Blood tests and age-related changes in older people

In this article...
- How age affects the kidney’s ability to excrete medication
- Diseases commonly seen in older patients
- How blood tests can help to identify age-related disease

5 key points
1. Health professionals often need to identify whether health changes are a normal part of ageing or a symptom of disease
2. The kidney’s ability to excrete waste products decreases with age
3. Cholesterol levels tend to rise with age, making cardiovascular disease more likely
4. Osteoarthritis cannot be detected by blood tests
5. Few blood tests are sufficiently robust to fully diagnose the diseases commonly found in older people

Author Andrew Blann is a consultant at City Hospital, Birmingham, and senior lecturer in medicine, University of Birmingham.


Many age-related changes in health can be detected in blood tests. In particular, renal function deteriorates with age, and this is factored in when estimating the glomerular filtration rate. However, some symptoms may be wrongly attributed to old age, while some medication can mask, exacerbate or cause problems in older people.

This article looks at specific areas of pathology to help practitioners use blood tests to understand, recognise and treat diseases in older patients.

Old age is often equated with failing health. However, while the body’s functioning declines as it ages, not all ill health in older people can be attributed to age. This means practitioners often have to determine whether certain physical changes in older patients, such as a loss of energy, appetite or weight, are a normal part of ageing or a sign of an abnormality.

Some common health problems in older people may be related to social factors such as poor diet, the consequences of living alone or the effects of hypothermia. It is vital that such problems are identified and addressed, and this often requires blood testing.

Laboratory results outside normal reference ranges are more common in older patients because they have an increased likelihood of disease, and are more likely to be using prescription drugs, sometimes in combinations. This has led to debate as to whether there should be a different set of reference ranges for certain blood tests for older patients.

The kidney
The kidney’s ability to remove waste products (creatinine and urea) declines with age, possibly due to a progressive loss of nephrons. However, since muscle produces most of the body’s serum creatinine, the loss of muscle mass that is a normal part of ageing may in part counter this by reducing the demands on the kidneys.

The effect of age on renal function is so significant that is factored into both of the most commonly used calculators for the estimated glomerular filtration rate (eGFR): those of Cockcroft and Gault; and of the Modification of Diet in Renal Disease consortium (Blann, 2014). For example, using the latter calculation, a serum creatinine result of 90µmol/L in an 85-year-old woman indicates chronic kidney disease (CKD) stage 3, whereas the same level in her 25-year-old granddaughter indicates less severe CKD stage 2.

Knowing the level of renal function or disease is important because many drugs are excreted through the kidney. Any degree of renal failure may mean drugs remain in the blood for longer, continuing to have a pharmaceutical effect. This leads to a prolonged half-life and higher biological action of the drug, so the dose may need to be reduced if a patient is over a certain age or has impaired renal function.

Metabolic disease
Cholesterol levels are affected by diet and tend to increase with age. This is therefore
taken into consideration when assessing the risk of cardiovascular disease, and may trigger the prescription of a statin. Plasma glucose also tends to rise with age, increasing the likelihood of impaired glucose tolerance. However, this does not necessarily increase the risk of diabetes unless the patient is overweight or obese. It is largely presumed that weight goes up with age as older people take less exercise but do not reduce their caloric intake.

Hypothyroidism is often found unexpectedly in older patients, which may justify widespread screening of thyroxine or thyroid stimulating hormone (TSH) through blood tests. Some hypothyroidism symptoms, such as fatigue, weight gain and the impression of generally “slowing down”, may be incorrectly interpreted as signs of normal ageing. Hyperthyroidism is found less frequently in older people. Many prescribed drugs can affect thyroid physiology. For example, L-dopa and glucocorticoids suppress TSH, while lithium inhibits the secretion of thyroxine. Amiodarone (prescribed for atrial fibrillation) has a structure that resembles thyroxine; hypothyroidism is a side-effect of amiodarone, although hyperthyroidism may also occur (Martino et al, 2001).

Connective tissue disease Non-inflammatory conditions Osteoporosis is a major public health issue in older people. One in four women and one in 20 men over the age of 60 years has the condition (Blann and Ahmed, 2014), which is often recognised by curvature of the thoracic spine, known as kyphosis or colloquially as “dowager’s hump”.

Osteoporosis is also the leading cause of fractures sustained after a fall; such a fracture may be the first indication of the condition. In the US in 2005, the two million fractures resulting from osteoporosis exceeded all the new cases of diabetes, coronary heart disease events, stroke, heart failure, breast cancer and overall cancer cases (Curtis and Safford, 2012). No laboratory tests can help in direct diagnosis or management, but tests can help to identify other conditions affecting the bones.

Osteomalacia is characterised by softening of the bones due to a defect in mineralisation of the bone matrix, cartilage or both. It is rare, but more common in certain ethnic groups, such as those from South Asia, and in older people. It is commonly caused by deficiency in calcium and/or phosphate (both are required for bone mineralisation).

Calcium deficiency may be due to an insufficient intake of vitamin D, which could be dietary or caused by low exposure to sunlight, while phosphate deficiency can be due to malnutrition or malabsorption, and insufficient vitamin D, which is the key blood test.

Paget’s disease, also known as osteodystrophia deformans, is caused by disruption in the process of bone turnover. It is characterised by new bone being laid down in an abnormal pattern, leading to structural changes and enlarged, misshapen bones that are weak and brittle. The disease is more common in men, and is rarely diagnosed in people aged under 40. As many people with Paget’s disease are asymptomatic, it is difficult to estimate its prevalence, but it may affect about 5% of the UK population over the age of 55 years (Ooi and Fraser, 1997). Clinical features include bone pain and bone deformities such as bowed tibia and kyphosis.

Serum calcium and phosphate levels tend to be within normal reference ranges in patients with Paget’s disease, but hypercalcaemia may occur in those who are immobilised. The abnormal bone turnover causes increased activities of the enzyme alkaline phosphatase, which can be measured by a blood test.

Bone pain with increased serum calcium, grossly elevated erythrocyte sedimentation rate (ESR) – which measures inflammation – and anaemia may be related to malignant myeloma. Patients with these symptoms require a full blood count, serum proteins and serum electrophoresis, as well as X-rays of the skull and areas of bone that are painful. These patients are at risk of renal disease, detectable with urea and electrolytes.

Inflammatory conditions Osteoarthritis (OA), which affects the major joints of the hips and knees, rarely has extra-articular manifestations and cannot be identified in a blood test. Rheumatoid arthritis (RA), is a systemic inflammatory disease and is likely to be associated with the following:

- Reduced haemoglobin, resulting in symptoms of anaemia;
- Increased ESR;
- Increased C-reactive protein (a measure of inflammation);
- Increased rheumatoid factor (an autoantibody).

It could be argued it is normal for ESR to rise with age; however, some contend that this shows a low level of pathology, such as inflammation. There is similar disagreement over low levels of haemoglobin, with some practitioners accepting that levels that would lead to investigations in younger patients are a normal part of ageing.

The leading risk factor for RA is being female, whereas risk of OA is increased by “wear and tear” of major joints, most likely caused by being overweight.

Reproductive organs Prostate-specific antigen (PSA) rises with age, but this may also be due to asymptomatic benign prostatic hyperplasia or prostate cancer.

Many cases of ovarian cancer are marked by increased levels of the blood marker CA 125. However, raised levels may be present in other cancers, such as lung, breast and bowel. The National Institute for Health and Care Excellence (2011) recommends an abdominopelvic ultrasound if the CA-125 is 35IU/ml or greater.

Screening The relatively high frequency of certain diseases often prompts screening programmes to detect asymptomatic diseases in older people. However, few tests alone have sufficiently robust sensitivity and specificity to fully diagnose the conditions discussed above. Blood tests are far more cost effective when used alongside signs and symptoms.

- This article was adapted from: Blann AD (2013) Routine Blood Tests Explained. Keswick: M&K Update.
