Blood glucose testing is a simple investigation to detect hyper- or hypoglycaemia and to indicate the patient’s ability to maintain normoglycaemia.

Blood glucose testing is one of a range of investigations used in the diagnosis of diabetes mellitus and is an integral part of the management of patients with unstable diabetes, glucose imbalance or metabolic derangement.

**PROFESSIONAL RESPONSIBILITIES**

This procedure should be undertaken only after approved training, supervised practice and competency assessment, and carried out in accordance with local policies and protocols.

**BACKGROUND PHYSIOLOGY**

Glucose is obtained from carbohydrates, the digestion of which causes a rise in blood glucose levels. This rise stimulates the beta cells of the pancreas to release the hormone insulin, which allows the passage of glucose into the cells where it is used in energy production. This brings the glucose level back to normal.

Insulin also facilitates the storage of glucose in the liver and muscles. If the blood sugar level falls (for example during fasting) the alpha cells of the pancreas release the hormone glucagon, which stimulates the mobilisation of stored glucose and the blood glucose level rises.

**Glucose imbalance**

The main cause of hyper- or hypoglycaemia is diabetes mellitus, where the body is unable to produce sufficient insulin. Patients may control their condition through diet, oral hypoglycaemic agents, insulin therapy or a combination of these. Instability in the condition can result from changes in therapy, energy expenditure and diet.

Acute illness, particularly infection, major surgery and critical illness will stimulate release of stress hormones including glucagon, which will cause glucose imbalance. Hypoglycaemia is described as a blood glucose level that does not meet the metabolic demands of the body (typically less than 3.9 mmol/l). Causes include:

- Hepatic dysfunction/failure;
- Malnutrition;
- Insulin or oral hypoglycaemic agent overdose, or insufficient intake of glucose following administration of such agents.

Hyperglycaemia is described as a high blood glucose level (typically, consistently greater than 8 mmol/l). Transient hyperglycaemia will occur in healthy individuals, for example following a meal. Blood sugar levels may be influenced by certain drug therapies, in particular steroids.

**GLUCOSE TESTING**

This has been traditionally performed using blood from arteries, veins or capillaries. However, non-invasive approaches are
being developed. The most common method currently in use is capillary sampling and testing at the bedside.

**Point-of-care testing**

Point-of-care testing (POCT) is defined as any analytical test that is performed for a patient by a healthcare professional outside the conventional laboratory setting (MHRA, 2002).

Only staff whose training and competence has been established and recorded should carry out POCT (MDA, 2002). Systems should be in place to ensure that any devices used are subject to quality control procedures, the frequency of which should be in line with the manufacturer’s recommendations. Written instructions for use should accompany the device. Factors influencing results include:

- Hyperlipidaemia may elevate readings (Dougherty and Lister, 2004);
- High haematocrit may lower readings, particularly in the presence of hyperglycaemia (Dougherty and Lister, 2004);
- Certain drugs.

Should any of the above be suspected, or results occur that are incongruent with clinical presentation, a laboratory value should be requested.

**The procedure**

- Gather equipment required – gloves, apron, quality control solutions, disposable lancet, test strips, glucose monitoring device, gauze/tissue, sharps disposal box;
- Obtain informed consent for procedure;
- Check any manufacturer’s recommendations for product. Perform and document quality assurance procedure;
- Check product expiry dates;
- Ensure that the monitor and the test strips have been calibrated together (Fig 1). Each particular batch of strips will require calibration to the machine;
- Ask the patient to wash their hands before blood sampling;
- Wash hands, don plastic apron;
- Advise the patient to sit down;
- Load lancet as required (Fig 2);
- Take a blood sample from the side of the finger using the lancet as directed in manufacturer’s recommendations (Fig 3). Ensure that the site of piercing is rotated. Using the side of the finger is reported to be less painful (Dougherty and Lister, 2004);
- Dispose of lancet in sharps disposal box;
- Bleeding may be encouraged by ‘milking’ to form a droplet of blood that is large enough to cover the test pad (Fig 4);
- Apply the blood to the testing strip (Fig 5);
- Proceed as device instruction;
- Ensure the punctured area has stopped bleeding and assess patient for any adverse reaction;
- Dispose of waste appropriately;
- Wash hands;
- Analyse the reading and document result (Fig 6).