Undernutrition: A Major Problem in Nursing Homes

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In developing countries, protein undernutrition occurs predominantly in young children, whereas in developed countries, it is most commonly seen in long-term care. Similarly, isolated vitamin deficiencies, such as pellagra, beri-beri, and Wernicke’s encephalopathy, occur in developing countries, whereas these are rare in developed countries, being replaced by vitamin B₁₂ deficiency and hypovitaminosis D and a variety of complex nutritional disorders seen in older persons living in long-term care. In developed countries, there are usually adequate quantities of food, so the development of undernutrition occurs because of disease or poor nutritional choices associated with the anorexia of aging.¹–⁴

ANOREXIA

Older persons develop a physiological anorexia of aging to balance their decreased energy expenditures.⁵ This physiological anorexia has multiple causes, including alterations in taste and smell, decreased fundal compliance leading to more rapid antral filling and early satiation, increased satiating effect of cholecystokinin, and an increase in leptin.⁶–⁹ These peripheral changes are associated with an alteration in central nervous system neurotransmitters such as dynorphin.¹⁰ This anorexia of aging makes older persons vulnerable to developing weight loss when they become ill.

The most common reason for pathological weight loss in older persons is depression.¹¹–¹⁴ Polypharmacy is rampant in nursing home residents and is a major cause of anorexia.¹⁵–¹⁷ Maintenance of good oral health care and sensible treatment of dysphagia play an important role in weight maintenance.¹⁸–²² In persons with anorexia, providing liquid caloric supplements between meals can increase energy intake.²³ Snacks between meals are also a useful approach.¹ Therapeutic diets need to be avoided.²⁴,²⁵ Improving the dining room environment and providing buffet dining to enhance choices as well as ice cream parlors have also proved to be successful approaches to decrease weight loss.²⁶,²⁷ Intake of 400 g per day of fruits and vegetables in nursing homes improves nutritional status.²⁸ Older persons struggle to adequately increase their food intake after a period of dietary restriction.²⁹ Megestrol acetate can be used to “jump start” feeding in nursing home residents, but is not often reimbursed by Medicare D carriers.³⁰,³¹ Other orexigenic drugs are under development.³²

The Simplified Nutrition Assessment Questionnaire or the Mini Nutritional Assessment can be used to recognize older persons at risk for anorexia and malnutrition.³³,³⁴ A logical approach to weight loss in the nursing home is available.³⁵ Nutritional support after discharge from the hospital has been demonstrated to improve functional status.³⁶ Weight loss is a key component of frailty definitions.³⁷–⁴⁰

CACHEXIA AND SARCOPENIA

Cachexia is caused by disease processes that produce excess cytokines.³¹–³³ This results in excess loss of muscle and fat and anorexia. Cytokines result in decreased albumin owing to third-spacing.⁴⁴ This is the reason why albumin and prealbumin are poor measures to be used for nutritional assessment. Persons with mild levels of cytokine excess, as are seen in persons with chronic obstructive pulmonary disease, can improve their weight and function with a combination of protein supplements and exercise.⁴⁵ Sarcopenia is the aging-associated loss of muscle mass that leads to loss of strength and function.⁴⁶–⁴⁸ Exercise, leucine-enriched essential amino acids, creatine, and vitamin D can all slow this process.⁴⁹ One study suggested that a caloric/protein supplement with testosterone can reduce hospitalizations in frail, older persons.⁵⁰

NUTRITION AND COGNITION

Undernutrition in older persons is associated with poor cognition.⁵¹,⁵² This is also true for poor intake of levels of specific nutrients.⁵³,⁵⁴ However, outcomes of replacing specific nutrients have, on the whole, failed to show meaningful improvements in cognition, unless the individual has very low levels of the nutrient. These studies highlight the importance of maintaining a balanced diet to maintain cognition. The intake of omega-3 polyunsaturated fatty acids may slow cognitive decline, but many short-term studies have been disappointing.⁵⁵ Both hyperglycemia and hypertriglyceridemia are associated with cognitive disturbances.⁵⁶–⁵⁷ In older persons with
dementia, low cholesterol levels are more likely to produce deterioration in cognition than are high levels.\textsuperscript{58,59}

**HYPOVITAMINOSIS D**

The vast majority of nursing home residents have low levels of 25(OH) vitamin D.\textsuperscript{60–63} Vitamin D replacement in persons with low vitamin D has been associated with a decrease in hip fracture, falls, and mortality, as well as an increase in strength and function.\textsuperscript{64–67} Three studies have shown that exposure either to natural sunlight or ultraviolet light for a short time period increases 25(OH) vitamin D levels in nursing home residents.\textsuperscript{68–70} If exposure to sunlight is not feasible, nursing home residents should receive 1000 IU of vitamin D each day or have their levels measured. Replacement should be to the level of 25 to 30 ng/mL. Bread fortified with 5000 IU of vitamin D per daily serving has effectively increased 25(OH) vitamin D levels in nursing home residents.\textsuperscript{71}

**DEHYDRATION**

Older persons fail to recognize that they are thirsty, placing them at major risk for developing dehydration when exposed to either changes in the internal milieu or the external environment.\textsuperscript{72,73} Clinically, dehydration is difficult to recognize in older persons, requiring in long-term care that nurses aides recognize a decrease in urine output or urine concentration. Overtreatment of heart failure and infections represent major causes of dehydration. Dehydration also causes falls and delirium.\textsuperscript{74}

Prevention of dehydration in long-term care requires nursing staff to make regular “fluid rounds” concentrating on the frail elderly and also to have high awareness of the factors that increase dehydration. A number of residents need parenteral fluids at regular levels. For many nursing home residents, subcutaneous fluid administration is an excellent method to prevent and treat dehydration.\textsuperscript{75,76}

**VITAMIN B\textsubscript{12} DEFICIENCY**

Vitamin B\textsubscript{12} deficiency can occur in up to 6% of older persons.\textsuperscript{77} Clinically, it can present with tingling of the fingers, megaloblastic anemia, cognitive problems, and loss of posterior column function (vibration and position sense), leading to loss of balance, falls, and paraplegia. Any of these symptoms can occur in isolation early during vitamin B\textsubscript{12} deficiency. Vitamin B\textsubscript{12} deficiency occurs more commonly in persons with diabetes mellitus, thyroid disorders, Addison’s disease, or celiac disease.\textsuperscript{78}

Biochemically, the diagnosis is made by finding a low or borderline low serum vitamin B\textsubscript{12} level coupled with an elevated methylmalonic acid level. Both folate and vitamin B\textsubscript{12} deficiency lead to increased homocysteine levels. Treatment can be by injections of vitamin B\textsubscript{12}, high-dose oral vitamin B\textsubscript{12}, or nasal administration of vitamin B\textsubscript{12}.

**ZINC DEFICIENCY**

Persons with diabetes mellitus, liver disease, heart failure, and a variety of cancers, and those receiving diuretics are at risk of developing zinc deficiency.\textsuperscript{79} Persons with diabetes mellitus both fail to absorb zinc and have hyperzincuria.\textsuperscript{80,81} Zinc plays a role in immune function, wound healing, insulin secretion, taste, and appetite. Zinc replacement should be considered in persons with diabetes mellitus and poorly healing skin ulcers, although controlled trials are lacking. Zinc deficiency in the nursing home has been associated with increased pneumonia.\textsuperscript{82} A number of studies have shown that zinc replacement in older persons improves immune function\textsuperscript{83,84} and one small study suggested it can reduce infections in older persons.\textsuperscript{85} In children, a recent Cochrane collaboration suggested zinc lozenges reduce the duration and severity of the common cold.\textsuperscript{86} Side effects were a bad taste and nausea.

**CONCLUSIONS**

Appropriate intervention trials for undernutrition in nursing homes are lacking. The focus of modern American medicine on the “obesity epidemic” has resulted in a relative neglect of undernutrition. Like so many conditions in medicine, the focus on only one side of the coin has led to harm. The concept that too low (too little) or too high (too much) are equally bad for the individual has been termed the “risk factor paradox” by Kalantar-Zadeh et al.\textsuperscript{87}

Persons in nursing homes need a careful nutritional risk assessment.\textsuperscript{88–90} The goal should be to weight maintain or have a small weight gain. The ideal way to replace vitamins and trace elements is naturally in an adequate diet and not in a pill form. Having residents out in the sun for 30 minutes a day should be sufficient to increase vitamin D levels. There is a need for carefully designed, large studies of calorie and protein supplements to determine their true utility in nursing home residents. This lack of high-quality nutritional studies in nursing homes needs to be remedied. Hopefully, the International Association of Gerontology and Geriatrics/World Health Organization white paper stressing the need for research in nursing homes to improve quality of life will lead to funding agencies providing sufficient funds to rectify this situation.\textsuperscript{91}

**REFERENCES**

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