the critically ill patient and should also be avoided to prevent infectious complications.	B	5
	Reductions and increases in mortality rates have been reported in ICU patients when blood glucose is maintained between 4.5 and 6.1 mmol/L. No unequivocal recommendation on this is therefore possible at present.	C	5
	There is a higher incidence of severe hypoglycemia in patients treated to the tighter limits.	A	5
Lipids	Lipids should be an integral part of PN for energy and to ensure essential fatty acid provision in long-term ICU patients.	B	6.1
	Intravenous lipid emulsions (LCT, MCT or mixed emulsions) can be administered safely at a rate of 0.7 g/kg up to 1.5 g/kg over 12 to 24 h	B	6.8
	The tolerance of mixed LCT/MCT lipid emulsions in standard use is sufficiently documented. Several studies have shown specific clinical advantages over soybean LCT alone but require confirmation by prospective controlled studies.	C	6.4
	Olive oil-based parenteral nutrition is well tolerated in critically ill patients.	B	6.5
	Addition of EPA and DHA to lipid emulsions has demonstrable effects on cell membranes and inflammatory processes. Fish oil-enriched lipid emulsions probably decrease length of stay in critically ill patients.	B	6.6
Amino Acids	When PN is indicated, a balanced amino acid mixture should be infused at approximately 1.3–1.5 g/kg ideal body weight/day in conjunction with an adequate energy supply.	B	7
	When PN is indicated in ICU patients the amino acid solution should contain 0.2–0.4 g/kg/day of L-glutamine (e.g. 0.3–0.6 g/kg/day alanyl-glutamine dipeptide).	A	8
Micronutrients	All PN prescriptions should include a daily dose of multivitamins and of trace elements.	C	9
Route	A central venous access device is often required to administer the high osmolarity PN mixture designed to cover the nutritional needs fully..	C	1.3
	Peripheral venous access devices may be considered for low osmolarity (<850 mOsmol/L) mixtures designed to cover a proportion of the nutritional needs and to mitigate negative energy balance.	C	1.3
	If peripherally administered PN does not allow full provision of the patient's needs then PN should be centrally administered	C	1.3
Mode	PN admixtures should be administered as a complete all-in-one bag	B	1.4

Las guías de la ESPEN hacen apartados también sobre la nutrición parenteral en casos especiales, por ejemplo el paciente con pancreatitis aguda. Es importante determinar el estado nutricional previo de estos pacientes y la gravedad de la pancreatitis para establecer un plan nutricional.

Existe un estado catabólico al igual que en la sepsis y en el trauma, con gluconeogénesis pese a aporte exógeno de glucosa, aumento del gasto energético, aumento de la resistencia a la insulina y aumento de la dependencia de oxidación de ácidos grasos.

Ocurre un balance nitrogenado negativo con pérdida de proteínas y posterior estado de desnutrición

Es por esto que el aporte de aminoácidos deberá ser de 1,2-1,5 g/kg/día, a menos que exista fallo hepático o renal en cuyo caso será menor. Se deberá realizar aporte de glutamina al igual que con el paciente crítico en general.

Los aportes de carbohidratos en forma de glucosa o de lípidos no afectan la función o secreción pancreática por lo que pueden y darse de forma segura, y en ausencia de hipertrigliceridemia la administración de lípidos es segura, pero si hay aumento de los niveles de TG por mas de 72 h se deberá retirar el aporte de lípidos hasta que sea resuelto.

Al igual que en el enfermo crítico se administrarán suplementos de micronutrientes, y se vigilarán niveles de potasio, magnesio, fosfato, tiamina y sodio.

ESPEN uso de glutamina parenteral (> 0,30 g/kg dipéptido Ala-Gln) cuando está indicada NP. Recomienda iniciar NP tras una adecuada reposición hidroelectrolítica y estabilización hemodinámica, y una vez que ha pasado el pico de respuesta inflamatoria (habitualmente 24-48 horas del ingreso).

Summary of statements: Pancreas			
Subject	**Recommendations**	**Grade**	**Number**
Metabolism	Substrate metabolism in severe acute pancreatitis (AP) is similar to that in response to severe sepsis or trauma. There is increased protein catabolism, characterized by an inability of exogenous glucose to inhibit gluconeogenesis, increased energy expenditure, increased insulin resistance and increased dependence on fatty acid oxidation to provide energy substrates.	A	1.1
	Energy needs may differ and change substantially according to severity and stage of the disease, the patient's associated diseases, and specific complications occurring during the clinical course of AP.	B	
Amino acids	Severe AP is characterized by substantial protein catabolism and increased energy requirements.	A	1.2
	Parenteral amino acid infusion does not affect pancreatic secretion or function.	A	
	When PN is indicated, parenteral glutamine supplementation (>0.30 g/kg Ala–Gln dipeptide) should be considered.	B	1.3
Carbohydrates	Glucose should be the preferred carbohydrate energy source for several reasons: it is cheap, readily available and easy to monitor. Moreover its administration may counteract gluconeogenesis, but meticulous attention is required to avoid hyperglycemia.	A	1.4
	In case of hyperglycemia exogenous insulin is recommended to maintain blood glucose as close as possible to the normal range.	B	
	Parenteral carbohydrate infusion does not affect pancreatic secretion and function.	A	
Lipids	Lipids provide an efficient source of calories. The use of intravenous lipids in pancreatitis is safe if hypertriglyceridemia is avoided.	C	1.6
	Triglyceride values below 12 mmol/L are recommended but ideally serum levels should be kept within normal ranges.	C	
	Current best practice recommendations are to ensure appropriate infusion rates for fat emulsions (from 0.8 to 1.5 g/kg per day) and temporarily to discontinue infusion if persistent (>72 h) hypertriglyceridemia occurs (>12 mmol/L).	C	
Micronutrients	As in all critically ill patients, a daily dose of multivitamins and trace elements is recommended. Despite patients with severe AP having demonstrable deficits in plasma and tissue levels of several micronutrients, at present there are insufficient data to support supranormal doses.	C	1.7
Indications	In cases of mild disease, oral feeding can be resumed after a short period of starvation if pain has ceased.	A	1.8
	In mild AP spontaneous recovery with resumption of oral intake generally occurs within 3–7 days, and therefore, there is no need for special nutritional treatment (neither PN nor EN) unless such patients are malnourished prior to the initial attack, or when a therapeutic period of starvation is indicated for a period of longer than 5–7 days. In these cases EN should be started as soon as possible.	A	
	The indication for PN is simple and uncontroversial. All patients in whom the clinician decides that some form of nutritional support is indicated should have this commenced by the enteral route. Only in those patients who are unable to tolerate targeted requirements is PN indicated. PN, therefore, is required only when the gut has failed or administration of EN is impossible for other reasons (e.g. prolonged ileus, complex pancreatic fistulae, abdominal compartment syndrome).	B	
Route	The central route should be preferred to deliver PN when it is needed in pancreatitis.	B	1.9
Contraindications	In the severe form of AP, if EN is insufficiently tolerated, there is no specific contraindication to starting PN as soon as possible.	C	1.10
	PN should be given after an adequate fluid resuscitation and when the patient has achieved full hemodynamic stabilization (usually 24–48 h from admission).	B	
Pitfalls and complications	The problems are those of PN in general rather than of its use in AP in particular. Particular attention should be given to avoid overfeeding.	B	1.12
Requirements	Patients should receive 25 non-protein kcal/kg per day increasing to no more than a maximal caloric load of 30 kcal/kg per day. This limit should be reduced to 15–20 non-protein kcal/kg per day in cases with SIRS or MODS and when a patient is at risk of refeeding syndrome.	B	1.12
Chronic pancreatitis	Malnutrition is frequent in patients with CP due to pain-induced anorexia and to continuing alcohol abuse. Increased resting energy expenditure is also seen. PN may, on rare occasions, be indicated in patients with gastric outlet obstruction secondary to duodenal stenosis and in those with complex fistulating disease.	C	2.1

En pacientes con enfermedad hepática sólo alcanza un alto grado de recomendación el iniciar la NP inmediatamente en pacientes hepatópatas con signos de desnutrición que no puedan tolerar NE. Los pacientes que toleren vía oral o NE pero que tendrán un ayuno > 12 h deberán recibir glucosa IV, y si será >72h deberán recibir NP. Los pacientes desnutridos tienen mayor riesgo de Síndrome de realimentación

El empleo de soluciones ricas en aminoácidos ramificados y pobres en aromáticos en encefalopatía severa también se considera recomendación A. El resto de la guía habla de recomendaciones sobre la composición de la nutrición en:

1) Esteatosis hepática: El aporte de carbohidratos se dará en forma de glucosa y deberá ser el 50-60% del aporte energético no proteico. Los lípidos deberán contener menos cantidad de ácidos grasos omega 6 debido a las mezclas con aceites de pescado o aceite de oliva. Aminoácidos 1,2-1,5 g/Kg/d.

2) Cirrosis hepática: Además de las indicaciones para esteatosis hepática, la NP también está indicada en casos de encefalopatía hepática y posterior a intervenciones quirúrgicas cuando el paciente no pueda iniciar NE. En cirróticos con desnutrición existen menos complicaciones postoperatorias si se administra NP en el período postoperatorio. El metabolismo basal de estos pacientes se encuentra aumentado, siendo 1,3 veces mayor que el valor normal, por lo que es un estado de hipermetabolismo. Al realizar los cálculos energéticos en pacientes con ascitis se deberá tomar como referencia el peso ideal y no el real. En cirrosis sin desnutrición los aportes de aminoácidos deberán ser 1,2 g/kg/día, y en caso de desnutrición 1,5 g/kg/día. En pacientes con encefalopatía el aporte de aminoácidos será preferiblemente con aminoácidos de cadena ramificada y bajo contenido de aminoácidos aromáticos, metionina y triptófano.

3) Fallo hepático agudo: Las indicaciones de NP son las mismas que en la esteatosis hepática. Existe aumento del gasto energético que se tendrá que tener en cuenta para el cálculo de la nutrición. Deberá administrarse suficiente glucosa (2-3 g/kg/día) como profilaxis de la hipoglucemia, por pérdida de la gluconeogénesis hepática, falta de glucógeno e hiperinsulinismo. La administración de aminoácidos no es mandatoria en el fallo hiperagudo, pero si en el agudo y subagudo (0,8-1,2 g/kg/día).

Summary of statements: Alcoholic Steatohepatitis			
Subject	**Recommendations**	**Grade**	**Number**
General	Use simple bedside methods such as the Subjective Global Assessment (SGA) or anthropometry to identify patients at risk of undernutrition.	C	1
	Start PN immediately in moderately or severely malnourished ASH patients, who cannot be fed sufficiently either orally or enterally.	A	1
	Give i.v. glucose (2–3 g kg^{-1} d^{-1}) when patients have to abstain from food for more than 12 h.	C	1
	Give PN when the fasting period lasts longer than 72 h.	C	1
Energy	Provide energy to cover 1.3 × REE	C	2
	Give glucose to cover 50–60 % of non-protein energy requirements.	C	3
	Use lipid emulsions with a content of n-6 unsaturated fatty acids lower than in traditional pure soybean oil emulsions.	C	3
Amino acids	Provide amino acids at 1.2–1.5 g kg^{-1} d^{-1}.	C	3
Micronutrients	Give water soluble vitamins and trace elements daily from the first day of PN.	C	3
	Administer vitamin B1 prior to starting glucose infusion to reduce the risk of Wernicke's encephalopathy.	C	3
Monitoring	Employ repeat blood sugar determinations in order to detect hypoglycemia and to avoid PN related hyperglycemia.	C	6
	Monitor phosphate, potassium and magnesium levels when refeeding malnourished patients.	C	3

Summary of statements: Liver Cirrhosis			
Subject	**Recommendations**	**Grade**	**Number**
General	Use simple bedside methods such as the Subjective Global Assessment (SGA) or anthropometry to identify patients at risk of undernutrition.	C	4
	Start PN immediately in moderately or severely malnourished cirrhotic patients, who cannot be fed sufficiently either orally or enterally.	A	4
	Give i.v. glucose (2–3 g kg^{-1} d^{-1}) when patients have to abstain from food for more than 12 h.	C	4
	Give PN when the fasting period lasts longer than 72 h.	C	4
	Consider PN in patients with unprotected airways and encephalopathy when cough and swallow reflexes are compromised.	C	4
	Use early postoperative PN if patients cannot be nourished sufficiently by either oral or enteral route.	A	4
	After liver transplantation, use early postoperative nutrition; PN is second choice to EN.	C	4
Energy	Provide energy to cover 1.3 x REE	C	5
	Give glucose to cover 50 % - 60 % of non-protein energy requirements.	C	6
	Reduce glucose infusion rate to 2–3 g kg^{-1} d^{-1} in case of hyperglycemia and use consider the use of i.v. insulin.	C	6
	Use lipid emulsions with a content of n-6 unsaturated fatty acids lower than in traditional pure soybean oil emulsions.	C	6
Amino acids	Provide amino acids at 1.2–1.5 g kg^{-1} d^{-1}.	C	7
	In encephalopathy III° or IV°, consider the use of solutions rich in BCAA and low in AAA, methionine and tryptophane.	A	7
Micronutrients	Give water soluble vitamins and trace elements daily from the first day of PN.	C	8
	In alcoholic liver disease, administer vitamin B1 prior to starting glucose infusion to reduce the risk of Wernicke's encephalopathy.	C	3, 8
Monitoring	Employ repeat blood sugar determinations in order to avoid PN related hyperglycemia.	A	6
	Monitor phosphate, potassium and magnesium levels when refeeding malnourished patients.	C	8

Summary of statements: Acute Liver Failure			
Subject	**Recommendations**	**Grade**	**Number**
General	Commence artificial nutrition when patient is unlikely to resume normal oral nutrition within the next 5–7 days.	C	9
	Use PN when patients cannot be fed adequately by EN.	C	9
Energy	Provide energy to cover 1.3 × REE.	C	10
	Consider using indirect calorimetry to measure individual energy expenditure.	C	10
	Give i.v. glucose (2–3 g kg^{-1} d^{-1}) for prophylaxis or treatment of hypoglycaemia.	C	11
	In case of hyperglycaemia, reduce glucose infusion rate to 2–3 g kg^{-1} d^{-1} and consider the use of i.v. insulin.	C	11, 6
	Consider using lipid (0.8 – 1.2 g kg^{-1} d^{-1}) together with glucose to cover energy needs in the presence of insulin resistance.	C	11
Amino acids	In acute or subacute liver failure, provide amino acids at 0.8–1.2 g kg^{-1} d^{-1}.	C	11
Monitoring	Employ repeat blood sugar determinations in order to detect hypoglycaemia and to avoid PN related hyperglycaemia.	C	11
	Employ repeat blood ammonia determinations in order to adjust amino acid provision.	C	11

Los pacientes con Insuficiencia renal son un grupo heterogéneo de pacientes que van desde pacientes con otra enfermedad de base que desarrollan un fracaso renal agudo y probablemente necesiten terapias de reemplazo renal, hasta los pacientes con insuficiencia renal crónica que son dependientes o no de diálisis.

Estos pacientes tienen alteración del balance de agua, electrolitos, ácido-base y alteraciones en el metabolismo de proteínas, aminoácidos, carbohidratos y lípidos, lo cual convierte en un reto el adecuado aporte de nutrientes mediante NP.

Los que se someten a técnicas de reemplazo renal tienen una pérdida importante de aminoácidos, proteínas y de sustancias hidrosolubles como vitaminas por lo cual es necesario realizar una reposición de los mismos.

En este tipo de paciente se produce lo que se conoce como pérdida de proteínas (protein-energy wasting), y para su diagnóstico es necesario tener niveles séricos bajos de albúmina, transtiretina o colesterol; índice de masa corporal bajo y disminución de la masa muscular.

En la Insuficiencia Renal Aguda el objetivo es administrar un adecuado aporte de energía, proteínas y micronutrientes para prevenir la pérdida de masa corporal, evitar alteraciones metabólicas, mejorar la función inmune y atenuar el estado inflamatorio con mejora del sistema antioxidante y función endotelial, ya que se producen alteraciones metabólicas con aumento del catabolismo de las proteínas, aminoácidos, resistencia a la insulina, reducción de la lipólisis, depleción del sistema antioxidante con disminución de los niveles de vitaminas A y E, estado proinflamatorio e inmunodeficiencia, además de que aquello que se someten a técnicas de reemplazo renal alteran de manera importante en metabolismo de proteínas, carbohidratos y lípidos, además de micronutrientes, con una pérdida aproximada de 0,2 g de aminoácidos, 5-10 g de proteínas al día, y pérdidas de sustancias hidrosolubles, además de producir hipofosfatemia e hipomagnasemia.

Las indicaciones de NP son las mismas que para el paciente crítico, con un aporte > 30-35 kcal/kg/día. La restricción de potasio en la NP suele ser innecesaria si se administra una adecuada terapia de reemplazo renal, pero ésta puede producir hipomagnesemia e hipofosfatemia, por lo cual es necesario realizar determinaciones de los mismos en pacientes que lleven este tipo de terapias durante tiempo prolongado.

El aporte mínimo de proteínas es 1,5 g/kg/día y debe aumentarse para compensar las pérdidas de proteínas y aminoácidos durante la TRR (aproximadamente 0,2 g/Kg/día). Es importante vigilar signos de toxicidad por vitamina A y oxalosis por vitamina C, además de los niveles de calcio, magnesio, selenio y tiamina con la TRR, ya que se han demostrado disminución de los niveles aún con adecuado aporte.

En la Insuficiencia renal crónica también se produce una pérdida importante de proteínas, y esta pérdida va a ser mayor con los años de hemodiálisis. Las indicaciones de NP son las mismas que para fracaso renal agudo, cuando un paciente no tolere la vía oral o enteral o cuando esta vía no sea suficiente

En pacientes que no están en diálisis existe un balance muy estrecho entre generar toxicidad por exceso de aportes y no cumplir los requerimientos energéticos, por lo que es difícil el aporte de nutrientes por vía parenteral.

Summary of statements: Nephrology concern

Subject	Recommendations	Grade	Number
Acute renal failure	ARF not only affects water, electrolyte and acid–base metabolism but also induces global changes in the "milieu interieur", with specific alterations in protein, amino acid, carbohydrate and lipid metabolisms. Additionally, it exerts a pro-inflammatory reaction and has a profound effect on the anti-oxidative system. ARF, especially in the ICU setting, rarely represents an isolated disease process. Metabolic changes in these patients are also determined by the underlying disease and/or co-morbidities, by other organ dysfunction, as well as by the modality and intensity of renal replacement therapy (RRT).	B	1
	Renal replacement therapies have profound effects on metabolism and nutrient balances.	C	2
	Poor nutritional status is a major risk factor for morbidity and mortality, thus determining outcomes.	B	3

Summary of statements: Nephrology concern

Subject	Recommendations	Grade	Number
Goals of nutritional support	The primary nutritional goals of PN in ARF should be the same as those in other catabolic conditions in the ICU, such as ensuring the provision of optimal amount of energy, protein and micronutrients, with the aims of prevention of PEW, preservation of lean body mass, maintenance of nutritional status, avoidance of further metabolic derangements, enhancement of wound healing, support of immune function, and reduction in mortality. In the case of ARF patients, nutritional goals could also include the attenuation of their inflammatory status and improvement of the oxygen radical scavenging system and of endothelial function.	C	4
Outcomes	Due to the lack of well-designed randomized controlled trials the evidence regarding the effects of PN on survival and renal recovery remains inconclusive.	C	5
Indications	The indications for and contraindications to PN in ARF are comparable to those in other critically ill patients (see ICU guidelines). PN is appropriate in ARF when the GI tract cannot be used for enteral feeding, or when EN is not enough to reach nutrient intake goals.	C	6
Requirements	Macronutrient requirements are more influenced by the severity of underlying disease, type and intensity of extracorporeal RRT, nutritional status and associated complications, rather than by the ARF itself.	C	7
	Micronutrient requirements have been poorly investigated in ARF patients. In ICU patients with ARF, the enhanced requirements for water-soluble vitamins induced by extracorporeal therapy should be met by supplementing multivitamin products. In line with standard recommendations, because of the possibility of accumulation, patients should be carefully monitored for signs of vitamin A toxicity. Similarly, it has been recommended that vitamin C should not exceed 30–50 mg/day, because inappropriate supplementation may result in secondary oxalosis. Recent data show that prolonged CRRT results in selenium and thiamine depletions despite supplementation at recommended amount.	C	7
	ARF is associated with major fluid, electrolyte and acid–base equilibrium derangements, such as hypo- and hypernatremia, hyperkalemia, hyperphosphatemia, and metabolic acidosis. Restrictions of potassium, magnesium and phosphate in PN are however usually unnecessary if the patients are on daily RRT (CRRT, hemodialysis or SLED). Serum electrolyte levels largely depend on the electrolyte composition of the dialysate/reinfusate solutions, and the intensity of RRT. Hypophosphatemia and hypomagnesaemia can frequently be observed during CRRT or SLED, and should be anticipated.	C	7
Formula and route	Standard formulae are adequate for the majority of patients. However, requirements can differ and have to be assessed individually. When there are electrolyte derangements, three-in-one formulae without electrolytes or customized formulae can be advantageous.	C	8
	For short time periods, peripheral PN can be used in ARF patients, according to fluid restriction needs and calorie/protein goals, but due to the need for fluid restriction and the high osmolarity of more concentrated commercial three-in-one admixtures, PN in ARF patients, especially those in the ICU, often needs to be infused centrally.	C	9
Chronic renal failure	An energy intake $\geq$ 30–35 kcal/kg/day is associated with better nitrogen balance and is recommended in stable CKD patients.	B	12
Indications	Conservatively treated patients with CKD seldom need PN. Potential indications of PN in CKD patients are similar to the indications for PN in non-renal patients. Malnourished CKD patients requiring nutritional support should only be considered for PN when ONS and EN are impossible or fail to reach nutritional goals. Special attention should be given to CKD requiring PN during perioperative periods.	C	13
	When nutritional requirements cannot be met by dietary intake (with or without ONS), in combination with EN or by the enteral route alone, the goals of PN in CKD patients are (a) prevention and treatment of PEW leading to cachexia; (b) ensuring the provision of optimal levels of energy, essential nutrients and trace elements; and (c) attenuation of disease (CKD) progression through protein or phosphate restriction.	C	14
Formula	Because no data are available on specific PN formulae, standard PN mixtures should be used if PN is indicated. In patients receiving PN without any oral or enteral supply, vitamins and trace elements should also be administered intravenously. If the patients need PN for a period exceeding two weeks, accumulation of vitamin A and trace elements should be considered.	C	15

Monitoring	Reports in the literature regarding the use of PN in non-dialyzed CKD patients are scarce. Positive nitrogen balance can however be demonstrated in CKD patients submitted to surgery. Because of the risk of electrolyte disturbances, stringent monitoring of the electrolytes, especially during the first weeks of PN support, is recommended.	C	15
	PEW is very common in patients undergoing maintenance hemodialysis; its prevalence varies from 20% to 70% according to the nutritional parameters considered.	B	18
	Although initiation of dialysis results in an initial improvement in nutritional indices, some dialysis-specific factors, like impairment of subjective well-being, loss of nutrients, protein catabolism and inflammation are relevant for the high incidence of PEW.	C	19
	In acutely ill HD patients the requirements are the same as in ARF patients. Macronutrient requirements of metabolically stable patients include nitrogen delivery of 1.1–1.5 g/kg per day and energy of 30–40 kcal/kg per day.	C	21
	Mineral requirements include needs for 800–1000 mg phosphate, 2–2.5 g potassium and 1.8–2.5 g sodium per day.	C	21
	Due to dialysis-induced losses, water-soluble vitamins should be supplied: folic acid (1 mg/day), pyridoxine (10–20 mg/day) and vitamin C (30–60 mg/day). Vitamin D should be given according to serum calcium, phosphorus and parathyroid hormone levels. Routine hemodialysis does not induce significant trace-element losses. However, in depleted patients, zinc (15 mg/day) and selenium (50–70 μg/day) supplementation may be useful.	C	21
Outcomes	PEW is recognized as an independent determinant of morbidity and mortality in HD patients.	B	22
	Large randomized, controlled trials are needed to evaluate the effects of IDPN on quality of life, hospitalization rate and survival. Retrospective studies suggest that IDPN may reduce hospitalization rate and survival. Randomized controlled trials evaluating the effect of IDPN are needed.	B	25
	Acutely ill patients with CKD on dialysis should be treated in a similar manner to those with ARF. Standard amino acid solutions can be used for IDPN in non-acutely ill malnourished HD patients. The energy supply should combine carbohydrate and fat. The use of specific parenteral solutions is not yet supported by controlled data.	C	26
	In acutely ill patients with CKD on dialysis the route for PN should be the same as in ARF patients. In non-acutely ill malnourished HD patients, IDPN is infused through the venous line during dialysis.	C	27
Chronically dialyzed patients	In acutely ill patients with CKD on dialysis the decision to use PN should be based on the same criteria as in ARF patients.	C	28
	In non-acutely ill malnourished HD patients with mild PEW as defined by insufficient spontaneous intake, dietary counseling, and, if necessary, ONS should be prescribed. In patients exhibiting severe PEW, with spontaneous intakes more than 20 kcal/day: dietary counseling and ONS should be prescribed; IDPN is indicated in patients unable to comply with ONS; EN can be necessary when ONS or IDPN fail to improve nutritional status. In patients exhibiting severe PEW, with spontaneous intakes less than 20 kcal/day, or in stress conditions: both ONS and IDPN are generally unable to provide satisfactory nutritional supply and are not recommended; daily nutritional support is necessary and EN should be preferred to PN; central venous PN is indicated when EN is impossible or insufficient.	C	28
	Since CAPD patients usually have better residual renal function, several uremic symptoms and metabolic abnormalities are less pronounced than in patients on HD therapy. However peritoneal losses of various nutrients are significant while absorption of glucose from the dialysate is enhanced.	C	29

Summary of statements: Nephrology concern

Subject	Recommendations	Grade	Number
	The enhanced loss of proteins or amino acids can induce protein PEW and deficiencies of micronutrients. Due to the increased glucose load, body weight may even increase in CAPD patients but this reflects an increase in body fat mass only and masks a loss in lean body mass. The high glucose load is also responsible for induction or aggravation of diabetes, hypertriglyceridemia in 60% of patients, and increased LDL and VLDL cholesterol.	C	30
	Acutely ill CAPD patients have the same nutritional requirements as ARF patients. Macronutrient requirements of metabolically stable patients include nitrogen delivery of 1.1–1.5 g/kg per day and energy of 30–40 kcal/kg per day.	C	31
Indications	Intravenous PN has been poorly investigated in CAPD patients. Present data suggest that PN should be limited to malnourished and stressed CAPD patients, or patients with severe encapsulating peritonitis, when nutritional requirements cannot be ensured by oral or enteral routes. In acutely ill patients with CKD on dialysis the decision to use PN should be the same as in ARF patients. In CAPD patients presenting with mild PEW as defined by insufficient spontaneous intakes, dietary counseling, and, if necessary, ONS should be prescribed. In patients exhibiting severe PEW, with spontaneous intakes more than 20 kcal/day: dietary counseling and ONS should be prescribed; IPPN may be considered in patients unable to comply with ONS; EN can be necessary when ONS are unable to improve nutritional status. In patients exhibiting severe PEW, with spontaneous intakes less than 20 kcal/day, or in stress conditions: daily nutritional support is necessary and EN should be preferred to PN; central venous PN is indicated when EN is impossible or insufficient.	C	32, 38
Goals of PN	In acutely ill patients with CKD on dialysis, the goal of PN is to reduce protein catabolism and nutritional depletion-associated morbidity and mortality. In chronically undernourished CAPD patients IPPN aims to improve quality of life and to reduce PEW-related complications, hospitalization rate and mortality.	C	33
Formula	During central venous PN the energy supply should combine carbohydrate and fat. Amino acid based PD solutions can be used for IPPN in non-acutely ill malnourished CAPD patients. The use of specific formulae for parenteral mixtures is not yet supported by controlled data.	C	35
Route	The special form of PN unique to CAPD patients is Intraperitoneal Parenteral Nutrition (IPPN). IPPN is shown to improve nitrogen balance and nutritional parameters. When nutritional requirements cannot be ensured by oral or enteral routes, IPPN can be proposed in stable CAPD patients. In acutely ill patients with CKD on CAPD the route for PN should be the same as in ARF patients. In these patients a combined use of PN and IPPD, using an amino acid based PD solution can be suggested. In non-acutely ill malnourished CAPD patients, the preferred route is via the peritoneum.	B	32, 36

Pacientes con Insuficiencia cardíaca tienen alteración del estado nutricional y el metabolismo de los nutrientes debido a un estado catabólico por cambios en el estado inmunológico y neurohormonal, con aumento de catecolaminas, cortisol, aldosterona y renina, además de activación de citoquinas. La prevalencia de caquexia cardíaca es de 12-15% en pacientes con NYHA II-IV, y se define como la pérdida de al menos 6% del peso en 6 meses, predominantemente a nivel muscularLa mortalidad de estos pacientes es 2-3 veces mayor cuando existe caquexia cardíaca.

A todo esto se agrega el hecho de que también existe un estado de malabsorción por disminución de la perfusión intestinal, por lo que la NE no siempre es suficiente, necesitando suplementos con NP, aunque no hay recomendaciones establecidas.

La Insuficiencia cardíaca afecta el estado nutricional y el metabolismo de los nutrientes debido a un estado catabólico por cambios en el estado inmunológico y neurohormonal, con aumento de catecolaminas, cortisol, aldosterona y renina, además de activación de citoquinas.

La prevalencia de caquexia cardíaca es de 12-15% en pacientes con NYHA II-IV, y se define como la pérdida de al menos 6% del peso en 6 meses, predominantemente a nivel muscular

La mortalidad de estos pacientes es 2-3 veces mayor cuando existe caquexia cardíaca.

También existe un estado de malabsorción por disminución de la perfusión intestinal, por lo que la NE no siempre es suficiente, necesitando suplementos con NP, aunque no hay recomendaciones establecidas.

Summary of statements: Parenteral Nutrition in Cardiology

Subject	Recommendations	Grade	Number
Background	The prevalence of cardiac cachexia, defined from weight loss of at least 6% in 6 months, has been estimated at about 12–15% in patients in New York Heart Association (NYHA) classes II–IV. The incidence of weight loss >6% in CHF patients with NYHA class III/IV is approximately 10% per year. CHF affects nutritional state, energy and substrate metabolism.	B	1.1
	The mortality in CHF patients with cardiac cachexia is 2–3 times higher than in non-cachectic CHF patients.	B	1.2
	Although there is limited evidence that gut function is impaired in CHF, decreased cardiac function can reduce bowel perfusion and lead to bowel wall oedema, resulting in malabsorption.	B	1.3
Indications	Although there is no evidence available from well-designed studies, PN is recommended to stop or reverse weight loss in patients with evidence of malabsorption, on the basis that it improves outcome in other similar conditions and there is a plausible physiological argument for it.	C	1.4
	Currently there is no indication for PN in the prophylaxis of cardiac cachexia. Further studies are needed to assess the impact of the parenteral administration of specific substrates on cardiac function.	C	1.5

Summary of statements: Parenteral Nutrition in Cardiology			
Subject	**Recommendations**	**Grade**	**Number**
Contra-indications	There are no specific contraindications to PN in CHF patients. However, considering that cardiac function is decreased and water retention is frequently found in CHF patients, it is recommended that PN should be avoided, other than in patients with evidence of malabsorption in whom enteral nutrition has been shown, or is strongly expected, to be ineffective.	B	1.6
Implementation	When feeding CHF patients, either enterally or parenterally, fluid overload must be avoided.	C	1.6

Summary of statements: Parenteral Nutrition in Respiratory Medicine			
Subject	**Recommendations**	**Grade**	**Number**
Background	Between 25% and 40% of patients with advanced COPD are malnourished.	B	2.1
	Being underweight and having low fat-free mass are independently associated with a poor prognosis in patients with chronic respiratory insufficiency, especially in COPD.	B	2.2
Indications	There is no evidence showing that gut function is impaired in COPD patients. Therefore, considering that enteral nutrition is less expensive and associated with fewer and less severe complications than parenteral nutrition, enteral nutrition should represent the first approach to patients with COPD in need of nutritional support.	B	2.3
	There is limited evidence that COPD patients intolerant of EN profit from PN. Small studies do however suggest that, in combination with exercise and anabolic pharmacotherapy, PN has the potential to improve nutritional status and function.	C	2.4
Effect of PN	Loss of body weight is correlated with increased morbidity and mortality. However, due to the lack of studies of its effects, it is not possible to be sure if prognosis is influenced by the provision of PN.	B	2.5
Regimen selection	In patients with stable COPD, glucose-based PN causes an increase in the respiratory CO_2 load. PN composition should accordingly be orientated towards lipids as the energy source. There is not sufficient evidence to recommend specific lipid substrates.	B	2.6

En cuanto a la enfermedad pulmonar obstructiva crónica existe un porcentaje alto de pacientes con desnutrición, y sus causas son multifactoriales, desde hipoxia, sedentarismo, aumento del metabolismo y el uso de ciertos medicamentos y la existencia de bajo peso está asociado a peor pronóstico.

No existe evidencia de alteraciones de la absorción intestinal por lo que son pocos los pacientes que requieren NP.

La NP en estos pacientes tiene que tener menor cantidad de glucosa y mayor de lípidos como fuente de energía, ya que la glucosa aumenta el CO2.