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A. N. J. REINDERS FOLMER and J. SCHOUTEN

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Editors:

A.N.J. REINDERS FOLMER, M.D.
President, Gerontological Institute, Amsterdam

J. SCHOUTEN, M.D.
Member of the Board, Gerontological Institute, Amsterdam

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PHYSICAL EXAMINATION OF THE ELDERLY, PROBLEMS AND POSSIBILITIES

Francis I. Caird

University Department of Geriatric Medicine, Southern General Hospital, Glasgow, G51 4TF, United Kingdom

Clinical diagnosis is as essential to the proper management of an elderly patient as it is for younger patients, but there are many important differences in the diagnostic process in old age. These differences are of four main kinds:

1) multiple pathology is the rule in the elderly, so that multiple rather than single diagnoses should be sought;

2) different techniques are required for the clinical history;

3) individual symptoms and their interpretation differ in the elderly;

4) clinical examination requires to take a number of important differences into account.

Multiple pathology

This is almost universal in the elderly, so that a diagnostic process that assumes that only one condition must be diagnosed, and that this must account for all the patient's problems, is totally unrealistic. The fact that it is also largely unrealistic in middle-aged patients seems to have escaped recognition by teachers of conventional medicine.

Differences in techniques of history-taking

These result from difficulties in communicating with elderly patients, due to deafness and impairment of memory and concentration. Deafness may be circumvented by speaking slowly and clearly, and by the use of appropriate hearing aids and communicators, and if all else fails, by the use of written questions. This is a most valuable exercise for the physician, who is compelled to ask only a few, simple, brief, and clearly-worded questions. Otherwise time and patience will soon run out.

Impairment of memory and concentration, and the frequent presence of a confusional state in ill old people necessitate questioning some person other than the patient. This will usually be a caring relative, but if the patient lives alone, anyone in frequent contact with him.

Differences in interpretation of symptoms

These are of two main kinds, those resulting from the fact that many symptoms in old people are non-specific, and those resulting from changes in specific symptoms.

There are four common non-specific symptoms which occur in a wide variety of illnesses in the elderly: confusion, falls, immobility, and incontinence. Any of these may be due to conditions as diverse as myocardial infarction, pneumonia, cerebral infarction, and drug toxicity. To assume that a confusional state must be due to brain disease, immobility or falls to a locomotor disorder, or incontinence to a disturbance of the urinary tract, would be quite mistaken. As Sir Ferguson Anderson has pointed out, the situation is very similar in young children, and there is an analogy between convulsions in an infant and the recent development falls in an old person. Both may be due to many diseases, and both require a proper diagnosis of their cause.

The most striking single alteration in specific symptoms in old age is the reduction in the intensity of visceral pain. This is apparent in cardiac infarction, which may be painless even in patients in whom pain is not over-shadowed by breathlessness or confusion. Similarly pleural pain may be absent in patients with pneumonia or pulmonary infarction who have a clearly evident pleural friction rub. Both perforated peptic ulcer and acute cholecystitis may be painless. Headache is a relatively rare symptom in elderly patients, and so must be taken seriously when it is present. It is common in giant-cell arteritis, but unusual in intracranial tumour. In a personal series of 88 cases of intracranial tumour, headache was a prominent symptom in only five. By contrast pain from bones and joints seems much less altered in old age, so that rib fractures and fractures of long bones are usually painful.

The sensation of breathlessness due to cardiac failure may also be reduced, and in the elderly fatigue is often the leading symptom of cardiac failure. Whether this is due to reduced visceral sensation or to differing patterns of cardiovascular adaptation to impairment of left ventricular function, is obscure.

A final example of modification of symptoms is the frequent absence of thirst in old people with evidence of gross water depletion. In reply to direct questions, such patients will say that they are thirsty and will drink avidly if given water, but will not spontaneously complain of thirst, and will do nothing active to satisfy their thirst. This is a matter of extreme importance in the nursing of sick elderly patients, since it is essential that adequate fluids are given without waiting for the patient to ask for them.

Other aspects of the history require comment. The past medical records of the patient are much more valuable than the patient's account of his previous illnesses, since they are likely

to contain detailed information on the results of investigations unknown to the patient or his relatives.

It is always essential to have accurate information on what drugs an elderly patient is taking. This includes both drugs prescribed by physicians, and those bought without the physician's knowledge; the latter frequently include aspirin-containing analgesics, which may be significant as causes of gastrointestinal blood loss, and laxatives, which may cause diarrhoea and potassium depletion. It must also be established which prescribed drugs are being taken and which are not. Thus for instance recurrent cardiac failure may be due to a recent myocardial or pulmonary infarction, or to discontinuance by the patient or his relatives of drugs prescribed for the control of cardiac failure. The implications for future management are clearly different, and not to know is to throw away vital diagnostic information.

One final general point about the history is useful. It is frequently more valuable to know the duration of illness and the sequence of development of the illness rather than to have precise details about what symptoms are currently present. Quite often it is possible to be reasonably certain either of the time-scale or of the actual symptoms, but not both. If so, it must be accepted that all the facts that can be obtained have been obtained. Time is then better spent in examining the patient than in further persistence with the history.

Physical examination

The essential procedures and observations to be made on physical examination of an elderly person are the same as at any age, but there are also many important differences. This is particularly true of examination of the nervous system, an important part of geriatric practice, since so many of the disabling diseases of old people are neurological in origin.

The first essential point to establish is the patient's mental state. The routine use of simple structured psychometric tests is very valuable in determining the presence of intellectual impairment, and its degree. Which test is used is less important, but it must include at least an indication of orientation in time and space, and for person, and some test of immediate recall. It is also valuable to have a simple classification of the severity of intellectual impairment. One such is as follows:

1) In mild intellectual impairment there is definite impairment of memory and calculating ability.

2) In moderate impairment there is in addition disorientation for time, space, or person; and

3) in severe impairment there is in addition difficulty with self-care, of which difficulty with dressing is almost always the first evidence. Urinary incontinence due to cerebral disease

only very rarely occurs in the absence of severe intellectual impairment as defined.

Several minor neurological abnormalities are extremely common in the elderly, and cannot therefore be taken as evidence of neurological disease. These include small, slightly irregular pupils, impaired upward gaze, absent abdominal reflexes, absent ankle jerks, and reduced vibration and position sense in the lower limbs.

In addition, several commonly encountered signs are very rare in the elderly when they would be expected. The most important of these is papilloedema, which is extremely uncommon in intracranial space-occupying lesions in the elderly. It was for instance present in only 3 of a personal series of 88 cases of intracranial tumour. Why this is so is far from clear. It may be that the extra space made available by the cerebral atrophy of old age means that there is less increase in intracranial pressure for a mass lesion of given size, but it may be that alterations in the vascular pattern in and around the optic disc are responsible.

Some other signs are also frequently present but open to different interpretation. Thus the commonest cause of local muscle wasting is joint disease, and is immediately apparent in the quadriceps wasting which accompanies osteoarthritis of the knees, and the wasting of the small muscles of the hand that accompanies rheumatoid and occasionally osteoarthritis.

The great majority of physical signs in the nervous system retain their customary significance in old people. Dysphasia is still a sign of focal hemisphere disease, and must therefore be distinguished from confusion, a sign of diffuse cerebral disorder. This is particularly important in the not infrequent case when dysphasia is virtually purely receptive in type. Hemianopia remains a sign of post-chiasmal structural disorder, and can usually be detected if sufficient attention is paid to maintaining the patient's concentration on the task of confrontation. Impairment of conjugate eye movements and disconjugate eye movements remain important signs, as do nystagmus and cerebellar ataxia.

In the upper limbs, the simplest test of motor power is to ask the patient to stretch out his hands in front of him, palms upwards. This will enable observation of the downward and lateral drift of the hands in sensory loss, the presence of weakness of proximal or distal muscle groups, and the pronator sign characteristic of pyramidal lesions. In the lower limb motor power may be most easily tested by asking the patient to lift his leg from the bed and hold the heel off the bed. A simple grading of muscle power can be based on this elementary test. It is also always necessary to observe any elderly patient who can walk trying to do so, with whatever aids are appropriate, though the abnormalities of gait observed rarely conform to classical text book descriptions.

The reflex abnormalities commonly found include absence of ankle jerks, and in a proportion of elderly patients with senile dementia, generalised reduction in tendon reflexes, probably reflecting reduced velocity in motor and sensory nerves. The plantar reflexes retain their usual significance.

Sensory testing in the elderly is often extremely difficult, and it is only rarely profitable to embark on much detail. Pain sense can be tested with relative certainty, and the use of sensory suppression as a sign of cortical disturbance is valuable both in cutaneous sensation and in the visual fields.

Neurological Investigations

Neurological examination will therefore provide the basic evidence on which a neurological diagnosis can be made in an elderly patient. Investigations are however often essential. These should include a search for possible extracranial sources of intracranial disorder, such for instance as recording of the blood pressure in the lying and standing positions (to exclude postural hypotension) a chest X-ray, an electrocardiogram, and a blood count.

Formal neurological investigations are frequently indicated. If the problem is a focal hemisphere lesion, then a scintiscan is the simplest and most easily available investigation. It will only very rarely be normal in the presence of a significant space-occupying lesion, though it will frequently be abnormal in the first 6-8 weeks after a recent cerebral infarction. The EEG is often of value in establishing the existence and localisation of cortical lesions, and sometimes also in providing more specific diagnostic information, as of metabolic or epileptic disorders.

The CT scan provides the most accurate and detailed non-invasive method of diagnosis of many intracranial disorders. The considerable degree of ventricular dilatation and widening of the sulci, i.e. cerebral atrophy, that is normal in the CT scan of elderly patients must always be remembered. For this purpose old age begins at somewhere around the age of 50. The main value of the CT scan is that for the first time it is possible to make a positive diagnosis of cerebral infarction, from the presence of a low-density lesion that is not space-occupying, and often has a pattern characteristic of an arterial or watershed territory.

Conclusions

Such then are some of the considerations which concern the clinical diagnosis of disease in old age. It is the need to learn these differences, and to gain experience of the variations of normality and the common patterns of abnormality that present in the elderly, that gives geriatric medicine much of its intrinsic interest, and also much of its justification for being regarded as a specialty.

MODERN VIEWS ABOUT LABORATORY EXAMINATION OF THE ELDERLY

H. Malcolm Hodkinson

Geriatric Unit, Department of Medicine, Royal Postgraduate Medical School, Hammersmith Hospital, London W12 OHS, England.

In the past, investigation of elderly patients was often regretably inadequate. One of the main achievements of the development of modern geriatric medicine has been to demonstrate that appropriate investigation leading to an accurate diagnosis is the cornerstone of effective treatment of elderly patients. However, in investigating frail elderly patients, we have to ensure that we do not impose upon them unpleasant tests which will not be justified by their likely contribution to management. There is thus a heavy emphasis on choosing non-invasive investigatory methods and, among these, laboratory tests on blood and urine are of obvious importance.

The relative neglect of laboratory investigation of older patients in the past has been largely put to rights in the past decade, an advance which has been greatly helped by the widespread introduction of laboratory automation which has made it possible to carry out admission profiles of laboratory tests in elderly patients in many centres. There has thus been a marked expansion of our knowledge of the biochemistry and haematology of old age. Coupled with this there has been an increasing recognition of the special difficulties of test interpretation in the age group, though these difficulties represent an exageration of the same problems encountered in other groups rather than situations peculiar to old age.

In particular, investigation of the elderly shows up the limitations of the usual interpretive strategy based on the concept of 'normal range' and impels us to look for more effective methods. The term 'normal range' derives from the normal or Gaussian distribution which, together with the closely related log-normal distribution where a normal distribution results when values of observation are replaced by their logarithms, adequately describe most biochemical and haematological test results that are common in clinical practice (1). Unfortunately, this use of 'normal' becomes contaminated by associations of normal in the sense of non-pathological. Normal distributions are fully described by two parameters, mean and standard deviation and the 'normal range' is bounded by limits of mean $\pm$ 1.96 standard deviations, these values enclosing 95% of the total population. Thus by definition 5% of values from a reference population from which a normal range is derived will lie outside that range; they are not 'abnormal' of course but because of the unfortunate choice of the term 'normal range' clinicians are likely to make this erroneous association.

This and other problems stemming from the use of the concept of normal range will be examined in more detail later. First let us

look at the more immediate practical problems resulting from the fact that our patients are old, ill, may have multiple pathologies and may be on a variety of different treatments.

EFFECTS OF AGE

Normal ranges for the elderly are now reasonably well established for the commonly used tests. They have been summarised by Caird (2) and Hodkinson (3). In general, the ranges are not very different from those found for younger subjects. Even where there are significant changes with age, the magnitude of these may be insufficient to make a practical difference. One of the most powerful effects is the fall of albumin with age (4). Even so, the range for serum albumin in old age is only two or three grams per litre lower than in middle age. A more practically important difference occurs in the case of serum phosphate however. This falls progressively with age in men but rises slightly in elderly women so that the sex difference becomes marked, ranges in old age being 0.65-1.23 mmol/l in men and 0.86-1.32 mmol/l in women (3). However, it is generally true that changes in normal ranges provide only minor difficulties in the interpretation of biochemical tests in the elderly.

EFFECTS OF ILLNESS

Illness itself has many important effects on laboratory test results, effects that may be strikingly important in the old where illness is often severe. Thus two-fifths of the elderly admitted to my own department have evidence of constitutional upset whilst approximately a seventh are clinically dehydrated.

Dehydration, apart from its effects on renal function, leads to elevation of haemoglobin, cell counts and the plasma proteins because of haemoconcentration. Spurious elevation of any of these may only be recognised after rehydration when values fall back into the normal range. Alternatively an apparently normal value may prove to be abnormally low after hydration has been restored.

Renal impairment has similarly important effects and is frequently encountered in elderly hospital patients, the 95% range for blood urea being 3.1-20.6 mmol/l in an inpatient series (3). This has major effects on serum phosphate and urate. Serum phosphate shows a distribution which is severely skewed upwards in elderly patients (3), significantly reducing the value of the test as a screen for osteomalacia. The value of uric acid in the diagnosis of gout is similarly impaired.

Severe illness may also lead to impaired homoeostasis. For example, osmoregulation appears to be generally less efficient in old age (5) and severe illness may quite often lead to gross hyponatraemia.

Perhaps the most common disturbances associated with severe illness are those of the plasma proteins however. There is commonly a fall in albumin and other carrier proteins such as thyroxine-binding-globulin and iron-binding-protein. These changes appear to be non-specific effects related to the degree of constitutional disturbance produced by illness for lowered levels of these proteins have considerable adverse prognostic significance (6).

Low carrier protein levels have considerable effects on the measured values of protein-bound substances such as thyroxine, iron and calcium. Interpretation of such values is likely to be highly unreliable in ill old people unless appropriate corrections for protein binding changes are made. The considerable magnitude of these protein disturbances needs to be emphasised. For example, the age changes in albumin of 2-3g/l are dwarfed by those due to illness, old people admitted to a geriatric department having mean albumin 8.3g/l below that of well elderly subjects (3).

EFFECTS OF MULTIPLE DISEASE

Multiple disease is the rule rather than the exception in the elderly patient and this may further complicate test interpretation. For example, the value of alkaline phosphatase as a screening test for osteomalacia is very much reduced in the elderly patient because of the high prevalence of other diseases capable of causing its elevation. Thus in 500 patients admitted to a geriatric department, osteomalacia accounted for only 14% of raised alkaline phosphatases in women and none of those in men (7). Liver disease, fractures, rheumatoid arthritis and Paget's disease were all more frequent causes of elevation of the enzyme. Raised serum alkaline phosphatase is thus of relatively little value in the diagnosis of osteomalacia though a normal value has considerable value in helping to exclude the presence of the disease.

EFFECTS OF DRUG THERAPY

Multiple disease in the elderly patient all too often leads to multiple treatments; indeed the elderly are often most inappropriately and grossly overtreated. For example, in one British study (8) of over seventy-fives living at home a staggering 87% were on regular medication, whilst rather more than a third were on three or more different daily drugs. The elderly admitted to hospital are likely to be receiving even more medicines and a multi-centre study of admissions to British departments of geriatric medicine showed that as many as one in eight was suffering from recognisable drug side effects at the time of admission (9).

Drugs can certainly have many effects on laboratory test results whether by in vitro or in vivo mechanisms and very large numbers of such perturbations of investigatory results have been described (10). Common and important examples include the elevation of serum thyroxine by L-dopa treatment and the lowering of serum phosphate and calcium and elevation of thyroxine-binding-globulin seen with stilboestrol therapy (11). Such gross effects can readily be recognised once we have become aware of them. It seems likely that we often fail to recognise less dramatic disturbances and we are totally ignorant as to the effects of combinations of multiple drugs. Unrecognised drug effects may well result in a substantial reduction of the diagnostic usefulness of laboratory tests in elderly patients. For example the range is considerably skewed upwards for free-thyroxine-index in elderly in-patients as compared with elderly subjects at home, a difference which may well be due to unrecognised drug effects (12). This wider range substantially decreases the

value of the test in diagnosing thyrotoxicosis in elderly hospital patients.

LIMITATIONS OF THE CONCEPT OF NORMAL RANGE

Clearly the many disturbances of tests which may arise in our elderly, ill and all too often overtreated elderly patients need to be well understood if their laboratory investigations are to help us to make correct diagnoses rather than mislead us. Even with the best understanding of all these sources of test disturbance, however, we are left with the general consequence that this increase in unwanted 'noise' must inevitably weaken the discriminatory power of the tests we use. In consequence, it is particularly important that we use the best possible strategy for test interpretation if we are to minimise these disadvantages of investigation of the elderly patient.

What are the chief weaknesses of the 'normal range' approach then? We lose information when we change the continuously graded test values into two categories, within and out of normal range. In other words we convert a continuous grey scale into artificially distinct black and white which are all too often uncritically equated with 'abnormal' and 'normal'. This crude approach may serve well enough in straightforward situations. For example, if we strongly suspect a disease which we know often gives rise to elevation of a certain test and then carry out that test and find its result to be above the upper limit for the normal range of the test we would take this to be powerful support for the diagnosis, reasoning that only $2\frac{1}{2}\%$ of results for healthy subjects without the disease would be so high. However, in these days of routine test profiles we are often in the far more difficult situation of trying to interpret such an 'abnormal' result when we had little or no previous expectation that this particular disease might be present. In this situation we might be more inclined to accept that the 'abnormal' high result was due to the $2\frac{1}{2}\%$ sampling chance rather than the disease but would be very uncertain as to the correct interpretation. Profiles lead to such situations all too commonly for whilst one test gives a 5% chance of an 'abnormal' result in the healthy person, multiple tests give $(1 - 0.95^n) \times 100\%$ sets of results containing one or more 'abnormals' if we assume independence of the individual tests; thus more than half the sets will contain 'abnormals' once we exceed thirteen tests in our profile! We can clearly see that the simple 'normal range' approach fails use in this sort of situation because it does not readily allow us to incorporate our previous beliefs as to the likelihood of disease in test interpretation though we know that this must be highly relevant.

AN ALTERNATIVE STRATEGY

To interpret the test logically we need to know more - specifically we need to know how test values are distributed in the presence of the disease as well as in its absence. Unfortunately the literature rarely gives us this vital information. Where both distributions are known it is typical to find that they are of the same type (both normal or both log-normal), have similar spreads