from the few patients contributed that the psychiatrists in the other centres were far more selective and entered only those they judged to have an intermediate prognosis.

Conclusion

The hypothesis put forward derives reasonable support from the first and third studies considered, but its application to the fluphenazine trial is purely speculative. It does, however, provide an explanation for conflicting results from trials of the same

treatment. It also suggests that positive results of clinical trials are unlikely to be applicable to the whole range of patients suffering from a particular condition.

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Medicine in Old Age

Diet in the Elderly

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The King Edward's Hospital Fund's 1965 report of an investigation into the dietary of elderly women living alone starts by stating "The precise nutritional needs of old people are unknown." Such is still the case today. Logically the subject may be divided into two headings: (1) overnutrition, and (2) undernutrition, with malnutrition affecting both groups. Nevertheless, though Sheldon noted that 20% of women over 80 were overweight, overnutrition can hardly be said to be a major problem in clinical geriatrics, even though it may produce sequelae such as atheromatous degeneration and osteoarthritis.

The precise definition of both undernutrition and malnutrition becomes impossible if the normal nutritional needs are not known. Opinions vary widely about the incidence of malnutrition, particularly if subclinical malnutrition is looked for. Not surprisingly the incidence depends on the type of person investigated; thus it is lower in incidence among healthy people living at home than in enfeebled people in institutions. Geography has some bearing by reason of social factors, and the amount of sunlight and racial factors may also influence the incidence. Practising geriatrics in a predominantly working class area with a low retirement income, I find malnutrition in one form or another to be very common in hospital admissions.

Social, Clinical, and Environmental Factors

To consider diet in isolation could become an intellectual abstraction, for eating is not solely to sustain life: the preparation and consumption of food is done with others for enjoyment. Thus social isolation due to bereavement or families living some distance away plays a large part in malnutrition. Furthermore, depression in all its shades may be responsible for much self-neglect, while increasing physical infirmity leads to problems in shopping and cooking, compounded by poor housing and the isolation of houses from shops. Retirement to a "place near the

sea" often brings unexpected difficulties when infirmities develop.

Illness in old age may lead to an inadequate diet, and it is important to remember that diseases of the gastrointestinal tract complicated by malabsorption may be asymptomatic. Very often the patient forgets to say that he has undergone a gastrectomy. Jejunal diverticula may be found in patients with osteomalacia or vitamin B₁₂ or folic acid deficiency. Idiopathic steatorrhea can present in the elderly and blind-loop syndromes may also be seen. Drugs present an additional nutritional hazard and it is well known that barbiturates and anticonvulsants lead to folic acid deficiency. Not so widely recognized is that these drugs may precipitate osteomalacia because of an increased rate of breakdown of vitamin D metabolites.

Long-stay patients in institutions are often bereft of sunlight and have diets low in vitamin D and sometimes calcium. Thus, not surprisingly institutional osteomalacia may occur as well as scurvy, iron deficiency, and folate deficiency: 20% of patients recently admitted to hospital from a chronic sick institution were found to have biochemical osteomalacia.

The Ideal Diet

Longitudinal studies of the diet of old people show that there is an élite group whose nutrient intake is high and changes little with age. In others the nutrient intake declines probably owing to illnesses. The oft quoted "normal" decline in dietary intake after 80 is probably due to cross-sectional studies being used.

The total calorie intake needs to be related to energy expenditure, which is often quite low—even below 2,000 calories. Thus a reducing diet often has to be much lower than realized—600-800 calories, for instance.

The élite group referred to above was notable for having a high protein intake, 70 or more g per day; 58 or 60 g is the estimated need.

To provide 30% of the required number of calories would mean a fat content of 66 g for a 2,000 calorie diet and hence the normal intake of fat could vary from 50 to over 100 g.

Sixty per cent. of the calorie requirements can be derived from carbohydrates, 266 g being needed for a 2,000 calorie diet.

The estimated vitamin needs are shown in table I.

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TABLE 1—Daily Vitamin Needs for Elderly

Vit. A	Vit. B ₁	Vit. B ₂	Vit. B ₁₂	Folic Acid	Vit. C	Vit. D
5,000 I.U.	0.8 mg	1.3 mg	1 mg	250 mg	? 20 mg	?250 I.U.

The minimal quantity necessary of both vitamin C and D is not known accurately, and the limit of 20 mg of vitamin C may well be too low. 250 I.U. of vitamin D is an inspired guess and is half the daily need of a child.

The estimated daily mineral needs are probably 800 mg for calcium and 12 mg for iron. Cobalt, copper, magnesium, zinc, and other trace metals do not usually need to be considered by the clinician—though zinc depletion may delay wound healing.

Clinical Presentation

Though it is more convenient to describe deficiency states one by one, deficiency states are usually compound problems; thus iron and folic acid deficiency, scurvy and osteomalacia may be found together.

PROTEIN DEFICIENCY

A lowered intake of protein leads to a loss of body weight, and equilibrium may be reached when the consequent weakness reduces energy expenditure. With severe protein lack the patient is apathetic, listless, and depressed, with pallor, hypothermia, and thin wrinkled skin. The eyes are sunken and all muscles are wasted. The temporal and masseter muscles seem to waste selectively in the early stages of protein deprivation. The pulse is slowed and the blood pressure lowered. Starvation oedema is dependent in type and not related solely to hypoproteinaemia. The body fat is lost. Occasionally old people are discovered in such a state. Milder degrees of this condition are usually encountered but, as always in geriatrics, it is difficult to decide between a change due to age and a mild clinical abnormality.

FAT AND CARBOHYDRATE DEFICIENCIES

Rather than a specific fat deficiency it is much more likely that the patient suffers from other deficiencies if fat consumption falls—especially from lack of vitamin D. Often a falling fat intake is “balanced” by an increasing carbohydrate intake.

The undernourished have a diet with a high carbohydrate percentage as the carbohydrates are the cheapest form of food. Carbohydrate deficiency is therefore rare.

VITAMIN DEFICIENCIES

Vitamin A

Though some dietary surveys have shown a reduced intake of vitamin A there is no real evidence to demonstrate clinical signs of this. Vitamin A and carotenes are found in a wide variety of substances—dairy produce, fish oils, vegetables, and cereals—so that it is unlikely that a diet is completely deficient.

B Group

Vitamin B₁ (Thiamine).—Wet or dry beri-beri is the classical presentation of thiamine deprivation, and rarely this is seen in geriatric practice as high output cardiac failure with considerable oedema and a dilated heart; very occasionally the “dry” form with a peripheral neuritis affecting the legs, with burning paraesthesia, cramps, weakness, and tender calves, is encountered. Biochemical evidence of thiamine deficiency has been found in a large percentage of long-stay patients.

Vitamin B₂ (Riboflavin) and Nicotinic Acid.—Deficiency of both these vitamins is shown by abnormalities of the mouth and tongue, skin, and muscles. Nicotinic acid deficiency may be complicated by diarrhoea, peripheral neuritis, and mental changes. Cheilosis, angular stomatitis, and glossitis may have causes other than riboflavin deficiency—for example, iron deficiency or ill fitting dentures—and hence these signs must be interpreted cautiously. Nasolabial seborrhoea (that is, enlarged, often red follicles near the sides of the nose with the follicles plugged with dry sebaceous material) occurs with riboflavin deficiency.

The blood riboflavin level may be estimated, but often does not correlate with the clinical state even if the signs of riboflavin deficiency are classical. The evidence is also conflicting about whether the signs respond to vitamin therapy.

Folic Acid.—Nutritional folic acid deficiency is common among old people, though a macrocytic anaemia due to this is much less common. Serum folic acid levels below 2 µg/100 ml probably indicate deficiency but the red cell folate level is now thought to be a better guide. Gastrointestinal lesions should be sought and a careful inquiry into drugs prescribed should be made.

Vitamin B₁₂.—Atrophic gastritis occurs increasingly with age and the incidence of pernicious anaemia increases also; a pure dietary cause for B₁₂ deficiency is rare. When the classical features of pernicious anaemia are present, diagnosis presents no difficulty. Neurological manifestations may occur without anaemia, and dementia with low levels of vitamin B₁₂ in the cerebrospinal fluid and normal levels in the serum has been described in the elderly.

Vitamin C

Severe scurvy is sometimes seen but lesser degrees are more difficult to spot. Hyperkeratosis of the hair follicles causes the hair to curl within the plaque of keratin (Royston's curls) and these are numerous over the anterior abdominal wall (they occur normally over pressure sites). Haemorrhage occurs around the hair follicle and petechial haemorrhages appear especially around the ankles and feet. Large spontaneous ecchymoses appear in muscles and skin, and haemarthroses may also occur. Gingivitis does not occur in the edentulous.

Scurvy tends to affect those who cannot cook (widowers) and those who have bizarre diets—for example, prolonged gastric diets. The most useful test is the white cell ascorbic acid level (normal >2 mg/100 ml).

In conditions of “stress” such as a healing bed sore, Vitamin C requirements may increase and supplementation is necessary. Patients in institutions are highly vulnerable. Mass catering destroys vitamin C, so that not only may the basic diet be deficient but a plentiful supply of fresh fruit may not be provided.

Vitamin D

The diagnosis of severe osteomalacia is easy provided that the doctor thinks of it. Backache, bone pains, fractures, and muscular weakness of a proximal myopathy type with the finding of Chvostek's and/or Trousseau's signs are the main clinical findings. Demonstration of Looser's zones radiologically and the finding of low levels of serum calcium and phosphorus, and a high level of alkaline phosphatase, confirms the diagnosis. The histological appearance of a bone biopsy specimen, is more difficult to interpret in a severely osteoporotic skeleton.

TABLE II—Some Dietary Supplements Available (Contents per 100 g.)

Product	Calories	Protein (g)	Fat (g)	Carbo- hydrates (g)	Vit. A (I.U.)	Vit. B (mg)	Ribo- flavine (mg)	Folic acid (mg)	Vit. C. (mg)	Vit. D. (I.U.)	Iron (mg)	Calcium (mg)
Carnation (Instant Breakfast) ..	357	21.8	2.59	61.6	4,090	1.5	2.6	—	76	—	10	—
Casilan	344	90	1.8	—	—	—	—	—	—	—	—	1,130
Forceval	370	55	<19	30	8,333	10	6.6	0.03	170	850	17	1,170

The biochemical findings may be normal in patients with histologically proved osteomalacia, and a low alkaline phosphatase level occurs in patients with osteomalacia who are bed-fast. Subclinical states are very difficult to identify and the relatively high incidence of raised alkaline phosphatase levels in patients with skeletal rarefaction may be an indication that a mild degree of osteomalacia is more common than realized. The fact that some elderly people and long-stay patients have low vitamin D intakes (often below 50 I.U. daily) and are confined to the home or an institution without access to sunlight should make the doctor particularly mindful of osteomalacia. Thus measurements of the serum calcium, phosphorus, alkaline phosphatase, and serum protein levels should be part of every elderly patient's screening procedure.

MINERAL DEFICIENCIES

Calcium

There is no evidence that calcium deficiency leads to osteoporosis or that a low calcium intake is associated with any clinical state. A low calcium intake is dangerous if vitamin D preparations are given as it may worsen the hypocalcaemia with the development of tetany and cardiac arrest.

Iron

Iron-deficiency anaemia is common in the elderly owing to a low intake (especially in long-stay patients), poor absorption due to several factors, and gastrointestinal blood loss from hiatus hernia or diverticulitis. It is always important to examine thoroughly the gastrointestinal tract of a patient with iron deficiency anaemia.

Management of Undernutrition

It is most important to identify the underlying cause of under-

nutrition seen in the elderly—including depression, dementia, physical incapacity, low income, bereavement, "therapy"—and to exclude any underlying disease causing anorexia or mal-absorption. Very often the situation may be improved by general measures such as a supplementary pension, a home help, or meals-on-wheels. Rehousing, especially sheltered housing, can help greatly. An institution is a last resort, but this is not without its own dangers.

Without doubt the best treatment is preventative, and good dietary advice should and does form part of pre-retirement education. With established malnutrition the best treatment is still a good diet. During the initial phase protein, vitamin, and mineral supplements may be used, and several are now available which are very palatable (table II). Iron therapy often needs to be given separately, as does vitamin C and D therapy. Nevertheless, since pills and capsules are not consumed reliably by many patients their number is best kept to a minimum.

The patient who will not eat and visibly fades away is fortunately an infrequent problem. It can be difficult to decide how energetic the treatment should be and an intubated patient struggling to die needs a humane approach. Adding life to years and not years to life should always be the guideline of therapy.

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