

The management of the patient with malnutrition: from evidence to clinical practice

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ABSTRACT

Malnutrition can be defined as a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue/body form (body shape, size, composition) body function and clinical outcome. Malnutrition is a highly prevalent condition in the acute hospital setting with studies reporting rates of approximately 40%. Malnutrition is associated with many adverse outcomes including depression of the immune system, impaired wound healing, muscle wasting, longer lengths of hospital stay and increased mortality. Unidentified malnutrition not only heightens the risk of adverse complications for patients but results in an increase in health care costs. This can be prevented if special attention is given to their nutritional care. For this reason, hospital and healthcare organizations should have a policy and a specific set of protocols for identifying patients at nutritional risk, leading to appropriate care plans. The objective of this monograph is to provide evidence-based recommendations for the proper management of malnutrition by multi-parametric analysis of the guidelines available to date.

Introduction

Experts define malnutrition as *an acute, subacute or chronic state of nutrition, in which varying degrees*

*of overnutrition or undernutrition with or without inflammatory activity have led to a change in body composition and diminished function.*¹ Malnutrition is a highly prevalent condition in the acute hospital setting with studies reporting rates of approximately 40%.² Malnutrition is associated with many adverse outcome including depression of the immune system, impaired wound healing, muscle wasting, longer lengths of hospital stay and increased mortality.³

Adult malnutrition typically occurs along a continuum of inadequate intake and/or increased requirements, impaired absorption, altered transport, and altered nutrient utilization. There is an inextricable relationship between nutrition status and severity of illness. Individuals may present with inflammatory, hypermetabolic and/or hypercatabolic conditions. Inflammation is increasingly identified as an important underlying factor that increases risk of malnutrition, and that may contribute to suboptimal response to nutrition intervention and increased risk of mortality. For these reasons, parameters used to diagnose malnutrition in the screening and assessment processes reflect both nutrition intake, severity, and duration of disease.⁴ In conclusion malnutrition is associated with poor outcomes for patients including increased morbidity and mortality, decreased function and quality of life, increased frequency and length of hospital stay, higher infection and complication rates.⁵

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Epidemiology

Malnutrition is a common occurrence in hospitalized patients, with an incidence of 30-55%.⁶ A great number of studies in different countries confirm the high prevalence of undernutrition particularly in geriatric patients. Malnutrition is likely to be more frequent in elderly subjects who are living at home but that need help from domiciliary care suggesting probable loss of autonomy. Data deriving from studies involving approximately 1300 hospitalized elderly patients have shown that 40 to 55% were malnourished or at high risk of malnutrition, while nearly 12% were affected by a severe degree of protein energy malnutrition. Among younger elderly up to about age 75 the prevalence of malnutrition is reported to be low (below 10%).⁷ There are data suggesting that surgical patients with malnutrition are 2 or 3 times more likely to have minor or major complications and increased mortality, and their in-hospital length of stay can be extended by 90%, compared with the stay of well-nourished patients. In Western Europe, some 25-30 per cent of preoperative surgical patients are thought to have increased nutritional risk before surgery. A large part of these patients is undernourished when admitted to hospital and in the majority of them, undernutrition develops further while in hospital.⁴ These data justify the economic impact of malnutrition in hospitalized subjects, with charges that are 35 to 75% higher in mal-nourished patients than in well-nourished ones.⁷

Diagnosis

The process of nutrition care may be broken down into a series of steps with feedback loops. These include nutrition screening, formal nutrition assessment, formulation of a nutrition care plan, implementation of the plan, patient monitoring, reassessment of the care plan and reevaluation of the care setting, and then either reformulation of the care plan or termination of therapy (Figure 1).⁶

Nutrition screening

Nutrition screening is the first step in nutrition care.

Nutrition screening has been defined by the American Society for Parenteral and Enteral Nutrition (ASPEN) as *a process to identify an individual who is malnourished or who is at risk for malnutrition to determine if a detailed nutrition assessment is indicated*.¹ Nutritional screening is a dynamic process to identify changes in a patient's condition that affect nutritional status.⁶

Nutrition screening is a rapid and simple process conducted by admitting staff or community healthcare

teams. All patients should be screened on admission to hospital or other institutions. In the United States, the Joint Commission mandates nutrition screening within 24 h of admission to an acute care center.¹

Objective data such as height, weight, weight change, primary diagnosis, and presence of comorbidities can be used in nutrition screening to indicate malnutrition or risk of malnutrition. Factors indicative of malnutrition include:⁶ i) involuntary loss or gain of $\geq 10\%$ of usual body weight within 6 months, or $\geq 5\%$ of usual body weight in 1 month; ii) body weight of 20% over or under ideal body weight, especially in the presence of chronic disease or increased metabolic requirements; iii) inadequate nutrition intake including an impaired ability to ingest or absorb food adequately.

Screening tools embody the following four main principles:⁴

- *What is the condition now?*

Height and weight allow calculation of body mass index (BMI). Normal range 20-25, obesity >30 , borderline underweight 18.5-20, undernutrition <18.5 . In cases where it is not possible to obtain height and weight, a useful surrogate may be mid-arm circumference, measured with a tape around the upper arm midway between acromion and the olecranon. This can be related to centiles of tables for that particular population, age and sex.

- *Is the condition stable?*

Recent weight loss is obtained from the patient's history, or, even better, from previous measurements in medical records. Involuntary loss or gain of $\geq 10\%$ of usual body weight within 6 months, or $\geq 5\%$ of usual body weight in 1 month, or body weight of 20% over or under ideal body weight are usually regarded as significant.

- *Will the condition get worse?*

Confirmatory measurements can be made of the patient's food intake in hospital or by food diary.

- *Will the disease process accelerate nutritional deterioration?*

In addition to decreasing appetite, the disease process may increase nutritional requirements due to the stress metabolism associated with severe disease (e.g., major surgery, sepsis, polytrauma), causing nutritional status to worsen more rapidly, or to develop rapidly from fairly normal states of above.

A number of screening tools have been developed for identifying patients at risk for poor nutrition. The National Institute for Health and Care Excellence (NICE) recommends the use of the *malnutrition universal screening tool* (MUST) to identify adults, who are malnourished, at risk of malnutrition (undernutrition), or obese. MUST incorporates BMI, weight loss in three to six months, and anorexia for five days due to disease. It is particularly sensitive for recognition of malnutrition in hospitalized patients.

The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the use of the Nutritional Risk Screening 2002 (NRS-2002) score for identifying patients at nutritional risk among a general hospital population.⁴ It contains the nutritional components of MUST, and in addition, a grading of severity of disease as a reflection of increased nutritional requirements. According to this instrument the patient is classified as *not at risk* if BMI is ≥ 20.5 kg/m², food intake is normal, weight has not been declining during the last weeks and current illness is not severe (*i.e.*, no increased stress metabolism). When these criteria are not met, the evaluation proceeds by giving 0-3 points in relation to BMI, recent weight loss and food intake during the previous weeks, 0-3 points according to illness severity and stress metabolism and one extra point for age >70 years. Individuals who receive ≥ 3 points are defined to be *at nutritional risk*.

Mini nutritional assessment (MNA) detects under-nutrition among many elderly patients. It consists of a global assessment and subjective perception of health, as well as questions specific to diet, and a series of anthropomorphic measurements. It has been widely validated and is predictive of poor outcomes. The MNA-short form (MNA-SF) uses six questions from

the full MNA and can substitute calf circumference if BMI is not available. A validation study demonstrated good sensitivity compared with the full MNA.

Nutrition assessment

Nutrition assessment has been defined by ASPEN as a comprehensive approach to diagnosing nutrition problems that uses a combination of the following:¹ i) medical, nutrition, and medication histories; ii) physical examination; iii) anthropometric measurements; iv) laboratory data.

Nutrition assessment is suggested for all patients who are identified to be at nutritional risk by nutrition screening. A nutrition assessment provides the basis for a nutrition intervention.¹

It is a longer process than nutrition screening which leads to an appropriate care plan considering indications, possible side-effects, and, in some cases, special feeding techniques.⁴ The goals of a formal nutritional assessment are to identify patients who are malnourished or who are at risk for malnutrition, to collect the information necessary to create a nutrition care plan and to monitor the adequacy of nutrition therapy.⁶

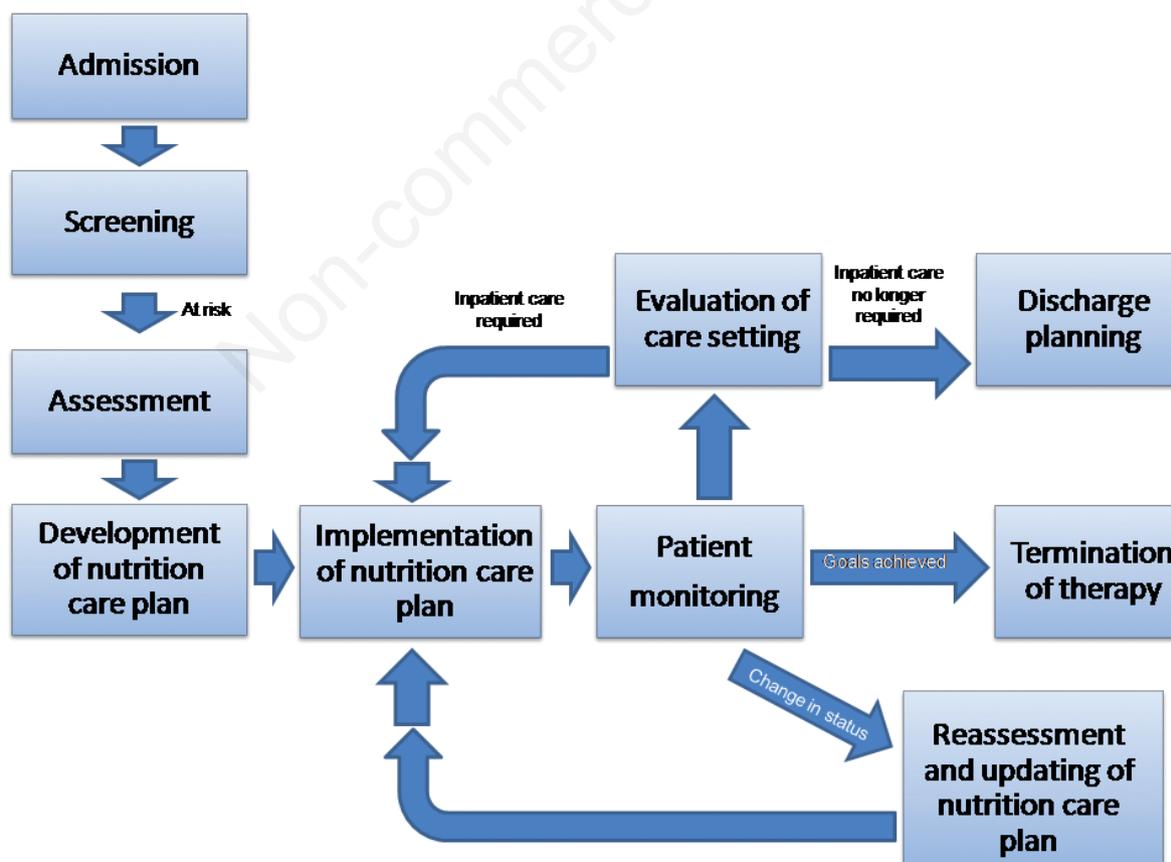


Figure 1. The nutrition care process.⁶

The subjective global assessment is widely used for most adults. Evaluation of nutrition status consists of two components: nutrition assessment and metabolic assessment. Nutrition assessment utilizes static measurements of body compartments and examines the alterations caused by undernutrition. Metabolic assessment includes the analysis of the structure and function of organ systems, of altered metabolism as it relates to the loss of lean body mass or other body compartments, and of the metabolic response to nutrition intervention. There is an inextricable relationship between nutrition status and severity of illness: nutrition support can improve the effectiveness of illness treatment, prevent the development of malnutrition and promote healing.

A combination of clinical and biochemical parameters should be used to assess the presence of malnutrition. The past medical history can be helpful in raising suspicion for increased risk of malnutrition and the presence or absence of inflammation. The patient history should focus on weight (ideal, usual, and current weight, and recent weight loss), changes in eating habits and gastrointestinal function, the nature and severity of the underlying disease, and any unusual personal dietary habits or restrictions.^{5,6}

Physical examination can reveal the presence of several of the diagnostic characteristics of malnutrition, such as weight loss or gain, fluid retention, loss of muscle or fat, and other signs of specific macro and/or micronutrient deficiencies, *i.e.*, hair-bearing areas and the oral mucosa.⁵ However, the clinical signs and symptoms of most nutrient deficiencies are not manifest until an advanced state of deficiency develops. If the signs and symptoms of a deficiency exist, it must be correlated with the patient's history and laboratory data to establish a deficiency diagnosis.⁶

About anthropometric data, unintended weight loss is a well-validated indicator of malnutrition. Weight should be measured on admission to any clinical setting and monitored frequently throughout the length of stay. The BMI accounts for differences in body composition by defining the level of adiposity

according to the relationship of weight to height and eliminates the dependence on frame size. BMI is a useful assessment tool because it has a low correlation with height and high correlation with independent measures of body fat for adults (including the elderly). A BMI of 14 to 15 kg/m² is associated with significant mortality, less than 18.5 kg/m² is considered underweight, greater than 25 kg/m² connotes overweight, and a BMI greater than 30 kg/m² indicates obesity.^{6,8} Although malnutrition can occur at any BMI, individuals at either extreme of BMI may be at increased risk of poor nutritional status.⁵

Traditionally, serum proteins levels correlate with nutrition status and severity of illness. The most often analyzed visceral proteins are serum albumin, transferrin, and prealbumin (Table 1).⁶ Despite this, serum parameters may be also influenced by ongoing illness or injury, and thus it may not clearly reflect changes in the individual's nutritional status. Particularly, in the critical care setting, the traditional protein markers may be a reflection of the acute phase response (increases in vascular permeability and reprioritization of hepatic protein synthesis) and do not accurately represent nutrition status.⁹

Information regarding food and nutrient intake may be obtained from the patient and/or caregiver. A modified diet history, calorie counts and/or prior documentation of periods of inadequate food intake in the patient's medical record may be used as evidence of inadequate intake. Functional status should be performed too.⁵

Indirect calorimetry and body composition analysis have been suggested for clinical use to quantitatively measure energy needs and assess nutrition status. However, their routine use cannot be advocated because they are expensive and technically demanding.

Finally, sound clinical judgment and expertise are required to integrate nutrition assessment findings into the daily delivery of patient care.⁵ The professional judgment of the attending health professional remains the primary component of quality medical care.¹

The nutrition care plan is the final component of

Table 1. Nutritional parameters.

Parameters	Malnutrition		
	Mild	Moderate	Severe
Anthropometric			
Weight loss of usual weight	5-10%	11-20%	>20%
Body mass index (kg/m ²)	18.4-17	16.9-16	<16
Biochemical and immunological			
Albumin (g/dL)	3.5-3	2.9-2.5	<2.5
Transferrin (mg/dL)	150-200	100-149	<100
Prealbumin (mg/dL)	18-22	10-17	<10
Lymphocytes (/mm ³)	1200-1500	800-1199	<800
Retinol-binding protein (mg/dL)	2.9-2.5	2.4-2.1	<2.1

the nutrition assessment. The care plan is used to organize the information obtained in the assessment and *to declare a professional judgment*. The nutrition care plan should include nutrition goals and the route of administration of nutrition support.⁶ Nutrition assessments may lead to recommendations for improving nutrition status or a recommendation for rescreening. Clinical assessment (including rescreening and re-assessment) is a continuous process.

Nutrition intervention

Patients identified by screening and assessment as at risk for malnutrition or malnourished should receive specialized nutrition support (SNS). The administration of SNS is never an emergency. It should not be initiated until the patient is hemodynamically stable. SNS is defined as the provision of nutrients orally, enterally, or parenterally with therapeutic intent.⁶

Enteral nutrition (EN) involves the nonvolitional delivery of nutrients by tube into the gastrointestinal tract. The EN is the method of choice (Figure 2)⁶ in all patients with an indication for SNS and who have a

bowel functioning. The advantages of the EN on parenteral nutrition (PN) are: preservation of anatomical and functional integrity of the intestinal mucosa, use more and more physiological substrates, reduced incidence of metabolic or septic complications, greater ease and confidence in the administration and lower cost.

Selection of the proper enteral access device is based on the patients' gastrointestinal anatomy and function, anticipated duration of EN, and the potential for aspiration. The nasoenteric tube is the most commonly used method of enteral access because it can be inserted into the stomach, duodenum, or the jejunum. These tubes are indicated for short-term (less than 4 weeks) use because they have low complication rates, are relatively inexpensive, and easy to place. Patients requiring long-term EN (greater than 30 days) should receive more permanent access as tube enterostomies. Gastrostomy is the most common method for long-term access. Contraindications to enteral feeding include diffuse peritonitis, intestinal obstruction, intractable vomiting, paralytic ileus, intractable diarrhea, and gastrointestinal ischemia.^{6,10}

PN is the administration of nutrients intravenously. It requires central venous access in order to provide nu-

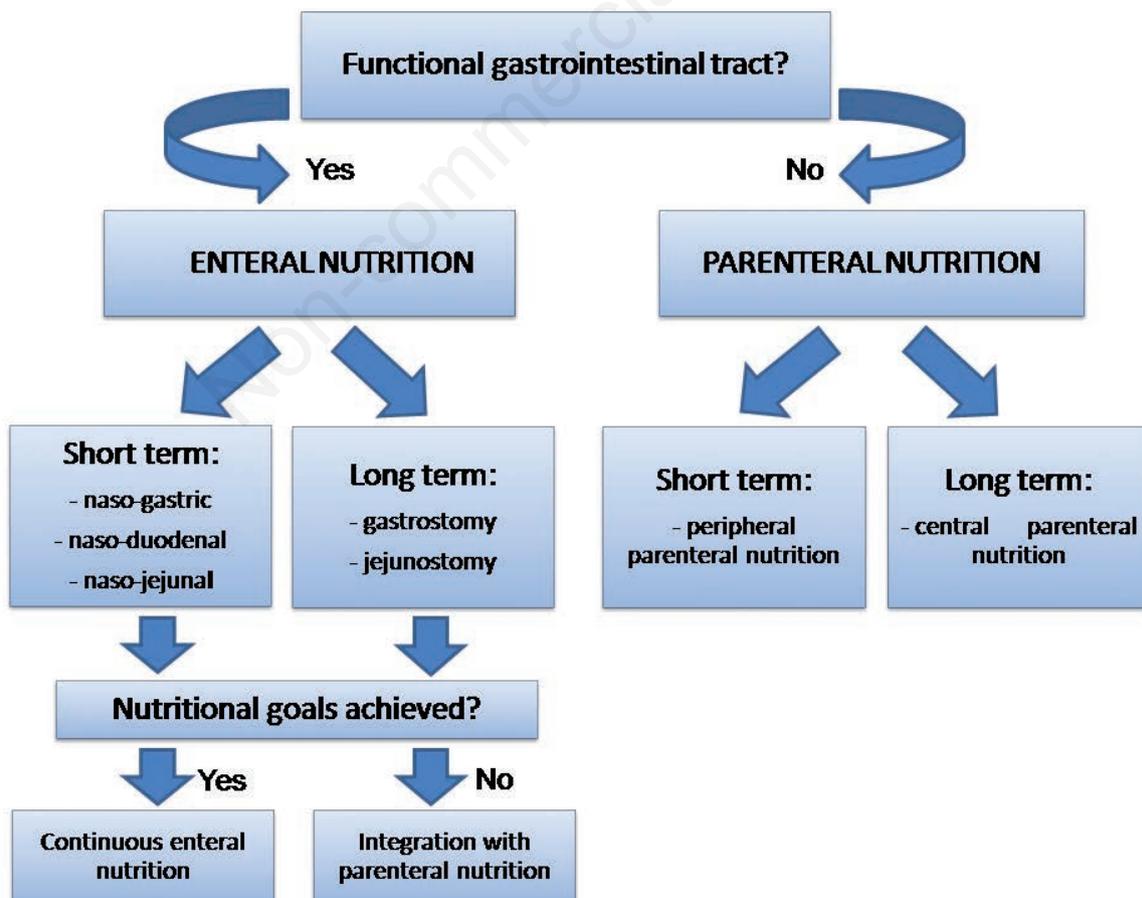


Figure 2. Decision algorithm for specialized nutrition support.⁶

trients at greater concentrations than is possible through peripheral veins. Selection of the most appropriate parenteral access device is based on the patient's vascular access history, venous anatomy, coagulation status, the anticipated duration of PN, the care setting, and the nature of the underlying disease. PN is an invasive therapy with inherent risks. Appropriate use of this complex therapy maximizes clinical benefit while minimizing the potential risk for adverse events. PN is appropriate when SNS is indicated and a contraindication to the use of EN is present or EN is not tolerated.^{6,11}

Another controversial issue is the optimal timing of initiation of SNS. On the basis of available data, it does seem reasonable to initiate SNS in patients with inadequate oral intake for 7 to 14 days or in those patients in whom inadequate oral intake is expected over a 7- to 14-day period.⁶

Monitoring patients maintained on SNS is necessary to determine efficacy of specialized nutrition therapy, detect and prevent complications, evaluate changes in clinical condition and document clinical outcomes. These goals may include maintenance or repletion of lean body mass, reduction in morbidity and mortality, improvement in quality of life, or optimization of clinical outcomes such as reduction of hospital length of stay and cost. Energy balance, body composition analyses, body weight measurements, anthropometry, serum protein concentrations, protein balance, functional status, focused physical examination are all parameters that have been used to assess nutrition status and efficacy of SNS. The patient should be evaluated periodically to determine whether continued SNS therapy is needed. Readjustments of the nutrition prescription may be necessary if oral intake has improved.⁶

Although SNS can be a useful and life-saving therapy in a variety of settings, both EN and PN may cause significant complications: the refeeding syndrome, hyperglycemia and hypoglycemia, acid-base abnormalities, hypertriglyceridemia, excessive carbon dioxide production, hepatobiliary complications and metabolic bone disease. Then, vascular access sepsis in patients receiving PN is a common complication. Gastroesophageal reflux and pulmonary aspiration are potential complications of EN. Gastrointestinal complications, *i.e.*, diarrhea, are common during EN. These complications can be minimized through diligent patient monitoring by nutrition support professionals.⁶

Malnutrition in chronic kidney disease

The International Society of Renal Nutrition and Metabolism has defined protein energy wasting (PEW) as a state of decreased body protein mass and energy reserve stores including muscle and fat wasting and visceral protein pool.¹² The term PEW was developed recognizing as not all causes of wasting are due

to inadequate nutrient intake or increased nutrient loss. The proposed causes of PEW are a result of a complex series of interrelated mechanisms including nutritional and non-nutritional mechanisms (Table 2).¹³ The term uremic malnutrition-inflammatory syndrome describes a close association between malnutrition and inflammation bases for the development of PEW. PEW is common in chronic kidney disease (CKD) patients. The prevalence of PEW increases with progression of renal failure.¹⁴ Protracted nutritional deficiency and inflammatory-oxidative stress closely correlate with progressive loss of renal function varying from 18%-48% in stage 3-4 of renal failure (glomerular filtration rate 60-15 mL/min) up to 75% in end stage renal disease (stage 5).¹³ For the diagnosis of PEW at least out of the 4 listed in Table 3¹⁴ must be presented. It is important to acknowledge and to prevent this syndrome because malnutrition and inflammation are strong predictors of poor outcome in CKD patients.¹⁵ In fact alterations in nutritional status have been described as important predictors of mortality in patients with CKD. Studies reveal how only the patients with hypoalbuminemia were found to be at a high risk for mortality at follow-up compared with patients with normal albumin. Dietary intake is compromised not only by a direct anorectic effect of uremic toxins, but also by the impact of short- and long-term satiety factors, including serotonin, cytokines, and leptin. Increased levels of cytokines such as interleukin (IL)-6, IL-1 and tumor necrosis factor- α and elevated levels of protein-c reactive are detectable with progression of CKD.¹³ Furthermore poor renal leptin clearance may worsen calorie intake and escalate cytokine release from the adipose tissues.

Dietary therapy by manipulating protein intake is the goal of treatment for PEW. Low-protein diet (0.6 g/kg/day) with low potassium (<2 g/day), sodium (<2 g/day), phosphate (<1 g/day) and fluid (<1 L/day) intake are indicated.¹⁴ Unintentional weight loss or sarcopenia, poor appetite, serum albumin <4 g/dL and fast decline in renal function induce additional interventions as diet supplementation with high biological value proteins (essential amino acids and keto acids) and correction of acidemia if present and inflammation if possible. Intensified therapy with adjunct pharmacology as antidepressants, antioxidants, anabolic, phosphate and potassium binders, diuretic and renin-angiotensin system modulators and appetite stimulators is possible in case of no improvement or deterioration.¹⁴

Malnutrition in the elderly

Nutritional disorders are of specific relevance for the elderly. The incidence in hospitalized geriatric patients is very high, around 22-68% of patients, depending on the population and the assessment method

used.¹⁶ Data deriving from a meta-analysis involving 30,000 elderly patients screened by a specific nutritional tool show the mean prevalence of malnutrition is 1% in healthy elderly, 4% in outpatients, 5% in Alzheimer's disease patients and over 20% in hospi-

talized patients.^{16,17} *The ageing process is a of course biological reality which has its own dynamic, largely beyond human control.*¹⁸ Ageing determines physiological changes including: atrophy of mucosa of mouth and tongue with consequent hypogeusia, re-

Table 2. Cause of protein-energy wasting in patients with chronic kidney disease.¹³

A. Inadequate nutrient intake

i) Anorexia caused by:

- Uremic toxicity
- Impaired gastric emptying (*e.g.*, diabetic gastroparesis)
- Inflammation with or without apparent comorbid conditions
- Hormonal derangements (*e.g.*, elevated serum leptin low serum ghrelin)
- Emotional and/or psychological disorders

ii) Poor adherence to the following prescribed dietary restrictions

- Low- and very-low-protein diet
- Low energy intake
- Low-potassium and low-phosphate regimens
- Low-salt diet with restricted fluid (to control edema)
- Low-fat diet (such as DASH diet)
- Low-carbohydrate diet for glycemic control (*e.g.*, in patients with diabetes)

iii) Social-economic constraints: poverty, inadequate dietary support

- Physical incapacity: inability to acquire or prepare food or to eat or digest foods
- Poor dentition and/or severe gum disease
- Neurologic disorders (*e.g.*, after cerebrovascular accidents with deglutition disorders)

B. Moderate or severe proteinuria

C. Hypercatabolism caused by comorbid illnesses

- Cardiovascular diseases
- Diabetic complications
- Infection and/or sepsis
- Other comorbid conditions

D. Hypercatabolism associated with the uremic milieu

- Negative protein balance
- Negative energy balance
- Endocrine disorders of renal failure
- Resistance to insulin
- Resistance to growth hormone and/or insulin-like growth factor-I
- Increased serum concentrations of or sensitivity to glucagon
- Hyperparathyroidism

E. Acidemia due to metabolic acidosis

F. Concurrent blood losses

Table 3. Diagnosis of protein-energy wasting in patient with chronic kidney disease.¹⁴

Nutritional intake	Body mass and composition	Laboratory measurements
Direct: dietary recalls and diaries	Body mass index	Visceral proteins (negative acute phase reactants also affected by nutrient intake): serum albumin, prealbumin, transferrin
Indirect: based on urea nitrogen appearance (<i>e.g.</i> , 24-h urinary urea collection)	Skin and muscle anthropometric measurements:	Lipids: cholesterol, triglycerides, other lipids and lipoproteins
		Indicators of muscle mass and/or meat or protein intake: serum creatinine, urea
		Growth factors: insulin-like growth factor-I, leptin
		Peripheral blood cell count: lymphocyte count
		Proinflammatory cytokines: serum C-reactive protein, tumor necrosis factor- α , interleukin-6

duced gastric and pancreatic secretion and reduced production of cellular enzymes causing reduced digestion and absorption of nutrients. The decrease in lean body mass and body metabolic rate may also contribute to the development of a physiological anorexia of the ageing. Furthermore, elderly patient shows a physiological decrease in sense of appetite due to increased levels of cholecystokinin and to delayed gastric emptying. In addition to physiological factors many other causes of malnutrition are related to disease most frequent in the advanced age such as organ failure, neoplastic diseases and use of drugs that can interfere with absorption or excretion of some nutrients and drugs that determine alteration of taste. Loneliness, economic difficulties, institutionalization can also be a cause of impaired intake of food. The causes of malnutrition in elderly are therefore very numerous and can be schematically divided into medical, social and psychological (Table 4).^{19,20}

Recently the ESPEN has defined the difference between malnutrition, cachexia and sarcopenia. Cachexia is defined as a complex metabolic syndrome associated with underlying illness and characterized by loss of muscle with or without loss of fat mass. The prominent clinical feature of cachexia is weight loss of adults (correct for fluid retention). Sarcopenia is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and is correlated with a risk of adverse outcomes such as physical disability, poor quality of life and death.²¹ The European Working Group on Sarcopenia in Older People recommends using the presence of both low muscle mass and low muscle function for the diagnosis of sarcopenia. Anorexia, inflammation, insulin resistance, in-

creased muscle breakdown are frequently associated with cachexia. Thus, most cachectic individuals are also sarcopenic, but most sarcopenic subjects are not considered cachectic. Therefore, malnutrition seen in elderly hospitalized patients is often a combination of cachexia (disease related) and malnutrition (inadequate consumption of nutrients) as opposed to malnutrition alone. The consequences of malnutrition on the health of the elderly can be divided into: i) direct consequences: impaired wound healing, reduced bowel motility, muscle wasting, depression of the immune response, increased risk of infections, fracture and pressure ulcers; ii) indirect consequences: higher morbidity, longer length of hospitalization, increased use of drugs and length of rehabilitation, decreased quality of life, increased mortality and costs of care.

Alzheimer's disease and nutritional assessment

A particular category of older people at risk of malnutrition is represented by patients affected by Alzheimer's disease. Already in 1907 Alois Alzheimer described in its first patients a *slowing progressive decrease in body weight* that has been subsequently confirmed in a large number of Alzheimer's patients.

In the literature, it is still debated if the weight loss is a causal event or result of Alzheimer's disease.²² Some authors supporting the first thesis suggest that the micro or macro nutrients deficiency is associated with lower cognitive performance even in subjects without dementia. On the other hand, it is equally true that it might be an effect of disease because the neurodegenerative process that begins before clinical diagnosis may be itself a primary cause of the loss of weight.²³

Weight loss may also be a part of a body's adaptive response to stress of disease or a form of down regulation of energy needs associated with reduced brain function. Therefore, this so-called *non-intentional weight loss* would be a direct consequence of the disease not only for the association of dementia with behavioral disorders but also because brain lesions typical of Alzheimer's disease involve the brain areas responsible for food intake.²⁴ However, regardless of the source, weight loss in these patients seems to be inevitable as strictly associated with the physiopathology of the Alzheimer's disease. Prevention is undoubtedly essential. It is important to identify patient at risk, to assess their nutritional status and to prevent consequence of malnutrition on cognitive function.

Nutritional assessment in elderly

The MNA is the best-validated and most widely utilized screening test for malnutrition in older people.

Table 4. Risk factors for malnutrition.

Medical

Poor appetite
 Poor dentition or other local problems
 Loss of taste and smell
 Respiratory disorders (chronic bronchitis, emphysema)
 Endocrine disorders (hyperthyroidism, diabetes)
 Neurological disorders (Parkinson's disease, cerebrovascular accident)
 Infection
 Physical disability (arthritis, osteoporotic fractures)
 Drug interactions (digoxin, metformin, lassative, antibiotics, etc.)
 Severe disease like cancer or ictus

Social

Isolation
 Economic difficulties
 Inability to shop or prepare food

Psychological

Confusion
 Anxiety
 Dementia
 Depression

The full MNA includes 18 items divided in 4 steps: anthropometric assessment, general assessment, short dietary assessment, and subjective assessment.

Besides the MNA a number of screening tests for malnutrition have been validated, however, it is not yet clear which one has the best performance in predicting longer term outcomes in hospitalized older people. MNA-SF was developed and validated for screening of low-risk subjects. It consists of 2 steps with items similar to those of MNA. If step 1 suggests risk for the patients, step 2 should be performed. The MNA-SF can be used easily as an efficient screening tool for community elder subjects during their geriatric assessment. Some studies suggest that it can be done by their practitioners or on admission to the hospital (or home care) to value early the risk of malnourishment and to detect patients who could be helped by precocious nutrition intervention.²⁵ According to ASPEN guidelines elders are considered at nutritional risk if any one of the following is present: i) actual or potential for developing malnutrition (involuntary loss or gain of $\geq 10\%$ of usual body weight within 6 months, or $\geq 5\%$ of usual body weight in 1 month, or BMI < 20 kg/m); ii) presence of chronic disease, or increased metabolic requirements; iii) altered diets or diet schedules (receiving total parenteral or enteral nutrition, recent surgery, illness, or trauma); iv) inadequate nutrition intake including not receiving food or nutrition products (impaired ability to ingest or absorb food adequately) for > 7 days. Undernutrition and risk of undernutrition represent essential and independent indications for enteral nutrition in geriatric patients.¹

Recent ESPEN guidelines defined oral nutritional supplements as product to be used as nutritional support of the common diet which are recommended in order to increase the intake of energy, protein and micronutrient in those patients still able to feed by natural way.¹¹ This strategy aims to reduce the need for more invasive techniques of nutrition. In case of inability to achieve weight gain by natural way, tube feeding (TF) is recommended.²⁶ EN by TF is clearly indicated in patients with neurological dysphagia. In contrast, TF by percutaneous endoscopic gastrostomy (PEG) or nasogastric tube feeding (NGT) is not indicated in final states of diseases, including final dementia. The choice between PEG and NGT remains controversial, but PEG seems to be more efficient.

The most important factors for maintaining good nutritional status in elderly people with Alzheimer's disease are: appropriate techniques of nutrition, texture's and mealtime with exploitation of cognitive daily peak time. The latter varies usually from early morning until afternoon so that breakfast and lunch are the most opportune moments for optimization of nutritional intake. It also appears necessary to inter-

vene on the psychological stress of caregivers that could influence the behavior of patients.

Malnutrition in liver cirrhosis

Malnutrition as a complication of chronic liver disease has important prognostic implications. Protein-calorie malnutrition is found in 65-90% of patients with advanced liver disease and in almost 100% of candidates for liver transplantation.^{27,28} Patients with chronic liver disease also frequently develop micronutrient deficiencies. Patients with cholestatic liver disease are subject to calorie depletion and are more likely to present a deficiency in fat-soluble vitamins, whereas patients with non-cholestatic disease predominantly experience protein depletion.²⁹

Causes of malnutrition in liver disease are: i) poor oral intake due to an altered sense of taste, early satiety related to mechanical compression from massive ascites, increased serum concentration of leptin, commonly recommended dietary restrictions, weakness, fatigue, and low-grade encephalopathy; ii) malabsorption: fat malabsorption due to a reduction in the bile-salt pool, bacterial overgrowth, portal hypertension, use of medications that lead to malabsorption (such as neomycin); iii) increased energy expenditure, the exact cause of hypermetabolism remains unclear, but certain predisposing factors have been identified such as infection and ascites; iv) an altered pattern of fuel consumption, *i.e.*, a more rapid transition from the use of carbohydrates to the use of fat stores as a substrate for metabolism.

Many of the commonly used markers of malnutrition are not useful parameters for the prediction of malnutrition in this patient population. Fluid retention influences weight and body cell mass. Many of the typical markers of nutritional status are less reliable in patients with cirrhosis: for example, concentrations of albumin and prealbumin could be low because of low levels of synthesis. Other tools such as subjective global assessment or even hand-grip strength should be considered.³⁰

The goals of nutritional therapy are to improve protein-calorie malnutrition and correct nutrient deficiencies. This can be accomplished via oral, enteral, or parenteral methods, or a combination of these modalities. Intervention in the early stages of malnutrition can improve outcomes.

There is some evidence to suggest that parenteral feeding might be superior to enteral feeding in patients with portosystemic shunting, because enteral feeding might worsen hyperammonemia in this specific patient population.³¹

The European Society for Clinical Nutrition and Metabolism created guidelines for meeting nutritional goals in patients with end-stage liver disease.³² They

recommend initiation of enteral feeding when oral intake is inadequate. In patients with compensated cirrhosis, the guidelines recommend that patients consume 25-35 kcal/kg body weight per day of non-protein energy and 1-1.2 g/kg body weight per day of protein or amino acids. In patients with complicated cirrhosis associated with malnutrition, nonprotein energy should be increased to 35-40 kcal/kg body weight per day and protein intake should increase to 1.5 g/kg body weight per day. According to the guidelines, protein intake should decrease to 0.5-1.5 g/kg body weight/day if stage I or II encephalopathy is present, and to 0.5 g/kg body weight/day if stage III or IV encephalopathy is present. More recent evidence suggests that protein restriction should not be recommended, even in the setting of episodic hepatic encephalopathy.

It has been proposed that eating a late evening snack could alleviate the shift towards lipid oxidation by reducing the length of overnight fast. A typical recommendation for patients with advanced liver disease is to consume four to five small meals per day, as well as a late evening snack.

Branched chain amino acids (BCAAs) - leucine, isoleucine and valine - have been shown to affect gene expression, protein metabolism, apoptosis and regeneration of hepatocytes, and insulin resistance. They have also been shown to inhibit the proliferation of liver cancer cells in vitro, and are essential for lymphocyte proliferation and dendritic cell maturation. In patients with advanced chronic liver disease, BCAA concentrations are low, whereas the concentrations of aromatic amino acids (AAAs) such as phenylalanine and tyrosine are high, a low Fisher ratio (BCAAs/AAAs) has been proven to a marker of liver disease progression, while a simplified Fisher ratio (BCAAs/tyrosine) predicts albumin levels at one year.³³⁻³⁵ Several clinical trials have suggested that BCAA supplementation improves the prognosis of cirrhotic patients, and a recent review concludes that their supplementation improves nutritional status and quality of life in patients with advanced cirrhosis, and some international guidelines already recommend their use.³⁶ Another review of meta-analysis recommends oral administration of BCAAs in hepatic encephalopathy, especially in combination with non-absorbable disaccharides.³⁷ In hepatocellular carcinoma BCAAs supplementation improves quality of life and helps preserve liver function during treatment.³⁸

The management of patient with malnutrition: rationale and objective

Malnutrition is highly prevalent condition in the acute hospital setting with rates of approximately 40%. Malnutrition is associated with many adverse outcome therefore unidentified malnutrition not only

heightens the risk of adverse complications for patients but results in an increase in health care costs. The objective of this monograph is to provide evidence-based recommendations for the proper management of malnutrition by multi-parametric analysis of the guidelines available to date.

The management of patient with malnutrition: methodology

In order to provide evidence-based recommendations for the management of patients with malnutrition, we first verified the existence of guidelines (GL) on the matter. Therefore, we conducted a search using the following database GL:

i) Scottish Intercollegiate Guidelines Network (SIGN); ii) Institute for Clinical Systematic Improvement (ICSI); iii) National Institute for Health and Clinical Excellence (NICE) - National Health System (NHS) evidence; iv) National Guideline Clearinghouse (NGC); v) Canadian Medical Association, CMA Infobase; vi) New Zealand Guidelines Group; vii) Italian National Health System Guidelines; viii) Clinical Practice Guidelines Portal; ix) eGuidelines.

The research was carried out by four authors independently, using as key-word term *malnutrition* when the site included the search function, and in other cases we listed the last manually GL stored in the database or made reference to the *gastrointestinal illness*. The results obtained separately were then compared and discussed together. The GL thus obtained was evaluated using the AGREE instrument (Appraisal of Guidelines, Research and Evaluation II) by 4 authors independently. AGREE II assesses compliance with 23 requirements, meeting 6 domains as the explanation of the purpose, the clarity, the involvement of all stakeholders, the rigor of development, applicability and editorial independence of the same. Each author assessed the compliance of individual requirements with a score from 1 (disagree completely) to 7 (complete agreement). The scores assigned by each author were added within individual domains and reported with the highest and the lowest score possible within the domain based on the number of requirements included and the number of evaluators.

The management of patient with malnutrition: results

Through the databases listed above, we identified and we analyzed 11 GL. The GL derived from the Canadian Clinical Practice are well structured (score 5.78). The main recommendations are clear, easily identifiable and closely related to the scientific evidence that supports them although addressed only to

the mechanically ventilated patient. The ASPEN GL include three GL. The ASPEN GL nutrition screening, assessment and intervention (score 6) are clearly described. The recommendations are supported by solid scientific evidence and originated from the high methodological rigor. The ASPEN PN ordering (score 4) are focused only PN. There is no summary of PN, which can guide the use. The ASPEN GL PN and EN (score 6) is very detailed and accurate. The GL addresses the nutritional problems also in special conditions such as pregnancy, the advanced age, obesity, and in the presence of kidney, heart, lung, pancreas and liver disease. The division into paragraphs facilitates the use allowing easy identification of the topics of interest and main recommendations. The ASPEN critically ill patient (score 6.17) provides a detailed description of the malnutrition in critically ill patient. The recommendations are specific, unambiguous and easily identifiable. Another strength of the GL is the high methodological rigor. The ESPEN GL on EN liver (score 4.5) answers to the most frequently asked questions on clinical nutrition patient's liver disease. The use of summary tables allows easy identification of the main recommendations. The ESPEN GL on EN Geriatrics (score 3.8) are extremely clear. The recommendations are easily identifiable. The GL provides good guidance on the introduction of EN in geriatric specifying in detail the nutrition in the elderly frail, elderly neoplastic and elderly with dementia. The GL is however focused on indications of EN in the subtype of malnourished patient (the elderly). The ESPEN GL on PN (score 3.8) concerns the PN in the intensive care unit. The target is therefore limited. The content is clear and unambiguous and it is summarized in the main recommendations easily identifiable. The evaluation AGREE about the methodological rigor is lacking. The ESPEN nutritional screening 2002 (score 3.5) is clear and succinct. However, the topic is focused only on nutritional screening. Most of the items AGREE (especially those concerning the methodological rigor) are not identifiable. The scientific evidence dates back to 2002. The NICE GL (score 5.29) are well structured. The highlight is the clarity. The presence of tables allows easier applicability and clinical management of the problem. The methodological rigor of the GL is satisfactory. The GL of National System (score 3) is very detailed but of little practical applicability despite the GL presents many figures, tables and checklists. The target population is pediatric therefore not our competence. The GL New Zealand (score 4.85) is primarily structured in the form of schemes. The methodological rigor is absolutely satisfactory. The Italian GL for artificial nutrition in the elderly (score 4.77) is easy to read and understand. The topics are summarized on key recommendations. Many items of evaluation AGREE, however, are not

available. The writing in the Italian language restricts the diffusion. The GL SINPE for Artificial Nutrition Hospital 2002 (score 4) is well structured. The recommendations are easily identifiable (tables, figure and algorithms). However, many items are not available in the GL. The writing in the Italian language restricts the diffusion.

Therefore, the GL on malnutrition for all types of patients and for each setting (hospital and outpatient) are the NICE GL, the GL of National System and GL of New Zealand. On the basis of the evaluation by the AGREE instrument the GL produced by NICE are qualitatively the best and whose implementation in clinical practice appears desirable.

Clinical approach to patients with malnutrition

The process of nutrition care may be broken down into a series of steps with feedback loops (Figure 1). Nutrition screening, assessment, and intervention in patients with malnutrition are key components of nutrition care.

All patients should be screened on admission to hospital or other institutions. Objective data such as height, weight, weight change, primary diagnosis, and presence of comorbidities can be used in nutrition screening to indicate malnutrition or risk of malnutrition. Involuntary loss or gain of $\geq 10\%$ of usual body weight within 6 months, or $\geq 5\%$ of usual body weight in 3 months or body weight of 20% over or under ideal body weight, especially in the presence of chronic disease or increased metabolic requirements or inadequate nutrition intake including an impaired ability to ingest or absorb food adequately are factors indicative of malnutrition.⁶ As tools for nutritional screening exists MUST, NRS-2002 and MNA.

All patients who are identified to be at nutritional risk by nutrition screening must perform nutrition assessment. A combination of clinical and biochemical parameters should be used to assess the presence of malnutrition. Components of nutrition assessment are: i) medical and social history gathered from chart review and patient interview (past medical and surgical, pertinent medications, alcohol and drug use, bowel habits, psychosocial data as economic status, occupation, education level, living and cooking arrangements, mental status, age, sex, level of physical activity, daily living activities); ii) diet history and intake (taste changes, dentition, dysphagia, feeding independence, diet restrictions, ethnicity, eating away from home, fad diets) to estimate nutrient intake obtained through diet intake from 24-h recall, food frequency questionnaire, food diary, observation of food intake; iii) clinical examination; iv) anthropometrics: weight, height, body mass index BMI, waist circum-

ference; v) biochemical data: serum proteins levels (prealbumin, albumin, transferrin), vitamins.

Nutrition support intervention is recommended for patients identified by screening and assessment as at risk for malnutrition or malnourished. EN should generally be used in preference to PN. PN can be used when the gastrointestinal tract is not functional or cannot be accessed and in patients who cannot be adequately nourished by oral diets or enteral.

Clinical governance instruments: clinical pathways and audit

Malnutrition is common in in-patients (both acute or chronic) but often underestimated, thus its real incidence and prevalence in hospitalized patients are difficult to establish.³⁹

Beside the Joint Commission recommendations of 1996 indicating to screen in-patients for malnutrition within 24 h of admission, in recent years, different approaches (often no evidence-based) have been used, at admission, to screen patients for malnutrition.⁴⁰ This seems the reason of the extreme heterogeneity of malnutrition incidence and prevalence in literature.

To overcome this issue, International scientific societies have produced GL concerning the routine screening, diagnosis and management of malnourished patients. With the availability of these additional evidence-based recommendations, it is up to clinicians to apply them in the specific institutions or hospitals in order to standardize as much as possible their behaviors, thus ensuring a universal access to good quality of care.

In order to make these GL's specific to every single hospital ward, it seems necessary to use the basic tools of clinical governance, such as clinical pathways (CP) - or PDTA in Italian - and monitoring their application through the consistent use of cyclical clinical audit, constantly verifying process and outcomes indicators.

Aim of this paper is to illustrate a project regarding the application of the above Clinical Governance tools to the management of malnutrition for in-patients in Internal Medicine Units. Malnutrition is often present in subjects with concomitant chronic diseases, elderly, with comorbidities, with multiple risk factors; it is a major cause of complications, it worsens clinical outcomes and patients' quality of life, it prolongs hospitalization, favors re-hospitalization, and, last but not least, increases operating costs of care.

Healthcare clinicians routinely make decisions on complex situations that may relate to the management of defined pathological conditions (*i.e.*, malnutrition), to clinical problems (*i.e.*, dyspnea), to organizational aspects (*i.e.*, Echocardiography Organization Service) or to the choice of diagnostic tests (for example myocardial scintigraphy) or specific therapeutic treatments (*i.e.*, thrombolysis).

Clinicians' decisions, however, sometimes suffer from some limitations such as variability, defects adequacy, appropriateness and integration of care, which may depend on both the single physician's point of view or the different conditions in which the clinician works.⁴¹

GL, generally, provide behavioral recommendations supported by different degrees of scientific evidence aiming at assisting clinicians in their daily activities, thus making as much homogeneous as possible the multiple choices in the daily clinical routine.

GL's recommendations and evidence from different clinical trials representing the best clinical practice to overlook, however, must necessarily be contextualized in the local community through the construction of CP which represent the best feasible path for the approach to a defined pathological condition, compatibly with the local available resources.

CP conceptually derives, with the necessary modifications, from the industrial world, just like other tools of health policy (*i.e.*, clinical audit).

As well as for the industrial world, the translation of CP in Medicine requires a clear definition of objectives, roles and tasks of health personnel, standardization and reproducibility of services provided and clear information to patients; this will determine:⁴² i) reduction of delays and waste; ii) unnecessary treatment variations; iii) continuity and coordination of the care process; iv) minimization of any risk for patients; v) improved clinical outcomes.

The steps necessary to build a CP are the following: i) choice of the topic; ii) constitution of the multi-professional and multi-disciplinary working group; iii) analysis of the actual path; iv) analysis of the ideal path; v) creation of the reference path and pilot phase; vi) dissemination, implementation and updating of the care pathway; vii) periodic review of the indicators of structure/process/outcome.

The choice of the topic is a fundamental moment in designing a CP; it consists in a careful analysis of the needs of the specific area of work where it will be applied; in particular, the CP's topic must be chosen on the basis of the presence of at least one of the following characteristics: i) high volumes (something that is done routinely or with high frequency); ii) high costs (something that uses a high proportion of resources); iii) high risk (something that exposes workers to high risks and/or patients); iv) high complexity (something that requires a high level of organization or clinical care); v) high variability (something that is subject to considerable heterogeneity of application); vi) lack of integration between various sectors, such as between hospital and the adjoining territory.

The topic's choice requires, obviously, relevant and high quality GL availability.

Once the so far current clinical practices are established (actual pathway) such as the theoretical horizon

(ideal pathway), it is mandatory, for clinicians, to build the best pathway fitting to the single and specific working life, *i.e.*, what we call reference pathway.

To identify the best practices, indeed, it is necessary to look at the scientific literature, in particular to the current GL, and where these do not cover all the aspects concerning that specific CP, it is fundamental to look back both at systematic reviews and at clinical studies.

Thereafter, the working group performs the complex task of adapting the recommendations summed up from the reference literature to local context.

This is the most critical phase of the project: to avoid the building of a unenforceable CP, it is necessary that all the recommendations are evidence-based, shared by the multi-professional and multi-disciplinary working group;^{43,44} furthermore a preliminary simulation is necessary to identify practical obstacles such as structural or organization inadequacies, scarcity of technology, professional (*i.e.*, inappropriate number of health workers, inadequate staff, *etc.*), social, cultural, geographical (*i.e.*, language interpreter not always available, *etc.*) lacks and finally legislative problems (*i.e.*, AIFA notes, *etc.*).⁴⁵

If our *reference document* tells us what to do, the creation of our path must follow this rule: who, when, how, where, minimizing eventual misunderstandings.

Usually CPs are described through the *flux diagram*, which is the use of the flowcharts, *graphical representation of a process as a sequence of activities and decision intersections, made according to standard mode in order to make simpler and immediate process understanding to everyone involved.*⁴¹

CPs can be described also through the matrix representation. This is a more complex representation arising from the functional diagram and, unlike the simple flow chart, allowing concisely to clarify activities, actors, place and resources of that specific CP.^{41,42,46,47}

The document, starting from recommendations or criteria chosen by GL and adapted to the local context, must identify some indicators (which must be evaluated before and after the definitive application of the CP) in order to demonstrate its effective application and the effectiveness in terms of outcome.

The recommendations or criteria (*i.e.*, the explicit definition of what is considered useful to be measured through indicators) should be evidence-based, clear, explicit, shared by the multi-professional team, related to relevant aspects of health care, translated into a measurable indicator and therefore, quantifiable.

Every single standard for each criterion/indicator must be identified, *i.e.* the threshold value, the minimum acceptable level to strive in satisfying the criterion/indicator in the specific reality evaluated; it is generally expressed as a percentage and must be, as well as the criterion, evidence-based, shared by professionals, realistic and adapted to the local context.

The indicator is a ratio between two elementary measures, a numerator and a denominator and it allows measuring the sanitary performances in order to compare them to the previously identified standard.

There are three possible types of indicators: those of structure, process and outcome.

The way of collecting numeric data for calculating specific indicators (prospective, retrospective or mixed) should be a priori established, such as which sources to be consulted. It is mandatory to establish the data collection period, *i.e.*, how long the data collection must be performed. If the collection is prospective, it should not exceed 6-8 weeks (to avoid personnel motivation lack), while for the retrospective data collection a longer period might be expected.

Furthermore, it is important to size the sample, *i.e.*, the number of patients who must be evaluated in order to reach statistically valid conclusions, using in some cases also statistical techniques.

The reference path draft must be followed by a pilot phase consisting of project implementation only in some specific realities; it will serve to identify critical areas (not emerging during the drafting stage) and inconsistent actions and to analyze the effective impact through specific indicators.

Once the pilot phase is successfully completed, then it is time to spread the project and then to verify its real application.

In particular, the indicators verification activities must be realized repeatedly over time because it is widely documented the physiological progressive decline of the attention of healthcare personnel at the path, resulting in a rapid deterioration of the performances previously reached.

The indicators calculation is intended to produce numerical values, which must be compared to the standard values of reference.

Once the indicators calculation is obtained, it will be compared with the best practice (standard) and, through the use of relatively simple statistical techniques, quantitative estimates of in-appropriateness will be obtained (whether in defect or in excess).

If significant differences between the value of one or more indicators and the standard established a priori are found, it becomes important to implement strategies facilitating behavioral changes and improving the quality of care and assistance. A string in our bow is represented by clinical audit, a clinical governance tool through which, once identified the critical process, the working group will draw up a plan of action allowing to: i) implement change; ii) outline the proposed actions; iii) outline the responsible for each action; iv) evidence the timing and implementation strategies accompanying improvement activities so as to maximize the positive impact on the care process.

Once the negative performance aspects emerged are

improved, then clinician can move to the re-audit phase; this phase allows evaluation and quantification of the effectiveness of the improvements, and it consists in the repetition of process and outcome indicators' activity detection and its comparison with standards.

It is very important that the positive changes achieved are maintained over time or, in other words, that the project is part of a continuous quality improvement system. Furthermore, the team must develop adequate monitoring of the results achieved and maintain them (or improve) over time.

Rationale for the construction of a clinical pathway on malnutrition

We decided to choose as subject the management of malnutrition as it meets many of the criteria needed for the construction of a CP, already listed in the previous paragraph: i) it is a problem with high volumes, in fact malnutrition in hospital has an incidence of 30-55% depending on the studies examined;⁶ ii) malnutrition increases costs (35%-75% higher than those required by the non-malnourished patients);⁷ iii) there is a high variability in the management of this problem as demonstrated by international studies;^{48,49} iv) recent GL and specific tools for the screening and diagnosis of malnutrition are currently available.^{1,5,9,11}

The project

Primary aim of our project is to take a *snapshot* of the identification and management of malnutrition in in-patients in 11 Internal Medicine Units spread throughout the Italian territory. Our impression, created by simple comparison, is that the way of handling this problem, similar to what is found in the international literature,⁵⁰ is far from homogeneity.

Aims of this exploratory phase are: i) to determine

the prevalence of standardized methods (MUST, *etc.*) to screen for nutritional status in chronic patients hospitalized in Internal Medicine wards; ii) to determine the prevalence of standardized methods (MNA, subjective nutritional assessment, *etc.*); iii) to assess the nutritional status in chronic patients hospitalized in Internal Medicine wards resulting at risk of malnutrition with the above mentioned screening tools; iv) to determine the prevalence of nutritional interventions in patients resulted malnourished on the basis of the assessment methods used; v) to determine the prevalence of nutritional reassessment and the intervals between reassessments during the hospitalization in patients judged not a risk of malnutrition.

The methods used in exploring malnutrition assessment are the following. It will be identified, without prior notice, one day as a specific Nutrition Day. In this index day in each of the participating centers an Internist, working in the Department and well informed in advance about the study, will check the medical records of chronic inpatients relatively to: i) the documentation of nutritional risk screening at the time of admission; ii) the documentation of nutritional assessment in chronic patients judged at risk of malnutrition with the screening tools at the time of admission; iii) the nutritional risk screening tool used; iv) the nutritional assessment tool used; v) the documentation of specific nutritional plan used in patients judged malnourished or at risk of malnutrition; vi) the documentation of reassessment in patients judged not a risk of malnutrition at the time of admission.

Each Internist involved will fill in an application form and then the data will be registered in an electronic format, previously provided.

Each center data will be centralized to estimate the process indicators (Table 5).

Data obtained will be pooled together to evaluate the overall estimate for each indicator compared to the reference standard but they will also be separated for each individual center; in the areas in which deviations

Table 5. The process indicators.

Total number of inpatients who underwent a nutritional risk screening at the time of admission
Total number of inpatients
Total number of inpatients judged to be at risk of malnutrition who underwent a nutritional assessment
Total number of inpatients judged to be at risk of malnutrition
Total number of inpatients judged malnourished for whom a consequent nutritional intervention has been performed
Total number of inpatients judged malnourished
Percentage of different methods used to screen and to assess for malnutrition; description of the methods used [questionnaire (MUST, MNA, NRS-2002), anthropometric measurements (BMI, skinfold thickness, <i>etc.</i>), biohumoral data (prealbumin, lymphocyte counts, hemoglobin, <i>etc.</i>)]
The documentation of reassessment in patients judged not a risk of malnutrition at the time of admission
Total number of patients not a risk for malnutrition at admission who was reassessed with the same screening method
Total number of patients not a risk for malnutrition at admission

MUST, malnutrition universal screening tool; MNA, mini nutritional assessment; NRS-2002, Nutritional Risk Screening 2002; BMI, body mass index.

from the standard are identified, specific CPs will be built: recommendations selected by the GL to build indicators will then be contextualized in individual centers and made explicit in the form of the path to be specifically applied.

Furthermore, in accordance with the call to action of feed Medical Education (M.E.) Global Study Group,⁵¹ an international expert group on nutrition, the general outlines of every single CP specific to each center, if necessary, will be the same as the CP proposed by feed M.E. Global Study Group; these will be applied to the patient hospitalized at the time, during hospitalization and at discharge (Figure 3).⁵¹

Concerning the diagnosis moment, the CP proposed by feed M.E. Global Study Group suggests using the Subjective Global Assessment for all adults and MNA for older people; once identified the malnourished patient, the malnutrition CP recommends a customized nutritional treatment within 24-48 h of admission.

Subsequently, after the development and implementation of CP, the same indicators established prior to application will have to be re-tested periodically and, in case of persistence of variances, implementation strategies such as multi-professional and multi-disciplinary meetings and improvement groups (to discuss on the

variability management) will be performed in order to find improved performance strategies.

In conclusion, the attention to nutrition is an essential element for a good quality clinical practice, it improves patient outcomes and reduces complication-associated costs. International studies have already shown that this problem is globally underestimated and underdiagnosed in hospitalized patients, but there is no scientific evidence specific to Internal Medicine in-patients often at risk of malnutrition or already malnourished on admission.

Our project is to document the methods of screening, diagnosing and treatment of malnutrition used in 11 Internal Medicine Units spread throughout the Italian country and if, we suppose, in nonconformance with the International GL, in following the call to action of feed M.E. Global Study Group by developing the details of the CP proposed by the same group in the form of a local CP (PDTA).

The project concerns the control of the effective application of these CPs through calculating process indicators which will be cyclically evaluated; the goal is to bring the indicators to benchmark; in case of deviations, tools as multi-professional and multi-disciplinary meetings and improvement teams will be performed.

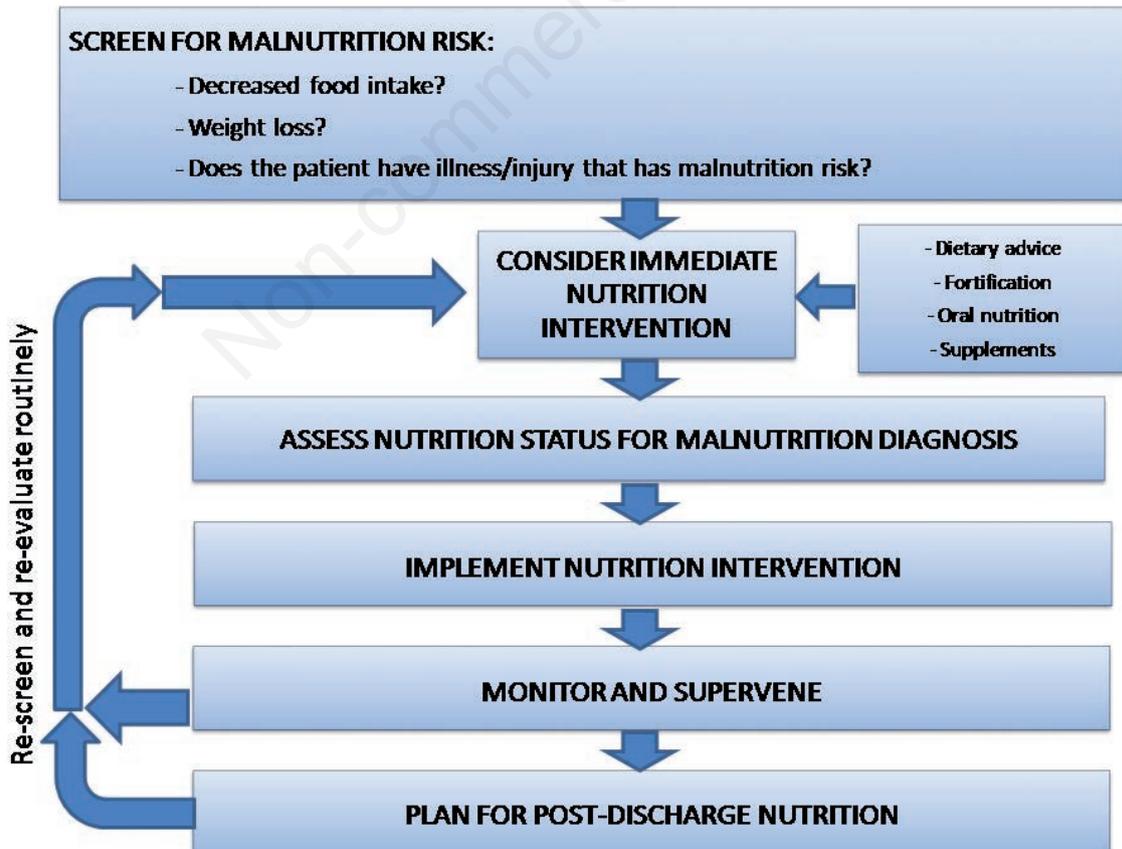


Figure 3. Malnutrition clinical pathway.⁵¹

Conclusions

Malnutrition is a highly prevalent condition in the acute hospital setting and the development of malnutrition is associated with many adverse outcomes and increased health care costs. This can be prevented if special attention is given to their nutritional care. For this reason, malnutrition must also be a clinical competence of internist for its nature and frequency. This monograph highlights the importance of establishing specific set of protocols for identifying patients at nutritional risk, leading to appropriate care plans.

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