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☐ **Original Article** ☐

Nutritional and Health Status of Korean Elderly Living in America

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ABSTRACT

This cross-sectional study was designed to describe the nutritional and health status of the Korean elderly residing in America using demographic variables, dietary, anthropometric and functional status indicators, and to investigate possible relationships among these variables. Sixty elderly persons aged 61 – 91 years were assessed in their homes. Dietary intake was estimated by the 24-hour recall and brief dietary questionnaire. The following anthropometric measures were taken : weight, height, knee height, triceps skinfold, and midarm circumference. Functional status was measured by activities of daily living(ADLs), instrumental activities of daily living(IADLs) questionnaires, and a measure of psychosocial status as "happiness score" (a life satisfaction questionnaire). Intakes of energy, calcium, magnesium, folacin, vitamin B_6, and zinc were low in this elderly sample. Females 75 years of age and older had extremely low energy intakes. A large percentage of subjects reported difficulty with both activities of daily living and instrumental activities of daily living. Subjects over 75 years of age reported more difficulty than younger subjects for most activities. Gender differences were seen in anthropometric variables and energy intake. Happiness scores were similar in subjects, regardless of age or gender, however, happiness score was significantly correlated with the energy and protein intake($p<0.05$). Several difficulties were encountered during the assessment of this elderly sample. The conditions in the home were unpredictable and often inadequate for the anthropometric measures in particular. Further research is needed to improve current methodologies so that they may be more adaptable to the conditions found in homes. (*Korean J Community Nutrition* 3(5) : 707~714, 1998)

KEY WORDS : nutritional status · elderly · dietary intake functional status · happiness score.

Introduction

Until recently, little attention has been paid to the nutritional status and nutrition-related needs of the elderly. Older people experience various nutritional problems and needs that are related to many environmental, social, economic, and physical changes of aging(Baker et al. 1982).

With advancing age the efficiency of body systems decreases and the incidence of chronic diseases increases(Shanghnessy & Kramer 1992). Increase in disease susceptibility and some behavioral change seen in elderly persons have been linked to nutritional deficiencies(Ferrini et al. 1994). Obstacles to adequate nutrition such as limited income and physiological and social changes, exist for many elderly persons

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(Cardigan 1995). Concern for the nutritional well-being of this population requires a review of the risk factors specific to an elderly population and research to determine the nutritional and functional status of elderly persons.

The aging process leads to a deterioration of function in most body organs, although there are substantial differences among persons and among organs (Chernoff 1990). Age-related decreases in taste sensitivity(Metthews 1992) associated with a progressive loss in the number of taste buds, and in the sense of smell have been documented. Hearing loss is common in elderly persons as hearing declines gradually over time(Mobarhan & Trumbore 1991). Visual impairment is also more common at advanced ages, as the lens of the eye becomes less elastic and thickens with age, reducing visual acuity(Avorn & Langer 1982). Each of these sensory changes may affect interest in food and eating as well as the ability to prepare food.

The National Nursing Home Survey of 1987 (National Center for Health Statistics 1989) reports that 86% of all elderly persons suffer from at least one chronic disease. The disease process often alters nutritional requirements. Futhermore, traditional therapies for many chronic diseases directly influence nutrient intake by demanding some type of dietary restriction(Collins 1988). Common examples are cardiovascular disease and diabetes mellitus. For these conditions, weight loss may be prescribed, perhaps placing the elderly person at risk because of the caloric restriction involved. Many other chronic diseases reduce appetite, either by causing psychological distress, such as depression, or by altering the senses of taste and smell. Cancer often reduces appetite and is frequently associated with anorexia(Cardigan 1995). Acute conditions also affect nutrient requirements. For example, infection, broken bones and surgery increase nitrogen needs(Bidlack & Smith 1988).

The high amount of drug use among elderly persons can influence nutritional status. Malabsorption is a major mechanism by which this occurs. Some drugs bind nutrients and make them unavailable for absorption. Nutrient intake and requirements may change in response to drugs of digitalis family, which increase calcium and magnesium excretion and cause side effects such as nausea, vomiting, dry mouth and cramping(Roe 1991).

Several aspects of the social environment affect food choices and nutritional status. Many elderly persons face a socially restrictive environment in which normal daily activities such as shopping for favorite foods and visiting neighbors are impossible(Goodwin 1989). The cultural behaviors of American society, where food consumption is a social activity, influence the food habits and nutrition of elderly persons. Isolation from family meal times, dining with friends and other social aspects of eating may be a threat to the elderly persons(Ryan & Bower 1992). Ham(1989) has concluded that an individual at "high – risk" for nutrition-related disorders would be the elderly person who is isolated, poor, depressed and functionally dependent in at least one activity of daily living (ADL).

Methods of nutritional assessment must overcome difficulties encountered because of age-related and disease-related changes in elderly persons. Difficulties arise with both assessment techniques and the interpretation of that measurement values. Chumelea et al.(1986) have found measurements on older adults aged 54 to 85 years have more frequent and larger inter-observer errors than those on younger adults, but intra-observer error was not reported to be higher, indicating that one observer should be used to take every measure. Interpreting the results of an assessment of elderly persons is difficult because of the lack of standards for comparison, effect of disease, and the high amount of inter-individual variability in elderly persons.

At the present time, the nutritional evaluation of elderly persons, particularly those who are not healthy remains a challenge. The most suitable method of assessment in terms of the individual appears to be that of a reassessment monitoring status over time in order to detect changes.

The purpose of this study was designed to describe nutritional and health status of free living Korean elderly living in America using demographic vari-

ables, dietary intakes, anthropometric measures and functional status indicators and to investigate the relationships among these variables.

Subjects and Methods

1. Subjects

The participants for this study were 60 elderly(30 males and 30 females) aged 61-91 years who lived independently in their own houses or apartments in Pennsylvania. The Age group cutoff points for the two groups was 74 years and younger for the young-old group and aged 75 years and older for the old-old group. Trained interviewers asked participants about their general condition(age, income, living arrangement) as well as questions related to the health and food habits in each participant's home.

2. Dietary survey and anthropometric measurement

Nutrient intakes were estimated by recalling all foods and beverages consumed in the 24 hours for 3 consecutive days and answering a brief dietary questionnaire. Anthropometric values such as height, weight, knee height, triceps skinfold and midarm circumference were measured using a portable scale, a measuring tape and caliper.

3. Functional status

Two measures of dependence are commonly employed to assess functional status. Functional status was measured by activities of daily living(ADLs) which measure very basic self-care activities such as dressing, bathing, walking, eating, moving and instrumental activities of daily living(IADLs) which measure home management activities important in independent living and conduct of personal affairs such as use of the telephone, handling money, and purchasing food (Dawson et al. 1987).

4. Psychosocial status

Ten statements related to psychosocial status were given to the subjects. Each statement ask the subject to express the frequency of occurrence of certain feelings or activities. The frequency was divided to three categories, that is, rarely(less than two times per week), sometimes(two or three times per week), and most of the time(over three times per week). The scores of 2,1 and 0 are given to above categories respectively, and the total score for statements was named "happiness score(full score is 20)". The higher happiness score means the better life satisfaction.

5. Statistical analysis

The spss/pc$^+$ program was used to examine the association of variables in this study. Group comparisons on variables with interval values were obtained by two-tailed t-tests. Categorical data were analyzed with χ^2 procedures.

Results and Discussion

1. Characteristics of subjects

The mean age of the subjects was 75±7.4years, ranging from 61 to 91years. A wide variety of health conditions were reported and the 10 most common chronic conditions in subjects are listed in Table 1 in the order of prevalence. Twenty-seven percent of the subjects lived below the poverty levels. Poverty is perhaps the single most important risk factor leading to poor nutritional status in older people. Low income of older persons may often have limited access to food and fewer food choices, particularly when needs perceived as more pressing such as utility bills, phone bills, medication expenses and so forth take precedence. Females 75 years and older included the greatest number of subjects with incomes below the poverty level. Income level was not correlated with any of the assessment variables.

Thirty-two subjects(53.3%) lived alone. The remaining 46.7% lived in a household with at least one other person. Living with another person was correlated with a higher happiness score($r=0.411$) and larger triceps skinfolds($r=0.392$) in males. More females than males lived alone($p<0.05$). The correlation of gender with living arrangement was highly significant($p<0.001$). More females 75 years and older lived alone, and this was significantly different from males in either age group($p<0.05$). Demo-

graphic data for the subjects assessed during this study are shown in Table 2.

2. Dietary intake

Twenty-five percent of the sample reported skipping meals. Six of the subjects who reported skipping meals did so because of illness. Eighty-six percent of the sample drank milk everyday and 95% drank milk more than once a week. Meat and potatoes were the foods most often stated as favorites. Meat, fish and spinach were the foods often reported as never eaten.

Most subjects were able to describe what they had eaten without apparent difficulty. Average daily intakes for energy and 13 nutrients are presented in Table 3 for the total samples, and for each gender-age group. Males and females had similar mean intakes for most nutrients, although the mean values for females tended to be slightly lower. Females had significantly lower mean intakes for magnesium and energy. This trend was similar as the results of domestic research. Daily intake of energy of subjects were higher than that of the elderly from low income areas in Seoul(Son & Yoon 1997), but a little bit lower than that of the elderly living in Cheongju area(Kim et al. 1997). Although intake of most of the other nutrients were higher than domestic data especially in vitamin A and calcium. Nutrient intakes differed little with age. Males 75 years and older had slightly lower mean intakes than younger males of vitamin B_6, vitamin B_{12}, vitamin C, iron, folacin, magnesium and zinc, however, these differences were not significant. Females 75 years and older had slightly lower mean intakes than younger females of thiamin, riboflavin, folacin, iron, magnesium, zinc, calcium and phosphorous, only the difference in phosphorous intake was significant($p<0.05$).

The most dramatic difference was seen in energy intake between the younger and older females ; females 75 years and older reported significantly lower energy intake($p<0.01$). Energy intake was shown to be correlated with age($r=0.38$) and gender($r=0.42$). In males, energy intake was also correlated with the variables of arm muscle area($r=0.51$) and midarm circumference($r=0.45$). Energy intakes in each of the gender-age groups were below the lower and of the range of energy intake suggested by the RDAs. In

Table 1. Chronic diseases or conditions of elderly

Condition	Rank	
	< 75 yr	≥75 yr
Arthritis	1	1
Hypertension	2	2
Heart Disease	3	4
Hearing Impairments	4	3
Orthopedic Impairments	5	6
Chronic Sinusitis	6	7
Diabetes	7	–
Cataracts	8	5
Tinnitus	9	–
Hemorrhoids	10	–
Visual Impairments	–	8
Atherosclerosis	–	9
Constipation	–	10

Table 2. Demographic characteristics of elderly

Characteristic	Total	Male			Female		
		all	<75 yr	≥75 yr	all	<75 yr	≥75 yr
	(n=60)	(n=30)	(n=15)	(n=15)	(n=30)	(n=15)	(n=15)
Age range	61 – 91	61 – 91	63 – 91	63 – 74	61 – 91	61 – 73	75 – 91
Income below poverty[1)]	6(26.7)[2)]	7(23.3)	3(20.0)	4(26.7)	9(30.0)	3(20.0)	6(40.0)
Living arrangment lives alone	32(53.3)	11(36.7)a	5(33.3)[c]	6(40.0)[b]	21(70.0)[a]	9(60.0)	12(80.0)[bc]
lives with others	27(45.0)	18(60.0)	10(66.7)	8(53.3)	9(30.0)	6(40.0)	3(20.0)

1) The US Bureau of Census defined poverty threshold for single individual aged 65yrs or older as an annual income of $4,954 or less. For two person families as an income of $6,251 or less

2) number(%)

[a]Significant at the 0.02 level [b]Significant at the 0.05 level [c]Significant at the 0.01 level

Table 3. Average daily nutrient intake of elderly

Nutrient	Total (n=60)	Male			Female		
		total	<75yr	≥75yr	total	<75yr	≥75yr
Energy(Kcal)	1281 ± 428[1)]	1396 ± 453[a]	1476 ± 569	1316 ± 296[b]	1166 ± 375[a]	1344 ± 350[a]	987 ±317[b]
Protein(g)	58 ± 23	63 ± 24	64 ± 28	62 ± 20	54 ± 21	61 ± 20	47 ± 20[a]
Vitamin A(RE)	715 ± 631	672 ± 587	757 ± 654	587 ± 526	734 ± 545	740 ± 605	728 ±602
Vitamin C(mg)	71 ± 49	74 ± 47	80 ± 61	68 ± 45	68 ± 44	69 ± 50	67 ± 41
Vitamin B6(mg)	1.5 ± 1.0	1.4 ± 1.0	1.6 ± 1.3	1.3 ± 0.5	1.5 ± 1.1	1.5 ± 1.0	1.6 ± 1.3
Vitamin B12(mg)	3.2 ± 2.4	2.8 ± 2.3	3.5 ± 3.0	2.2 ± 1.1	3.5 ± 2.6	3.7 ± 2.8	3.4 ± 2.5
Thiamin(mg)	1.3 ± 0.6	1.2 ± 0.5	1.2 ± 0.6	1.2 ± 0.4	1.3 ± 0.7	1.5 ± 0.8	1.1 ± 0.6
Riboflavin(mg)	1.5 ± 0.7	1.5 ± 0.6	1.5 ± 0.8	1.5 ± 0.4	1.5 ± 0.8	1.7 ± 0.8	1.3 ± 0.8
Folacin(mg)	198 ± 152	203 ± 120	211 ± 142	195 ± 99	192 ± 179	196 ± 201	189 ±162
Iron(mg)	10.4 ± 7.1	10.5 ± 6.1	11.1 ± 7.7	9.9 ± 4.1	10.2 ± 8.1	11.0 ± 8.8	9.4 ± 7.5
Magnesium(mg)	195 ± 108	222 ± 137[a]	243 ± 174	201 ± 87	167 ± 60[a]	169 ± 65	64 ± 56
Calcium(mg)	666 ± 301	682 ± 290	686 ± 334	678 ± 249	650 ± 316	726 ± 329	575 ±293
Phosphorus(mg)	976 ± 356	1056 ± 388	1078 ± 479	1034 ± 286[c]	897 ± 307	1020 ± 281	773 ±290[a,c]
Zinc(mg)	6.3 ± 3.2	6.9 ± 3.8	7.5 ± 4.6	6.2 ± 2.7	5.7 ± 2.4	6.3 ± 2.3	5.0 ± 2.5

[1)]Mean±standard deviation
[a]Significant at the 0.05 level [b]Significant at the 0.01 level [c]Significant at the 0.02 level

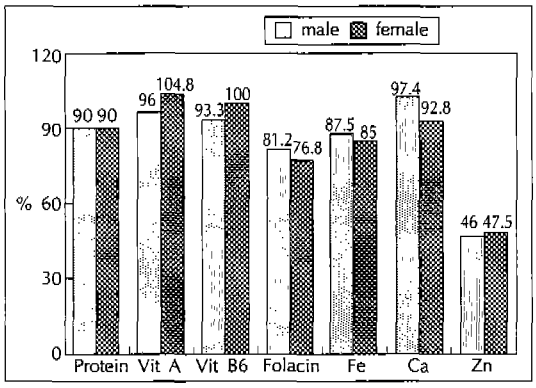

Fig. 1. Mean nutrient intake of elderly compared to the RDA.
*Recommended Dietary Allowances For Koreans 6th Revision 1995(The Korean Nutrition Society)

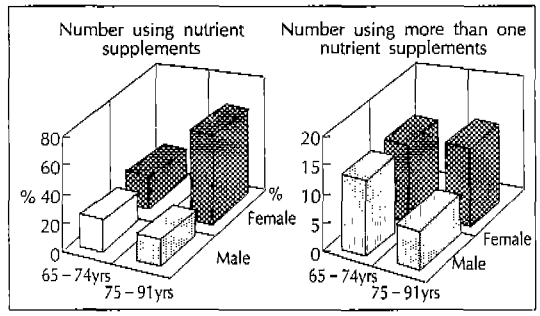

Fig. 2. Frequency of nutrient supplements usage in elderly by sex.

addition to low energy intakes, the following nutrients were consumed in amounts less than the RDA : folacin, vitamin B_6, magnesium, calcium and zinc(Fig. 1).

3. Nutrient supplements use

Nutrient supplements were used by 36.7% of the subjects. Females used supplements more often than males. The females 75 years and older were the highest users of supplements, with 66.7% using supplements(Fig. 2).

Of those using supplements, most took them regularly, and very few took more than one supplement. A wide variety of supplements were used, including multivitamin and mineral supplements, single nutrients, and other substances, such as garlic oil. Supplement usage was not related to any other variable.

Hale et al.(1987) showed that the percentage of older users is increasing, particularly for vitamin E, C, calcium and zinc. People who perceived themselves to be in "good health" were more likely to use supplements than those who thought themselves to be "less healthy".

Certainly toxicities are associated with excessive consumption of vitamins and minerals especially fat-soluble vitamin A and D, and the water-soluble vitamins, particularly niacin, pyridoxine and ascorbic acid(Bistrian et al. 1976).

Table 4. Mean anthropometric values

Measure	Male			Female		
	Total	<75yr	≥75yr	Total	<75yr	≥75yr
MAC[1](cm)	31.0± 5.6[2]	31.2± 7.1	30.8± 3.6	31.8± 5.7	31.0± 5.9	32.6± 5.6
TSF(mm)	18.3± 9.9[a]	19.4±11.8[b]	17.2± 7.6[c]	30.2±10.8[a]	29.7±10.8[b]	30.8±11.1[c]
AMA(cm^2)	51.7±14.6[c]	51.8±19.2[d]	51.5± 8.0[b]	40.2±10.1[c]	38.1± 9.7[d]	42.4±10.3[b]
Weight(lbs)	144.6±35.1	148.6±39.1	140.6±33.5	125.8±28.1	127.6±28.9	124.0± 0.3
Height(in)	64.3± 4.9[e]	64.0± 5.4	64.7± 4.4[f]	61.0± 3.6[c]	61.4± 4.8	60.6± 1.8[f]
BMI(kg/m^2)	24.6± 6.2	25.6± 7.6	23.7± 5.0	23.6± 5.4	23.7± 5.6	23.6± 5.5

1) MAC=midarm circumference TSF=triceps skinfold AMA=arm muscle area
2) Mean±standard deviation
[a]Significant at the 0.0001 level [b]Significant at the 0.02 level [c]Significant at the 0.001 level
[d]Significant at the 0.05 level [e]Significant at the 0.01 level [f]Significant at+ the 0.01 level

4. Anthropometric measurements

Mean anthropometric values are listed in Table 4. Midarm circumferences(MAC) were similar for all subjects, although males and females differed on several other measures. Females had significantly higher triceps skinfold(TSF) values($p<0.001$). Males had significantly higher values for arm muscle area(AMA)($p<0.001$), and height($p<0.01$). When the sample was divided by age and gender, the same differences were observed, with the exception of height which did not differ between males and females 75 years and older. Age had no significant effect on anthropometric measures within gender.

Several of the anthropometric variables showed significant correlations among variables studied. For the samples as a whole, midarm circumference was highly correlated with triceps skinfold($r=0.79$, $p<0.001$), arm muscle area($r=0.79$, $p<0.001$), and body mass index($r=0.69$, $p<0.001$). In males midarm circumference was also correlated with energy intake($r=0.45$, $p<0.05$). Triceps skinfold in males was correlated with body mass index($r=0.74$, $p<0.001$), arm muscle area($r=0.42$, $p<0.05$), happiness score($r=0.39$, $p<0.05$) and living with another person($r=0.38$, $p<0.05$). Triceps skinfold in females also showed a relationship to arm muscle area($r=0.64$, $p<0.01$) and body mass index($r=0.76$, $p<0.01$), and was correlated with a negative effect($r=-0.40$, $p<0.05$). Arm muscle area was correlated with energy intake($r=0.51$, $p<0.01$) in males, and with body mass index($r=0.62$, $p<0.001$) in females.

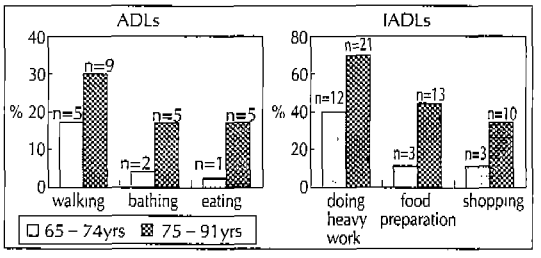

Fig. 3. Prevalence of Functional Limitations in elderly by age group.

5. Functional status

Difficulties with personal care activities(ADLs) increase with age. Functional limitations of subjects are listed in Fig. 3. The 16.7% of subjects 65 to 74 years old report difficulty walking ; this figure increased to 30.0% in the 75 years and over age group. Approximately 6.7% of those aged 65 to 74 years report difficulty bathing while 16.7% report difficulty bathing in the 75 years and over category. Eating seems to present the least problem with only 3.3% reporting difficulty in the 65 to 74 year age group rising 16.7% in those aged 75 years and older. Eating, which is an activity of daily living and source of personal and social pleasure, has often been addressed as a matter of health concern only when so deranged that it threatens to exert its own pathological effects on health.

Difficulties with home management activities(IADLs) affect a larger percentage of the older population(Dawson et al. 1987). Approximately 40% of those aged 65 to 74 years experienced difficulty doing heavy housework ; this figure increased to 70% in the 75 years and over category. As for food procurement

Table 5. Average Happiness score of the elderly subjects

	Male		Female	
	<75yr	≥75yr	<75yr	≥75yr
Happiness score	10.2±7.2[1]	10.3±6.8	10.3±7.0	10.1±8.5
	(9-15)[2]	(4-12)	(9-16)	(6-14)

[1]Mean±standard deviation [2]Range

Table 6. Correlation coefficient between happiness score and nutrients intake of subjects

Nutrients/Happiness score	r
Energy(Kcal)	0.471*
Protein(g)	0.398*
Vitamin A(RE)	0.198
Vitamin C(mg)	0.093
Vitamin B_6(mg)	0.151
Vitamin B_{12}(mg)	0.125
Thiamin(mg)	0.078
Riboflavin(mg)	0.103
Folacin(mg)	0.087
Iron(mg)	0.181
Magnesium(mg)	0.024
Calcium(mg)	0.073
Phosphorus(mg)	0.163
Zinc(mg)	0.114

*$p<0.05$

Table 7. Average Happiness score of subjects by living arrangement

Living arrangement	N	Happiness score (Mean±SD)
lives alone	32	10.0±8.7*
lives with others	27	10.4±7.5

*$p<0.05$

and food preparation activities, approximately 10% had difficulty in shopping and 10% in preparing meals in the 65 to 74 year age group, rising to 43.3% and 33.3% respectively in the 75 years and over category.

Impairment in the ADLs or IADLs is potentially indicative of impairment in the ability to perform those activities necessary to support good nutritional status. Thus, a general indication of functional status may be very useful in the determination of increased nutritional risk(Colucci et al. 1987). Likewise, specific evalution of eating behavior is important(Collinsworth & Boyle 1989).

6. Psychosocial status

Significant changes in psychosocial status are risk factors for poor nutritional status, although perhaps poor nutritional status in itself will ultimately induce psychosocial changes. Opportunities for social interaction have a positive impact upon morale, life-satisfaction, well-being and food intake(Ryan & Bower 1989).

The average happiness score and range of the subjects was 10.3±8.7(Table 5). These values were similar in subjects regardless of age or gender, however, the happiness score was significantly correlated with the energy and protein intake and living arrangement(Table 6, 7).

Losses of family, friends, income, independence and self-esteem can result in loneliness, grief and depression. Any or all of these factors can affect appetite resulting in limited food intake and increased risk of poor nutritional status.

Conclusion

The data from this study associated with nutritional and health status are consistent with that hypothesis food consumption and nutrient intakes were decreased with increasing age. Gender differences were also seen in anthropometric variables and energy intake. A large percentage of subjects reported difficulty with personal care activities(ADLs) increase with age and home management activities(IADLs) affect a larger percentage of the older group. Psychosocial status which is expressed as a happiness score can affect appetite resulting in limited food intake and increased risk of poor nutritional status. In appropriate dietary intakes and chronic disease or disability place a substantial number of older adults are at a high risk of malnutrition. The outcome of unrecognized or untreated malnutrition is often considerable dysfunction and disability and a reduced quality of life.

On the basis of the results I could suggest that the following recommendations be considered :

1) A "nutritional risk factor" screening tool should

address the psychosocial, health and environmental characteristics that indicate increased risks of malnutrition.

2) Strengthen the basic knowledge of the biology of aging and nutrition, the aging process, the chronic degenerative diseases and conditions associated with aging, and how best to promote healthy aging

3) Develop instruments to evaluate older individual's functional status, that can also serve as an indicator of the likelihood of poor nutritional status.

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