

**Guidelines in Medicine**

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VOLUME 1

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**GERIATRICS**

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by A.N. Exton-Smith  
and P.W. Overstall

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**GERIATRICS**

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# 1

## Ageing

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The more one thinks and talks about 'the elderly' the easier it is to forget that in clinical practice one is always dealing with an individual. Although some useful generalizations may be made about the ageing process and the differences in disease presentation and management of the older patient, it is a mistake to regard the elderly as a homogeneous group. Indeed, variations between individuals tend to increase with age.

The physiological, psychological and social changes that occur in old age can be regarded as being, potentially, an experience common to all and comparable to the effect of puberty on adolescents. How an individual responds to growing old appears to depend more upon his previous pattern of life than upon anything in the ageing process itself.

### LIFE EXPECTANCY

This is a statistical projection based on the annual death rate and is not related to ageing changes in individuals. A simple formula was shown by Gompertz in 1825 to predict accurately the probability of dying at any given age: the probability rising exponentially with

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increasing age beyond 30 years.

There has been a remarkable increase in life expectancy in developed countries over the last century. This has been largely due to improvements in nutrition and public health measures which reduced water- and food-borne diseases. The influence of immunization and therapy had little effect on mortality until the introduction of sulphonamides in 1935, and even since then has probably remained much less important than continued improvements in nutrition and the environment (McKeown, 1976).

Despite the considerable reduction in deaths occurring before the age of 65 there has been very little increase in life expectancy for those who reach that age, so that although life expectancy at birth between 1911 and now has increased from 49 to 70 years for men and from 52 to 76 years for women, there has been only a 1-year increase in life expectancy for men at 65 years, and 4 years for women. The population 'bulge' of elderly people is due to late Victorian and Edwardian fecundity. Large families, that were raised in the expectation that half would die in infancy, have in fact survived. It is not so much that the elderly are living longer as that more are reaching old age.

## THEORIES OF AGEING

There is at present no single theory that adequately explains ageing throughout the body. A satisfactory model for ageing in connective tissue does not explain changes in epithelial cells that divide throughout life, or non-dividing cells such as neurones. Indeed it is probable that different tissues age in different ways.

### *Genetic factors*

Genetic factors undoubtedly affect ageing, and this is most apparent in variations in life span between different species. Man may live for 70 years, but a butterfly for only 24 hours. Within the same species the range of individual life spans is smaller than that between different species, and it was shown in the 1930s that the life span of any human

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could be predicted with some accuracy given the age at death of the parents and four grandparents. The question is whether genetic material is programmed from the start to produce ageing after a certain period (in the same way that puberty is triggered) or whether genetic instability, either through copying errors or through chromosomal damage, produces malfunction.

### *Error accumulation*

Actively dividing cells depend on the accurate transmission of genetic material from parent to daughter cell. Information is programmed in nuclear DNA and transcribed to the messenger RNA of the daughter cell, which acts as a template for protein synthesis. Enzymes are involved at all stages and, if faulty, would impair protein production; eventually the accumulation of errors could cause cell malfunction.

What is not clear though is the cause of the first error. It may be a mutation of nuclear DNA or, just as likely, a failure of feedback mechanisms to correct errors that are inevitable in a biological system. A single faulty enzyme could rapidly produce third- and fourth-generation errors in protein synthesis so that the number of errors needed to impair cell function need only be small. Why this process is not harmful in youth may be due to an efficient immune system that declines with age. Although chromosomal aberrations increase with age it still has to be shown that irreparable faults in DNA, RNA or protein synthesis are the actual cause of ageing.

### *Mutation*

This is defined as a faulty transcription of DNA during mitosis. Ageing may be due to an accumulation of mutations caused by radiation and other environmental hazards such as toxic chemicals. Certainly, repeated small doses of radiation will reduce an animal's life span and the effect of both ageing and radiation is to increase the number of mutations. The longevity of an old animal is inversely proportional to the number of mutations that develop, but there appears to be a fundamental difference between the mutations produced by age and those that follow radiation. For a given number of mutations the life-shortening effect of the naturally produced variety is much

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greater than that of radiation. In addition, mutations produced by radiation only survive a few divisions and then disappear, which implies that radiation damage is normally repaired (Busse, 1977).

### *Programmed ageing*

The idea that ageing is due to the running down of a biological 'clock' is an attractive one. Growth and puberty are genetically determined and it is probable that ageing is too. For some time it was thought that ageing occurred at a supracellular level in the animal as a whole, since an early *in vitro* experiment had apparently shown that cells could be cultured indefinitely. Immortal cell lines are still cultured (such as the Hela-cell derived from a human cervical carcinoma), but it is now clear that only abnormal cells behave in this way. Hayflick (1976) has shown that there is a fixed number of divisions that a normal cell can undergo before it dies. Normal human embryonic fibroblasts will undergo  $50 \pm 10$  doublings *in vitro*. The *in vitro* doubling capacity declines with increasing age of the animal so that fibroblasts from adults divide only  $20 \pm 10$  times. Predictably, cells grown from patients with progeria, who have accelerated ageing, show a considerable reduction in doubling capacity compared with normal persons of the same age. Hayflick has also shown that the 'clock' controlling the finite number of cell doublings is located in the nucleus, and that although cells may be stored almost indefinitely at low temperatures, when reconstituted the culture will still die after making its total of about 50 doublings.

### *Cross-linkage*

This is an age-related process that is found in collagen, but not in intracellular protein. With age, ester bonds form between collagen molecules producing dense knots that alter the structure and function of connective tissue (Hall, 1976). Skin loses its elasticity, the resilience of intervertebral discs declines, and tendons and collagenous sheaths around muscles become increasingly rigid.

### *Free radicals*

These are molecular fragments which contain an unpaired electron,

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and are therefore highly reactive. They are formed during normal metabolism and also from chemicals found in food and tobacco. They are considered harmful because it is thought that they increase mutation, promote cross-linkage and may be involved in the development of ageing pigment. Free radicals are inactivated by anti-oxidants, of which Vitamin E is an example. Attempts to show that Vitamin E can prolong life have not yet proved conclusive.

### *Immune theory*

Considerable interest has been shown in the thymus since it may, through its role in maintaining immunological competence, be responsible for the appearance of senescence. If ageing is due to increasing autoimmune aggressiveness it would fit well with the observed age-related involution of the thymus and weakening of immunological surveillance. With advancing age there is a reduction in peripheral blood T-cells, which are responsible for cellular immunity and delayed-type hypersensitivity. Skin-test antigens such as tuberculin and dinitrochlorobenzene (DNCB), which provoke a delayed-type hypersensitivity reaction, are less likely in the elderly to produce a positive result. The decline in T-cells is also associated with a rising incidence of infections and malignancies. B-lymphocytes, which develop into plasma cells and are responsible for the synthesis of circulating antibodies, increase with age. Autoantibodies and serum immunoglobulins (mainly IgG) progressively rise, and so does the incidence of multiple myeloma and giant cell arteritis.

### SOCIOLOGICAL FACTORS

Nearly 20% of the population of Great Britain is over the age of 60. This proportion is very similar to that found in France and West Germany and is slightly higher than that in the USA and the Netherlands. India and Brazil have only 4% of the population over 60 years. The

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majority of the elderly in this country are the 'young old', below the age of 75, who are usually still in good physical and mental health. But this leaves 25% over 75 years; 2.75 million people, who, as a group, are the largest users of Health and Social Services. It is in this group that a considerable increase is expected over the next 20 years.

There is no reason why the projected population figures should cause despair, since in all the industrialized countries affected there already exists the knowledge and skill necessary to maintain an effective service, provided that resources are shifted to meet the new need. More money alone, however, is not sufficient; we need to question some of the widespread assumptions that are made about the elderly.

### *Negative attitudes*

#### *Employment*

Most Western countries have a strong work ethos, and prize productivity and earning capacity, so that the retired worker tends to be regarded as a less than useful citizen. The increasing cost of contributions by the working population to maintain adequate pensions for the retired can produce resentment if it is forgotten that much of today's affluence is the fruit of earlier generations' toil. The decline of crafts and family businesses in favour of mechanization and large industrial complexes lessens the value of the older person's experience and often makes his skills obsolete.

#### *Fear of ageing*

Each of us must face the prospect of growing old and dying, and the current taboo which surrounds death does not encourage a calm acceptance of the realities. Personal fears of disability and suffering may sometimes be relieved only by adopting denigratory attitudes to the elderly, or by a tendency to sentimentalize. Calling old people 'those geriatrics' or regarding them as naughty children to be patronized by the use of endearments are common examples.

#### *Illness and morale*

A common fallacy is to regard all old people as being in poor mental

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and physical health and as 'blocking' hospital beds up and down the country. In fact 95% of the elderly live in their own homes and most rate their health as good or fair. It is often thought that old people feel sorry for themselves and are bad-tempered, but there is little or no sign of a significant decline in happiness or life satisfaction with age (Palmore and Maddox, 1977).

### *Sexual experience*

The taboo on sex in old age, which survives despite the greater liberality and frankness with which the subject is treated in other age groups, means that difficulties can arise. Kinsey first showed that a large number of the elderly engaged in sexual activity. In the longitudinal study at Duke University it was found that over a 10-year period the percentage of healthy men who had regular sexual intercourse declined from 70% to 25%, but the percentage who retained a sexual interest remained constant at about 80%. In women only 20% reported having regular sexual intercourse and about a third continuing sexual interest, but these percentages remained constant over the 10-year period (Pfeiffer, 1977).

The status of the elderly in our society varies so widely with sex, socioeconomic group and ethnic origin that one should regard with some caution the tendency to ascribe qualities, often negative, to the group as a whole. Constantly emphasizing that the elderly are poor and deprived tends to encourage people to expect the worst. To limit one's concern to purely financial matters may be an implicit denial of the old person's personal and emotional needs (BASW Working Party, 1977).

## *Poverty*

There are substantial differences in income between different retired households, although inequalities are less than in the general population (Age Concern Research Unit, 1977). In 1975 the average weekly income of a household where the head was retired was £34.63, compared with £84.31 for a household where the head was still working.

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However, only one retired household in eight has a weekly income close to this average: 37% have weekly incomes below £20, and 13% have incomes of at least £60. By contrast figures for average income per head show that even in the poorest elderly household the income is at least 80% of the average found in households where the head is still working.

As might be expected most elderly households rely heavily on social security benefits, and these payments range from a minimum of 45% to 60% of total average income. Yet when elderly people were asked: 'How much extra money, if any, would you say you and members of your household need to come in each week in order to live without money worries and in health and comfort?' 40% said none, compared with 29% of young adults who replied similarly. The extra money that was needed by the elderly was very small: an average of £8.50 a week, which was less than half the extra amount that young adults felt they needed.

### *Standard of living*

The elderly have a lower rate of ownership of consumer durables than young adults, but are also less likely to have feelings of deprivation (Age Concern Research Unit, 1977). Indeed there is a considerable contrast in the elderly between their standard of living as measured by ownership of consumer goods and how they see it themselves. They generally express much more satisfaction with their standard of living than younger groups. Most elderly people express more satisfaction with their housing, the district they live in, their standard of living and their leisure activities than younger adults. Only in their satisfaction with their health is the trend reversed. The most common complaint in the elderly (25% of the sample) is general aches and pains. Despite the high overall life satisfaction of the elderly, one in five express a very low level of satisfaction. This minority contains a high proportion of women living alone, who regard themselves as being in very poor health.

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### *Loss*

Ageing has been described as a time of loss. The increasing prevalence of suicide and depressive illnesses shows that not all elderly people make a satisfactory adjustment.

### *Work*

Compulsory retirement means not only the loss of a job, but also loss of a routine, comradeship, status and income. For many men, going to

TABLE 1  
POINTERS TOWARDS SUCCESSFUL RETIREMENT

---

- 1 *Plan ahead*  
Consider finance, part time job, new routine.
  - 2 *Move house?*  
Advantages in moving to smaller house in same district.  
Disadvantages of 'the cottage by the sea' (loss of friends and neighbours, isolation, lack of transport, overstretched social services)
  - 3 *Maintain physical activity*  
Regular exercise (raise pulse rate to 120/min for 2 min a day and put every joint through a full range of movement). Develop hobbies and games.
  - 4 *Keep up morale*  
Maintain mental activity. Question long held beliefs (e.g. political).  
Make new friends.
  - 5 *Improve home safety*  
Check stair rods, remove high shelves and trailing wires.
  - 6 *Find new role*  
Remain 'engaged'.
  - 7 *Forget chronological age*
-

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work has been the focus of their lives, and some never manage to fill the emptiness that retirement brings. Pre-retirement counselling can produce useful adjustments in attitudes as well as in more practical arrangements. Retirement no longer signals the end of a person's useful life: most who reach retirement age can expect to live for another 15–20 years.

For a woman retirement is often easier because she still has a house to run and usually has developed a network of friends, neighbours, shopkeepers and delivery men around where she lives. However there may be considerable stress on a marriage when husband and wife suddenly find themselves at home together all day.

### *Gift relationship*

The loss of income on retirement threatens the loss of what anthropologists call the gift relationship. Giving money in exchange for goods; labour in return for wages is a fundamental part of life. The ability to 'pay one's way' may be lost either through poverty or disability, and to go from a position of being able to give to that of being only able to receive is, for some, a bitter experience.

### *Independence*

Increasing ill health threatens old people's independence, so that many are able to survive at home only with the help of a relative or social services. Physical infirmities may mean that dressing, washing or walking become so troublesome that the person, without being depressed, declares that life has become too difficult and tiring, and that they are ready to die.

### *Bereavement*

Death of spouse, relatives and friends are yet further blows. Grief and even anger need to be worked through, and the person needs help to face the loss and make the necessary adjustments.

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### PSYCHOLOGICAL FACTORS

The mental adjustments of old age are part of the continuous adaptation that goes on throughout life. Despite the similarity of the process at different ages there is an artificial division so that childhood and youth are seen as the time for education; middle age as the period when one builds a career; but it is not usual to recognize old age as a time for development. Yet the process of formulating short- and long-term goals, realizing ambition and coping with disappointments is essentially the same throughout life. The elderly have as much need to adapt to their surroundings as anyone else, but where there is mental or physical deterioration the ability to adjust is diminished.

#### *Activity or disengagement*

The recognition that some people have difficulty in adapting as they grow older has prompted considerable discussion on the nature of this change. In the early 1960s the theory was put forward that natural disengagement of society and the individual from each other was not only desirable for successful ageing but was inevitable, and should be regarded as the normal pattern. It was felt to be an essential adjustment that would conserve the elderly person's dwindling physical and mental resources. By contrast the activity, 'engaged' theory holds that most people maintain the same level of activity as they age, that decline of activity reflects ill health and not ageing as such, and that high levels of activity are reflected in a more successful old age (Palmore and Maddox, 1977). Most of the evidence, in particular the Duke longitudinal study, suggests that in Western society the activity theory is more appropriate. Over a 10-year period men showed little or no reduction in activity or life satisfaction, though for women there was a small decline in both activity and satisfaction. Although most people drop certain activities as they grow older they take up new ones instead, so that the overall level for individuals remains fairly constant. Certainly there appears to be a close correlation between a high

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morale and high levels of activity. However, some elderly people disengage and express considerable life satisfaction. Much depends on their cultural background and previous life styles, so that in India it excites little comment if a man at retirement age withdraws from society, leaves his family and becomes a mendicant.

### *Loneliness*

With increasing age there is a greater chance of death of one's spouse, and at this time there is an increased risk of suicide. Although elderly people who live alone are more likely to complain of loneliness, single people are less likely to be lonely than those who have been widowed, divorced or separated. It would seem that desolation, rather than isolation, is the main feature of loneliness, and it is common to find people in residential homes who complain of loneliness despite the constant presence of other residents. The feeling that there is no friend or relative who cares for them, and a sense of exclusion from the rest of society, are common.

### *Intelligence*

It has become apparent in recent years that there is no simple correlation between advancing years and declining intelligence. Many of the preconceptions are based on Wechsler's cross-sectional study with the Wechsler Adult Intelligence Scale (WAIS), which showed a peak of mental ability in the mid-20s and a steady decline after the age of 30. Cross-sectional work not only produces errors because of the differences between generations caused by variables such as educational standards, length of time at school, standards of housing, nutrition and public health, but also, in the case of the elderly, it does not allow for a decline in physical health. A quasi-longitudinal study has shown no sign of decline; instead IQ scores increased slightly up to the age of 50 and thereafter there was only a very small decline. It is acknowledged that the decline shown in cross-sectional studies may be 'an artifact which merely reflects and catalogues the differences in the sociocultural milieu and experiences of the different gener-