Malnutrition in North America: Where Have We Been? Where Are We Going?

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Abstract
Malnutrition was first highlighted as a prevalent concern in hospital care more than 30 years ago. In response the nutrition support field grew precipitously but changes in the healthcare environment have culminated in a period of accountability and consolidation in nutrition support practice over the past decade. Evolving regulatory environment and reimbursement policies have had a profound impact upon nutrition support and these trends are likely to continue. Both undernutrition and overnutrition (obesity) remain prevalent concerns in North America. In particular the growing prevalence of overweight/obesity will have far-reaching implications for nutrition support practitioners and will require the development, testing, and validation of new standards of assessment, intervention, and monitoring. Adoption of common language and definitions by practitioners will facilitate standardized interventions, outcome measures, and high quality research. The future remains bright with tailored nutrition interventions poised to become a part of the individual medical treatment plan for specific patient conditions and genotypes. Future research priorities should include studies of nutritional modulation of inflammatory conditions with specific nutrients and functional foods and the testing of individualized nutritional interventions tailored to gene polymorphisms.

Introduction
In 1974 Butterworth [1] raised awareness of the ‘skeleton in the closet’, the problem of iatrogenic malnutrition among hospitalized patients in the United States. That same year, Bistrian et al. [2] first described the high prevalence of low albumin among hospitalized patients. These alarming reports regarding the high prevalence of malnutrition combined with the recognition that malnutrition is associated with adverse patient outcomes and the
The growing availability of enteral and parenteral feeding interventions laid the foundation for the rapid emergence of nutrition support in North America. Multidisciplinary nutrition support teams, professional nutrition societies, training programs, and professional certifications blossomed in relatively short order. Within just two decades the surge in nutrition support enthusiasm reached a peak; all to be tempered by evolving changes in the healthcare environment that have culminated in a period of accountability and consolidation in nutrition support over the past 10 years. Suddenly practitioners were asked to show that what they do in nutrition support actually makes a difference in patient outcomes. It was no longer enough to say, ‘It is nutrition, it must be good for you’. This challenge to the field has helped to drive a much needed priority for well-conceived outcome research and a movement toward the adoption of evidence-based practices. In addition, changes in reimbursement policies have impacted the healthcare environment dramatically, such that if you are a nutrition support practitioner who is not a source of revenue, then you are perceived as an expense. Many nutrition support practitioners found themselves expendable. One consequence is that the number of fully multidisciplinary nutrition support programs has declined, and in particular the numbers of physicians and nurses actively participating in nutrition support programs has fallen precipitously. Many variants of nutrition support teams now exist and dietitians and pharmacists continue to be represented. Efforts at nutrition licensure and certification have generally not been as rewarding as had been hoped for nutrition support professionals in North America. These credentials have not been necessary for employment and they have not translated into enhanced recognition or compensation.

**Prevalence**

Nutritional concerns span the spectrum of community, hospital, and chronic care settings in North America. The prevalence of malnutrition depends upon the criteria that are used. There are relatively few undernourished people in community settings, generally <10%. These are usually individuals with serious underlying disease, mental illness, substance abuse, eating disorders, or homeless or homebound status. Particularly vulnerable community populations include those of low socioeconomic status, certain racial/ethnic groups, and the elderly. The growing population of older persons will have a tremendous impact upon resource consumption across the spectrum of healthcare and will necessitate the broad availability of nutrition practitioners with expertise in the assessment and care of these individuals. Despite the availability of food programs for those in need, food security issues remain relatively common for vulnerable populations [3–5].

In hospital and chronic care settings the prevalence of undernutrition is much higher, generally on the order of 30–50% [2, 6–8]. These are often indi-
individuals with acute illness, injury or surgery as well as those with significant underlying disease or disability. With an aging population the acuity and disease burden of those who are hospitalized continues to climb.

The tremendous growth in the prevalence of overweight/obesity observed in North America is also having a profound impact upon public health, disease burden, and healthcare. Based upon NHANES 2003–2004 [9] some two thirds of American adults are classified as overweight/obese and one third as obese (32.2%). Among children and adolescents 17.1% are classified as overweight/obese. The growing prevalence of overweight/obesity has far-reaching implications for nutrition support practitioners and will require the development, testing, and validation of new standards of assessment, intervention, and monitoring. It is important to note that one can be obese and undernourished at the same time. Micronutrient deficiencies have been associated with poor quality diets in obese older persons [10, 11]. Sarcopenic obesity may be associated with disease, injury, or functional compromise [12, 13]. Multiple nutrient deficiencies may be observed in persons who have undergone bariatric surgeries [14, 15].

**Definition**

Traditionally malnutrition has been used to mean undernutrition, but this may be appropriately expanded to include other deviations from sound nutritional status, including micronutrient deficiencies and overnutrition (obesity). The lack of shared definitions is problematic, for example cachexia means different things to different practitioners. This confusion makes standardized interventions, outcome measures, and high quality research much more difficult.

Roubenoff et al. [16] proposed a practical approach to categorizing undernutrition syndromes that takes inflammatory response into consideration. Five syndromes are described: cachexia, wasting/marasmus, protein-energy undernutrition, sarcopenia, and failure to thrive. Since inflammation and compromised dietary intake or assimilation are often present at the same time, there frequently is overlap among undernutrition syndromes and a given underlying condition may precipitate more than one type of syndrome. Key features for each syndrome are summarized in table 1. By adopting such an approach a common language for nutrition support practitioners can be promoted.

**Regulatory Environment/Reimbursement**

Regulatory environment and reimbursement policies have had a profound impact upon healthcare in North America and nutrition support has not escaped these evolving trends. Managed healthcare capitation and
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Table 1. Key characteristics of undernutrition syndromes

<table>
<thead>
<tr>
<th>Undernutrition syndrome</th>
<th>Characteristics</th>
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<tbody>
<tr>
<td>Wasting</td>
<td>Loss of body cell mass without underlying inflammatory condition. Visceral proteins preserved. Extracellular fluid not increased</td>
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<tr>
<td>Sarcopenia</td>
<td>Aging-related muscle loss without other precipitating causes</td>
</tr>
<tr>
<td>Cachexia</td>
<td>Loss of body cell mass with underlying inflammatory condition. Decline in visceral proteins. Increased extracellular fluid</td>
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<tr>
<td>Protein-energy undernutrition</td>
<td>Clinical and laboratory evidence for reduced dietary intake of protein and energy. Reduced visceral proteins</td>
</tr>
<tr>
<td>Failure to thrive</td>
<td>Weight loss and decline in physical and/or cognitive functioning with signs of hopelessness and helplessness</td>
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reimbursement based upon diagnosis-related groups, have driven far-reaching cost-containment efforts. Lengths of hospital stay have decreased such that outpatient and home-based nutrition services have assumed greater importance. Many persons do not have insurance coverage for such services. Not only has pressure to increase revenue and decrease expense resulted in fewer physicians and nurses with active involvement in nutrition support, but enteral and parenteral nutrition formularies are also increasingly restricted. Practitioners often cannot access the desired specialty products for the indicated patient conditions. It is often particularly difficult to secure insurance coverage in the outpatient setting for oral nutritional supplements or tube feeding equipment/supplies.

Medicare regulations serve as the template for many other commercial insurers in the United States. These regulations were critically reviewed by the Food and Nutrition Board Committee on Nutrition Services for Medicare Beneficiaries in 2000 [17]. It was recommended that nutrition therapy be a reimbursable benefit upon referral by a physician for those conditions for which nutrition therapy is found to be of benefit. Legislation has subsequently endorsed reimbursement for nutrition therapy for management of diabetes and for pre-dialysis renal failure. Other recommendations have not been adopted. The regulation that excludes coverage for enteral and parenteral nutrition unless they are anticipated to be required for at least 90 days was questioned. This unfortunate requirement persists such that patients may be discharged without the indicated nutrition support interventions or may remain in the hospital longer than necessary to receive the indicated nutri-
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tion support interventions. The Joint Commission requirement for nutrition risk screening within 24 h of hospital admission was found to not be evidence-based and to possibly produce inaccurate and misleading results. A call was made for further testing of screening methodologies as well as the optimal timing of nutrition screening. Appreciable resources currently continue to be devoted to systematic nutrition risk screening of all hospital admissions that has not been validated.

Research Priorities

Ultimately it will be necessary to demonstrate that nutrition screening can identify malnourished individuals at-risk of adverse outcomes that are amenable to favorable nutrition interventions. Some of the most extensively tested nutrition screening/assessment tools have been developed for older persons. An example is the Mini-Nutritional Assessment (MNA), an 18-item tool that includes BMI, mid-arm and calf circumferences, weight loss, living environment, medication use, dietary habits, clinical global assessment, and self-perception of health and nutrition status [18–20]. Also available as a screening tool is the 6-item MNA Short-Form that includes food intake, weight loss, mobility, acute disease or psychological stress, dementia or depression, and BMI [19]. It is important to recognize that screening/assessment tools cannot be adapted for populations or settings for which they were not developed without appropriate validation testing. For example, there is a pressing need to develop, test, and validate screening/assessment tools for obese persons.

Underweight and weight loss are clearly valid clinical indicators of undernutrition [21, 22], but fundamentally we lack sound laboratory indicators of nutritional status. Research is needed to validate new reliable indicators. One approach to overcoming these limitations has been to combine multiple variables using multivariable regression modeling. An example that includes both nutritional and inflammatory indices is the Prognostic Inflammatory and Nutritional Index (PINI) = (α1-acid glycoprotein) × CRP/(albumin) × (pre-albumin) [23].

Some of the hopes for nutrition support in promoting improved patient outcomes have gone unfulfilled in early studies, but often the outcomes of interest like length of stay, complications, and mortality, are also impacted by multiple other non-nutritional variables. Limitations have included poor study design, inadequate sample size, heterogeneous subjects, variable nutritional status, and inappropriate outcome measures. There must be priority for the support of strongly designed multicenter studies that are adequately powered with appropriate entry/exclusion criteria, standardized nutrition interventions, and well-defined outcome measures.

A particularly noteworthy theme for further investigation is the nutritional modulation of inflammatory conditions with specific nutrients and functional
foods [24]. For example, there has been considerable interest in the application of n-3 fats to modulate inflammatory response in clinical settings like arthritis and inflammatory bowel disease [25, 26]. Use of enteral feedings enriched with eicosapentaenoic acid (20:5n-3), γ-linolenic acid (18:3n-6), and antioxidants has been associated with improved gas exchange, respiratory dynamics, and requirements for mechanical ventilation among patients with adult respiratory distress syndrome [27]. As understanding of the fundamental role of inflammation in medical conditions continues to grow, it is likely that there will be opportunity for a variety of therapeutic nutritional interventions that will become an integral part of the individually tailored medical treatment plan. Extending this vision of individualized treatment, one of the highest priorities for research must be the application of gene polymorphisms to tailored nutritional interventions. For example, it appears likely that there are single nucleotide polymorphisms that predispose an individual to a more robust inflammatory response and greater risk for developing adult respiratory distress syndrome in critical illness [28, 29]. Such individuals might be targeted for aggressive early intervention with anti-inflammatory nutrients. Another example is the identification of single nucleotide polymorphisms of the methylenetetrahydrofolate reductase gene. The C677T allele is associated with the highest levels of homocysteine and lowest levels of folate [30]. Such individuals could be targeted for more aggressive folic acid replacement therapy, because elevated homocysteine is associated with increased risk for cardiovascular disease, stroke, dementia, and osteoporosis.

**Conclusion**

Undernutrition remains a significant concern in North America, especially in hospital and chronic care settings. Overweight/obesity continues to grow in prevalence and will require the development, testing, and validation of new standards of assessment, intervention, and monitoring for nutrition support practitioners. Adoption of common language and definitions by practitioners will facilitate standardized interventions, outcome measures, and high quality research. Evolving trends in the healthcare regulatory environment and reimbursement have culminated in a period of accountability and consolidation in nutrition support over the past 10 years. The future is bright with tailored nutrition interventions poised to become a part of the individual medical treatment plan for specific patient conditions and genotypes.

**Future Research Priorities Include:**
- Further development and testing of screening/assessment tools
- The identification and validation of new laboratory indicators of nutritional status
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- The conduct of well-conceived nutrition intervention studies tied to relevant clinical outcome measures
- Studies of nutritional modulation of inflammatory conditions with specific nutrients and functional foods
- Testing of individualized nutritional interventions tailored to gene polymorphisms

References

Discussion

Mrs. Anthony: In talking about your research priorities, you mentioned the need for different outcome measures and the such. Can you comment a little on the recent use of meta-analysis in the nutrition literature?

Dr. Jensen: Mrs. Anthony is touching on an interesting and controversial point. Of course, meta-analysis and evidence-based review are beginning to drive practice worldwide. Getting back to our discussion of the need for high-quality outcome studies, the reality is that existing studies are small and underpowered. One approach to dealing with this is to try to combine the analyses of multiple studies. The problems with this are myriad and they relate to everything we highlighted on study limitations: disparate populations, disparate interventions, disparate conditions, and disparate levels of undernutrition. All that said, it is a way to explore this type of data and some people are very focused on doing this. I think the practical reality, and what I would recommend, is that meta-analyses are meant to be hypothesis-generating, to drive the next phase of research. They are not meant to develop clinical practice guidelines and to drive standards. My personal approach to this would be to use them to generate hypotheses that can be tested prospectively. It doesn’t mean that we can’t use them to guide us in the meantime but some of these studies are very difficult to do and very costly. That would be my current vision of how to use meta-analyses.

Dr. Sanz: Meta-analyses collate studies with their own hypotheses. They are already hypothesis-driven. It is like a circle where, based on studies with clear hypotheses, we perform the analysis. What is the advantage is of restarting the circle?

Dr. Jensen: No matter how you cut it, it is not a prospective, randomized, blinded trial. Even when you set up as rigid criteria as possible, there is no way that you can say that the patients are all the same, the procedures are all the same, and the outcome measures were done in exactly the same way. It simply is not comparable to a large, well-conceived prospective trial. Obviously, there will be differences of opinion about how one wants to use this. It is problematic, though I am not saying that we can’t use them. They can be very helpful but I am just suggesting that the
best way to use them is to design appropriate clinical trials in the meantime to help guide us.

Dr. Kondrup: Sometimes, I feel that we are medieval age monks whipping ourselves whenever we talk about obesity and obesity surgery. In Denmark I have teased our National Board of Health on why they waste so much money on treating obesity because there is no documentation that this will improve survival, reduce morbidity or be cost-efficient in any way. But this locomotive is still pulling ahead and we keep whipping ourselves that we don’t have the evidence.

Dr. Jensen: It’s interesting to see that, in the United States, there is very compelling surgical literature saying that, for severely obese patients, bariatric surgery can be cost-effective by documenting improvements in diabetes, dyslipidemia and hypertension, and then projecting that over years of healthcare utilization. The one thing I would point out, which is not often highlighted, is that, for example, you are a very skilled bariatric surgeon, doing 100 cases, and only 1 or 2 of those 100 cases have serious complications; the cost associated with those 1 or 2 patients’ serious complications can outweigh the net benefit of almost all the others. You rarely see that addressed.

Dr. Kondrup: We can also easily demonstrate that malnutrition leads to immobilization and muscle weakness and, if treated we can improve it, just like we can improve the blood sugar of patients losing a lot of fat. What authorities want from us is really the cost-effectiveness of the long-term outcome, and they don’t require the same evidence for obesity surgery.

Dr. Labadarios: Dr. Kondrup, the comment you made about us whipping ourselves makes me wonder if we have enough advocacy for this cause in hospital management. Looking at undernutrition, there are UNICEF, WHO and millions of other NGOs who actually push a mandate systematically. These NGOs do very important work in general terms, depending how you look at it, but they want nothing to do with ill people. They only use ill people to the advantage of prevention, which is correct, rather than treatment. So, as part of my previous comment, do we use the right words to promote or highlight a particular issue? I don’t know of any NGOs in the clinical area who actually push medical aides. Perhaps some of my colleagues here can share some their ideas.

Dr. Jensen: I would agree that we have a tremendous need for advocacy worldwide for our cause. If you want to talk about difficult causes, look at my work with obesity and ageing. It was hard enough to go to Washington and get money for work with obesity, though now you can. NIH and some other agencies are throwing some tremendous funding especially at adolescent and pediatric obesity and prevention. But, at the other end of the spectrum, you wouldn’t get the time of day. Now, to make it even more difficult, we are talking about being obese, older and undernourished at the same time. Part of this is that we need to get our message across at the government and public health levels, and very much to the healthcare environment itself, from insurers, reimbursers and our fellow practitioners. Certainly in North America, many physicians remain unconvinced that nutrition support is a major player that can impact their patient outcomes. This is where using nutrients pharmacologically may go a long way for us as part of the medical treatment of their patients.

Dr. Bistrian: When you mentioned serum albumin and prealbumin and other secretory proteins, isn’t the presence of inflammation and its severity an important variable on whether someone needs nutritional support? Don’t serum albumin and white count number and differential do that effectively?

Dr. Jensen: I think that they are tremendously useful, and in the way that you are alluding to. They help identify people under inflammatory stress, from which it is a very logical leap to say that they are at nutritional risk. The flipside of this is that in
intensive care we see people with low visceral protein status who are not malnourished at that time. It does not mean that they are not at risk; they certainly will be. If you see a multi-trauma case and 24 h later their albumin is 2.5, it is a question of semantics and what you want to call undernourished? To me, it is an appropriate massive inflammatory response which places them at risk of adverse nutritional outcomes.

**Dr. Bistrian:** Yes, but in the US, wouldn’t by definition everyone in the ICU have an inflammatory response and a low serum albumin? The nutrition of everyone in an ICU needs to be addressed because there is clear evidence that early invasive nutrition support in the critically ill within the first 3 days is an important variable in determining morbidity and mortality.

**Dr. Jensen:** Sure, I am not quibbling with that. All I am saying is that, at that point in time, it is a very potent inflammatory indicator. It has tremendous prognostic import specifically for that reason. It doesn’t mean that they are undernourished at that point in time but they are at great risk. Aside from a few acute drug overdoses, virtually anyone in an ICU in America is going to be at significant nutritional risk.

**Dr. Kondrup:** I would see low albumin as part of the indication for nutritional support but not part of the diagnosis. I think we have to distinguish between them. In the ICU, if you want to diagnose malnutrition when the patient arrives, you need 24-hour urinary nitrogen excretion. We just did a study on that with 60 patients and there is no correlation between the urinary nitrogen loss and their COP levels for instance. Urinary nitrogen must be measured in all patients in the ICU as this is really a sign of malnutrition. While low albumin adds to the indication for treatment.

**Dr. Bistrian:** Are you not suggesting then that one of the indications for nutritional support is someone who is malnourished and who might benefit from nutritional support, but another indication is someone who is injured and calling that malnutrition is probably what got us into the trouble that we are in. People who were well-nourished to begin with and become critically ill, at least for a week or longer, have no classification. We could call them protein-calorie malnourished and yet, quite clearly, it is one of the most common indications for nutritional support. Is that not what people believe?

**Dr. Kondrup:** We would have to turn some switches in the brains of our colleagues because if you have a patient who is not yet dehydrated but has a fistula or something like that, and is losing liters per hour or per day, you would start treating him with fluid therapy because otherwise he would die from dehydration within a few days. So, there is an indication for fluid therapy, although he is not yet dehydrated. Of course, the problem is the same, you want to prevent severe dehydration. We need to train our colleagues to see that we have two main groups: those who are already malnourished and those at risk of becoming so. This is similar to fluid therapy.

**Dr. Elia:** You can have a person in the ICU who is likely to be unconscious for a long time and likely to be on a respirator with acute respiratory distress syndrome. He may not be malnourished at that time but he is at risk. I think that part of our clinical practice is to try and prevent the development of malnutrition and the perceived adverse consequences from an early stage if you know that the patient will be out of action and unable to eat for many days or weeks.

**Dr. Jensen:** This ultimately gets back to something we have highlighted repeatedly, which is the need for some definitions that we can use systematically throughout the world. In the United States, part of what drives this is that, for reimbursement purposes, to administer nutrition support to an acutely ill trauma patient, for example, we have to label him as something. The DRG code for some of those people would be protein-energy malnutrition. While, strictly speaking, that may or may not be what they have; they certainly have a robust inflammatory response that puts them at great risk. None of us would propose to starve them for a week, but it does highlight the need for some common definitions.
Dr. Elia: It is also a matter of whether a DRG requires the condition to have developed. Do you wait a week, when you know that it will develop, and then call them malnourished, or do you say that this individual is at risk or there is a probability that this condition will develop if you don’t do something?

Dr. Jensen: Practically speaking, we label them with this condition upfront, even though we know that is not what it is.

Dr. Bistrian: For these reasons wouldn’t it be helpful for the future to identify indications for nutritional support without having malnutrition as one of the diagnoses, or even being at risk? In other words, nutritional support is indicated for someone who is going to be in the ICU for 7 days with a head injury or burns or trauma of a certain severity. Wouldn’t that be more reasonable? Otherwise, we pay for things for reasons that are not what they should be.

Dr. Elia: Absolutely, if you identify a condition that you can’t do anything about, it is a waste of time, money and effort. The whole art of clinical nutrition is to identify individuals who are likely to respond to treatment. If you don’t have that, then you don’t have a discipline.

Dr. Bistrian: I don’t want to take away from your talk but, Dr. Hoffer, you have thought long and hard about some of these issues, do you have any comments?

Dr. Hoffer: I was thinking about the practice in the ICU of my hospital. I am not familiar with the American DRG system as we have a universal healthcare system in Canada. I am not trying to be too sanguine but that is the policy in place right now in our ICU. All patients are immediately followed by a well-qualified expert dietician and all patients who cannot be fed adequately are fed by one route or another. It is just the existing state of care in our institution, and it surprises me that this would not be the case in all of them. Perhaps I am wrong, perhaps we are not so unique in our hospital but perhaps we are.

Dr. Jensen: Practically speaking, in any leading institution in the United States, everyone is very aggressively screened within 24 h, and intervention happens very rapidly. The DRG part is the flip side, which is where reimbursement comes from. If you are giving an ICU patient aggressive early tube feeding, for example, they will need a nutrition DRG code attached to that. So by and large they will be labelled protein-energy malnutrition for reimbursement reasons. We are not talking about what they have but it depends on what protein-energy malnutrition means. What they really have is a very appropriate and massive manifestation of inflammatory response that has tremendous prognostic import to us. Part of it may well be, as Dr. Bistrian stated, that we are misstating what we are doing.

Dr. Labadarios: What you are actually suggesting is taken from one of the ASPEN recommendations. There is no need to wait for 5–7 days. Isn’t that so? There is that one last thing, if the patient is well-nourished.

Dr. Jensen: The ASPEN guidelines are in a state of evolution and review as we speak. Certainly, I would think that the standard of care in many ICUs in the United States for patients at risk is not to wait 5–7 days. People are being intervened very acutely, often within 24 h.

Dr. Labadarios: I am agreeing and highlighting something that needs to be addressed in exact terms because it has implications. For instance, the feeling of 5–7 days goes around. If you talk to management money-wise, there are some things that seem to suit them, but other things that don’t suit them they prefer to ignore. This has practical implications. My question, or perhaps comment, relates to an earlier point that you made regarding inflammation. What ever happened to the PINI index? Everyone asks you what to measure and, you are right, we don’t know. We did have the PINI index, and there were some initial data. What is the experience of the people here about the PINI index?
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*Dr. Jensen:* That is a timely observation. Since we lack single good indicators of nutritional status, it is an interesting approach to combine multiple variables and multi-variable analysis to develop predictive equations. The PINI is a good example as it has a mix of nutritional and inflammatory indicators that has validity in terms of predicting adverse outcomes. This may well be a very practical approach.

*Dr. Bistrian:* To address your question, Dr. Labadarios, I believe the 5- to 7-day rule came from a Swedish study on previously well-nourished subjects who underwent major thoraco-abdominal surgery and other experiences. Most of those individuals do not have a major inflammatory response postoperatively and 80–90% of them would have oral intakes within 5 days. It was thought then, rather than feed everyone having major surgery, to wait 5–7 days, depending on the quality of the nutrition support service, before initiating nutritional support. It was thought to be beneficial because those for whom the time was 14 days or more before initiation of nutritional support, the outcome was severely impaired. That is where it comes from and it is probably common among surgical services to give a period of 5–7 days for initially well-nourished subjects. That period is dramatically shortened if the patient is moderately or severely malnourished. Dr. Kondrup, is that the practice in Denmark?

*Dr. Kondrup:* I think so. This is one of the issues that we have not solved yet. As a rule of thumb, 5–7 days are reasonable. We would though advocate enteral feeding from day 0.

*Dr. Bistrian:* On average, in surgical patients when you start enteral feeding on day 0, the first 3 days are essentially grossly inadequate feeding.

*Dr. Kondrup:* This is not to keep their nutritional status but to keep the bowels functioning and to prevent the translocation of all those problems. There was a study done in Denmark where well-nourished colectomy patients were started with enteral feeding 4 h after the operation. The tube was left there only for 3 days, when the patients could start eating themselves. This gave 85% reduction in wound infections. The control group was a placebo with a tube and colored water.

*Dr. Bistrian:* There is always a concern that the routine use of nasogastric feeding tubes in otherwise well-nourished patients is that the tubes have complications associated with them, including aspiration pneumonia. In addition, there is good evidence that they impair ventilatory function. So, their use is not benign and you need to be certain of benefit in order to justify their routine application. That is why they aren’t routinely used in most American hospitals.

*Dr. Jensen:* In the United States, there is fair consensus in the standard of care over not waiting 5–7 days in a critical care setting. As we discussed, these people are in such proinflammatory states and are perceived to be at great nutritional risk. In general, certainly at our ICUs at Vanderbilt, these people are being tube fed within 24–36 h.

*Dr. Elia:* In coming to this 5- to 7-day rule, you have taken a clinical perspective. One can also take a physiological perspective. A typical person with a BMI of 20–25, who fasts and eats nothing for 5 days, would lose about 5% of their body weight or more. Admittedly some of that is water. If an entirely healthy individual has a BMI of 35 and fasts for 5 days, they would lose about 5% of body weight. If someone has an initial BMI of 18 and fasts for 5 days, they will lose close to 10% of body weight. This is without disease, so imagine a catabolic process as well that could add to the loss of lean tissue as well. The issue of 5–7 days is a convenient cutoff point but it also depends on the patient’s initial status. The percentage loss in an underweight patient is so much greater that we ought to start thinking about a shorter time without feeding for those already compromised nutritionally.

*Dr. Jensen:* We already do, and having a BMI of 18 would be considered initially malnourished, so it is dramatically shortened. For those initially severely malnourished,
we begin feeding immediately postoperatively; for those moderately to mildly malnourished, within 3 days. The timing of intervention depends on the baseline assessment of the individual status. If someone is (1) at great nutritional risk because of their inflammatory status, that moves them ahead, and (2) if they are significantly undernourished at baseline, we are not going to starve them for a week and then intervene. This is where we get back to Dr. Kondrup’s observation that people who are moderately obese may have more metabolic reserve in some fashion and better outcomes.

Mrs. Anthony: I would like to talk a little more about guidelines per se. With two very predominant sets of guidelines right now, the new ESPEN ones and the ASPEN ones, and I am happy to hear that ASPEN is redoing them. One of the goals of this workshop is to talk about how we communicate to the non-nutrition people, whether they be legislators, regulators or other healthcare professionals. They look to these guidelines very strongly for practice and I have always struggled with this 5–7 days. For a well-nourished, non-stressed patient it makes perfect sense, but I am not sure how the guidelines are interpreted by others. This is why this discussion has been generated. ESPEN seems to have come up with specific guidelines for specific disease states, and the ICU ones say start as early as possible and talk about early enteral nutrition. ESPEN and ASPEN are now talking about collaborating on international guidelines, which is a huge amount of work but would be a useful tool as we try to communicate to the others with a unified voice. This needs to be made really clear. Even in the Canadian critical care guidelines, the talk is about evidence-based guidelines. While we support them, we need to know that the average clinician or non-nutrition person only reads the one page of guidelines and not everything behind them. We need somehow to make those guidelines clear now. I know that is easier said than done.

Dr. Jensen: A major initiative has been kicked off with ESPEN and other organizations to begin a dialog that will ultimately result in some coherent international nutrition guidelines in relation to nutrition support. The title of my talk in Phoenix was ‘International Nutrition Guidelines: Global Consensus or Chaos?’ You can imagine taking all of these disparate entities and their advocates and guidelines and attempting to make some sense of this. From our initial meetings in Phoenix and beforehand, it is clear that this is great opportunity to find some common ground and move ahead. There are some areas of strong consensus and we need some clear language that the consumers and practitioners worldwide will find clinically useful. For example, we are not going to take critically ill people and starve them for a week and then intervene. It is going to be a great challenge. The initial approach we are taking is to focus on a couple of guideline initiatives at a time. For example, for Prague, the agenda has a guideline in relation to supporting burn patients and another in relation to pancreatitis. There is also some clear language in trying to define malnutrition and the risk of adverse outcomes. It is going to be tremendously challenging but there will be great benefit from pooling all the different parties. Of course, a host of countries and nutrition entities have already developed some wonderful guidelines that make a nice starting point.

Dr. Roessler: I wanted to touch on a point that has not been discussed so far. You said that in the last decade the role of the nutrition support team has decreased due to cost containment. I would be interested in any data on how the relative cost of nutritional support has evolved from 10 years ago to the present. Pharmaceutical costs are going up and I would bet that nutrition support costs, in relative terms, is decreasing.

Dr. Jensen: That is a great question. It is very difficult to demonstrate because the outcomes that we would like to look at in relation to that are multifactorial. The healthcare costs of a given patient have multiple variables impacting on them. Part of the challenge is that we have always tried to sell nutrition support to hospital
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administrations in the United States by saying that we are going to improve patient outcomes, shorten lengths of stay, decrease ventilator days and decrease mortality. In certain instances well-defined outcome studies can be done, but it is very challenging because you are talking about outcome variables with multiple impact variables besides nutritional status. Disease burden is a simple example. One of the easier ways that we have been able to sell nutrition support to hospital administrations in the US has been to say that we will reduce inappropriate use of nutrition support modalities. Especially when you consider the misuse of parenteral modalities, there can be great costs involved and that has been one of the easier ways to demonstrate the benefit of a nutrition support team per se. There are also studies showing that a nutrition support team creates a lot more laboratory work, which has significant costs. It is a tricky issue.

*Dr. Labadarios:* What the situation now with the international guidelines? There are the ESPEN, the ASPEN and the Canadians guidelines too. Are we going for a unified, international set of guidelines and under whose auspices will they be issued?

*Dr. Jensen:* Between ESPEN and ASPEN, we have sent out a call to all the worldwide nutrition societies to convene in Prague at the next ESPEN meeting to discuss this initiative. Indeed, the goal is to develop some common guidelines that can be readily disseminated to nutrition practitioners throughout the world.