

Body composition and aging: a practising clinician's point of view

Derek M. Prinsley

19/37 Foley St., Kew, Victoria 3101, Australia

Human size and shape vary widely. Relative obesity or apparent under nutrition may not limit survival into old age. Normal body appearance can mask gross malnutrition, particularly mineral and vitamin deficiency, problems of measurement in the elderly. Obesity is associated with joint degeneration and systemic disease but with reduced incidence of fractures. Undernutrition is associated with skin breakdown, poor wound healing and fractures. Body composition changes due to disease include dysphagia, myxoedema, anaemia, chronic cardiac and renal disease. Skeletal changes include osteoporosis and Paget's disease. Body composition can change due to treatment, control of dietary energy intake and tube-feeding.

It is not practical to generalize about changes in body composition of elderly people. Fortunately aging does not affect all body tissues and functions uniformly and simultaneously. The clinical impression that most old people are thin and frail is then contradicted by the picture of robust, active and bright 80-year-olds off to bowls or the University of the Third Age.

Certain inevitable changes have to be faced due to physiological aging of body tissues, particularly collagen. There are widespread consequences from reduced elasticity and stiffening with aging of this structural item of body composition. A very early effect is the stiffening of the ocular lens which results in a need for reading glasses by the age of 50 for many people. Skin wrinkles and thinning hair are external signs of aging changes of body composition. Internal organs are also aging.

The liver becomes smaller and has diminished blood flow with consequent reduced protein synthesis and ability to metabolize drugs. Kidney size diminishes with parallel loss of glomerular and tubular substance. Fewer functioning nephrons and reduced blood flow results in vulnerability to renal insufficiency in any acute illness.

Ideal body weight in old age covers a wide range but it seems that significant levels above or below this range carry increased mortality risk. At what point is intervention justified? Overindulgence in food may be the only pleasure in old age but often stems from bad habits in earlier years with both cultural and genetic factors involved. Reduced physical activity and accompanying reduced appetite often leads to weight loss. Unchecked weight gain soon becomes obesity which leads to degenerative arthritis, diabetes and hypertension. Overeating is usually denied. Probing enquiries into food intake will often reveal a pattern of almost continuous snacking. 'Only a sandwich' needs to be described, particularly in the USA. The enormous quantity of filling plus sauce plus 'French fries' is not just a snack. Frequent fare of this type is far in excess of energy needs. Food availability, financial resources, ethnicity and geography all have an influence on body composition of people reaching old age. Body

weight finally tends to stabilize by coordination of level of physical activity, economic access to food and activity of hypothalamic centres for appetite and satiety.

Physicians are aware of a multitude of social and medical risk factors which may upset this physiological stability. Adverse social conditions include poverty, bereavement and isolation. Poor housing and cooking facilities, lack of food storage and decent local food shops exacerbates life-long bad food habits. Immobility, alcohol and bad weather are further reasons for prolonged mismanagement of nutrition.

Chronic neurological conditions with feeding difficulty, depression, arthritis, failing eyesight and poor dental health are to be added to more florid conditions which are medical risk factors. A clinician needs to be fully aware of less obvious background factors in health care of elderly patients which may only come to light when a home visit is made.

Disease caused by malnutrition may be discovered in apparently well-nourished patients. Zinc deficiency presents with a complex nonurgent clinical picture without evidence of change in body composition. Scurvy always produces anaemia but calorie intake is otherwise adequate to maintain body weight in this malnutrition disease.

Measurement of body composition in the elderly is no easier than in other age groups. Haematological indices can be accurately measured and should be within normal range for all age groups. Biochemical indices in healthy old people have wider ranges for both low and high 'normal' levels. Anthropometry, apart from weight measurement, is full of practical difficulties. Measurement of height is disturbed by the stooped posture of many old people. A calculation of height can be made from iliac crest to knee joint in bedfast or chair fast patients. This measure is not affected by osteoporosis. Arm circumference seems to be unreliable due to muscle wasting and centripetal redistribution of body fat. Waist and hip circumference ratios are also unreliable due to general loss of abdominal muscle tone. Bioelectrical impedance studies in the elderly suggest that the proportion of body fat remains the same but total fat increases due to increased

body weight. Large amounts of body fat and reduced muscle mass have important implications for drug management.

Avoidance of obesity in old age is clearly indicated. The major geriatric diseases of stroke, diabetes, hypertension and arthritis are all associated with obesity. Elderly diabetics suffer accelerated arterial degeneration. While diet control is the obvious approach to management this is less than satisfactory where food is there and resolve is lacking. The USA practice of treating all elderly diabetics with insulin rather than attempting diet control is understandable.

We tend to visualize little old ladies as ideal, implying that thin and small is good. However, recent life tables of insurance companies seem to indicate that being moderately above accepted normal weight for age and height carries a better prognosis for long survival.

Body composition can be drastically affected by diseases which are common in geriatric practice. Fluid overload in congestive heart failure is readily recognized. Increase in body weight and apparent fluid retention in thyroid deficiency is less obvious. Loss of bone mass and skeletal changes due to osteoporosis are more of a challenge. Vertebral body compression with height loss is more apparent than changes in bone shape of the mandible which results in the foramen for exit of the mandibular nerve becoming directly and painfully compressed when chewing harder fibre containing foods. The cycle is thus established for soft foods only, increasing constipation, loss of appetite and loss of weight.

The most significant aspect of changes in body composition in old age for the clinician is in the use of drugs. Many older patients are justifiably on treatment for more than one disease with multiple potent drugs. Unwanted and unexpected effects associated with old patients are becoming better understood with development of clinical geriatric pharmacology. Absorption, distribution, metabolism and excretion of drugs are all altered by changes in body composition.

General unreliability about which drug, which dose and when to take it is only the beginning of medication problems. After the drug has been swallowed absorption takes place into a generally less hydrated body. Older people have diminished thirst sensation and do not drink enough. Consequently distribution of water soluble drugs occurs in increased concentration. This includes alcohol which is rapidly absorbed through the stomach. Older people have increasing difficulty in handling alcohol and the wiser ones learn to limit their intake.

Increased body fat stores create hazards with fat soluble drugs. Typical problems caused by hypnotics are related to storage of early doses in fat depots with consequent apparent ineffectiveness. Increased doses are prescribed and the full potential of the drug then is revealed. Toxic drowsiness will persist for days even if the hypnotic is discontinued immediately. The fat stored drug continues to be released into the circulation for several days.

Drugs which are stored in muscle may reach toxic levels because more free drug remains in the circulation when muscle mass is reduced. Digitalis is stored in muscle. Older patients do not require a loading dose and maintenance doses are smaller.

Serum albumen levels in old age may be low which indicates that drugs which are usually protein bound may be in the free form in large amounts. Competitive binding in the reduced albumin pool may result in one of two normally protein-bound drugs being released in toxic quantity. For example, bound warfarin may be displaced by another acidic binder such as aspirin, causing bleeding.

Drugs which are metabolized and broken down in the liver depend on integrity of the liver. Liver mass and liver function diminish with increasing age and allowances must be made by prescribing smaller doses and restricting use of some drugs.

Metabolized drugs are excreted through the kidneys. Drugs which are not broken down, such as digitalis, are excreted intact through the kidneys. Kidney size and function diminishes but does not impede drug excretion unless renal disease is also a factor. Impaired renal function tests make for caution in drug management.

Clinical trials of new drugs have used younger adults but recently trials have included older subjects and drug manuals are increasingly showing adult and geriatric doses. Pharmacology of old age is now receiving recognition.

Clinicians treating acutely-ill old patients have major concerns with fluid. Dehydration and failing cardiac and renal function are priority issues. Fluid overload in congestive heart failure requires equally urgent treatment. Other body components are barely considered in emergency situations. In less acute conditions, and in general long-term supervision of elderly patients, more attention can be directed towards body composition as a whole and the possibility of modification if indicated.

There is scope for education of older people about lifestyle, nutrition and use of drugs. The importance of weight control needs to be emphasized. A daily half-hour walk and cutting out saturated fat in the diet were the conclusions reached by a recent Conference on Nutrition and Fitness in Athens which should help us all, including the elderly, to reach an Olympic ideal. Drinking more fluid would also seem to be useful advice for the majority of older people. Many of the changes in body composition cannot be influenced and need to be kept in mind particularly in medication. Any possible improvement would be achieved mostly by weight control and better nutrition. The best contribution the clinician can make is to be fully aware of important changes in body composition of the elderly and act accordingly.

Bibliography

- 1 The adult. Chapter 5 in Human body composition. Gilbert B. Forbes - 96394 - 4. Springer-Verlag, 1987.
- 2 Estimating Body Composition in Children and the Elderly. Chapter 6 in Advances in Human body composition assessment, Timothy G. Lohman.
- 3 Nutrition and Aging, Clinics in Applied Nutrition, vol 1, No 4, 1991.
- 4 Steen B. Body composition. In Horwitz A, MacFayden DM, Munro H, Scrimshaw NS, Steen B, Williams TF eds. Nutrition in the Elderly. Oxford: Oxford University Press, 1989.
- 5 Warne RW, Prinsley DM, eds. A manual of geriatric care. Williams & Wilkins, 1988.