Old age begins at age 65. At least, this is what the New Deal Congress decided as it drafted the Social Security Act in 1935. Although there were compelling political realities responsible for this definition of old age, we now know that there is little physiological reason to define old age as that beginning at age 65.

The Social Security Administration’s definition of retirement age has become the de facto definition of the beginning of old age in our society. However, similar definitions of old age have been used for over one hundred years. In 1889, Prince Otto von Bismark, the Iron Chancellor of Germany, established the world’s first state system of social security. The average life expectancy in Germany at that time was 45 years. Thus, Bismark found it convenient to defer to Biblical authority as he set the retirement age at “threescore year and ten” (Psalm 90:10, RSV). This retirement age was later reduced to 65. Since then, various governments have set the retirement age between 60 and 70.

The Great Depression made economic security a pressing concern. Congress attempted to deal with this problem in 1935 by establishing the Social Security System. However, pragmatic considerations determined the age at which retirement benefits would commence. Placing the retirement age at 60 would have made the program too costly. However, since life expectancy in 1935 was only 62 years, setting the retirement age at 70 would have eliminated almost everyone from receiving benefits. Thus, age 65 was chosen as a compromise. It is this age which, for many purposes, has become synonymous with "old age."

There is, however, little physiological reason to equate age 65 or any other particular age with the start of "old age." Modern gerontology has shed light on the biology of aging and has provided compelling evidence that aging occurs as a continuous process. Thus there are "younger" ages and "older" ages, as opposed to "young" and "old" age.

Whereas the continuous nature of aging has been recognized, the causes of this process remain largely undefined. Various theories have been advanced to explain the aging process, some of which include: perturbations of biologic systems such as the neuroendocrine or immune systems, somatic cell mutation and genetic error accumulation, cell damage due to free radicals, cross-linking or instability of molecules, lipofuscin accumulation, and cell loss.

Although none of these theories in themselves provides a satisfactory explanation of the aging process, those based in genetics are receiving more support. It has been known for some time that normal cell lines have a fixed life span. Human fetal fibroblast will divide only about 50 times in culture before stopping. The reasons that mitoses cease after a specific number of cycles may prove the key to understanding the aging process.

A number of genes have already been implicated in the aging process. Some of these genes influence overall metabolic rate. Some subserve housekeeping functions and code for enzymes that mop-up metabolic byproducts, such as free radicals, that can damage DNA. Some code for proteins such as prohibitin which inhibits the division of cells.

Not only are the mechanisms responsible for aging coming under scrutiny, but so are the long held beliefs about the consequences of aging: progressive physiological deterioration and eventually, death.

Death is not necessarily related to aging. Accidental death in children, as pointed out by Masoro, bears little relationship to aging. In ancient societies, mortality rates were more influenced by environmental factors, such as food supplies, disease prevalence, epidemics, and trauma, than by senescence.

Figure 1, from Kirkwood and Holliday, demonstrates survival curves for four populations. In curve "A," while the effect of attained age on cumulative survival is clearly evident, age has no effect on the survival rate. This curve represents the expected survival of small animals in the wild. Survival in this population is highly dependent on factors external to the individual. The shape of this curve resembles that of first-order kinetics or a half-life decay curve.
In curves "B" through "D," there is a progressively increasing effect of attained age on survival rates. Such changes in the shape of the survival curves in human societies might be expected occur as violent deaths are reduced, and as sanitation, public health measures, and various medical therapies are introduced. This progressive change in the shape of the survival curves has been termed "rectangularization."

Curve "E" is a hypothetical curve in which survival is almost entirely dependent upon attained age. In this curve, survival is entirely dependent on senescence, those internal factors described earlier which may limit further cell replication.4

The age at which all of the curves converge on the abscissa defines the average life span of the population. "Life-span" is the genetically endowed limit to life for an individual if free from all external detrimental factors. The average life span for the U.S. population has been estimated to be between 114 and 116 years.5

Thus, the implicit message conveyed by analyses such as these in that there is biologic limit to maximum life expectancy at birth of somewhere around 100 years which, through risk factor modification and medical advances, may eventually be attainable.

If life expectancy eventually approaches the genetically determined life span, will morbidity rates also improve in parallel to mortality rates, or will the extra years of life gained by spent in a functionally impaired state? Many epidemiologists expect the former. They argue that an increase in the number and severity of functional impairments is not an inevitable consequence of aging. They correctly point out that early studies, which drew the conclusion that prevalence of impairments increases with age, were based upon "representative samples" of elderly. Since the prevalence of various chronic diseases increases with age, these studies seemed to show that functional disability was the expected consequence of aging. However, when a correction is made for the presence of latent and manifest disease, it can be shown that many physiologic functions are preserved into old age, and that there is great individual variation in the rate of functional loss.

An often-quoted story illustrates this point. In this story, an octogenarian is seen by a physician for a painful and stiff knee. The physician explains that this is simply the

FIGURE 1.
Probability of Survival

result of the aging process; that a stiff knee should come as no surprise at his age, and that it should be no cause for concern. The elderly patient rejects this explanation and replies: "My other knee is just as old as this one, and it's just fine!"

Thus, many anticipate that physiologic function may be relatively well preserved until shortly before death, at which time there may be a rapid decline in physical and cognitive function, the so-called "terminal drop." They anticipate that a "rectangularization" of the morbidity curve as well as a "rectangularization of the survival curve will occur. They anticipate that early risk factor modification will produce a "compression of morbidity," resulting in a relative short period of impairment. This is illustrated in Figure 2.6

Figures 3 and 4 illustrate the changes in life expectancy that have occurred in the U.S. during this century. But how likely is it that the further continuing improvement in mortality and morbidity will in fact be realized? Perhaps it is not as likely as we might wish to believe.

From Figures 3 and 4 it can be seen that most of the increases in life expectancy that has occurred in this century has occurred in the younger ages. Because mortality rates are already so low in the younger ages, further improvements in overall mortality would require dramatic reductions in mortality early in life.

It has been estimated that for life expectancy of the general population at birth to reach 85 years would require a 43% reduction in overall mortality rates for females and 65% for males. A life expectancy of 105 years would require reductions in mortality rates of over 90%. If improvement in mortality is achieved only in the group over age 50, somewhat larger mortality reduction would be necessary to achieve the targeted life expectancies.5

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**FIGURE 2.**
Probability of Survival
Acute Disease Model

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Eliminating all cancer deaths would increase life expectancy at birth by about 3.1 years for females and 3.2 years for males. Eliminating all deaths from ischemic heart disease would increase life expectancy 3 years for females and 3.5 years for males. From an insurer's perspective, these reductions in mortality at age 50 would translate into about 1 table for cancer and 1 table for ischemic heart disease.

Morbidity projections may also be overly optimistic. Projections based upon models such as those illustrated in Figure 2, are limited to the consequences of acute lethal conditions such as ischemic heart disease and cancer. When the model is adjusted to reflect chronic degenerative conditions such as those affecting musculoskeletal, immunologic, and neurologic systems like rheumatoid arthritis, osteoporosis, and Alzheimer's disease, a different survival curve results. (see Figure 5)

The natural history of this type of disease results in much longer periods of disability preceding death. Much of the improvement in mortality that has thus far occurred has been due to early diagnosis and treatment of acute lethal conditions. Less success has been realized in modifying the more chronic disease processes. Accordingly, an increase in the morbidity and mortality attributed to these processes may be anticipated. For example, it has been reported that of the six years in average life expectancy gained at age 65 in Canada between 1950-1978, 4.7 years was in an impaired state.

The implications for the insurer are clear. More people are surviving to older ages. The advances that have been made in improving life expectancy have been due in large measure to advances in public health policies and risk factor modification. These measures have been more effective in reducing mortality due to acute lethal conditions than due to chronic degenerative diseases. Accordingly, some compression of mortality and morbidity has been realized. There is, however, a limit as to the continuing reduction in mortality that may be

FIGURE 5.
Probability of Survival
Chronic Disease Model

anticipated. Insurers need to remain somewhat cautious in their projections for further improvement in mortality.

Further, because some compression of morbidity has also occurred, the attitudes of the elderly and of the physicians who care for them have changed. Impairments are less frequently interpreted as the natural consequence of aging, but rather as avoidable pitfalls along life's journey given optimum health care. To some extent this may be true. Nevertheless, further compression of morbidity may be less likely to occur unless significant advances in the understanding and treatment of chronic debilitating disease also occur.

Functional Assessment of the Elderly for LTC and Life Insurance

Various aspects of functional ability are important considerations in underwriting life, health, or long-term care products for the elderly. The specific elements of this assessment might include assessing Cognitive functioning, Activities of Daily Living (ADLs, IADLs, and AADLs, including driving), Gait and mobility, Exercise tolerance, and Psychiatric functioning.

These assessments might be more easily remembered by the aid of the mnemonic, A-AGED:

A: Alzheimer's disease and other forms of cognitive impairment
A: Activities of Daily Living (ADLs, IADLs, AADLs including driving)
G: Gait and mobility with attention to the risk of recurrent falls
E: Exercise tolerance with attention to NYHA/CCVS class and maximum oxygen consumption ($\text{VO}_2$) expressed in METs.
D: Depression and psychiatric status including an assessment of suicide risk

Importance of Functional Assessment in Underwriting

There can be little doubt of the importance of assessing functional ability prior to issuing insurance for long term care, for indeed the need for long term care is defined in terms of functional impairments, both physical and cognitive.

In addition, there is a growing body of evidence supporting the view that functional impairments are also risk factors for mortality in the elderly, as well as morbidity. Such non-traditional risk factors which have been shown to have predictive value for morbidity and mortality in the elderly include: the presence of dementia, the presence of impairments in Activities of Daily Living (ADLs), and gait assessment and a history of falling, and maximum exercise tolerance.

Thus, while it is clear that for underwriting purposes, functional assessment of the elderly applicant is important, how to obtain information on functional ability is a question that must be considered carefully, however.

Cognitive Status. The presence of dementia is a risk for LTC and subsequent mortality. Dementia is defined as a global impairment of cognitive function. The prevalence of dementia is about 5% in persons over age 65 and rises to about 20% by age 80. Dementia is a leading cause of death in the United States and has been estimated to account for 120,000 deaths per year. It may decrease life expectancies by one-half to one-third of that of healthy persons of the same age.

Between 50-75% of those patients with dementia have dementia of the Alzheimer's type (DAT). Alzheimer's disease progresses over a period of 2 to 20 years, leading to functional disability, malnutrition, wandering, falls, accidents, eventual immobility, and death. The length of survival in patients with DAT has been found to be related to the severity of dementia (relative risk of death = 2.7), a combination of wandering and falling (relative risk of death = 3.1), behavioral problems (relative risk of death = 1.5), hearing loss (relative risk of death = 1.5), and age at symptom onset (older subjects at the time of symptom onset having shorter survival).

Activities of Daily Living. Activities of Daily Living are those activities which we must all perform in order for us to live and for our lives to be meaningful and full. These activities may be characterized as basic activities of daily living (ADLs), instrumental activities of daily living (IADLs), and advanced activities of daily living (AADLs).

ADLs are those basic self-care activities which are necessary for us to live and remain healthy. ADLs include bathing, dressing, toileting, transferring, eating, and urinary and fecal continence.

IADLs are activities which require higher levels of functional ability. IADLs include such activities as telephoning, using transportation services, shopping for groceries, preparing meals, doing housework, and taking medicine.

AADLs are those activities that are volitional, reflect personal choice, and add meaning and richness to our lives. In large part, these activities are vocational, social,
or recreational. They may include working, attending church, going out to dinner, a movie, the theater, or a concert, playing cards, participating in physical recreational activities, driving, etc.

Data from the 1984 Longitudinal Study on Aging provided evidence that functional ability in the elderly, defined in terms of impairments in Activities of Daily Living (ADLs), was a predictor of both the need for LTC and for mortality. Of those elderly between 65-75, between 1-3% were found to require help with one or more ADLs, and 4% had daily incontinence. Of those aged 75-84, between 2 and 8% required help with one or more ADLs, and 8% had daily incontinence. It was shown that in a large population of white persons age 80 or over living in the community, those receiving help with any ADL at the time of the baseline interview were 4 times more likely to die, and survivors who had any ADL impairment were 6 times more likely to have used a nursing home in the following two years.

Driving may be considered one of the AADLs. An elderly person's motor vehicle driving pattern is an important consideration in assessing risk. Older drivers have been shown to have an elevated crash risk when they drive. This increase in mileage-based crash risk begins at age 60 and increases sharply at age 70. This increase is seen for both the total number of crashes and for fatal crashes alone.

In a study of 182 patients evaluated at a geriatric assessment center, the driving history of each patient was investigated. It was found that those elderly patients who were driving at the time of the assessment were younger than those who had ceased driving (74.1 years vs. 79.8 years) and had a higher MMSE (23.7 vs. 18.9). Yet the mean score on the MMSE for drivers (23.7) was below normal, and 40% of drivers were diagnosed as having dementia of the Alzheimer's type. In addition, 26% of the drivers needed help with either bathing or dressing.

**Gait Impairment and Falls.** Approximately 30% of elderly community dwelling persons fall each year. These falls may lead to institutionalization, injury, or death. A survey of six general practices in Great Britain demonstrated that falls are a marker for poor health and an increased risk of dying. This survey included 125 people aged 65 and older who fell in their own homes. Overall, there was a 4-fold increase in mortality among fallers at 1 year. If the person lay on the floor for more than 1 hour before being able to get up independently or with help (designated a "long lie"), the 1-year mortality was increased 7.6-fold. If the person had a history of previous long lies, the 1-year mortality was increased 13-fold. Thus, gait assessment would seem an important underwriting consideration.

<table>
<thead>
<tr>
<th>Baseline Status</th>
<th>Death (N=338)</th>
<th>Any NH Admission (N=152)</th>
<th>Among Survivors 2 or more hospitalizations in prior year (N=150)</th>
<th>Among Survivors 6 or more physician visits in prior year (N=368)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive help with any ADL</td>
<td>4.4</td>
<td>6.7</td>
<td>3.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Difficulty with ADL (no help)</td>
<td>1.9</td>
<td>3.7</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Any difficulty IADL</td>
<td>2.2</td>
<td>2.8</td>
<td>2.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Physical Able: No ADL or IADL</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>
A prospective study of community dwelling elderly found that a history of two or more stumbles or a history of a fall within the month preceding the initial evaluation was associated with an increased risk of falling over the subsequent year, relative risk of falling 2.3 and 5.9, respectively.\(^\text{15}\)

Tinetti developed a risk assessment scale for falls.\(^\text{17}\) She defined the relative risk for recurrent falls among the elderly in relationship to the presence of various impairments. These included:

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Rel. Risk of Recurrent Falls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to extend back</td>
<td>8.4</td>
</tr>
<tr>
<td>Mod. limitation in cervical range of motion</td>
<td>8.2</td>
</tr>
<tr>
<td>Decreased lower extremity strength</td>
<td>5.4</td>
</tr>
<tr>
<td>Self-perceived mobility problem</td>
<td>5.3</td>
</tr>
<tr>
<td>Use of a walking aid</td>
<td>4.6</td>
</tr>
<tr>
<td>Poor turning balance (observed)</td>
<td>4.5</td>
</tr>
<tr>
<td>Step length &lt; foot length (observed)</td>
<td>4.4</td>
</tr>
<tr>
<td>Decreased knee strength</td>
<td>4.2</td>
</tr>
<tr>
<td>History of falling with 1 year</td>
<td>3.7</td>
</tr>
<tr>
<td>Difficulty rising from chair (observed)</td>
<td>3.7</td>
</tr>
<tr>
<td>Poor immediate standing balance during the first 5 seconds after rising from a chair (observed)</td>
<td>3.7</td>
</tr>
<tr>
<td>Decreased distant vision &lt;20/30</td>
<td>3.5</td>
</tr>
<tr>
<td>Orthostatic blood pressure drop =&lt;20 torr at 3 minutes</td>
<td>3.4</td>
</tr>
<tr>
<td>Any abnormal lower extremity incoordination</td>
<td>3.3</td>
</tr>
<tr>
<td>Help with 2 or more ADLs</td>
<td>3.1</td>
</tr>
<tr>
<td>Poor balance upon sitting down</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Exercise Capacity. Exercise Capacity is an important predictor of cardiovascular mortality and morbidity.

Exercise intensity is often expressed in terms of the rate or oxygen consumption, i.e. in milliliters of oxygen consumed and burned by the body per kilogram of body weight per minute. A metabolic equivalent (MET) is the basal level of oxygen consumption which occurs during quiet rest or recumbency. One MET has been shown to be approximately equal to 3.5 ml of oxygen consumed per kilogram body weight per minute. Another way to express energy expenditure is in terms of kilocalories. One kilocalorie is approximately equal to the consumption of 200 ml of oxygen.

Activity level can be expressed in terms of metabolic equivalents (METS). Reclining: 1 MET, Standing: 1.5-2 METS, Walking 3 mph: 3 METS, Walking 3 mph: 4 METS, Playing golf without using a cart: 4 METS, Horseback riding (posting trot): 5 METS (this is also equivalent to the approximate peak energy requirements of activities of daily living such as bathing, dressing, etc.), Playing singled tennis: 6 METS, Jogging 5 mph: 8 METS, Shoveling snow: 9 METS, and Running 6 mph: 10 METS.\(^\text{11}\)

Cooper, in a 1989 study of 13,344 persons between the ages of 40-56 showed that the relative risk of mortality of the least fit compared to the most fit was of the order of 1.6 to 1.9. This relative risk was approximately equal to the relative risk of hypercholesterolemia, hypertension, hyperglycemia, or a positive family history or coronary disease. He also noted that when peak energy expenditure expressed in terms of METS fell below 9-10, the relative risk of mortality was increased. However, this study was limited in that it did not include elderly persons.\(^\text{18}\)

The Honolulu Heart Program followed 8,006 Japanese-American men and divided them into two age groups, those between age 45-64 and those older than age 65. These men were followed for twelve years; their activity was recorded on a daily log. Their level of activity was expressed in milliliters of oxygen consumed per hour. In those persons over age 65, mortality was 1.4 times greater in the inactive versus the total group and 2.2 times higher in the inactive versus the most active group.\(^\text{19}\)

The Harvard Alumni Study followed 16,936 alumni between the ages of 35-74. The alumni were surveyed by questionnaire. A physical activity index was constructed. It was found that the age adjusted relative risk of death for those expending less than 2,000 kilocalories/week in structured physical activity compared to those expending 2,000 kilocalories/week or more was 140%. There was a 1.2 to two-fold increased death rate in those persons over age 60 who expended less than 2,000 kilocalories/week.\(^\text{20}\) This amount of energy expenditure could be achieved by exercising at a level of 5 METS for 1 hour, 5 days each week. Some protection against mortality was also afforded to those persons expending 500 to 2,000 kilocalories/week in structured physical activities.

For those with coronary artery disease who have a peak energy consumption of 10 METS, the prognosis with medical treatment is equal to that with surgical treatment. For those who can expend 13 METS or more, the prognosis is excellent regardless of mode of therapy.\(^\text{21}\)

The prognostic value of exercise capacity was reviewed by Morris, et al. They conclude that exercise capacity seems to be an independent predictor of mortality, and when combined with clinical information or angio-
Survival in Patients with a Markedly Positive (≥2 mm ST Depression) Exercise Test

<table>
<thead>
<tr>
<th>METS</th>
<th>Percentage 6-year Survival with exercise angina (Typical Angina)</th>
<th>Percentage 6-year Survival without exercise angina (Silent Ischemia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 13</td>
<td>100%</td>
<td>97%</td>
</tr>
<tr>
<td>≤ 10</td>
<td>94%</td>
<td>87%</td>
</tr>
<tr>
<td>≤ 7</td>
<td>80%</td>
<td>64%</td>
</tr>
<tr>
<td>≤ 5</td>
<td>44%</td>
<td>60%</td>
</tr>
</tbody>
</table>

graphic data it becomes a very powerful predictor of mortality. A maximum exercise capacity of less than 6 METS indicates an increased mortality risk regardless of the underlying extent of coronary artery disease or left ventricular function. It has long been known that the prognosis is poor for those persons with established coronary artery disease who are unable to expend more than 5 METS (equivalent to the peak energy cost of activities of daily living). Thus, physical activity is an important predictor of mortality. In sum, it has been shown that the relative risk of coronary heart disease is increased 1.4-2.2 in inactive elderly compared to active elderly and that the relative mortality risk if 1.2-2.0 in inactive elderly compared to active elderly.

Cardiovascular Functional Classification Schemes. A convenient way to express exercise capacity is in terms of functional classification schemes such as the New York Heart Association (NYHA) or the Canadian Cardiovascular Society (CCVS) classifications. The Goldman Specific Functional Activity Scale (GSFAS) may be particularly appropriate for paramedical examinations or questionnaires designed to determine functional capacity.

The New York Heart Association devised a simple way of classifying functional capacity based on limitation by symptoms for a wide variety of cardiac disorders. It is commonly used in the everyday practice of medicine in some centers, and it is widely recognized among practicing physicians. In addition, this system is rational, has face validity, and is relatively easy to use.

The Canadian Cardiovascular Society proposed more detailed criteria which have been adopted by several other groups. This classification (CCVS Criteria) is very similar to the NYHA classification, but was found to be more reproducible (73% vs 56%).

The Goldman Specific Functional Activity Scale was found to be equally reproducible as the CCVS Criteria, and it was shown to have a greater validity than either the NYHA or CCVS Criteria (68% vs 51% and 59% respectively). This scale is designed as a 5-question flowsheet and is based upon the ability of the patient to perform specific activities requiring a known level of energy expenditure.

The advantages of the GSFAS are its relatively high reproducibility, validity compared to the NYHA Classification, and its ease of administration. The authors state that this scale was equally as valid when administered by a nonphysician as by a physician, and its questions were no more time-consuming than those used by participating cardiologists to estimate NYHA classifications.

Whereas none of these scales were designed to classify the degree of functional impairment due to pulmonary disease, they may be used for this purpose.

Psychiatric Disorders and Suicide. Psychiatric illness presents a significant mortality risk to the elderly. In a study of 36,529 New York State residents from 1969-1966, mortality ratios for persons having psychiatric illness over a 6-year period were 250% and 300% for males between 65-74 years of age and 75 years and older, respectively. Corresponding mortality ratios for females were 280% and 300%, respectively. In a 1981 study, psychiatric inpatients experienced mortality ratios between 240% and 290% for males between 60-70 years of age, between 210% and 330% for males aged 70 and older, between 320 and 330% for females between 60-70 years of age, and 260-270% for females age 70 and older.
In a study of 562 newly admitted patients to nursing homes in the Baltimore area, 13% were diagnosed as having depressive disorder and an additional 18% had depressive symptoms. The recognition rate of depressive disorder was 14% and 54%, respectively. Over the subsequent year, 45% of those with a depressive disorder died compared with 24% of those with depressive symptoms, and 30% of those without depression (P). Mortality ratios were increased for depressive disorder (RR=1.59; 95% CI=1.02 to 2.51; P), impairments in ADLs (RR=1.52; 95% CI=1.03-2.25; P), male sex (RR=1.88; 95% CI=1.31-2.71; P), and hospitalization during the study year (RR=1.44; CI=1.01-2.06; P).27

Psychiatric illness, including depression, is a risk factor for suicide in the elderly. Using 1985 data it was shown that the suicide rate per 100,000 members of the population was 12.3. In those between the ages of 75 and 84, the rate was 25; in those males over age 85, the rate was 56. The typical profile of an elderly suicide victim is that of male sex, living alone, often in ill health (50%). There is usually an associated high degree of premeditation and a high degree of success. Firearms are preferred over other methods. There is also a high prevalence of psychiatric disorders (75% of cases having a past psychiatric diagnosis). These diagnoses include major depression (50%), alcohol abuse (10%), adjustment disorder (10%), dementia (8%), and major depression with psychoses (4%).28

Psychiatric illness is also a risk for LTC. The prevalence of psychiatric behavioral disorders in nursing homes has been estimated to be between 68% and 94%.29 Rovner has divided psychiatric disorders seen in the nursing home into 1) cognitive disorders (delirium and dementia), 2) depression, and 3) behavioral disorders.30

Using data from the 1977 National Health Interview Survey, Weissert identified 18 variables that on multivariate analysis were found to be significantly related to nursing home use. In this study, the relative risk of nursing home use was 1600% if a mental disorder was present. This study, however, did not separate dementia from other mental disorders or nervous system diseases.31

In a review of depression in the elderly, it has been estimated that after an initial episode of depression occurring after age 60, up to 25% of elderly remained continuously ill with depressed over a mean follow-up period of 31.9 months. Physical illness, cognitive impairment, and severe depressive symptoms were frequently related to poor prognosis, whereas most social factors were not.32

In the 1988 Wisconsin Nursing Home Survey, it was shown that 21.7% of all admissions were for mental disorders excluding senility.33 These same four diagnostic categories were among the 10 such diagnostic categories associated with the longest nursing home stays.34

In addition, it has been reported that half of the patients with early onset schizophrenia who have been deinstitutionalized in the past 30 years are now in nursing homes.35

Behavior disorders are also a risk factor for nursing home admission. Behavioral disorders include acting-out of impulsive and antisocial behaviors. These behaviors are hard to manage and tax the ability of family and care-givers to respond appropriately. The causes of the behavioral disorders are many, varies, and include the patient’s frustration in growing old, underlying lifelong personality disorders, concomitant physical illness, chronic psychiatric disorders, and new or acute psychiatric illness.36 In one study it was found that 76% of residents in a community nursing home had at least one behavioral problem.39

### Nursing Home Stays

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>ICD-9-CM Codes</th>
<th>Percentage of All Admissions</th>
<th>Percentage of Residents Staying ≥3 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonorganic psychoses</td>
<td>295-298</td>
<td>8.6%</td>
<td>55.4%</td>
</tr>
<tr>
<td>Organic psychoses</td>
<td>290-294</td>
<td>7.5</td>
<td>38.6</td>
</tr>
<tr>
<td>Organic nonpsychotic mental disorders</td>
<td>310</td>
<td>4.1</td>
<td>54.7</td>
</tr>
<tr>
<td>Nonorganic nonpsychotic mental disorders</td>
<td>300-392, 306-309, 311-414, 316</td>
<td>1.5</td>
<td>46.1</td>
</tr>
</tbody>
</table>
Routine Clinical Exams Cannot Reliably Detect Functional Impairments

It is important at the outset to be aware of the lack of efficacy that a routine clinical exam has in detecting functional impairments.

It is well recognized that although physicians and nurses can recognize severe impairments in their patients, they have difficulty in detecting lesser degrees of impairments.

In a study of 79 elderly patients (age range 70-89 years) hospitalized on an internal medicine service, it was shown that the clinical judgement of physicians and nurses regarding the functional ability of their patients had good specificity (ability to recognize normal function) but had varying sensitivity (ability to recognize impairments) depending on the specific function in question. This was especially true in four areas: mental status (sens=32%, spec=88%) when compared to Cognitive Capacity Screening Examination, nutrition (sens=58%, spec=94%) when compared to the global assessment method described by Baker, vision (sens=23%, spec=100%) when compared to the actual ability of the patient to read a newspaper, and gait (sens=39%, spec=92%) when compared to watching the patient walk. The sensitivity and specificity of clinical judgments of physicians and nurses in detecting impairments in ADLs compared to the Katz inventory were somewhat better (85-92% and 88-95%, respectively) except in their ability to recognize incontinence (sens=29%, spec=91%). There was no significant difference between the physicians’ and nurses’ ability to detect impairments.

These findings are especially disturbing considering that these patients were evaluated during hospitalization, a time when they would be expected to demonstrate a high prevalence of impairments, yet most impairments went unrecognized. In addition, impairments were defined in such a way so that only great difficulty in performing a function would be considered an impairment, eg. walking 5 or less steps without a walker.

Other studies have shown that physicians document the presence of cognitive impairments on the medical record in only 23-27% of cases of dementia admitted to the hospital. It may be that cognitive deficits are recognized but not entered into the medical record. However, even upon direct questioning, physicians and nurses identified only 32% and 40% of patients with cognitive impairment.

The solution to this problem is to use an instrument (a test) to evaluate functional ability. However, screening for functional impairments with various tests also creates problems. These tests may not be reliable if done by untrained personnel. Including tests of functional ability in "MD exams" may make them prohibitively expensive. Some applicants may be offended by these tests. If the testing instruments are not selected carefully, the public, regulators, and clinicians may question the validity of the results.

Therefore, tests must be selected with care. Screening should be done only for those impairments which greatly affect the ability to underwrite a particular insurance product profitably. Simple testing instruments with objective scoring criteria should be chosen over ones that are more complex or subjective, albeit more detailed. Consideration should be given to working with paramed companies to developing economical testing techniques and strategies rather than requiring that such tests of functional ability be part of more expensive "MD exams."

What Aspects of Functionality Should Be Tested in the Underwriting Process?

The various aspects of functional assessment which may be important to consider in underwriting the elderly applicant for life insurance include:

A: Alzheimer’s disease and other cognitive disorders
A: Activities of Daily Living, including Basic, Instrumental, and Advanced ADLs
G: Gait Assessment
E: Exercise Tolerance
D: Depression and Psychiatric Impairments

ADLs. ADLs would seem to be fairly easy to assess on the basis of answers given on the application, on part II of the paramed exam, or during a telephone interview. Questions about ADLs would seem unlikely to result in complaints from applicants.

Gait. Information about an applicant’s gait and mobility status will be uncommonly encountered. Specialized tests of gait may be easily administered during a paramed exam. Such assessment may be requested if a suspicion of any gait impairment is raised on the application, medical history, or telephone interview. Such triggers might include:

1. Any history of falls in the last year not associated with recreational or physical activities (walking for exer-
Exercise Tolerance. Information pertaining to an applicant's exercise tolerance may occasionally be found in the medical record or calculated from the results of a treadmill done for clinical reasons or requested for cause or to satisfy age and amount requirements. If none of this information is available, an applicant's exercise tolerance may be estimated from answers to a few questions that may be asked as part of a telephone interview or on part II of the paramed exam.

This leaves the areas of cognitive assessment and the assessment of depression for further consideration. There are possible benefits to be realized from assessing functionality in both of these areas. However, because of the potential for criticism from applicants, agents, and perhaps to a lesser extent from attending physicians, we must exercise great care in determining which applicants should have further assessment in these areas.

Just as comprehensive geriatric assessments have been shown to be of little value in both the very highly functioning or low functioning elderly, tests of functional ability may be expected to be of little value in elderly applicants who have multiple impairments or in those who by all other indications are functioning at a very high level. Functional assessment in the underwriting process should target those elderly applicants who are not otherwise declinable and who have risk factors for, or some indication of, an increased likelihood of functional impairment.

Alzheimer's Disease and Other Cognitive Impairments. The presence of dementia is a risk for LTC and subsequent mortality. Dementia is defined as a global impairment of cognitive function. The prevalence of dementia is about 5% in persons over age 65 and rises to about 20% by age 80. Dementia is a leading cause of death in the United States and has been estimated to account for 120,000 deaths per year. It may decrease life expectancies by one-half to one-third that of healthy persons of the same age.

Between 50-75% of those patients with dementia have dementia of the Alzheimer's type (DAT).

In a study of 200 patients having a mean age of 73.9 years at the onset of dementia, the median survival from...
the onset of dementia was found to be 9.3 years, (1.8 to 16+ years).46

Using this data, one can then estimate the consequences of accepting at a standard rating those cases with mild Alzheimer’s disease (It is assumed that cases of severe Alzheimer’s disease or Alzheimer’s disease associated with nocturnal wandering or other behavioral disturbances will have been identified by telephone interview and/or by reviewing medical records.)

Thus, from this analysis it appears that although Alzheimer’s disease that has been diagnosed is responsible for a significant increase in mortality risk (+110%), the aggregate risk of early Alzheimer’s disease in the elderly population, as long as there is not significant antiselection, is much less (+6 to +20%). Furthermore, most of this increase in risk appears after the first five years. During the first five years, the mortality risk is essentially standard.

Therefore, it may not be necessary to screen all applicants for the presence of dementia. Deferring dementia screening would certainly have the benefits of reducing underwriting costs, speeding up the underwriting process, and avoiding the criticism that would likely result from such screening.

If screening for dementia is not done, it would be especially important to protect against antiselection by carefully reviewing medical records and by being alert to any indication of impaired cognitive ability detected in the underwriting process. If any indication of impaired cognitive function is detected, a specialized tests of cognitive ability and/or a postponement would be appropriate.

Depression. A similar analysis for the mortality risk associated with depression reveals a somewhat greater mortality risk than for Alzheimer’s disease.

The mortality risk associated with depression is significantly elevated for young and middle aged persons (370%) and extremely elevated for the elderly (600 to 2000% in the first year).

In a long term follow-up study of 89 patients drawn from all age groups, 47 the observed 15-year cumulative death rate was 225/1000, resulting in a 15-year cumulative mortality ratio of 190% compared to the general British population. The cumulative excess death rate was 107/1000/15 years. The anticipated death rate based upon the basic 7580 tables would be 39.77/1000 over 15 years. Thus, the 15-year select/observed mortality ratio would be (107+39.77)/39.77 = 369%.

In another study of Finnish elderly identified by screening for depressive symptoms and followed for a mean of 15 months, the 1-year mortality ratio for men and women combined was 1930%.48

Finally, in a study of elderly Baltimore nursing home patients, the relative risk of death at one year attributable to depression was 159%.49

There were 140 excess deaths per thousand in the depressive groups compared to those without depression, which when compared to the expected death rates in an insured elderly population gives a mortality ratio of 1100%.

The prevalence of depression in elderly outpatients has been stated to range from between 7% and 25%. Using a prevalence of 12.5%, an analysis similar to that performed for Alzheimer’s disease indicates that the aggregate expected mortality ratios for depression to be between 130% and 330%.

Thus, it may be more important to screen elderly life insurance applicants for depression than for cognitive impairment.

Specialized tests for depression screening in the elderly have been developed (see below). However, using these tests indiscriminantly also has disadvantages similar to those for dementia screening tests.

Fortunately, risk factors have been identified which predict depression or suicide in the elderly.50,51 These include:

- Male sex
- Physical illness that produces symptoms or functional limitation
- Solitary living situation
- History of previous depressive illness
- History of previous suicide attempt(s)
- Bereavement
- Debt or decreased income
- History of drug or alcohol abuse

Some of these risk factors, such as financial instability, would make an elderly individual ineligible for some types of life insurance. Others would be cause for declination. However, it may be that the presence of other risk factors (identified by *), while not a cause for declination, should prompt further evaluation for the presence of depression with a specialized test or examination.
Summary and Recommendations

Consideration should be given to:

1. Obtaining medical records on all elderly applicants.
   Physician's statements are of limited value.
2. Screening applicants with a telephone interview incorporating items from ADL/IADL survey instruments.
3. Testing selected applicants who have a suggestion of cognitive impairment but who do not carry the diagnosis of dementia with a test for cognitive function.
4. Evaluating selected applicants who have risk factors for or a suggestion of depression who are not otherwise declineable and who do not carry the diagnosis of depressive illness or symptoms with an instrument designed to screen for depression.
5. Modifying Part II and Part III of applications to better assess important risk factors in the elderly population.

APPENDIX

Survey of Various Instruments for Assessing Functional Ability

(Note: Instruments which may have applicability in screening elderly insurance applicants for life or long-term care insurance are indicated by *)

Cognitive Ability. Some of the more commonly used instruments to assess mental status include:

- the Wechsler Memory Scale (1945)
- the Blessed-Information-Memory-Concentration Test (1968)
- the Folstein Mini-Mental State Exam (1975)
- the Pfeiffer Short Portable Mental Status Questionnaire (1975)
- the Kokman (Mayo) Short Test of Mental Status (1987)
- the Knopman Delayed Word Recall Test (1989)

Physical Functioning. Some of the more commonly used instruments to assess physical functional ability include:

- the Katz ADL scale (1963)
- the Barthe Index (1965)
- the Kenny Self-Care Scale (1965)
- the Performance test of ADLs (1976)
- the 5 Item OARS (1978)
- the Framingham Disability Study (1981)
- the Jette Functional Status Questionnaire (1986)

IADLs
- the IADL Scale of Lawton and Brody (1969)
  * the Fillenbaum Brief IADL Measure (1985)
  the 7 Item OARS, items 56-62 (1988)

AADLs
- the Rosow-Breslau Hierarchical Health Scale (1966)
  * the Reuben Hierarchical Exercise Scale for AADLs (1990)

Multi-Dimensional Tests and Other
- the COOP Chart Method of Functional Assessment (1987)
- the MOS Short-form General Health Survey (1988)
- the Reuben Physical Performance Test (1990)
- the Williams Timed Manual Performance Test (1990)
- the Pannill Patient-Completed Screening Instrument for Functional Disability (1991)

Emotional Status. Some of the more commonly used instruments to assess emotional state included:

- the Beck Depression Inventory (1961)
- the Zung Self-Rating Depression Scale (1965)
- the Hamilton Depression Inventory (1967)
  * the Yesavage Geriatric Depression Scale (1983)
- the Short Care Scale (1984)
- the Cornell Scale
- the Profile of Mood States

Gait and Mobility. Some of the more commonly used instruments to assess gait and mobility include:

- the Tinetti Performance-Oriented Assessment of Mobility (1986)
- the Mathias Get-Up and Go Test (1986)
  * the Timed Up & Go Test (1991)

REFERENCES


52. Newirth FJ, Vice President and Medical Director, AMEX Life Assurance Co., Oct. 9, 1992, personal communication.