# GUIDE TO HEALTH SCREENING IN THE WORKPLACE

## Office of the Chief Medical Officer

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**Third Edition**

This document is a guide for government departments, the Office of Government Procurement and public sector employers on sourcing employee health screening from commercial providers.

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# INTRODUCTION

**This is the Third Edition of the CMO Office Guide to Health Screening In The Workplace. The previous editions have been well received and have been widely used in Civil Service departments as well as the Office of Government Procurement.**

Following the COVID-19 global pandemic, there is now a much better understanding of diagnostic tests. We know from COVID Antigen / PCR tests that no test is 100 per cent accurate 100 per cent of the time, and that problems exist with false positives and false negatives. There is a greater understanding that large scale untargeted testing & screening is not always a good thing.

Management continue to be offered what seems like a bewildering array of tests and questionnaires by outside commercial providers, and are often unsure of the best way to proceed. The number of tests on offer has grown since the last edition of these guidelines, and hence we have expanded the range of tests covered.

The main purpose of these guidelines is to help management decide what tests to offer to employees, and what steps need to be put in place to ensure health screening programmes by external providers are run correctly.

Health screening generally involves a number of processes. The first of these is an individual medical review. This includes asking employees about any current health issues, their past medical history, their medications and their relevant family history.

The second process involves lifestyle questionnaires. These ask employees about lifestyle factors, such as smoking, alcohol consumption, stress, diet, sleep, etc. with a view to modifying these lifestyle factors in order to prevent the future development of illness.

The third process may involve physical examination and tests including blood pressure, cholesterol, BMI and eyesight testing. These physical measurements will help to identify those with abnormal measurements or those at risk of developing particular diseases. For example, a person with a high BMI is at risk of developing type 2 diabetes and heart disease. The purpose of this is to detect an abnormality with a view to intervening before any illness develops. For example, a raised cholesterol can be treated with drug therapy in order to reduce the risk of a future heart attack.

Workplace health screening should not be confused with statutory workplace health surveillance for recognised hazards such as noise in the workplace, or general population screening for public health purposes.

Government Departments and Offices offer health screening to employees both to help improve their overall health and wellbeing, and also to show that their employer is interested and concerned about their welfare. Whilst the latter may seem like a "soft" or "paternalistic" reason to offer health screening, it is a perfectly legitimate and reasonable motivation.

Whilst there are no real contentious issues or problems around lifestyle questionnaires, there are difficulties and potential pitfalls around laboratory test screening, such as false positive results and false negative results. A

false positive test suggests that a person has a condition when in fact they do not have a condition (for example a high Prostate Specific Antigen (PSA) level wrongly suggesting that a man has prostate cancer). A false negative result wrongly reassures an individual that they do not have a condition when in fact they do have a condition (for example a normal cervical smear test in a woman who has early cervical cancer).

Some screening tests simply "bring forward" the date of diagnosis of an asymptomatic condition, but earlier detection has no impact on eventual outcomes in terms of reducing disability or mortality. There may not much benefit in being aware of a condition earlier if this does not improve prognosis.

The more testing an individual undergoes, the more susceptible they are to false positive and false negative results. This is because all tests will have an inherent error rate. They can lead to difficulties if an individual is subsequently seeking life assurance, mortgage protection or income continuance insurance.

*Hence, paradoxically, less is sometimes best when deciding what tests to offer. This is one of the key messages of these guidelines.* In addition, because a smaller number of tests means lower cost to the employee, there is likely to be more uptake of screening by employees.

Workplace health screening tests can be divided into four categories, namely tests that are known to be beneficial, tests that are possibly beneficial, tests that are of uncertain benefit and tests that are best offered by a national screening programme or GP. These guidelines seek to categorise laboratory tests into these four different categories.

I hope these guidelines are of help in deciding what health screening you should consider offering to your employees. The guidelines may also be of benefit to other public sector or private sector organisations.

I would like to thank Dr Sharon Lim, Occupational Physician and also Dr Ruth McCullough Specialist Registrar in Occupational Medicine for their assistance in drafting these guidelines.

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# EXECUTIVE SUMMARY

**The purpose of this document is to give guidance to government departments and employers who are sourcing workplace health screening programmes from outside commercial providers. The Civil Service Chief Medical Officer's (CMO) Office is frequently asked for an opinion on the various health screening tests provided by companies.**

This is the third edition of these guidelines, and have been updated to include new tests that have come on the market in recent years.

Details of what questions Departments/ Offices should ask of commercial health screening providers and the steps that should be put in place to ensure that programmes are conducted in a safe and effective manner are also included.

Health screening in the workplace is very different from attending a health professional for treatment when ill. Whilst health screening may sometimes diagnose diseases, its main aim is to detect non-symptomatic disease or lifestyle risk factors that may lead to disease.

Health screening can involve medical history and lifestyle questionnaires, physical examinations/ measurements, and blood/laboratory tests. The purpose of the lifestyle questionnaire is to detect some adverse lifestyle factor such as smoking before it causes disease or illness such as lung cancer. Medical questionnaires will also identify those at a higher risk of certain conditions, which may guide the selection of appropriate laboratory tests for that individual.

The purpose of the blood / laboratory tests is to detect a non-symptomatic abnormality such as raised cholesterol before it causes an illness like a heart attack or stroke.

In relation to blood and laboratory tests, the World Health Organisation (WHO) has for many years recommended that testing should only be conducted where the disease

- Is a common health problem
- Is a serious health problem
- Has effective treatment available
- Has screening test procedures which are acceptable, safe, accurate and relatively inexpensive
- Has been shown to benefit from early intervention and have a positive effect on eventual outcomes.

Usually a combination of both blood/ laboratory tests and lifestyle analysis is used to give a comprehensive picture of the participant's health. The results of the tests are given typically 1–2 weeks following the tests. All abnormal results should be referred for further investigation to the individual's General Practitioner (GP).

The more tests carried out does not necessarily mean more benefits to the employee. Excessive testing can even have significant adverse outcomes. *This is the key message of these guidelines.*

Laboratory tests and procedures for asymptomatic workers can be divided into three broad categories namely tests that are beneficial, tests that are possibly of benefit, and tests that are of uncertain benefit. There is also an additional fourth category of tests that are best provided by General Practitioners or by National Screening Programmes.

*Tests that are commonly offered by providers are categorized in the table below. We advise that all of the tests in the beneficial category should be offered to employees, and that some of the tests in the possibly beneficial category may be offered to employees.*

| Beneficial | Possibly Beneficial | Benefit Uncertain | National Programme / General Practitioner Discussion First |
|---|---|---|---|
| Blood Pressure<br>BMI & Waist Circumference<br>Cholesterol & Triglycerides<br>Glucose or HbA1c<br>Cardiovascular & Diabetes Risk Calculators | Full Blood Count<br>Renal Profile<br>Liver Function Tests<br>Thyroid Function Tests<br>Urinalysis<br>Atrial Fibrillation Screening<br>Vision Test (for VDU) | Resting ECG<br>Bone Density/ DEXA Scan<br>Uric Acid<br>Lung Function<br>Apo lipoprotein B<br>Lipoprotein A<br>Food Allergy & Intolerance Testing | Breast, Cervical, Colon & Prostate Cancer Screening<br>Haemochromatosis Screening |

We are not advocating offering the tests for the "Benefit Uncertain" category as part of Workplace Health Screening Programmes. These tests *are* of value in a clinical setting where a patient has a known illness or condition and is being monitored over time for this condition. An example might be a patient who is on corticosteroid medication and needs to be monitored to ensure they are not developing osteoporosis. However this is occurring in the context of ongoing clinical care, not the detection of a previously recognised asymptomatic condition.

We would advise that Breast, Cervical and Colon Cancer screening programmes are best offered as part of national screening programmes. These programmes operate to a high standard and are free to the public.

Prostate Cancer Screening (PSA Testing) is *on balance* best offered by a General Practitioner after careful discussion, rather than part of a mass workplace screening programme. The context is that it is not possible to always discuss the complex pros and cons of PSA testing in a busy mass workplace screening programme. We would suggest that you read the detailed

section in Chapter 2 on PSA Testing before deciding whether or not to offer this test to your employees.

In terms of lifestyle questionnaires the CMO's Office has no specific recommendation except that they should include questions on diet, exercise, smoking and alcohol use.

It is important that the following steps are followed when engaging commercial providers to ensure that the screening is conducted to a high standard:

- Indemnity Insurance for the Department against any mistakes or errors
- Programme should be overseen by a medical doctor registered with the Irish Medical Council.
- Any significantly abnormal results should be interpreted by a health professional
- Provide an aggregative report/evaluation of the programme to the Department
- Clarify arrangements for follow up of abnormal results that require further investigation with employee's own GP.

# SECTION
# 01

# HEALTH SCREENING

**Health screening is where an individual is assessed in order to detect disease or risk factors which currently have no symptoms. The purpose of this is to stop it from developing in the first place, prevent it from progressing or reduce the amount of disability it can cause.**

**Health screening is carried out on healthy people. It is not appropriate for the investigation or monitoring of individuals who already have symptoms or diseases.**

## 1.1 Types of Health Screening

Screening involves screening everyone in a certain category, for example everyone of working age, typically aged 18–66 years.

- Laboratory tests / investigations measure a parameter such as blood cholesterol or blood glucose. If this parameter is outside its expected normal range, it may indicate an increased risk of developing future illness (e.g. raised cholesterol and heart disease) or else the presence of an illness that is not yet producing symptoms (e.g. raised glucose and diabetes).

- Lifestyle screening uses a questionnaire filled in by the client to identify lifestyle factors such as smoking which may affect health. Education and information by way of leaflets and advice on the various factors identified such as smoking, diet etc. are given to the client with the aim of a change or modification of lifestyle to improve health.

- A combination of both is the usual type of screening offered by commercial suppliers.

## 1.2 Principles of Health Screening

The World Health Organisation's (WHO) suggested criteria for health screening are that the disease being screened for

- Is a common health problem in the target population

- Is a serious health problem in terms of disability or mortality

- Has effective treatments available which can reduce disability and mortality

- Has test procedures which are acceptable, safe, accurate and relatively inexpensive

- Has a long asymptomatic phase which allows for early intervention

- Has been shown to benefit from early intervention and have a positive effect on eventual outcomes.

## 1.3 Advantages

At present only a limited number of health screening tests have been shown to be of definite benefit. A health screening programme should ensure that it will do more good than harm and should ideally be based on scientific evidence.

For example, frequent blood pressure checks makes good sense as high blood pressure may not have any symptoms. High cholesterol levels or high glucose levels due to diabetes are common conditions in the Irish population. Evidence shows that early intervention is beneficial.

The benefits to the organisation are varied and are often sold as a healthier, fitter workforce with reduced levels of sickness absence, improved employee effectiveness and increased productivity. Whilst this may be the case, there is no conclusive research evidence to support this. However, an appreciation by staff that the organisation cares about their welfare certainly fosters employee commitment and work satisfaction.

Health screening can detect disease at an early stage before symptoms are present, reduce any resultant disability / impairment and at its best can save lives.

## 1.4 Disadvantages

Evidence suggests health screening that does not meet WHO criteria may be of doubtful value. Health screening can generate anxiety in people who previously felt well.

Over diagnosis may identify abnormalities that would never cause a problem in a lifetime. An example of this is prostate cancer screening. Autopsy studies have shown that a high proportion of elderly men who have died from other causes were found to have had prostate cancer. This indicates that more men die *with* prostate cancer than *of* prostate cancer.

An abnormal screening test result that is not fully investigated or followed up may affect an individual's entitlement to future life assurance cover etc. causing stress, anxiety and financial loss.

The tests used, like all medical tests, are not perfect. The result may incorrectly show positive for those without disease known as false positive. This will cause stress, anxiety and further unnecessary diagnostic tests and expense.

The result can also incorrectly give a negative result for those who have the disease known as false negative. This gives a false sense of security and may cause delay in final diagnosis.

Hence, random screening of healthy adults is not without its downsides. Employers should be careful in deciding what tests they offer from commercial providers.

## 1.5 Who Can Carry Out Workplace Health Screening

There are many companies in Ireland carrying out health screening in the workplace. They may include the tests which will be described here and also tests that are not described here. The CMO's Office cannot endorse any particular company over another. However, we are very happy to assist Departments / Offices if they have queries around a tendering process.

Please note that the Office of Government Procurement (OGP) has at the time of writing an agreed supplier list / procurement framework for sourcing of workplace health screening by public sector bodies. The CMO assists OGP in drawing this supplier list on an ongoing basis.

# SECTION
## 02
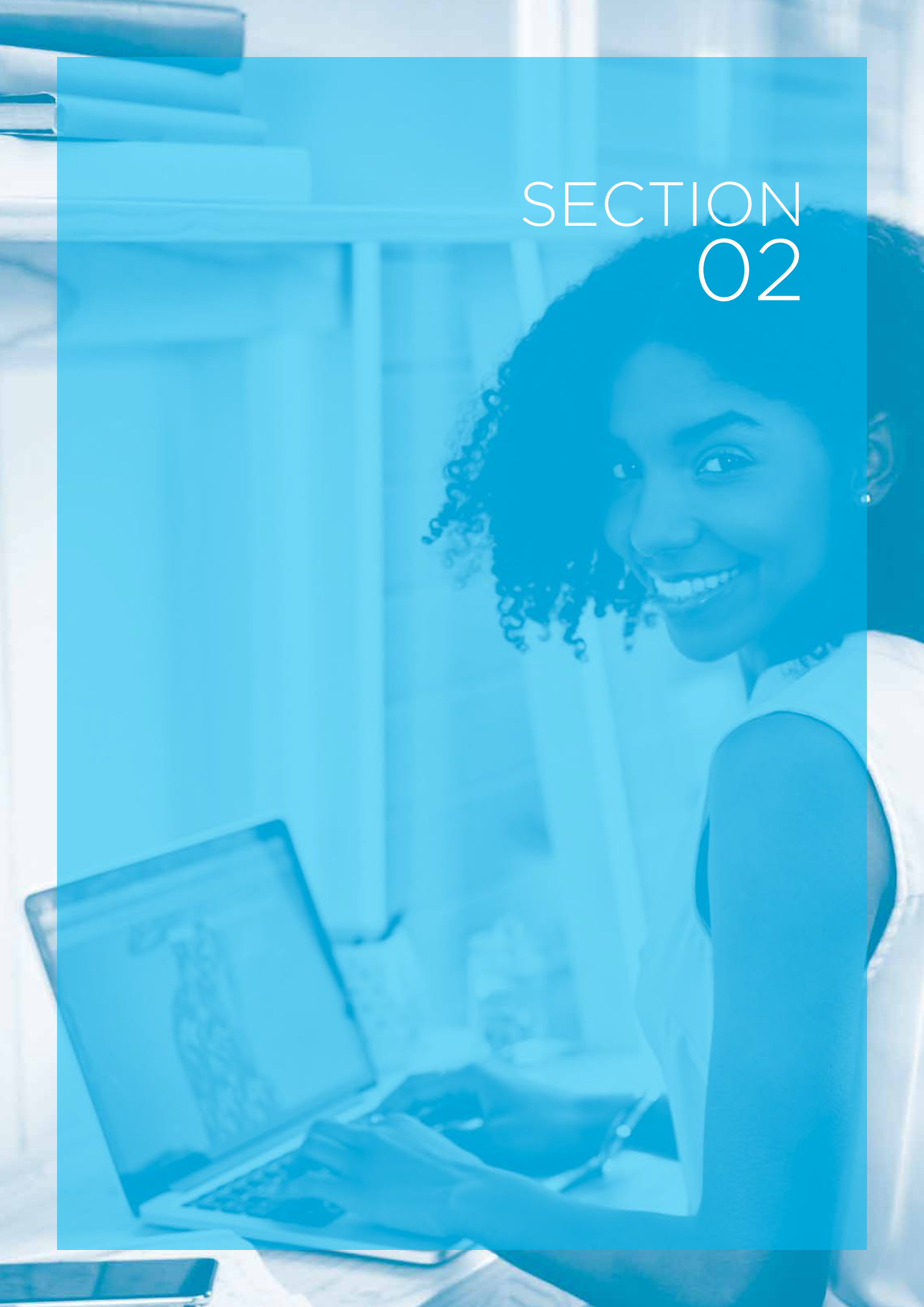
# TESTS

**A variety of tests can identify diseases that respond to treatment. Many conditions can be controlled or even reversed through a simple course of treatment once they are identified. Blood tests can identify diseases such as diabetes and high cholesterol. Blood pressure and weight measurements can also identify health risks which can lead to future illness such as heart disease. The results are compared to recommended readings for the tests for age etc. of the client. Abnormal readings are referred on to the client's General Practitioner for further investigation and follow up.**

The tests described here are the most commonly used for health screening. *This section is quite long and is intended as a reference section.* Tests are categorised into beneficial, possibly beneficial, benefit uncertain and best offered by a National Screening Program or GP.

*We advise that all tests in the beneficial category should be offered to employees. Depending on medical, lifestyle, occupational risk factors and budgetary constraints, we advise that some or all of the possibly beneficial tests should be offered to employees as well. We advise against offering tests that are of uncertain benefit, or that are best done by a General Practitioner / National Screening programme.*

## BENEFICIAL

### 2.1   Blood Pressure Measurement

This is a measure of the pressure of the blood against the walls of blood vessels. It rises and falls with each heartbeat. It is usually written as one number (systolic) over another number (diastolic), for example 120/80. The unit of measurement is millimetres of mercury (mmHg). The top number (systolic) measures the pressure when the heart contracts. The bottom number (diastolic) measures the pressure when the heart relaxes between beats.

An optimal blood pressure is 120/80 or less. It is not a cause for concern if the pressure is lower than that in a healthy individual as long as they do not have symptoms of a low blood pressure (fainting, light headedness, dizziness). If blood pressure remains elevated over a period of time, it is called hypertension. The diagnostic parameters of hypertension vary depending on the country of origin.

In Europe and the UK, any blood pressure found to be elevated persistently above 140/90 mmHg is classed as hypertension, while in the U.S.A., the cut-off is lower at 130/80 mmHg.

Based on the most recent European Clinical Practice Guidelines for the Management of Arterial Hypertension, blood pressure classification is as follows:

- Optimal Blood Pressure:       less than 120/80 mmHg

- Normal Blood Pressure:       less than 129/84 mmHg

- High-normal blood pressure:    130/85 to 139/89 mmHg

- Hypertension Grade (1):      140/90 to 159/99 mmHg

Both numbers in a blood pressure test are important. Even if only one is persistently high it is still deemed hypertension. Hypertension is never diagnosed based only on one reading as a number of situational circumstances can elevate your blood pressure. Some examples include anxiety, so called doctor induced "white coat hypertension," prior exercise or rushing for your appointment before your reading is taken. Note that different values apply to diabetics.

Hypertension puts extra strain on the blood vessels and the heart. If left uncontrolled, it can lead to having a stroke, heart attack, heart failure, kidney damage, blindness, and limb blood flow problems. Therefore the diagnosis and treatment of hypertension can save lives. Treatment for hypertension, which usually involves taking prescribed medication and lifestyle measures such as reducing dietary salt intake, reducing alcohol intake, maintaining an ideal body weight and regular physical exercise, is very effective at normalising blood pressure.

In spite of this, the rates of blood pressure control across the world and in Europe are not satisfactory and hypertension continues to be the major preventable cause of cardiovascular disease and death globally.

High blood pressure usually has no symptoms unless it is dangerously elevated. This is why the condition, where uncontrolled for an extended period of time, is thought to be a "silent killer". The gold standard for diagnosing high blood pressure is to wear a blood pressure monitor for twenty four hours. This service is provided for in most hospitals and GP practices. If a blood pressure reading is high on health screening, the individual should be advised to attend their GP for follow-up and a 24-hour-blood-pressure-monitor.

The cause of high blood pressure in over 90-95% of cases is unknown. Some factors can increase your risk of having high blood pressure. These include a positive family history, increasing age, being of African origin, a high amount of salt in your diet, a lack of exercise, being overweight, smoking and drinking excessive amounts of alcohol.

In 5-10% of cases, hypertension arises from an underlying medical condition such as kidney disease, diabetes, certain hormonal disorders, certain medications and illicit drug use. These cases are referred to as secondary hypertension.

## Recommendation

If blood pressure is greater than 130/80 mmHg, repeat measurement 5-10 minutes later.

If it remains greater than 130/80mmHg, advise to attend GP for 24 hour blood pressure monitor.

## 2.2 Cholesterol (Total, HDL and LDL) and Triglycerides

Cholesterol is a fat-like substance that is found in the bloodstream and body tissues. It is an essential substance required by the body for the healthy functioning of cells, nerve fibres and hormones. Cholesterol is naturally made in the liver and also comes from cholesterol in animal products such as meat, butter, cheese

and whole milk. Cholesterol is not found in significant amounts from plant sources. Hypercholesterolemia is the term for high levels of blood cholesterol.

Cholesterol cannot dissolve in your blood stream as it is a fatty substance. It is carried in the blood stream bound to molecules called lipoproteins. Total cholesterol level is measured by the addition of five main lipoprotein levels in the bloodstream. Health professionals are mainly concerned with low density lipoproteins (LDL) and high density lipoproteins (HDL). LDL is a "bad" form of cholesterol. Too much LDL in your bloodstream can deposit in the inner layer of blood vessels. Over time, LDL cholesterol and other substances build up in the wall of blood vessels in an inflammatory process called atherosclerosis. Blood vessels in the heart that are compromised can develop an obstruction that leads to a heart attack. If part of a blood vessel wall detaches and travels to the brain, it can cause a stroke.

HDL is a "good" form of cholesterol. It actually protects you from heart disease and the higher the level, the better the protective effect. The reason for that is that it carries bad cholesterol from your cells back to the liver where it is broken down and removed from the body.

Blood cholesterol is measured in units called millimoles per litre of blood (mmol/L). In Ireland it is recommended that your total blood cholesterol level should be less than 5mmol/L, your level of HDL be greater than 1mml/L and your level of LDL cholesterol should be under 3mmol/L. In certain patient groups such as those who have already suffered from a heart attack or have diabetes, lower levels of LDL and total cholesterol are recommended.

Diet and lifestyle impact on cholesterol levels. General advice on lowering and maintaining a healthy cholesterol includes maintaining a healthy weight, exercising regularly and reducing the amount of saturated animal fats in your diet.

Triglyceride is the chemical name for fat found in the blood and stored in body tissues. Triglycerides are made in the body from carbohydrates and fats. They are transported throughout the body attached to cholesterol and proteins called lipoprotein particles. Excessive consumption of fat, carbohydrate and alcohol results in high triglycerides in the blood stream and fat cells. Triglycerides are measured by analysing a fasting blood sample. Alcohol should be avoided for over 12 hours prior to the taking of the sample. Like cholesterol, high triglyceride levels are a risk factor for developing heart disease, diabetes and obesity.

In some acquired and genetic conditions such as disorders of the adrenal glands and diabetes, high triglyceride levels can also occur even with moderate amounts of fat consumption. This is as a result of a malfunction of the mechanisms in the body to break down fat. The American Heart Association recommends that a normal fasting triglyceride level should be < 1.7mmol/L. High levels need further investigation and treatment as necessary.

Triglycerides not used by the body are stored in the adipose (fat) tissues and the liver as energy reserves. People with high triglycerides often have high total cholesterol levels. Exercise clears fat rapidly from the blood stream as the muscle cells require fats for energy. Normal levels of triglycerides are maintained by a healthy lifestyle, reduced intake of saturated fat and carbohydrates in the diet, regular exercise and a healthy weight.

## Recommendation

Laboratory testing recommended.

Refer to General Practitioner for follow up if:

- Total Cholesterol greater than 5mmol/L,
- HDL Cholesterol less than 1mml/L,
- LDL Cholesterol greater than 3mmol/L
- Triglycerides greater than 1.7 mmol/L

## 2.3 Body Mass Index (BMI)

BMI is a simple calculation that interprets whether a person is a healthy weight for their height. The formula used to derive your BMI is your weight in kilograms divided by height in metres squared. So for example, if your weight is 68 kilogrammes and your height is 1.75 metres, then your BMI is 22.2 ($68 \div (1.75)^2$) kg/m$^2$.

For most adults a BMI between 18.5 and 24.9 indicates a healthy weight. A BMI which is less than 18.5 kg/m$^2$ or over 30 kg/m$^2$ is considered a risk to health. The standard weight status categories associated with BMI ranges for adults are shown in the following table.

| BMI | Weight Status |
|---|---|
| Below 18.5 | Underweight |
| 18.5 – 24.9 | Normal |
| 25.0 – 29.9 | Overweight |
| 30.0 and Above | Obese |

Obesity is the medical term used to describe the state of being overweight to the point where it is harmful to health and is associated with a number of serious and potentially life-threatening conditions. Obesity is generally caused by an imbalance between calorie intake (food) and calorie output (activity). According to the most recent Healthy Ireland report, two out of five Irish adults are overweight and one in four Irish adults are obese. There are many health benefits to maintaining a healthy weight. Overweight and obese individuals are at increased risk for many diseases and health conditions, including high blood pressure, raised cholesterol, Type 2 diabetes, cardiac disease, stroke and certain cancers (endometrial, breast, and colon). Obesity can also have an impact on quality of life and contribute to psychological problems.

While BMI is a valid assessment tool in identifying obesity, it is important to remember that BMI is not a direct measure of body fat and that BMI is calculated from an individual's weight which includes both muscle and fat. As a result, a minority of individuals may have a high BMI but not have a high percentage of body fat. For example, highly trained athletes may have a high BMI because of increased muscularity rather than increased bodily fat.

## 2.4 Waist Circumference

Apart from taking into account a person's weight and BMI, a waist circumference measurement is useful in checking a person's body fat distribution. Carrying too much fat around your middle section increases your risk of heart disease and diabetes. The measurement is taken by wrapping a tape around your waist, at a level midway between the bottom of your ribs and the top of your hips.

In general, there is a higher risk of health problems if your waist circumference is greater than 31.5 inches (80cm) in an Irish woman, and 37 inches (94cm) in an Irish man.

### Recommendation

BMI and Waist Circumference calculation recommended

Advice and written information for those with:

- BMI less than 18.5 kg/m$^2$ or greater than 25 kg/m$^2$;
- Waist circumference greater than 80cm in women and greater than 94cm in men.

## 2.5 Random Glucose Test

This is a blood test to measure sugar levels in the blood at the time of testing. The test can be a finger-tip test giving a rapid on-the-spot result, or by sending a blood sample to the laboratory. There may be a small difference in your blood sugar reading between those methods. When an individual has been fasting for at least 8

hours, a blood glucose test may be diagnostic of diabetes, or may require further follow-up tests. However, where an individual has not been fasting, a random non-fasting glucose level is of less value because it is influenced by food consumption. In a non-fasting situation, we would recommend offering a HbA1c test instead (see next section).

Glucose is a sugar found in carbohydrate foods. It is the main source of energy used by the body. Diabetes is a disorder of the metabolism in which sugar and starch are not properly absorbed from the blood, leading to high levels of glucose in the blood stream. This can cause fatigue, weight loss and excessive urination. Significantly elevated blood glucose levels can cause a life threatening condition known as diabetic coma.

Persistently elevated glucose levels can damage small blood vessels leading to kidney impairment, loss of sensation in hands/feet and visual impairment/blindness. Persistently elevated glucose levels can also damage large blood vessels predisposing to heart attack, stroke and lack of blood supply to the lower limbs/feet.

Insulin is a hormone made by the pancreas which controls the amount of sugar in the blood by moving it into the cells where it can be stored by the body for energy.

The two types of diabetes are most commonly known as type 1 and type 2 diabetes. Type 1 diabetes is also known as insulin dependent diabetes. It is usually first diagnosed in children, teenagers, or young adults but can occur at any age in life. It occurs when the pancreas does not make enough insulin. The cells become starved of energy and there is excess glucose in the blood. People who suffer from Type 1 diabetes must have daily injections of insulin to live. Proper diet, exercise and blood sugar monitoring is essential to manage the disease.

Type 2 diabetes is also known as non-insulin dependent diabetes. This condition has a more gradual onset and is therefore harder to detect. It is more common than type 1 diabetes. In its early stages, it is more due to an insensitivity to insulin in the cells of the body rather than a deficiency of insulin production. It is more common than type 1 diabetes, and is closely correlated with Body Mass Index (BMI). The higher an individual's BMI, the higher the risk of developing type 2 diabetes.

Some people have no early symptoms and are only diagnosed several years after the onset of the condition, already suffering from complications of the disease. Treatment will depend on the results of investigations and may be in the form of tablets. The tablets work by lowering the blood glucose by either stimulating the pancreas to produce more insulin or by helping the body to use the insulin that it does produce more effectively. Over time, persons initially controlled with tablets may eventually require insulin.

In Ireland, 3 yearly testing for diabetes is recommended for all adults who are over the age of 45, especially in those with a BMI > 25kg/m$^2$. Testing should be considered for younger adults or performed more frequently in any individual with a BMI > 25kg/m$^2$ and who have any additional risk factors, including raised blood pressure, raised cholesterol or family history of diabetes.

Glucose testing is not currently recommended in random public health screening of the general population. However, in a workplace screening setting, where there is already an easily screened "captive" population that are already attending for a lifestyle questionnaire / blood pressure check, we believe the extra marginal cost of glucose testing merits its inclusion in workplace screening. Similar arguments apply to cholesterol screening.

- **Normal: Fasting glucose less than 6.1 mmol/L**
- **Impaired fasting glucose: 6.1 to 6.9 mmol/L**
- **Diabetes: fasting glucose greater than or equal to 7.0 mmol/L**

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## 2.6   HBA1c (Glycated Haemoglobin)

This is a blood test that is drawn from a vein and sent to a laboratory for testing. An individual does not need to fast before this blood test. It is a measurement of glucose in the blood stream that is bound to haemoglobin. Haemoglobin is contained within our red blood cells. It reflects the average blood glucose levels over an 8-12 week period, which is roughly the lifespan of a red blood cell.

This test is commonly used to monitor sugar control in diabetic patients, but is relatively new to workplace health screening. It is an alternative to a fasting glucose test in diagnosing diabetes. The major advantage of this test is that an employee is not required to fast before the sample is taken. However, it is more expensive than a fasting or random blood glucose.

The results are interpreted using a percentage measurement. A cut off value of 6.5% is applied and values over this range are usually indicative of a diagnosis of diabetes. However, a value of less than 6.5% does not always exclude diabetes.

**- Normal: HbA1c less than 5.7%**

**- Pre-Diabetes: HbA1c between 5.7% and 6.4%**

**- Diabetes: HbA1c greater than 6.5%**

### Recommendation

Laboratory testing recommended. If fasting, check fasting glucose level. If not fasting, check HbA1c.

Refer to General Practitioner for follow up if:

• Fasting glucose greater than 6.1mmol/L

• HbA1c greater than 5.7%

## 2.7   Cardiovascular Risk Calculators

There are a number of risk assessment calculators available that use a number of variables such as age, sex, BMI, ethnicity, smoking status, blood pressure, etc. to estimate an individual's risk of developing cardiovascular disease. These calculators can aid in making clinical decisions on lifestyle interventions and use of medications such as anti-hypertensives or lipid-lowering medications. Some examples are:

• QRISK 3 calculator, which estimates an individual's 10 year risk of developing cardiovascular disease. The calculator is based on data from UK primary care patients who were followed up for 10 years, looking for the first development of cardiovascular disease. The calculator can be accessed at: https://qrisk.org/

• JBS3 calculator is based on the Joint British Societies' consensus recommendations for the prevention of cardiovascular disease, which was written as a collaborative effort by the British cardiovascular societies. This calculator refers to an individual's lifetime risk as well as their 10 year risk. The calculator (can be accessed at: www.jbs3risk.com

## 2.8   Diabetes Risk Calculator

A diabetes risk calculator estimates an individual's risk of pre-diabetes or diabetes. The data required to use the calculator includes age, sex, BMI, medical conditions, family history and medication.

The calculator can be accessed at: https://www.diabetes.ie/living-with-diabetes/are-you-at-risk-of-type-2-diabetes/

### Recommendation

Use of Risk Calculators such as QRISK 3, JBS3 or Diabetes Risk Calculator can help identify individuals at increased risk, in whom follow-up with their General Practitioner should be prioritised.

# POSSIBLY BENEFICIAL

## 2.9  Full Blood Count (FBC)

This is a blood test with approximately 12 different components. It is one of the most commonly ordered blood tests by health professionals. The main tests are haemoglobin to test for anaemia, white cell count to test for infection/immune levels, and platelet count to check for one of the essential blood clotting components required to stop bleeding.

The FBC gives indications of health problems which may require further investigations.

A low haemoglobin level (anaemia) can be caused by various health problems such as poor diet, blood loss, bone marrow problems etc. Anaemia due to iron deficiency is not uncommon amongst women of reproductive age, due to menstrual blood loss.

A low white cell count has many different causes, including bone marrow failure. A high white cell count can occur in infections or allergies.

## 2.10  Renal Profile / Urea & Electrolytes (U&E)

This laboratory test is known as Renal Profile, U&E or Urea & Electrolytes. Along with an FBC, a renal profile is one of the most frequently performed blood tests by health professionals. It commonly includes testing for electrolytes and substances known as creatinine and urea, which represents a test of kidney function. The kidneys have a whole host of functions within the body, including excreting waste products and maintaining salt balance within the blood.

Urea is a substance produced from the breakdown of proteins within our diet. Creatinine is a product of muscle metabolism. Both of these substances are excreted through the kidneys, and are a marker of kidney function. Electrolytes include sodium, potassium and bicarbonate. An important

function of the kidneys is to maintain the blood levels of these electrolytes within a well-defined concentration range. If the levels of these electrolytes are abnormally low or high, they produce significant impairment of a whole host of bodily functions. This can occur due to acute or chronic kidney failure, or a whole host of systemic diseases.

Creatinine levels can be tested to calculate a person's Estimated Glomerular Filtration Rate (eGFR). The eGFR is a numerical value that is generated to assess kidney function. It factors in the persons age, gender and ethnicity. This is quite an accurate measure of kidney function. It can detect the development of chronic kidney failure which is often asymptomatic in its early stages.

## 2.11  Thyroid Function Tests (TFTs)

This blood test checks the functioning of the thyroid gland. The thyroid gland produces hormones that are essential for normal body metabolism and cell activity.

The thyroid gland needs iodine, which is found in most normal diets. It is situated in the lower part of the neck below the Adam's apple and wraps around the windpipe (trachea). The blood test measures the levels of hormones to assess thyroid function. A reduced level of the hormone thyroxin is known as hypothyroidism and can cause a reduced metabolic rate, weight gain, slow pulse, depression and general slowness. A high level of the hormone is known as hyperthyroidism. This is caused by over-activity of the thyroid gland and can lead to, among other things, sweating, restlessness, nervousness, weight loss and a fast pulse rate.

As part of the TFT test, Thyroid Stimulating Hormone (TSH) produced in the pituitary gland in the brain is also measured. The results should be interpreted by a healthcare professional who will either recommend treatment or appropriate follow up testing.

## 2.12 Liver Function Tests (LFTs)

Medical screening to detect chronic liver disease usually involves a test that measures how well the organ is functioning. Blood tests, commonly referred to as liver function tests, are among the most commonly used. In a typical blood chemistry profile, six different liver function tests are done, namely Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Gamma Glutamic Transpeptidase (GGT), Lactic Dehydrogenase (LDH), Alkaline phosphatase (ALP) and Bilirubin.

All of the Liver Function Tests (LFTs), with the exception of bilirubin, are measurements of enzyme levels. These enzymes are normally present in liver cells, and there is a certain "normal" level of these enzymes circulating in the bloodstream. When the liver becomes inflamed or damaged, these enzymes are released into the bloodstream in abnormal amounts by the damaged cells. This results in elevated levels in the bloodstream.

Bilirubin, another substance commonly measured in the blood to detect liver disease, is produced from the breakdown of red blood cells. Again, a normal bilirubin level is maintained as the liver continually removes bilirubin from the bloodstream for further processing. If the liver is impaired, however, bilirubin is not removed, and the level in the bloodstream will rise.

It is important to remember that elevated liver function tests are not diagnoses in themselves but rather serve as indicators of abnormal function of the liver.

There are many diseases and conditions that can cause an elevation of these tests. Some of the more common causes are hepatitis (inflammation of the liver) from hepatitis viruses, medications or alcohol. Obstruction to bile outflow from the liver due to gallbladder stones or pancreatic tumours can also cause elevated LFTs. In Ireland, the most common cause of abnormal LFTs is chronic excess alcohol consumption.

## 2.13 Bone Profile

This is a panel of blood tests that look at bone metabolism. These tests measure levels of calcium, phosphate, and the enzyme alkaline phosphatase in the blood. Calcium and phosphate are important components of your bones. When an abnormal calcium level in the blood is detected, it is viewed as a marker for an underlying condition. A bone profile test result is not diagnostic for a disease and further blood testing or investigations are usually required to diagnose a medical condition.

Abnormal levels of calcium can indicate a wide range of conditions. These include an overactive parathyroid gland in the neck, food malabsorption from the intestine, thyroid problems, kidney impairment, bone disease or cancers.

## 2.14 Urinalysis

Urinalysis is mainly a test of kidney function, but can also detect and monitor conditions such as diabetes and infections. There are two ways of examining this. A simple on the spot test can be done using a urine dipstick. Alternatively, the sample may be sent to a laboratory for more detailed analysis.

The dipstick test detects and measures various compounds that are filtered in the kidneys and excreted in the urine. A urine dipstick is inserted into a urine sample. The stick or strip contains chemicals that react and change colour when the stick is dipped into the urine. The majority of results are obtained in 60 –120 seconds after dipping. The dipstick tests for urine acidity, protein content, white cells, red cells, nitrites and glucose. It is a quick and inexpensive test. This can help detect asymptomatic kidney disease, diabetes and urinary tract infections. The use of a urine dipstick test is not a diagnostic test for diseases. If an abnormality is found, it requires further evaluation by a health professional.

If a sample of urine is sent to a laboratory, a more definitive evaluation is possible, with less

potential for false positive results. The urine can be examined under a microscope. For example, false positive urine dipstick tests for blood can occur for a variety of reasons. This does not occur with laboratory analysis as the red blood cells can be seen with the microscope.

> ## Recommendation
>
> The above tests are not essential or core tests but we consider them possibly beneficial and are worth considering.
>
> Sample results outside the reference ranges should be followed up by the individual's General Practitioner.

## 2.15  Atrial Fibrillation Screening

Atrial Fibrillation (AF) is a disorder of the electrical conductivity of the heart where a heart beats irregularly and often fast. The irregular contraction of the heart increases the likelihood of blood clots forming in the heart. These clots may circulate to the brain increasing a person's risk factor for developing a stroke significantly.

The risk of getting AF increases with age. In a large population based European study, the prevalence of AF in the adult population was shown to be 5.5%. Some authorities recommend that a screening programme for AF should be established for people aged 65 years and over.

For an experienced health professional, it is very easily diagnosed by obtaining a two lead Electrocardiogram (ECG). This is an abbreviated version of the 12 lead ECG that measures the electrical activity of the heart. This test is quick and easy and can be beneficial as a test to diagnose AF.

If AF is diagnosed, treatments such as medications in the form of blood thinners and medications that slow the pulse rate may be prescribed to reduce the risk of getting a stroke. In some cases, the normal heart rhythm can be restored through hospital procedures called cardioversion or cardiac ablation surgery.

> ## Recommendation
>
> Two lead ECGs are not essential, but are possibly beneficial and should be considered as part of screening.

## 2.16  Vision Screening (Visual Acuity Only)

Every employee who habitually uses a VDU (computer screen) as a significant part of their normal work is entitled to an eye test before taking up work and at regular intervals thereafter (Health & Safety Authority 2007 VDU Regulations). The exact frequency of testing is determined by the nature of their work and also by the age of the employee. Testing can be carried out by a person trained to use vision screening equipment, not just a doctor or optician.

Whilst technically this only requires checking visual acuity (clearness of vision) at intermediate distance (VDU use), in practice testing also involves checking visual acuity for near vision and distance vision.

It should be pointed out that there is no medical evidence that not wearing glasses where required / using incorrect glasses damages vision. However, impaired vision may affect an individual's workplace efficiency if their work involves a lot of VDU use.

We do not recommend more complex screening in regular occupations, such as colour vision screening, visual fields (a person's field of view in each eye), retinal examination or tonometry (measuring the pressure of the eye to test for glaucoma). This adds to the cost of screening programmes as it is more time consuming and involves more complex equipment.

# BENEFIT UNCERTAIN

## 2.17 Resting 12 Lead Electrocardiogram (ECG)

An electrocardiograph (ECG) is a resting test of the heart to detect any underlying heart conditions. There are many ways of performing this test. A twelve-lead ECG is most commonly used today. The test is performed with the person lying down at rest and takes about 5 minutes. The leads from the ECG machine are attached to the skin at the wrists, ankles and front of the chest. When the machine is turned on a tracing of the activity of the heart is recorded on paper.

The 12 lead ECG is a static picture and may not reflect coronary artery problems at a time when there are no symptoms. An ECG may be normal despite the presence of an underlying cardiac condition as certain abnormalities only appear when the heart is exercised. Where doctors suspect underlying heart disease, they usually perform an Exercise Stress ECG, where the patient exercises on a treadmill whilst having a continuous ECG tracing done.

A 12 lead resting ECG simply shows the heart rhythm, but does not detect asymptomatic narrowing of the coronary arteries. This can sometimes be detected by a stress ECG that involves the patient exercising on a treadmill or bike. A stress ECG is quite an involved test and is usually performed in a hospital or clinic setting with full cardiac resuscitation equipment. This is because palpitations,

chest pain, myocardial infarction, shortness of breath, collapse, headache, nausea or fatigue can arise during and after testing. Routine ECGs performed on individuals with no cardiac history or symptoms can often be inconclusive, leading to unnecessary further testing which can be costly and cause significant anxiety without any significant health benefit.

For the above reasons, we do not recommend the routine use of the resting 12 lead ECG in health screening of asymptomatic individuals, as it is of limited value.

## 2.18 Bone Density / DEXA Scan

This is the X-ray measurement of bone structure, to measure bone density, diagnose osteoporosis and the risk of bone fracture by measuring the amount of calcium in regions of the bones. In women, bone mineral density declines sharply with the onset of menopause. The standard test for bone density is using Dual Energy X-ray Absorptiometry (DEXA) scanning of bones in the lower spine and hip. The patient lies fully-clothed on a padded table while getting the scan. The examination takes 10-15 minutes and the result is compared to the normal ranges for a patient's age. A radiologist interprets the results and provides a report.

Age is the strongest predictor of osteoporosis. Women aged 65 and over have a higher risk of having osteoporosis compared with women under that age. Low body weight is also associated with osteoporosis. Other risk factors for fracture or low bone density include family history of osteoporosis, low physical activity, smoking, excessive alcohol or caffeine use, and low levels of calcium and vitamin D intake. Certain medications (e.g. steroids for prolonged periods and some anti-epileptic medications) and intestinal malabsorption syndromes such as Crohn's Disease can also predispose individuals to osteoporosis.

At present, individuals with osteoporosis should be treated by adequate calcium intake, adequate vitamin D intake, regular exercise and

smoking cessation. In addition to these lifestyle measures, a number of different medicines are used to treat osteoporosis by stopping further bone density loss or increase existing bone density. Hormone replacement therapy can also help to protect against osteoporosis and strengthen bones in post-menopausal women.

There are indications for the use of osteoporosis screening in women who have specific risk factors such as low body weight, early menopause (aged <45), a poor dietary calcium intake, a family history of osteoporosis, certain medical conditions or are on specific medications. It is also an appropriate investigation following certain kinds of bone fractures. This is probably best arranged through their General Practitioner or a hospital doctor. At present, there is not a sufficient evidence base to recommend its use in random workplace screening.

## 2.19 Urate (Uric Acid)

Uric Acid is a chemical product formed from the breakdown of purines in the human body. Purine containing foods include certain fish, beer, wine and liver. Urate in the blood stream is usually excreted from the body by the kidneys into the urine. A blood sample is drawn from a vein and sent to a laboratory for testing. If a high level of urate is detected in your blood stream, this is called hyperuricaemia.

A urate level is usually ordered by a physician if there is reason to suspect gout. Gout is a painful inflammation of the joints that most commonly affects the big toe. Typically, it affects middle aged men, and is characterised by sudden onset of severe pain, swelling and redness in the big toe. Whilst it is a painful condition, it is not life threatening and is usually successfully treated.

Occasionally, gout type symptoms can be drug–induced (e.g. certain diuretic drugs used to treat high blood pressure) or due to an underlying systemic condition where there are raised levels of uric acid (e.g. leukaemia or kidney failure).

Urate is not used as a screening tool for gout as some individuals who have symptoms of gout may have a normal urate level while others with high levels of urate may not have any symptoms of gout. It is for the above reasons that we do not recommend its routine use as a screening tool in asymptomatic individuals.

## 2.20 Lung Function Testing / Spirometry

These are breathing tests to evaluate the function of the lungs. In an outpatient/health screening setting, it is performed on a portable machine called a spirometer. The person takes a deep breath and blows as hard as possible into a tube attached to the spirometer for as long as possible. Usually three tests are performed and the machine analysis the best of the three for the result. It measures how much air the lungs can take in and hold, and the length of time it takes for air movement in and out of the lungs.

The test can help diagnose lung disease and measure the severity of lung problems that prevent normal breathing. The utility in asymptomatic individuals is unclear but it can be of some use in encouraging smokers to quit by demonstrating that their lung function is abnormal.

Lung function tests are also used in statutory health surveillance in the workplace where there is dust or fume exposure that cannot be lowered to safe levels.

Whilst it may be of some benefit in encouraging smokers to quit, it adds to the cost of screening programmes and does not have an evidence base to suggest it is of value in asymptomatic individuals. We do not recommend its routine use in workplace health screening programmes.

## 2.21 Extended Lipid Profile Testing (including Apolipoprotein B)

Standard lipid profile testing includes testing for total cholesterol, triglycerides, HDL and LDL cholesterol. Extended lipid profile testing also includes testing for apolipoprotein B. Apoliprotein B levels are considered to be more useful than LDL cholesterol levels for clinical decision making on lipid-lowering medication. However, extended lipid profile testing involves an additional cost and is not widely recommended as part of initial general health screening.

## 2.22 Lipoprotein A

Lipoprotein (a) or Lp(a) lipoprotein is similar to LDL Cholesterol. High levels of Lp(a) in the blood can lead to the 'clogging' of arteries and has been identified as a risk factor for cardiovascular disease including heart attack, stroke, aortic valve disease and heart failure. The amount of Lp(a) in an individual's blood is determined by genetics. Lp(a) has been found to be lower in some populations like Chinese and Japanese and higher in others including African populations. It can also be elevated in conditions such as chronic kidney disease and hypothyroidism. Lp(a) testing is reserved for specialist lipid clinics and it is not recommended for routine health screening.

## 2.23 Food Allergy Testing Including Coeliac Disease

Food allergy is an adverse reaction to food that involves the immune system. Food allergies can be immediate (IgE mediated allergy) or delayed (non IgE mediated allergy). In Ireland, the most common food allergies are egg, milk and peanut. Allergies to tree nuts, shellfish, fish, wheat, soya, sesame and kiwi can also occur.

Food allergy testing is carried out by either specialist blood tests or skin prick testing.

These tests are usually carried out by specialist hospital based allergy clinics or general practitioners. This is a complicated area and can lead to lifelong exclusion of important dietary components.

For example Coeliac Disease is relatively common in Ireland. It is due to an immune reaction to the protein gluten, present in foods containing wheat, barley, rye and oats. This means lifelong avoidance of very common foods such as bread, pasta, cereals, as well as many food products / sauces that contain even very small amounts of flour or other gluten containing substances. This involves a substantial amount of dietary discipline, excludes many nutritious foods and is costly. Diagnosis is made by a specialist antibody test (IgA transglutaminase antibody) as well as a small bowel endoscopy (telescope test) conducted by a gastroenterologist. Evaluation of whether an individual may have Coeliac Disease is best handled by a General Practitioner.

Some commercial providers offer blood tests that claim to detect allergy to certain food components. The difficulty is that the presence of an antibody to a food component may simply indicate exposure to that food component and not necessarily any allergy or abnormal immune response. More specialist evaluation is required to establish whether an individual has for example Coeliac Disease because of the lifelong consequences this may have.

Food intolerance is an adverse reaction to food that does not involve the immune system. An example of a food intolerance is lactose intolerance. Lactose is a sugar that occurs naturally in dairy products. Lactose intolerance can be confirmed by a hydrogen breath test or a lactose tolerance blood test.

Testing for food allergies and intolerance should be targeted based on an individual's symptoms. A detailed discussion of this topic and why this testing is considered inappropriate in the workplace is beyond the scope of these guidelines. These tests are specialised and are not recommended as part of general health screening in asymptomatic individuals.

## BEST OFFERED BY A GENERAL PRACTITIONER OR A NATIONAL SCREENING PROGRAM

### 2.24 Prostate Specific Antigen (PSA)

Prostate Specific Antigen (PSA) is a blood test used for screening for Prostate Cancer. PSA is a protein produced by the prostate gland and found in the blood. There is controversy around its exact role in cancer screening programmes, and it is discussed here at some length. It should be said at the onset that there is not a straightforward answer as to whether PSA screening should be offered or not.

Prostate cancer is quite unusual in that it is a very common male cancer, yet in the majority of men it progresses so slowly that they will not become symptomatic and will die from an unrelated condition. Established risk factors for prostate cancer include increasing age, black ethnic origin and a family history of prostate cancer. The latter two risk factors convey modest risk compared with age. Prostate cancer is rare before the age of 50, and about 80% of cases and 90% of deaths occur in men over the age of 65 (i.e. generally outside the working age population). The lifetime risk of developing and dying from prostate cancer *if left untreated* is roughly 3%.

As mentioned earlier, the goal of any screening programme is early detection of an asymptomatic condition in order to reduce both morbidity (future symptoms/ health problems) and mortality (death) from that condition. In other words, its aim is to improve eventual outcomes. It is not to simply identify people with a condition and treat them, without any net benefit to the individual. In screening programmes, there is no point in bringing forward the date of diagnosis if the endpoint is still the same.

Firstly, we do not know why prostate cancer stays localised / asymptomatic within the

prostate gland in most men and why it in a minority of men it becomes invasive/ symptomatic and spreads outside the prostate gland. Mortality occurs where the disease spreads outside the prostate gland. The PSA test is not good at distinguishing between these two forms of prostate cancer.

Secondly, the PSA test has a high false positive rate. Thus, a man can have a high PSA for a whole host of reasons other than cancer (false positive). However, to establish this, a quite invasive test known as a transrectal prostate needle biopsy is required, which can have side effects of its own. Prostate biopsies have about a 2 per cent complication rate including bleeding, infection and urinary obstruction. A negative prostate biopsy does not out definitely out rule prostate cancer.

Thirdly, there is no universal agreement on how best to treat lower risk prostate cancer once detected. Treatments include "watchful waiting" (i.e. observation), surgical removal of the prostate gland, external radiation therapy or internal radioactive implants within the prostate gland. Although side effects vary between treatment modalities, a significant number of men experience urinary incontinence, erectile dysfunction and rectal dysfunction (pain/ diarrhoea/ bleeding). Urinary incontinence and erectile dysfunction can sometimes be permanent. These complications can have very significant effects on quality of life.

There have been a series of large population based studies looking at the efficacy of random population based PSA screening in asymptomatic men. These are known as randomised controlled trials, where one group of men undergo periodic PSA testing and a second comparable group of men do not undergo testing.

The two best known studies are the American Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial (PLCO Trial) and the European Randomised Study of Screening (ERSPC) for Prostate Cancer. These are very complicated long term epidemiological studies involving

large numbers of study participants and many years of follow-up. They are not discussed in detail here. Essentially they found that whilst repeated PSA screening at regular intervals increases survival from Prostate Cancer, but that this is potentially counterbalanced by various harms associated with screening.

The European study took into account not only years of survival, but also the improvement in what statisticians call Quality Adjusted Life Years (QALYs). Data modelling from the study found that with annual screening of men between ages 55 and 69 projected a lifetime nine fewer prostate cancer deaths per 1,000 men, with a total of 73 life- years gained. However, allowing for statistical variation, there was uncertainty whether there was a gain or a loss in Quality Adjusted Life Years. For readers familiar with statistics, the average gain in QALYs was 56 years, but with a range of 97 QALYs added to 21 QALYs lost, at a 95 % confidence interval. Thus, in simple terms, researchers are unclear if PSA screening actually adds to overall Quality of Life.

The Department of Health Cancer Control Strategy 2017-2026 does not make a specific recommendation for PSA screening of asymptomatic men. It advises that population-based screening programmes for any cancer should only be considered where clear evidence exists of the benefits outweighing harm.

The American Cancer Association recommends that men have a chance to make an informed decision with their health care provider about whether to get screened for Prostate Cancer. This should only be made after getting information about the uncertainties, risks and potential benefits of prostate cancer screening. They state emphatically that men should not be screened unless this takes place. They recommend that screening should be considered for men from age 50 who are at average risk of Prostate Cancer. Different criteria are recommended for men who have one or more first degree relatives diagnosed with prostate cancer before the age of 65.

Because of all of the above considerations, we *on balance* do not recommend the use of PSA testing in workplace health screening. A one-on-one discussion allowing careful consideration of the pros and cons of the test allows a shared informed decision to be made. We believe that this is generally best undertaken between the patient and their GP. It is not always possible to achieve this in the context of a mass workplace screening programme.

Thus, having considered this carefully, whilst we do not object in principle to employers offering PSA testing, the CMO Office recommendation is that *on balance* PSA testing is not at this point in time best offered in random workplace health screening. Instead, we recommended that men over 50 without risk factors discuss the pros and cons of the PSA test with their GP, and then make an informed shared decision about whether to proceed with PSA screening or not.

As with all screening tests, it is possible that this recommendation could change in the future in the light of new scientific evidence or an improved screening test.

## 2.25 Cervical Cancer Screening

Cervical Check, which is The National Cancer Screening Service (NCSS), provides free smear tests to women between the ages of 25–65 years. This is a population based screening programme operated on an active call and recall system. Women who have availed of Cervical Check smear test will be automatically recalled when their next test is due. A smear test is a simple procedure and is the most effective way to identify individuals at risk of developing cancer. Cervical screening used to test all samples for abnormal or pre-cancerous cells.

Recently the Irish cervical screening programme changed to HPV cervical screening. HPV stands for human papillomavirus. This is a name for a common group of viruses which can be transmitted from any kind of physical or

sexual contact of the genital area. Most people will get some type of HPV during their lives and for the majority, their immune system will clear the virus so it causes no harm. About 10% of HPV infections will not be cleared and this can put women at risk of developing cervical cancer. There are also some types of HPV that are considered 'high risk' and can lead to cell changes in the cervix which could turn into cancer if left untreated.

During screening, a sample of cells are obtained and tested for HPV. If HPV is found the sample will be tested for abnormal cell changes. If HPV is not found, the cells are not checked as the risk of developing cell changes is very low. The tests are every three years to five years for routine testing, but may be sooner if there are any abnormalities found in a previous test sample. The test can be done by the General Practitioner, GP practice nurse, or in women's health clinic. Positive tests need further investigation and the woman is referred on for a colposcopy. This is a telescope examination of the cervix, performed on an outpatient basis.

The NCSS is responsible for the governance and management of colposcopy services. A colposcopy is a simple medical diagnostic procedure performed at a colposcopy clinic in a hospital out-patient clinic. During the procedure the cervix and vagina is viewed through a magnified lens using a colposcope to examine for any abnormal cells. Biopsies are taken for examination in the laboratory. The main aim of the test is to detect pre-cancerous cells and prevent progression to invasive cervical cancer.

Cervical smears would not be recommended as part of a workplace health screening programme as it is best offered as part of the ongoing national programme. If a woman has symptoms of abnormal vaginal bleeding, discharge or pelvic pain they should visit their GP for assessment and discussion about further investigations that may be warranted.

## 2.26 Breast Cancer Screening

A Mammogram is an X-ray of the breasts and is offered through the National Breast Screening Program (Breast Check) for women between the ages of 50 and 69. The aim of this screening is to detect breast cancer at an early stage. The early detection of breast changes allows for better treatment outcomes including higher cure rates. Breast Check is a well organised and quality approved national programme.

Most breast cancer occurs in women over 50 years of age in Ireland. Breast cancer occurs infrequently in women under 40 years. Furthermore, it is easier to visualise cancerous changes in mammograms of women who have undergone menopause. These women are usually over 50 years of age. For women who are outside the age range of 50-69, the importance of self-examination of their breasts frequently should be emphasized.

If any abnormalities are detected, the first port of call should be a GP review and examination. We would not recommend a routine mammogram for screening of female employees as part of a workplace health screening program as we feel that this is best offered to women as part of a well-established quality assured national programme.

## 2.27 Bowel Cancer Screening (Faecal Occult Blood)

The initial screening test for bowel cancer involves testing for blood in the stool. There are many types of kits used for testing but most outpatient tests require the individual to collect a sample of their own stool for an on the spot test or processing in a laboratory.

The National Bowel Screening Program called Bowel Screen has been launched, to include screening of individuals between 60-69 years of age at two yearly intervals. There is a plan to develop the capacity to include those between the 55 to 74 age group in a phased basis over the coming years.

Blood in the stool is not a definitive diagnostic test for bowel cancer, and can reflect other non-sinister conditions such as haemorrhoids, bowel infections or recent dental surgery. If blood is detected, further confirmatory and diagnostic tests are ordered to investigate the finding. These diagnostic tests can sometimes be quite invasive, such a as a telescope test on the large bowel (colonoscopy).

We do not recommend faecal blood testing as a workplace screening test in healthy working individuals. We feel that bowel cancer screening is best conducted by the national screening programme within the target age group.

If an individual develops symptoms of concern, or are at a higher risk of developing bowel cancer, they are encouraged to attend their GP for a discussion and advice on the necessary investigations required for their symptoms.

## 2.28 Haemochromatosis Screening

Haemochromatosis is a condition where a person absorbs too much iron from their diet and this in turn deposits in various parts of the body. It is an inherited genetic disorder. Other causes of acquired haemochromatosis can occur in those with excess alcohol consumption, multiple blood transfusions and in persons who suffer from rare blood conditions. It affects more men than women. The symptoms of iron overload include abdominal pain, fatigue, joint pains, weight loss, generalised weakness, a darkening of the skin and symptoms of liver damage.

As the condition is one that is due to iron overload, a number of other blood tests may help point to a suspected diagnosis. Blood tests including haemoglobin, ferritin, transferrin saturation and total iron binding capacity may be abnormal.

However, the only diagnostic test for the hereditary form of haemochromatosis is a genetic test. This should be performed in consultation with a General Practitioner and a Medical Physician. It is also recommended that relatives of family members who are affected by this condition are offered the genetic screen. We do not advise workplace screening for this condition.

# SECTION
## 03

# Lifestyle Screening

A growing number of Irish people are now affected by chronic diseases and disabilities related to poor diet, smoking, alcohol misuse and physical inactivity. Lifestyle factors are extremely important determinants of health, and well established initiatives such as Healthy Ireland show the importance to government of such measures.

The workplace is an ideal location for seeking to modify health behaviours. The workforce is a "captive audience", and peer support/ encouragement can help the adoption of healthy lifestyles.

The major attraction of lifestyle screening is that whilst laboratory tests described in previous sections may detect a condition/illness that is currently asymptomatic, lifestyle screening can prevent the development of the condition or illness.

For example, whilst laboratory testing for glucose may detect diabetes in its asymptomatic phase, a lifestyle questionnaire detecting high body mass index that is followed by appropriate lifestyle modification can prevent the development of diabetes in the first instance.

## 3.1   Types of Lifestyle Screening

Lifestyle screening generally consists of a self-completed questionnaire in paper format or online, or sometimes a questionnaire administered face to face by a healthcare professional. Questions typically include age, gender, weight, smoking, alcohol intake, family history, occupation, exercise, sleep and diet. This identifies risk factors that may cause ill health. Risk factors such as obesity, poor level of exercise and smoking can be modified once they are identified.

A variation on health questionnaires are online disease risk calculators. These are based on large scale population based studies, and seek to individualise the risk of developing a disease in the future based on various person specific parameters such as height, weight, blood pressure, cigarette use etc.

For example, as discussed earlier, there are online risk calculators for developing circulatory disease that look at age, sex, BMI, race, medical history, exercise, dietary patterns, blood pressure and cholesterol if known. They can then give a 10– year - lifetime percentage risk of developing cardiovascular disease/stroke/heart attack, and how this can be reduced through modifiable factors such as exercise, diet and sometimes drug treatment of raised blood pressure or cholesterol.

The core components of any lifestyle questionnaire are body mass index (BMI), smoking history, alcohol consumption, diet and exercise. The rationale for each of these are discussed below in turn.

## 3.2   Smoking and Vaping

The negative health effects of smoking have been very well documented for many decades now. One in every two people who smoke will die from a smoking related illness. Smoking has a negative effect on the whole body and all its systems. Lifetime smoking roughly

doubles the risk of developing heart disease. It also significantly increases the risk of many common cancers, especially lung cancer. Unlike many other health risk factors, it affects other individuals through passive smoking and its effects on the unborn child.

Smoking raises blood pressure, pulse rate and carbon monoxide in the body and reduces oxygen levels. Smoking damages cells in the lung which can lead to bronchitis, chronic obstructive airways disease (COPD) and emphysema. Smoking can impair the body's immune system. Smokers suffer more from cough, chest infections and shortness of breath than non-smokers. Hence, it not only increases one's risk of a premature death, but also affects physical fitness and quality of life.

On average, smokers have a significantly reduced life expectancy compared to non-smokers. Even smoking a small amount can damage health and exacerbate existing medical conditions. Smoking is the single biggest cause of ill health globally.

Electronic cigarettes are battery powered devices that heat nicotine to create an aerosol. The aerosol is then inhaled and this is known as vaping. Vaping liquids also contain a number of other chemicals such as flavourings and colourings which can be harmful when inhaled. There is emerging evidence of possible inflammation and permanent scarring of the lungs from flavourings frequently added to vaping liquid. We are still learning about the long-term risks of vaping.

Current or past smoking history (including use of electronic cigarettes) is a standard question on health screening questionnaires.

## 3.3   Alcohol

Alcohol is a depressant and not a stimulant. The risks from its misuse are many and include accidents, injuries, mental impairment, overdose, relationship difficulties, addiction, financial problems and legal difficulties.

Different people react to alcohol in different ways and the age, gender and body weight of the individual affects the reaction.

Long term heavy drinking leads to an increase in blood pressure, heart irregularities, heart muscle disorder, stroke, certain cancers such as oesophagus, mouth, throat, larynx, colon, rectum and cirrhosis of the liver.

The HSE has low risk weekly alcohol guidelines which are 11 standard drinks or less over the course of a week for women and 17 standard drinks over the course of the week for men with two alcohol-free days.

Generally, questions on alcohol consumption are included on the lifestyle questionnaire. These typically seek to establish what the individual's weekly alcohol consumption is, and whether it is within safe limits/outside safe limits/exceeds harmful limits.

## 3.4 Diet / Nutrition

Every day the body requires a certain amount of energy from carbohydrate, protein and fat to function properly. It also needs vitamins and also over 20 dietary elements such as iron, calcium and magnesium. Because no single food provides all of the nutrients, the body needs a variety of foods

The concept of the food pyramid was first introduced in Sweden in 1972. It is a graphical recommendation of what a balanced diet should contain. Whilst it has come in for some criticism and is considered by some to be too complicated, its broad recommendations still hold true. The food pyramid is designed to make healthy eating easier.

Foods that contain the same type of nutrients are grouped together on each of the shelves of the Food Pyramid. This gives you a choice of different foods from which to choose a healthy diet.

Following the Food Pyramid as a guide will

help you get the right balance of nutritious foods within your calorie range. Studies show that we take in too many calories from foods high in fat, sugar and salt, on the top shelf of the Food Pyramid. They provide very little of the essential vitamins and minerals your body needs. Limiting these is essential for healthy eating.

So in a nutshell, working from the bottom to the top of the food pyramid, healthy eating involves:

• Plenty of vegetables, salads and fruit

• Plenty of bread, rice, potatoes, pasta and cereals – choose wholegrain and wholemeal

• Some milk, cheese and yoghurt

• Some meat, poultry, eggs, beans and nuts – choose lean meat

• A small amount of fats and oils

• Very rare to no servings of foods and drinks high in fat, sugar and salt.

If you eat a varied and balanced diet, then there is normally no need to take any food supplements – you'll get everything you need from your food. Vegetarians or Vegans need to take care to get enough iron, calcium and vitamin B12 in their diet and may need to take supplements for vitamin B12 and vitamin D in particular. In Ireland in the 21st century, our western diet typically puts us at risk of over nutrition and not under nutrition.

The one exception to this is folic acid. All women of child-bearing age who could become pregnant should take a supplementary folic acid each day. If a woman does become pregnant, she should continue to take the supplement during the first twelve weeks of pregnancy.

Eating well is not complicated but attention to recommended daily servings is important to control blood sugar and reduce the risk of diseases such as diabetes and obesity. Good nutrition increases energy levels and decreases lethargy and fatigue. Healthy eating simply means eating a wide variety of food in the

correct amounts to ensure energy and vitality. There is no good or a bad food, all foods should be enjoyed in moderation.

Poor diet is directly linked to the development of obesity, which is closely linked with the development of high blood pressure, high cholesterol and especially type 2 diabetes. Studies from the United States have shown that obesity is the number one risk factor for the development of type 2 diabetes. Indeed, an adult who is very obese (BMI over 40) has a 70% lifetime risk of developing type 2 diabetes.

The majority of middle aged adults in Ireland are overweight due to dietary factors and lack of exercise. If current trends continue, some reports suggest that Ireland may have the highest rates of adult obesity in Europe by 2030.

The lifestyle questionnaire generally includes questions about diet, and seeks to identify whether an individual has a healthy diet roughly in keeping with the food pyramid concept, or at the other end of the spectrum has a poorly balanced diet.

## 3.5  Exercise

Even in ancient times, the benefits of exercise were well known. According to Hippocrates, all parts of the body if unused and left idle, become liable to disease. The WHO recommends that adults should do at least 150-300 minutes of moderate-intensity aerobic exercise or at least 75-150 minutes of vigorous intensity aerobic exercise throughout the week, as well as muscle-strengthening activities involving all major muscle groups at least 2 days per week. Time spent being sedentary should be limited. Sedentary or inactive people should start with short sessions of 5–10 minutes and build up to the desired level of physical activity.

Exercise helps prevent the risk of premature death from heart disease, high blood pressure, high cholesterol, osteoporosis or thinning of the bones. It also reduces the risk of developing

various forms of cancer and diabetes. It is not necessary to be exhausted to achieve improvement in physical fitness and it is never too late to start exercising regularly.

More recently, it has been recognised that even moderate exercise improves psychological wellbeing, reduces anxiety and raises mood in persons who are depressed. The exact mechanism underlying this is unknown, but it may be that exercise causes the release of chemicals in our brain known as endorphins that help raise mood.

Lifestyle questionnaires seek to identify the nature, frequency and intensity of physical exercise, and seek to measure if the individual is achieving the recommended weekly amounts of exercise to promote a healthy lifestyle.

## 3.6  Sleep

Adequate sleep is increasingly being recognised as being important to physical and mental health wellbeing. Obviously there are periods in people's lives where sleep is unavoidably temporarily disturbed, such as with caring for new-born children. In the context of work, sleep can be unavoidably disturbed by shift work. There is now good occupational health advice on how to manage and organise shift work patterns, which is outside the remit of these guidelines.

The amount of sleep varies from individual to individual, but typically an adult needs 7-8 hours of sleep per night. It is a myth that middle aged or older people need less sleep. It is true however that "sleep drive" can decrease with advancing age. The onset of menopause can also lead to poor sleep.

Lifestyle questionnaires can look at factors that can affect sleep that sometimes employees can be unaware of. Good "sleep hygiene" measures are important in ensuring a good night's sleep. Some of these are obvious such as ensuring a bedroom is dark, is not too hot or cold, and is free from noise sources.

Two factors that are often overlooked are caffeine consumption and use of screens such as smartphones and tablets / laptops. Caffeine has a half-life of 5-6 hours, meaning that its concentration in the blood stream only declines by half 5-6 hours later. About 20 per cent of people metabolise caffeine differently to the general population, and may be extra sensitive to its effects. Hence, coffee consumption should generally be avoided from early afternoon onwards in persons who are having difficulty with sleep.

Screen devices such as laptops and smartphones can have an unrecognised effect on sleep. Because of the type of light given off by screens, the brain sleep centre can become confused as to what time of day it is, believing that it is daytime as opposed to night time. Hence it is best to avoid use of screens for at least an hour prior to normal bedtime.

# Recommendations & Conclusion

**At present there is only definitive evidence of benefit for a limited number of health screening tests in the workplace. This section summarises section 2 of this guide. It categorises tests into beneficial, possibly beneficial and of uncertain benefit in a workplace health screening program. It also details tests that are best offered as part of a national screening programme or through a General Practitioner.**

**It then makes some suggestions as to what to seek from commercial health screening providers when tendering for health screening programmes. A process map of the various steps involved in organising a screening program is also included.**

## 4.1 Recommended Measurements and Laboratory Tests

Measurements and Laboratory test screening can be divided into three categories, namely beneficial, possibly beneficial, and uncertain benefit. There are a fourth category of tests that are best carried out by a national screening programme or a GP.

Beneficial tests include blood pressure measurement, cholesterol, triglycerides, body mass index (BMI), waist circumference and either glucose or glycated haemoglobin. These are simple tests that detect common conditions and risk factors which can have serious consequences if not detected early. These are recommended as a core component of any workplace health screening programme. We consider all the tests below to be beneficial to employees. We recommend that you offer them as part of any workplace health screening programme.

| BENEFICIAL TESTS |
| --- |
| Blood Pressure Measurement |
| Cholesterol and Triglycerides |
| Body Mass Index and Waist Circumference |
| Glucose or Glycated Haemoglobin |
| Cardiovascular & Diabetes Risk Calculators |

Tests that may be beneficial include for example full blood count, renal profile, and liver function tests, among others. These tests are worth considering. They may increase the cost of a screening programme to employees, resulting in lower overall participation. They are not essential or core tests. We consider these tests to be possibly beneficial to employees:

## POSSIBLY BENEFICIAL TESTS

Full Blood Count

Renal Profile / Urea & Electrolytes

Liver Function Tests

Thyroid Function Tests

Bone Profile

Urinalysis

Atrial Fibrillation Screening (2 Lead ECG)

Vision Screening (Visual Acuity Only)

Tests that are of uncertain benefit in random workplace screening of well individuals include resting 12 lead electrocardiogram (ECG), bone density / DEXA Scan, lung function testing and urate screening. For example, bone density screening is better targeted at persons who have specific known risk factors for osteoporosis rather than well individuals.

An exercise stress ECG is expensive and needs to be conducted in a clinic or hospital setting that has resuscitation facilities. It is ordinarily not appropriate to onsite random health testing of asymptomatic individuals.

Therefore, the CMO's Office does not recommend offering the tests below as part of a workplace health screening programme, as the benefits are uncertain.

## UNCERTAIN BENEFIT

Resting 12 Lead ECG

Exercise Stress ECG

Bone Density / DEXA Scan

Urate (Uric Acid)

Lung Function Testing / Spirometry

Apo Lipoprotein A & B Testing

Food Allergy & Intolerance Tests

Because of the complex pros and cons of PSA screening for prostate cancer, we on balance do not recommend that Prostate Cancer (PSA) testing is offered as part of a mass workplace health screening programme. Instead, we recommend that men over 50 discuss it first with their GP, and then decide whether they wish their GP to do the test. Please note that PSA screening is discussed extensively in Section 2 of this guide and we suggest that you read this before consider whether to offer it or not. Breast, colon and cervical screening are best performed as part of national quality assured screening programmes organised by the National Cancer Screening Service (NCSS).

Therefore, the tests in the table below are best offered by a General Practitioner or as part of a national screening programme.

## BEST OFFERED BY GP / NATIONAL PROGRAMME

Prostate Cancer Screening (GP Discussion)

Breast Cancer Screening

Cervical Cancer Screening

Colon Cancer Screening

Haemochromatosis Screening (Family History)

### 4.2 Tendering for a Health Screening Programme

The process map for putting a health screening programme in place is shown in Figure 4.1.

The CMO's Office does not recommend any specific company to provide health screening in the workplace. However, we consider it advisable that the provider fulfils the following criteria:

- Confirm their medical and professional ability to provide the programme. It is useful to get references from other employers who have already used them if they are a new provider.

- The programme must be overseen by a qualified medical doctor. This does not mean that a doctor has to attend the screening sessions, just that there is background medical oversight of the programme.

- Indemnify the Department / Office against any laboratory errors or failure to adequately communicate medically important results to an employee.

- Outline how they are going to communicate the results of tests to employees. At the bare minimum, results should at least be posted or emailed to employees. Whilst a face-to-face follow–up consultation with a health professional is the ideal, this can be more costly. Be mindful of the fact that even now some employees may not have access to email or may have a sight or hearing disability.

- Outline how they are going to communicate to employees any significantly abnormal results that require immediate medical intervention. For example, if an employee has a significantly elevated blood glucose level, this may require quite urgent medical intervention. In these circumstances, the screening company should ordinarily make direct landline or mobile phone contact with the employee.

- Guarantees given that any replacement personnel during the course of the project are at least of equal expertise and experience. This can be a problem as some providers draft in new locum personnel at short notice.

- Provide a statistical report of the findings to the Department while respecting employee confidentiality.

Screening providers should not provide a prescription service. There is a danger that prescription medications can continue for an excessive period, and also that the provider does not have background knowledge of the employee.

## 4.3  Conclusion

Lifestyle questionnaires cause few problems as regards health screening. However, there are difficulties and potential pitfalls around laboratory test screening. A health screening programme should have a minimum of false positive results (wrongly reported as having the condition) and false negative results (wrongly reported as not having the condition). Offering more tests does not necessarily mean more benefits for the employee. In fact, paradoxically, it can mean less benefits for the employee, due to excessive false positives and false negatives.

Also, offering a large number of tests can increase the cost of health screening programmes, raising the co-payment that employees may make towards the cost. This can decrease participation rates in programmes, particularly from those who might most benefit from such programmes.

Health screening carried out for weight, blood pressure, cholesterol and/or glucose testing are of proven benefit. These should form a core part of any health screening programme. Health promotion information on healthy eating, exercise and fitness should be imparted as part of health screening. This education encourages participants to become more active and aware of how healthy living can improve their well being.

A health screening programme should be overseen by a qualified medical practitioner. Providers should explain how they are going to provide results to employees, and how they are going to handle significantly abnormal results. Departments / Offices should ensure that health providers have adequate indemnity insurance to protect against laboratory errors or communication failures.

A statistical report of aggregated results is required. The report will determine what health promotion initiatives are necessary and what would be most beneficial to the employees.

Figure 4.1

## Health Screening Process Map

### Screening Programme Design

- Establish Organisational Budget
- Decide on whether Co-Payment By Employees
- Refer to CMO Guide to Health Screening Document
- Contact CMO's Office for Advice if Necessary

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### Successful Tenderer

- Has Medical Practitioner Oversight
- Good Professional/Technical Ability
- Effective Communication Strategy

↓

### Screening

- Look at On-site Components
- Look at Online Components

↓

### Results Communication to Employee

- Significantly Abnormal: Received Directly from a Health Professional
- Routine: Received Via Written/Email Report/Face to Face

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### Results Communication to Organisation

- Require Summary Report of Anonymous Data
- Comparison to Previous Data if Available
- Use this to inform organisations future Health & Wellbeing Strategy