

# A call-to-action from the feedM.E. Middle East study group

## *Use of a screen-intervene-supervene strategy to address malnutrition in healthcare*

Osama Al-Zeer, MS, Tahsin G. Ozcagli, MD, PhD, Mehmet Uyar, MD.

### ABSTRACT

عالمياً ما يصل إلى 50% من المرضى المنومين في المستشفيات يعانون من سوء التغذية أو معرضين لخطر سوء التغذية. وتوصي التوجيهات بالفحص التغذوي لجميع المرضى عند دخول المستشفى. وتوضح نتائج الدراسات من المرضى المنومين في المستشفيات أن الفحص التقييمي، مع متابعة التقييم الغذائي والرعاية عندما يتطلب الأمر يمكن أن تحسن النتائج السريرية للمرضى وتقلل تكاليف الرعاية الصحية. وبالرغم من وجود الأدلة الدامغة فإنه لا يزال الانتباه إلى الرعاية التغذوية دون المستوى الأمثل في المرافق الصحية في جميع أنحاء العالم. وقد وضعت المجموعة العالمية feedM.E. خطوة بخطوة طريقة بسيطة للعناية التغذوية لتسهيل أفضل ممارسات الرعاية التغذوية. إن هذه الطريقة توجه الأطباء لفحص الحالة التغذوية للمرضى عند دخول المستشفى أو الشروع في تقديم الرعاية، وعند التدخل على وجه السرعة مع الرعاية التغذوية عند الحاجة أو المتابعة بشكل روتيني مع تعديل وتعزيز خطط الرعاية التغذوية. وتسعى مجموعة الشرق الأوسط feedM.E. لتمديد هذا البرنامج لمنطقتنا. ونصح الأطباء على اعتماد وتكييف طريقة العناية التغذوية (Nutrition Care Pathway) وذلك لتقديم رعاية تغذوية ذات جودة إلى الممارسة اليومية.

Up to 50% of hospitalized patients worldwide are malnourished or at risk of malnutrition. Guidelines recommend nutritional screening of all patients on hospital admission. Results from studies of hospitalized patients show that screening, with follow-up nutritional assessment and care when indicated, can improve patients' clinical outcomes and reduce healthcare costs. Despite compelling evidence, attention to nutritional care remains suboptimal in clinical settings worldwide. The feedM.E. Global Study Group developed a simple, stepwise Nutrition Care Pathway to facilitate best-practice nutrition care. This pathway guides clinicians to screen patients' nutritional status on hospital admission or at initiation of care; intervene promptly with nutrition care when needed; and supervise or follow-up routinely with adjustment and reinforcement of nutrition care plans.

The feedM.E. Middle East Study Group seeks to extend this program to our region. We advise clinicians to adopt and adapt the Nutrition Care Pathway, bringing quality nutrition care to everyday practice.

*Saudi Med J* 2015; Vol. 36 (8): 903-910  
doi: 10.15537/smj.2015.8.11671

From the Department of Clinical Nutrition (Al-Zeer), King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia, and Abbott Nutrition Research and Development (Ozcagli), Istanbul, the Department of Anesthesiology and Intensive Care (Uyar), Ege University Hospital, Izmir, Turkey.

Address correspondence and reprint request to: Dr. Mehmet Uyar, Department of Anesthesiology and Intensive Care, Ege University Hospital, Bornova 35100, Izmir, Turkey. E-mail: mehmet.uyar@ege.edu.tr

Up to 50% of hospitalized patients are reported to be at risk of malnutrition or actually malnourished.<sup>1,2</sup> Clinical studies in healthcare settings worldwide have shown that disease-related malnutrition is exceedingly common,<sup>3-7</sup> especially in older patients.<sup>8,9</sup> The prevalence of disease-related malnutrition-nutritional inadequacy with an inflammatory component<sup>10</sup> is similarly high in hospitals of both emerging and industrialized nations. This prevalence remains as high now as it was a decade ago in almost every country.<sup>11-14</sup> Patients with poor nutritional status are susceptible to disease progression and complications, and their recovery from illness or injury is often prolonged.<sup>1,15,16</sup> A key barrier to best-practice nutrition care is limited hospital resources; clinicians report that too little time and not enough money constrain staff training on how to recognize and treat malnutrition.<sup>17,18</sup>

While educational training and nutrition interventions have financial costs, so do the consequences of malnutrition. Disease-related malnutrition increases

costs of care due to higher rates of complications (infections, pressure ulcers, falls) longer hospital stays, and more frequent readmissions.<sup>19-28</sup> By contrast, clinical study results show that attention to nutrition care during hospitalization can improve patients' health outcomes and cut healthcare costs.<sup>29-39</sup> Nutrition planning and follow-up nutrition care can also provide both health and financial paybacks, whether the patient is living in the community, preparing for surgery, or ready to be discharged from the hospital.<sup>40-43</sup> Yet disease-related malnutrition continues to be overlooked and under-treated.

Despite compelling evidence of benefits from nutrition care<sup>29,30,32,34-38</sup> and clearly-stated nutrition care guidelines,<sup>43-46</sup> nutrition interventions for people with disease-related malnutrition still fall far short of best-practice.<sup>3,4,47</sup> To address this shortfall, clinicians worldwide have issued a "call-to-action" for increased recognition of nutrition's role in improving patient outcomes.<sup>42,48-50</sup> To take action, clinical nutrition experts from Asia, Europe, the Middle East, and North and South America formed the feedM.E. (Medical Education) Global Study Group and put together a working program to increase awareness and improve nutrition care around the world.<sup>1</sup> The global feedM.E. initiative introduced the mantra "screen, intervene, and supervise" to cue the steps of a straightforward Nutrition Care Pathway.<sup>1</sup> To support the feedM.E. global educational initiative, we formed a feedM.E. Middle East Study Group, which includes nutrition leaders from Egypt, Saudi Arabia, Turkey, and the United Arab Emirates (Table 1). The first meeting of the feedM.E. Middle East Study Group was held in Istanbul in June of 2014. We discussed how to support the principles and recommendations of the feedM.E. global initiative while taking into account some differing medical practices, socioeconomic conditions, and lifestyles in countries of the Middle East.

In our current article, we the members of the feedM.E. Middle East Study Group emphasize the screen-intervene-supervene strategy for nutrition

care, which is further defined for incorporation into practice as a Nutrition Care Pathway. For Middle East healthcare, we advise that this pathway can be adapted to meet cultural differences in different Middle East countries, and can be followed for patients in the community, in the hospital, and after discharge to home or to long-term care centers.

**Malnutrition in the Middle East.** Countries of the Middle East region are highly diverse in ecology (green valleys and dry yellow deserts), political structures (republics, monarchies), government stability or instability (conflicts, civil wars, unrest), and economic status (world's richest and poorest countries). This diversity creates marked differences in the health and nutritional status of people in regional populations.<sup>51</sup> In some cases, rapid urbanization and social development have occurred in the absence of economic growth.<sup>51</sup> For adults in the Middle East and worldwide, malnutrition is often related to sickness, which includes people with limited physical or mental function. Disease-related malnutrition occurs in people of all ages and circumstances but is notably common

**Table 1** - The feedM.E. Middle East Study Group.

Study group members	Affiliation
Osama Al-Zeer, MS	Director of Clinical Nutrition, King Khalid University Hospital, King Saud University, Kingdom of Saudi Arabia
Ejlal Al-Jalali, PhD	Director of Nutrition Department, Security Forces Hospital Program, Kingdom of Saudi Arabia
Wafaa H. Ayesh, MS	Director, Clinical Nutrition Department, Clinical Support Services Sector, Dubai Health Authority, United Arab Emirates
Refaat A. Hegazi, MD, PhD, MPH	Medical Director, Abbott Nutrition Research and Development, Columbus Ohio, USA
Sadık Kılıçturgay, MD	Professor of Surgery, Department of Surgery, Uludağ University Hospital, Bursa, Turkey
Enas Mogawer MD, PhD	Head, Clinical Nutrition Department, As-Salam International Hospital, Cairo, Egypt
Tahsin G. Ozcagli, MD, PhD	Medical Director, Abbott Nutrition Research and Development, Istanbul, Turkey
Mehmet Uyar, MD	Professor of Anesthesiology and Intensive Care, Ege University Hospital, Izmir, Turkey

**Disclosure.** Authors received grants from Abbott Nutrition affiliates to fund their travel to the June 2014 meeting of the Study Group in Istanbul. Members of the group did not receive payment for work on the document. Tahsin G. Ozcagli is a full-time employee of Abbott Nutrition; the current review is based on clinical evidence and is not influenced by this financial relationship. All other authors declare no conflict of interest.

in older people.<sup>9</sup> Disease-related malnutrition is evident at hospital admission, during hospitalization, and in the periods before admission and after discharge. With all these influences, the prevalence of disease-related malnutrition varies widely across the Middle East; from 6% to 58% of hospitalized patients are malnourished or at risk of malnutrition (Table 2). The wide range can be attributed to differing socioeconomic and health conditions in different countries, to different populations being assessed (elderly, patients with kidney disease, critically ill patients), and to differences in criteria used to define malnutrition. Table 2 provides examples of disease-related malnutrition reported over the past 2 decades. Updated surveys are needed in all Middle East countries using consistent criteria and validated tools for identifying malnutrition and its risk.<sup>52</sup>

**Malnutrition predicts poor health outcomes.** Poor nutrition is a predictor of poor outcomes, as shown by results of a large multicenter collaboration including hospitals in 3 countries of the Middle East (Lebanon, Egypt, and Libya) and 9 countries in Europe.<sup>53</sup> This prospective study enrolled 5,051 patients; of these, 33% of patients were found to be 'at risk' of malnutrition (NRS 2002 score). The proportion of 'at risk' patients generally reflected the severity of the underlying illness or injury in the population studied. For patients in

the Middle East, risk for malnutrition by hospital department was: internal medicine (11%), oncology (37%), surgery (55%), and intensive care (97%).<sup>53</sup> Patients 'at risk' had significantly more complications, longer lengths of hospital stay, and higher rates of mortality.<sup>53</sup> Further, of those who were discharged, fewer 'at risk' patients were discharged to home, and more were sent to nursing homes or to other hospital care sites, as compared with patients who were adequately nourished.<sup>53</sup>

**Malnutrition is under-treated.** Even when nutrition problems are identified, studies have found that such problems are not adequately treated. In one Middle Eastern study, 34 Turkish hospitals from 19 cities contributed data from 29,139 patients.<sup>54</sup> On admission, 15% of patients were found to be at nutritional risk; risk was highest in intensive care unit patients (52%). Of those identified to be 'at nutritional risk' in this study, only around half received nutrition intervention.<sup>54</sup> Studies carried out in Australian and European hospitals reported similar shortfalls in treating malnutrition or reaching nutritional targets.<sup>3,47</sup>

**Nutrition care improves outcomes and lowers costs.** Nutrition interventions, including food fortification or oral nutrition supplements (ONS), tube-fed enteral nutrition, and parenteral nutrition, are recognized to have significant clinical and economic benefits across

**Table 2** - Reports of hospital- and community-based malnutrition prevalence in Middle East countries.

Country	Study	Setting	Prevalence	Population	Assessment
Iran	Hosseini et al 2006 <sup>71</sup>	Hospital	5.7%	Adults >18 years	Anthropometrics
	Nematy et al 2013 <sup>72</sup>	Hospital		Adults, mean age 53.6 years	NRS 2002
	Amirkalali et al 2010 <sup>73</sup>	Community	47%	Elderly ≥60 years	MNA
Lebanon	Boulos et al 2014 <sup>74</sup>	Community	8% malnourished; 29% at risk	Elderly ≥65 years	MNA
Pakistan	Elmadbouly et al 2012 <sup>75</sup>	Hospital	23% malnourished; 58% at risk	Elderly ≥60 years	MNA
Kingdom of Saudi Arabia	Bani et al 1998 <sup>76</sup>	Hospital	28-34%	Adults >18 years	Anthropometrics
	Al-Saran et al 2009 <sup>77</sup>	Hospital	32%	Hemodialysis patients, mean age 50 years	SGA
	Alhamdan 2011 <sup>78</sup>	Hospital	36%	Elderly ≥60 years	MNA
	Alhamdan 2004 <sup>79</sup>	Community	38% 24%	Adult males <60 years Elderly males ≥60 years	Anthropometrics
Turkey	Nursal et al 2005 <sup>80</sup>	Hospital	11-16%	Adults aged >18 years	SGA, CC
	Klek et al 2015 <sup>81</sup>	Hospital	39% at risk	Adults	NRS 2002 or SGA
	Korfali et al 2009 <sup>54</sup>	Hospital	15% at risk, 52% of ICU patients	Adults	NRS 2002
	Ulger 2010 <sup>82</sup>	Community Geriatric outpatients	28%	Elderly aged ≥60 years	MNA

ICU - intensive care unit, MNA - Mini Nutritional Assessment,<sup>81</sup> SGA - Subjective Global Assessment,<sup>82</sup> NRS-2002 - Nutritional Risk Screening-2002,<sup>13</sup> CC - combination criteria

patient groups and in different settings. Specifically, nutrition interventions were associated with fewer in-hospital complications,<sup>30</sup> reduced pressure ulcer incidence,<sup>37</sup> achievement of higher functional status in recovery,<sup>30</sup> improved quality of life,<sup>34,55</sup> and reduced risk of mortality,<sup>56</sup> as shown by results of randomized and controlled trials and by meta-analyses. Nutrition interventions to prevent or treat disease-related malnutrition also show resource savings; reports have shown reduced length of hospital stay,<sup>57</sup> fewer readmissions,<sup>38,55</sup> and lowered hospital-related costs.<sup>35,36</sup> Few studies have considered cost of hospital-based malnutrition in Middle East countries. However, a recent survey of neurologists from 8 tertiary centers in Turkey examined current practice related to treatment of patients recovering from strokes.<sup>58,59</sup> The researchers determined that the overall one-year costs of care were higher for malnourished patients compared to those who were adequately-nourished (\$5201 versus \$3618;  $p=0.09$ ). Of the total costs, oral nutrition supplements (ONS) costs were \$868 in patients with malnutrition and \$501 in patients without malnutrition, whereas all others costs were \$4334 and \$3117. Investment in ONS as treatment for malnutrition was thus supported as a way to decrease the cost of illness.

**Malnutrition definition.** For caregivers to provide best-practice nutrition care, it is important to be aware of the current definition of malnutrition. Malnutrition is now recognized as 3 clinical syndromes, which are characterized by underlying illness or injury and varying degrees of inflammation.<sup>10</sup> These malnutrition syndromes are: 1) starvation-related malnutrition, namely, a form of malnutrition without inflammation; 2) chronic disease-related malnutrition, namely, nutritional inadequacy associated with chronic conditions that impose sustained inflammation of a mild-to-moderate degree; and 3) acute disease- or injury-related malnutrition, namely, undernutrition related to conditions that elicit marked inflammatory responses. Inflammation is a component of underlying disease in several chronic disease states, such as kidney disease and heart failure and thus increases the risk of malnutrition,<sup>60</sup> even among patients who are overweight or obese.<sup>61</sup> Most severe acute health crises such as severe infection, surgery, burn injury, or sepsis are associated with marked inflammation, which contributes to and intensifies risk for severe malnutrition.<sup>60</sup> Adult undernutrition was further described as a condition characterized by 2 or more of 6 criteria: unintentional weight loss, inadequate energy intake, loss of muscle mass, loss of subcutaneous fat, fluid accumulation, and functional decline (for example, decreased hand-grip strength).<sup>62</sup>

**The feedM.E. Nutrition Care Pathway.** The feedM.E. Global Study Group recently introduced screen-intervene-supervene as a guide for delivering prompt and complete nutrition care (Appendix 1A).<sup>1</sup> We members of the feedM.E. Middle East Study Group support this overall strategy, and we advise the use of the Nutrition Care Pathway to bring this strategy to everyday practice. To facilitate broad use of the Nutrition Care Pathway throughout the Middle East, we provide versions in Turkish and Arabic (Appendix 1 B and C). For complete uptake, specific aspects of nutrition care may need adjustments to meet country-to-country cultural differences to accommodate disparate lifestyles, food availability, and genetic factors, as was the case with a diabetes nutrition program.<sup>63,64</sup>

**Nutrition Care Pathway: screen for malnutrition risk.** Screening patients for malnutrition on admission to the hospital is now a standard of care. In the Middle East, we advise that routine nutrition screening is likewise appropriate in rehabilitation facilities, long-term care centers, and community healthcare settings. To determine nutritional risk, we advise screening with (1) the 2 Malnutrition Screening Tool (MST) questions<sup>65,66</sup> and (2) a quick clinical decision on whether the patient's illness or injury carries risk for malnutrition.<sup>10</sup>

In the Middle East, as is the case elsewhere, admitting nurses are often the first contacts for patients, and we suggest that nurses conduct the initial screen for nutritional risk. If risk is found, we advise immediate intervention with nutrition advice, an increase in the quantity or protein density of food, and/or use of protein-containing oral nutrition supplements. With risk recognition, particularly when the patient is unable to take food orally, refer to a trained clinician (dietitian, nutrition specialist) for further assessment and specific treatment.

**Nutrition Care Pathway: intervene with targeted nutrition.** The intervention portion of the Nutrition Care Pathway includes assessment of nutritional status, diagnosis of malnutrition, and implementation of treatment. For nutrition assessment, the SGA is widely used for most adults,<sup>67</sup> and the MNA is used for older persons;<sup>68</sup> other tools are available.<sup>52</sup> To facilitate malnutrition diagnosis and help standardize malnutrition care, experts from A.S.P.E.N. and the Academy of Nutrition and Dietetics (AND) defined specific criteria for malnutrition diagnosis.<sup>62</sup> Guidelines support prompt intervention, namely, targeted nutrition therapy within 24 to 48 hours of admission.<sup>43-46</sup> Implementation of treatment involves decisions on how much to feed, how

and when to feed, and what to feed, as discussed in detail for the feedM.E. global initiative.<sup>1</sup>

**Nutrition Care Pathway: supervene.** The next step of the Nutrition Care Pathway is to supervene, or follow-up with continuing attention to meeting nutrition needs. Individuals receiving nutrition therapy should also be monitored regularly to ensure feeding tolerance and adequate supplies of energy with sufficient protein, vitamins, and minerals.<sup>69</sup> For those patients who are initially well-nourished, rescreening should occur at regularly determined intervals, especially when clinical status changes.<sup>70</sup> An effective nutrition plan considers multiple aspects of care.<sup>43</sup> It requires that the patient have cognitive competence, social and functional abilities, and economic access to food; alternatively, some patients need a caregiver and other social support programs to meet their needs. The nutrition plan should be prepared for and discussed with the patient, modified as needed to meet personal and cultural preferences, and include ongoing measures/assessment of the patient's nutritional status.

To ensure best-practice nutrition care in the Middle East, we recommend continued efforts to prevent and treat malnutrition among patients who have been discharged from the hospital into long-term care centers or into the community. Such efforts include nutrition education for the patient or their caregivers and individualized dietary advice on the use of food enrichment and/or oral nutrition supplements. We also emphasize the importance of routine rescreening for malnutrition risk. We call on regional and local health authorities to endorse nutritional risk assessment as an integral part of routine medical care.

In conclusion, attention to nutrition is fundamental to good clinical practice. As members of the feedM.E. Middle East Group on nutrition in healthcare, we call healthcare providers in our region to action. To do so, we recommend use of the Nutrition Care Pathway that includes 3 key steps: screen always, intervene promptly when needed, and supervene or follow-up routinely. Because of wide socioeconomic differences among Middle Eastern countries, we recognize that feedM.E. global strategies may need to be adapted to meet country-specific needs, and we propose testing pilot models for feedM.E. training in each country.

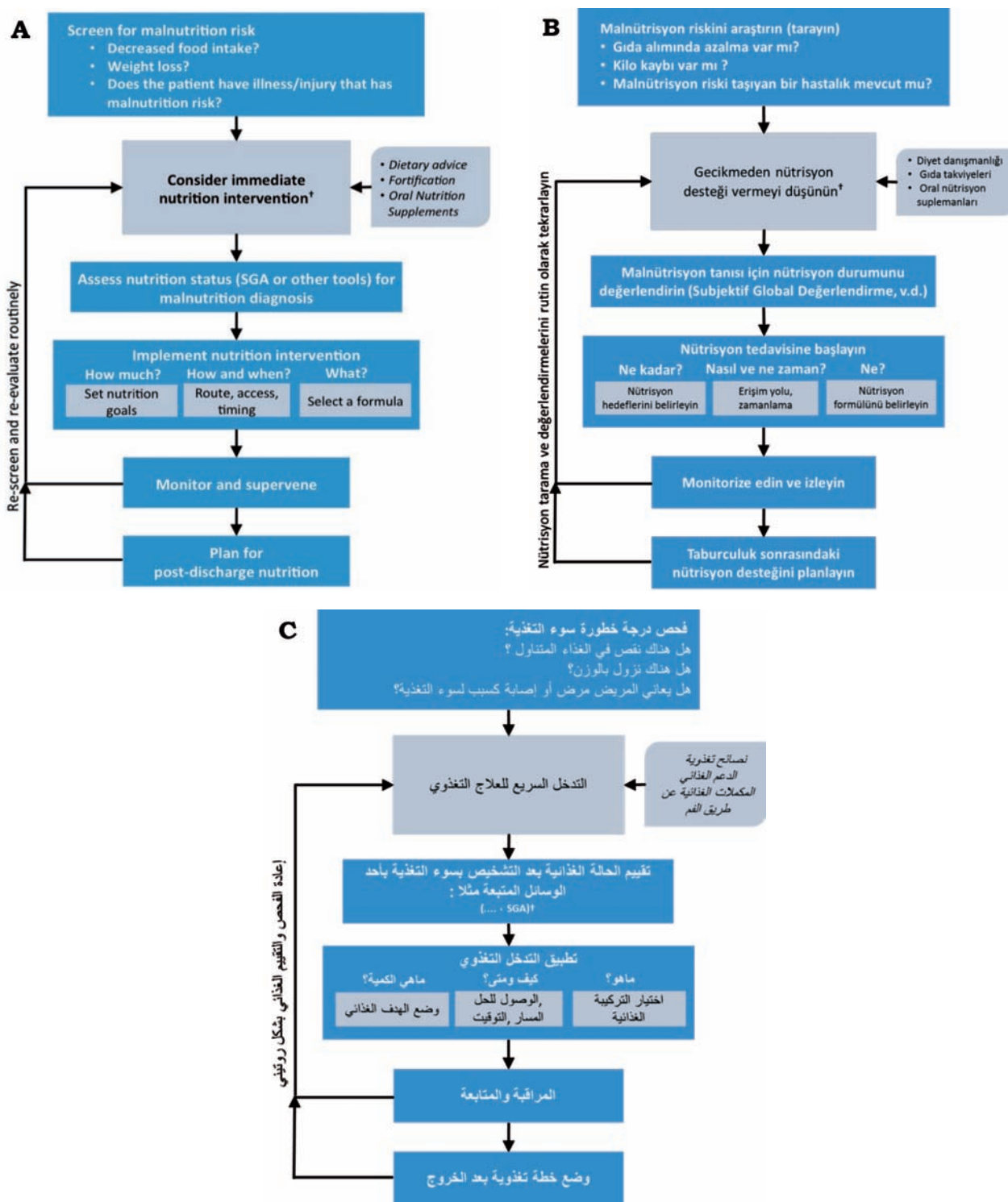
**Acknowledgment.** *The authors thank Cecilia Hofmann, PhD, for her valued assistance with compilation of the medical literature and with editing this English-language review article; her work was funded by Abbott Nutrition.*

## References

- Correia M, Hegazi R, Higashiguchi T, Michel J, Reddy B, Tappenden K, et al. Evidence-based recommendations for addressing malnutrition in healthcare: an updated strategy from the feedM.E. Global Study Group. *J Am Med Dir Assoc* 2014; 15: 544-550.
- Kirkland LL, Kashiwagi DT, Brantley S, Scheurer D, Varkey P. Nutrition in the hospitalized patient. *J Hosp Med* 2013; 8: 52-58.
- Agarwal E, Ferguson M, Banks M, Bauer J, Capra S, Isenring E. Nutritional status and dietary intake of acute care patients: results from the Nutrition Care Day Survey 2010. *Clin Nutr* 2012; 31: 41-47.
- Hiesmayr M, Schindler K, Pernicka E, Schuh C, Schoeniger-Hekele A, Bauer P, et al. Decreased food intake is a risk factor for mortality in hospitalised patients: the NutritionDay survey 2006. *Clin Nutr* 2009; 28: 484-491.
- Liang X, Jiang ZM, Nolan MT, Wu X, Zhang H, Zheng Y, et al. Nutritional risk, malnutrition (undernutrition), overweight, obesity and nutrition support among hospitalized patients in Beijing teaching hospitals. *Asia Pac J Clin Nutr* 2009; 18: 54-62.
- Zhang L, Wang X, Huang Y, Gao Y, Peng N, Zhu W, et al. NutritionDay 2010 audit in Jinling hospital of China. *Asia Pac J Clin Nutr* 2013; 22: 206-213.
- Tangvik RJ, Tell GS, Guttormsen AB, Eisman JA, Henriksen A, Nilsen RM, et al. Nutritional risk profile in a university hospital population. *Clin Nutr* 2015; 34: 705-711.
- Charlton KE, Nichols C, Bowden S, Lambert K, Barone L, Mason M, et al. Older rehabilitation patients are at high risk of malnutrition: evidence from a large Australian database. *J Nutr Health Aging* 2010; 14: 622-628.
- Imoberdorf R, Meier R, Krebs P, Hangartner PJ, Hess B, Staubli M, et al. Prevalence of undernutrition on admission to Swiss hospitals. *Clin Nutr* 2010; 29: 38-41.
- Jensen GL, Mirtallo J, Compher C, Dhaliwal R, Forbes A, Grijalba RF, et al. Adult starvation and disease-related malnutrition: a proposal for etiology-based diagnosis in the clinical practice setting from the International Consensus Guideline Committee. *JPEN J Parenter Enteral Nutr* 2010; 34: 156-159.
- Correia MI, Campos AC. Prevalence of hospital malnutrition in Latin America: the multicenter ELAN study. *Nutrition* 2003; 19: 823-825.
- Edington J, Boorman J, Durrant ER, Perkins A, Giffin CV, James R, et al. Prevalence of malnutrition on admission to four hospitals in England. The Malnutrition Prevalence Group. *Clin Nutr* 2000; 19: 191-195.
- Kondrup J, Allison SP, Elia M, Vellas B and Plauth M. ESPEN guidelines for nutrition screening 2002. *Clin Nutr* 2003; 22: 415-421.
- Pirlich M, Schutz T, Kamps M, Luchman N, Burmester GR, Baumann G, et al. Prevalence of malnutrition in hospitalized medical patients: impact of underlying disease. *Dig Dis* 2003; 21: 245-251.
- Barker LA, Gout BS, Crowe TC. Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. *Int J Environ Res Public Health* 2011; 8: 514-527.
- Loser C. Malnutrition in hospital: the clinical and economic implications. *Dtsch Arztebl Int* 2010; 107: 911-917.

17. Green SM, James EP. Barriers and facilitators to undertaking nutritional screening of patients: a systematic review. *J Hum Nutr Diet* 2013; 26: 211-221.
18. Jones NE, Suurdt J, Ouelette-Kuntz H, Heyland DK. Implementation of the Canadian Clinical Practice Guidelines for Nutrition Support: a multiple case study of barriers and enablers. *Nutr Clin Pract* 2007; 22: 449-457.
19. Banks MD, Graves N, Bauer JD, Ash S. The costs arising from pressure ulcers attributable to malnutrition. *Clin Nutr* 2010; 29: 180-186.
20. Fry DE, Pine M, Jones BL, Meimban RJ. Patient characteristics and the occurrence of never events. *Arch Surg* 2010; 145: 148-151.
21. Bauer JD, Isenring E, Torma J, Horsley P, Martineau J. Nutritional status of patients who have fallen in an acute care setting. *J Hum Nutr Diet* 2007; 20: 558-564.
22. Mudge AM, Kasper K, Clair A, Redfern H, Bell JJ, Barras MA, et al. Recurrent readmissions in medical patients: a prospective study. *J Hosp Med* 2011; 6: 61-67.
23. Correia MI, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. *Clin Nutr* 2003; 22: 235-239.
24. Gariballa S, Forster S. Malnutrition is an independent predictor of 1-year mortality following acute illness. *Br J Nutr* 2007; 98: 332-336.
25. Lim SL, Ong KC, Chan YH, Loke WC, Ferguson M, Daniels L. Malnutrition and its impact on cost of hospitalization, length of stay, readmission and 3-year mortality. *Clin Nutr* 2012; 31: 345-350.
26. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. *Clin Nutr* 2008; 27: 5-15.
27. Freijer K, Tan SS, Koopmanschap MA, Meijers JM, Halfens RJ, Nuijten MJ. The economic costs of disease related malnutrition. *Clin Nutr* 2013; 32: 136-141.
28. Rice N, Normand C. The cost associated with disease-related malnutrition in Ireland. *Public Health Nutr* 2012; 15: 1966-1972.
29. Banks MD, Graves N, Bauer JD, Ash S. Cost effectiveness of nutrition support in the prevention of pressure ulcer in hospitals. *Eur J Clin Nutr* 2013; 67: 42-46.
30. Cawood AL, Elia M, Stratton RJ. Systematic review and meta-analysis of the effects of high protein oral nutritional supplements. *Ageing Res Rev* 2012; 11: 278-296.
31. Freijer K, Bours MJ, Nuijten MJ, Poley MJ, Meijers JM, Halfens RJ, et al. The economic value of enteral medical nutrition in the management of disease-related malnutrition: a systematic review. *J Am Med Dir Assoc* 2014; 15: 17-29.
32. Milne AC, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. *Cochrane Database Syst Rev* 2009; CD003288.
33. Milte RK, Ratcliffe J, Miller MD, Crotty M. Economic evaluation for protein and energy supplementation in adults: opportunities to strengthen the evidence. *Eur J Clin Nutr* 2013; 67: 1243-1250.
34. Norman K, Kirchner H, Freudenreich M, Ockenga J, Lochs H, Pirlich M. Three month intervention with protein and energy rich supplements improve muscle function and quality of life in malnourished patients with non-neoplastic gastrointestinal disease--a randomized controlled trial. *Clin Nutr* 2008; 27: 48-56.
35. Philipson TJ, Snider JT, Lakdawalla DN, Stryckman B, Goldman DP. Impact of oral nutritional supplementation on hospital outcomes. *Am J Manag Care* 2013; 19: 121-128.
36. Somanchi M, Tao X, Mullin GE. The facilitated early enteral and dietary management effectiveness trial in hospitalized patients with malnutrition. *JPEN J Parenter Enteral Nutr* 2011; 35: 209-216.
37. Stratton RJ, Ek AC, Engfer M, Moore Z, Rigby P, Wolfe R, et al. Enteral nutritional support in prevention and treatment of pressure ulcers: a systematic review and meta-analysis. *Ageing Res Rev* 2005; 4: 422-450.
38. Stratton RJ, Hebuterne X, Elia M. A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions. *Ageing Res Rev* 2013; 12: 884-897.
39. Walzer S, Droeschel D, Nuijten M, Chevrou-Severac H. Health economics evidence for medical nutrition: are these interventions value for money in integrated care? *Clinicoecon Outcomes Res* 2014; 6: 241-252.
40. Hamilton C, Boyce VJ. Addressing Malnutrition in Hospitalized Adults. *JPEN J Parenter Enteral Nutr* 2013; 37: 808-815.
41. Rosen B, Maddox P, Ray N. A position paper on how cost and quality reforms are changing healthcare in America: focus on nutrition. *JPEN J Parenter Enteral Nutr* 2013; 37: 796-801.
42. Tappenden KA, Quatrara B, Parkhurst ML, Malone AM, Fanjiang G, Ziegler TR. Critical role of nutrition in improving quality of care: an interdisciplinary call to action to address adult hospital malnutrition. *JPEN J Parenter Enteral Nutr* 2013; 37: 482-497.
43. White J, Stotts N, Jones S, Granieri E. Managing postacute malnutrition (undernutrition) risk. *JPEN J Parenter Enteral Nutr* 2013; 37: 816-823.
44. Dhaliwal R, Cahill N, Lemieux M, Heyland DK. The Canadian critical care nutrition guidelines in 2013: an update on current recommendations and implementation strategies. *Nutr Clin Pract* 2014; 29: 29-43.
45. Kreyman KG, Berger MM, Deutz NE, Hiesmayr M, Joliet P, Kazandjiev G, et al. ESPEN Guidelines on Enteral Nutrition: Intensive care. *Clin Nutr* 2006; 25: 210-223.
46. McClave SA, Martindale RG, Vanek VW, McCarthy M, Roberts P, Taylor B, et al. Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). *JPEN J Parenter Enteral Nutr* 2009; 33: 277-316.
47. Schindler K, Pernicka E, Laviano A, Howard P, Schutz T, Bauer P, et al. How nutritional risk is assessed and managed in European hospitals: a survey of 21,007 patients findings from the 2007-2008 cross-sectional nutritionDay survey. *Clin Nutr* 2010; 29: 552-559.
48. Hodgson RS. Malnutrition: why should we care? *Intern Med J* 2013; 43: 473-476.
49. Muscaritoli M, Molino A. Malnutrition: the hidden killer in healthcare systems. *BMJ* 2013; 346: f1547.
50. Volkert D. Malnutrition in older adults - urgent need for action: a plea for improving the nutritional situation of older adults. *Gerontology* 2013; 59: 328-333.
51. Galal O. Nutrition-related health patterns in the Middle East. *Asia Pac J Clin Nutr* 2003; 12: 337-343.
52. van Bokhorst-de van der Schueren MA, Guaitoli PR, Jansma EP, de Vet HC. Nutrition screening tools: does one size fit all? A systematic review of screening tools for the hospital setting. *Clin Nutr* 2014; 33: 39-58.
53. Sorensen J, Kondrup J, Prokopowicz J, Schiesser M, Krahenbuhl L, Meier R, et al. EuroOOPS: an international, multicentre study to implement nutritional risk screening and evaluate clinical outcome. *Clin Nutr* 2008; 27: 340-349.

54. Korfali G, Gundogdu H, Aydintug S, Bahar M, Besler T, Moral AR, et al. Nutritional risk of hospitalized patients in Turkey. *Clin Nutr* 2009; 28: 533-537.
55. Starke J, Schneider H, Altheheld B, Stehle P, Meier R. Short-term individual nutritional care as part of routine clinical setting improves outcome and quality of life in malnourished medical patients. *Clin Nutr* 2011; 30: 194-201.
56. Barr J, Hecht M, Flavin KE, Khorana A, Gould MK. Outcomes in critically ill patients before and after the implementation of an evidence-based nutritional management protocol. *Chest* 2004; 125: 1446-1457.
57. Lee C, Rucinski J, Bernstein L. A systematized interdisciplinary nutritional care plan results in improved clinical outcomes. *Clin Biochem* 2012; 45: 1145-1149.
58. Arsava EM, Ozcagli TG, Guler A, Yaka E, Uluc K, Gungor L, et al. Management of cerebrovascular events in tertiary hospitals in Turkey and effects of malnutrition on the management: a cost of illness analysis. *Value in Health The Journal of The International Society for Pharmacoeconomics and Outcomes Research* 2014; 17: A110.
59. Arsava EM, Ozcagli TG, Guler A, Yaka E, Uluc K, Gungor L, et al. The impact of malnutrition on stroke management in tertiary hospitals in Turkey. *Journal of Neurology* 2014; 261: S267-S268.
60. Jensen GL, Hsiao PY, Wheeler D. Adult nutrition assessment tutorial. *JPEN J Parenter Enteral Nutr* 2012; 36: 267-274.
61. Benton MJ, Whyte MD, Dyal BW. Sarcopenic obesity: strategies for management. *Am J Nurs* 2011; 111: 38-44; quiz 45-6.
62. White JV, Guenter P, Jensen G, Malone A, Schofield M. Consensus statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: characteristics recommended for the identification and documentation of adult malnutrition (undernutrition). *JPEN J Parenter Enteral Nutr* 2012; 36: 275-283.
63. Hamdy O, Marchetti A, Hegazi RA, Mechanick JI. The transcultural diabetes nutrition algorithm toolkit: survey and content validation in the United States, Mexico, and Taiwan. *Diabetes Technol Ther* 2014; 16: 378-384.
64. Mechanick JI, Marchetti AE, Apovian C, Benchimol AK, Bisschop PH, Bolio-Galvis A, et al. Diabetes-specific nutrition algorithm: a transcultural program to optimize diabetes and prediabetes care. *Curr Diab Rep* 2012; 12: 180-194.
65. Ferguson M, Capra S, Bauer J, Banks M. Development of a valid and reliable malnutrition screening tool for adult acute hospital patients. *Nutrition* 1999; 15: 458-464.
66. Wu ML, Courtney MD, Shortridge-Baggett LM, Finlayson K, Isenring EA. Validity of the malnutrition screening tool for older adults at high risk of hospital readmission. *J Gerontol Nurs* 2012; 38: 38-45.
67. Detsky AS, McLaughlin JR, Baker JP, Johnston N, Whittaker S, Mendelson RA, et al. What is subjective global assessment of nutritional status? *JPEN J Parenter Enteral Nutr* 1987; 11: 8-13.
68. Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T, et al. Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. *J Nutr Health Aging* 2009; 13: 782-788.
69. National Collaborating Centre for Acute Care Clinical Guidelines. Nutrition Support for Adults Oral nutrition support, enteral tube feeding and parenteral nutrition. London (UK): National Collaborating Centre for Acute Care; 2006. p. 49.
70. Nutrition screening, assessment, and care plan development. In: Boullata J, Nieman Carney L, Guenter P, editors. A.S.P.E.N. Enteral Nutrition Handbook. 1st ed. Silver Spring (MD): ASPEN; 2010. p. 1-71.
71. Hosseini S, Amirkalali B, Nayebi N, Heshmat R, Larijani B. Nutrition status of patients during hospitalization, Tehran, Iran. *Nutr Clin Pract* 2006; 21: 518-521.
72. Nematy M, Salami H, Norouzy A, Siadat Z, Shahsavan N, Tavallaie S, et al. Indices of malnutrition in patients admitted to general medical and chest medicine wards of an Iranian teaching hospital on admission and discharge. *Mediterranean Journal of Nutrition and Metabolism* 2013; 6: 53-57.
73. Amirkalali B, Sharifi F, Fakhzadeh H, Mirarefin M, Ghaderpanahi M, Larijani B. Evaluation of the Mini Nutritional Assessment in the elderly, Tehran, Iran. *Public Health Nutr* 2010; 13: 1373-1379.
74. Boulos C, Salameh P, Barberger-Gateau P. Factors associated with poor nutritional status among community dwelling Lebanese elderly subjects living in rural areas: results of the AMEL study. *J Nutr Health Aging* 2014; 18: 487-494.
75. Elmadbouly MA, Abd Elhafez AM. Assessment of Nutritional Status of Hospitalized Elderly Patients in Makkah Governorate. *Pakistan Journal of Nutrition* 2012; 11: 984-990.
76. Bani I, Al Kanhal M. Malnutrition among hospitalized patients King Khalid University Hospital, Riyadh. *Saudi J Gastroenterol* 1998; 4: 172-175.
77. Al-Saran KA, Elsayed SA, Molhem AJ, AlDrees AS, AlZara HM. Nutritional assessment of patients in a large Saudi dialysis center. *Saudi Med J* 2009; 30: 1054-1059.
78. Alhamdan AA, Alsaif AA. The nutritional, glutathione and oxidant status of elderly subjects admitted to a university hospital. *Saudi J Gastroenterol* 2011; 17: 58-63.
79. Alhamdan AA. Nutritional status of Saudi males living in the Riyadh nursing home. *Asia Pac J Clin Nutr* 2004; 13: 372-376.
80. Nursal TZ, Noyan T, Atalay BG, Koz N, Karakayali H. Simple two-part tool for screening of malnutrition. *Nutrition* 2005; 21: 659-665.
81. Klek S, Krznanic Z, Gundogdu RH, Chourdakis M, Kekstas G, Jakobson T, et al. Prevalence of malnutrition in various political, economic, and geographic settings. *JPEN J Parenter Enteral Nutr* 2015; 39: 200-210.
82. Ulger Z, Halil M, Kalan I, Yavuz BB, Cankurtaran M, Gungor E, et al. Comprehensive assessment of malnutrition risk and related factors in a large group of community-dwelling older adults. *Clin Nutr* 2010; 29: 507-511.



**Appendix 1** - The feedM.E. Nutrition Care Pathway in A) English, B) Turkish, and C) Arabic. <sup>†</sup>For patients who can tolerate oral feeding. Reproduced from: Correia M, Hegazi R, Higashiguchi T, Michel J, Reddy B, Tappenden K, et al. Evidence-based recommendations for addressing malnutrition in healthcare: an updated strategy from the feedM.E. Global Study Group. *J Am Med Dir Assoc* 2014; 15: 544-550. With permission from Elsevier.