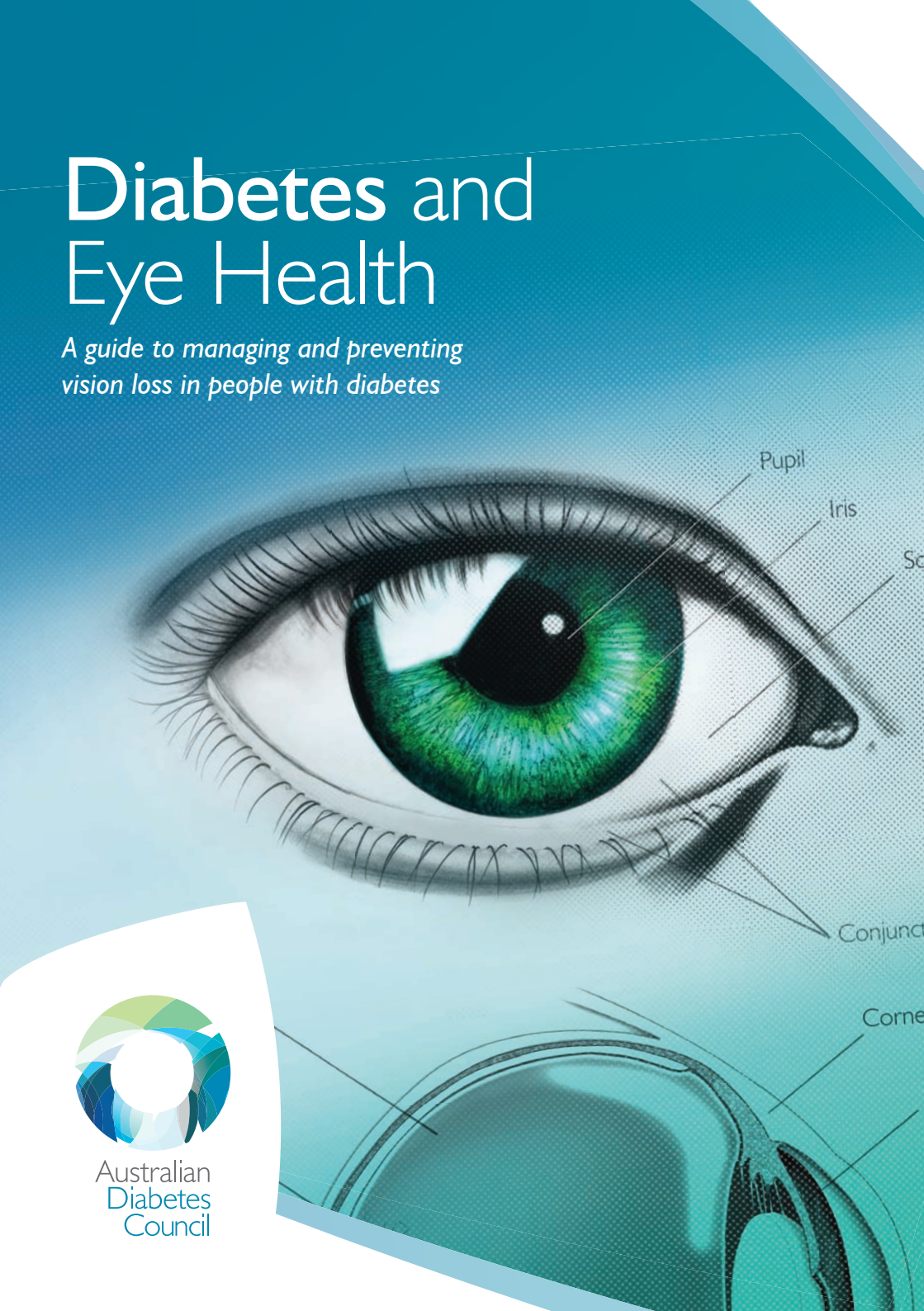
Diabetes and Eye Health

A guide to managing and preventing vision loss in people with diabetes



Australian Diabetes Council

Over 98% of severe vision loss can be prevented in people with diabetes with optimal management and treatment.[1]

“Over 1.1 million people in Australia have currently been diagnosed with diabetes and it is the fastest growing chronic disease[2]”

Diabetes is a chronic disease which, without optimal management, can lead to a number of serious complications such as nerve damage, eye damage, kidney disease and cardiovascular disease.

This booklet on diabetes and eye health is part of a series which focuses on the complications that can develop in people living with diabetes.

‘In high income countries diabetes is ranked among the leading causes of blindness’[3]

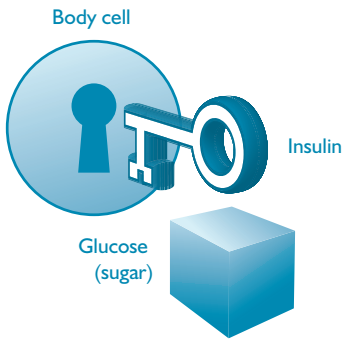
What is diabetes?

Diabetes is diagnosed when there is too much glucose (sugar) in the blood.

Glucose comes from the carbohydrate foods we eat and is needed by the body for energy.

Insulin is a hormone that acts like a key, helping glucose get into the cells of the body to make energy.

With diabetes the body does not produce enough insulin or the insulin produced does not do its job properly.



Is there a cure for diabetes?

At this stage there is no known cure for diabetes.

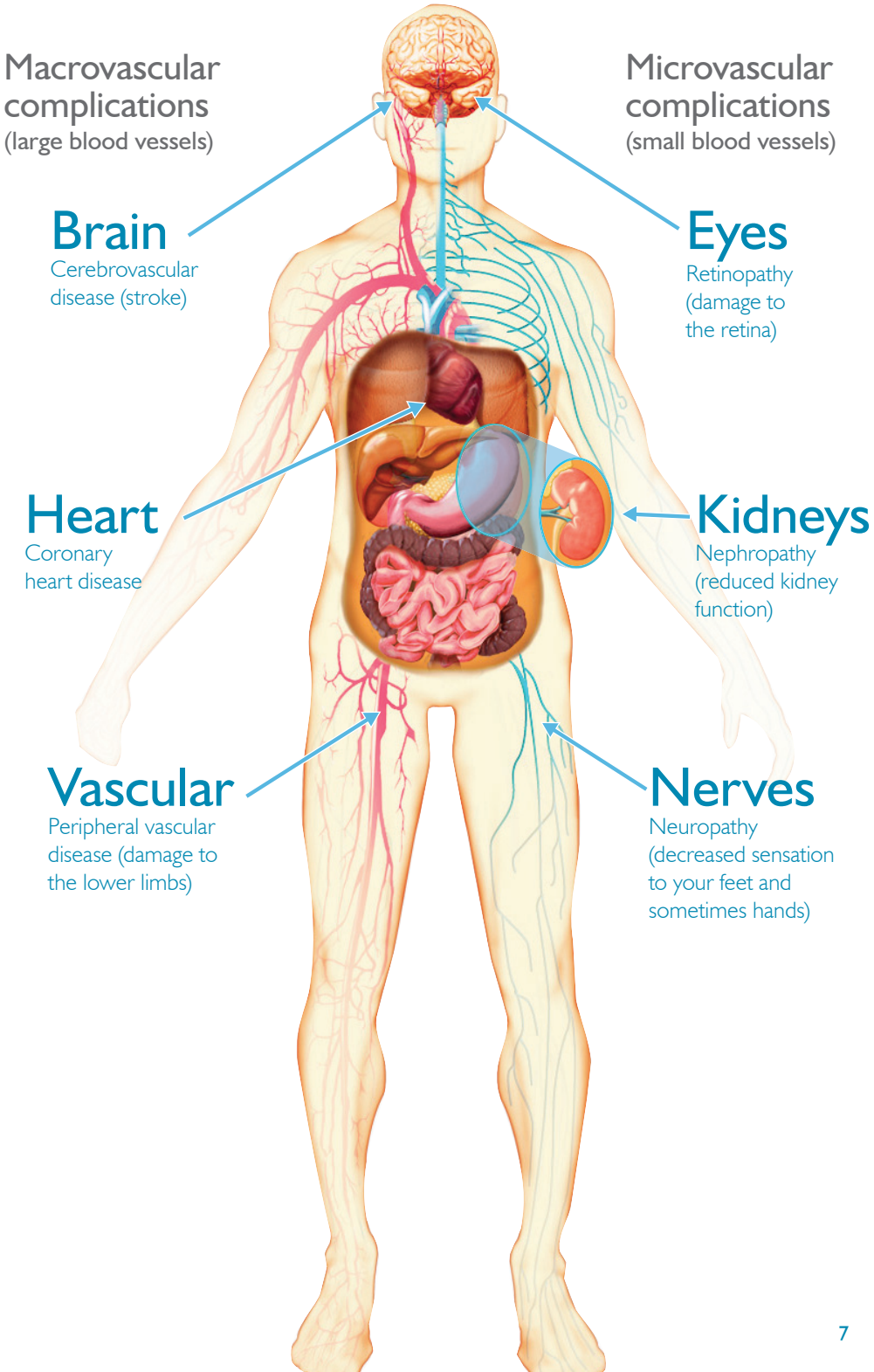
Diabetes and complications

When living with diabetes it is important to manage your blood glucose levels. Research has shown that having elevated blood glucose levels over a long period of time will cause damage to the large and small blood vessels in your heart, brain and feet and smaller blood vessels in the body. It is also important to maintain healthy blood pressure and cholesterol levels to reduce your risk of complications.

Investing in a brighter future

Recently we have seen research deliver significant advances in treatment and prevention methods. We hope that with investment in research that a cure might be found in the future.

This is why we have invested significantly in a Chair of Diabetes to be located at the University of Sydney. This senior research position will uniquely bring together medical research, sociological studies and town-planners to ensure a holistic approach to diabetes treatment and prevention into the future.



Types of diabetes

There are three main types of diabetes: type 1, type 2 and gestational diabetes.

Type 1 diabetes

Type 1 diabetes occurs when the pancreas is unable to make any insulin. This is because the cells that make insulin have been destroyed by the body's own immune system.

People with type 1 diabetes require insulin injections several times a day (or insulin via a pump) for life. A healthy lifestyle is also beneficial.

Type 2 diabetes

Type 2 diabetes occurs when the body does not make enough insulin or when the insulin that is produced does not work properly. This may be referred to as insulin resistance.

Type 2 diabetes is managed by a healthy lifestyle which includes healthy eating and regular physical activity. Medication and/or insulin may also be required.

Gestational diabetes (GDM)

Gestational diabetes (GDM) is a form of diabetes that occurs during pregnancy.

Although this type of diabetes usually disappears after the baby is born, the mother and baby have increased risk of developing type 2 diabetes in the future.

Risk factors for type 2 diabetes

The risk factors for developing type 2 diabetes are:

- A family history of type 2 diabetes
- Age (over 55 or over 45 with another risk factor)
- A history of high blood pressure, high cholesterol and/or heart disease
- Certain ethnic backgrounds – Chinese, Indian, Pacific Islander, Aboriginal or Torres Strait Islander
- Having previously been diagnosed with gestational diabetes
- Having the condition Polycystic Ovarian Syndrome (PCOS)
- Diagnoses of pre-diabetes (Impaired Fasting Glucose and/or Impaired Glucose Tolerance)
- Being overweight, especially around the waist
- Doing little or no physical activity

Being diagnosed at risk of diabetes does not necessarily mean you will develop type 2 diabetes. Lifestyle changes such as weight loss, healthy eating, and regular physical activity will reduce your risk.

Use the risk test at australiandiabetescouncil.com/whatismytype2risk to assess your risk of developing type 2 diabetes.

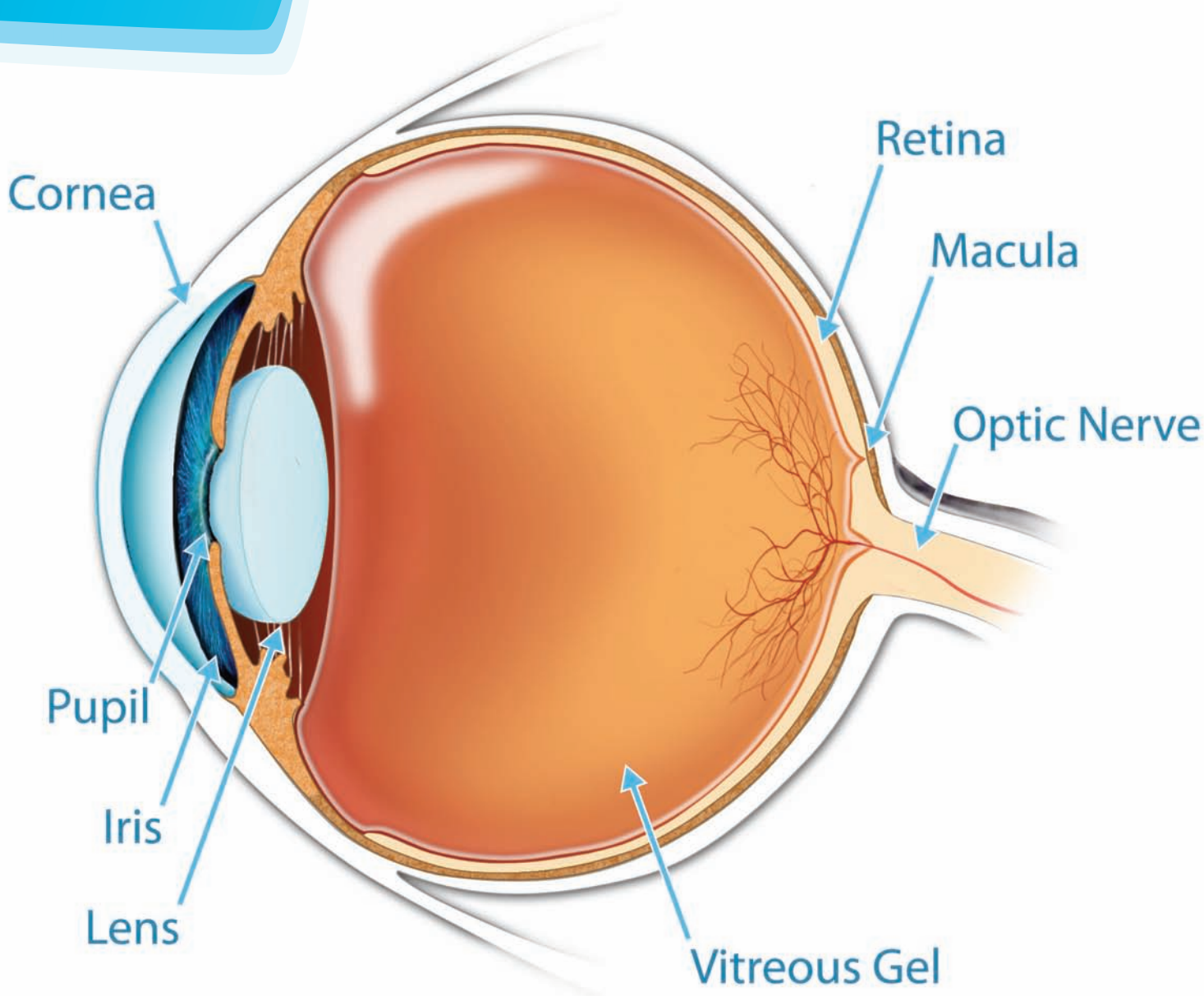
How does the eye work?

The eyes are your window to the world, the key organ in seeing what's around us.

Essentially your eyes act like a camera. Light enters through the cornea and pupil, which then passes through the lens, enabling light to be focused on the retina. The cells in the retina detect the light, like the film in a camera.

At the centre of the retina is the macula. The most crucial part of vision, the macula is responsible for our fine detailed central vision, whilst other parts of the retina are responsible for our peripheral vision (side vision).

The image received by the retina and macula is sent along the optic nerve to the brain. This is where the image is then interpreted.



Diabetes and Eye Disease

Exposure to elevated blood glucose levels (BGLs) over time can increase your risk of developing diabetes related eye complications.

You can help reduce the risk and severity of eye disease greatly by keeping your blood glucose levels within the normal range. Carrying out regular screening to detect the development of eye disease, and timely treatment of any problems, will also help reduce the risk of further development.

By keeping your blood glucose levels within the target range, the development of complications is significantly reduced.

Symptoms of eye disease

Most commonly, diabetes related eye disease has no significant signs or symptoms in the early stages. Often symptoms only appear in advanced stages of eye disease causing distorted and reduced vision. It is essential when living with diabetes that you have your eyes checked regularly!

It is extremely important if you notice any changes with your vision that you consult your doctor/optometrist/ophthalmologist as soon as possible.

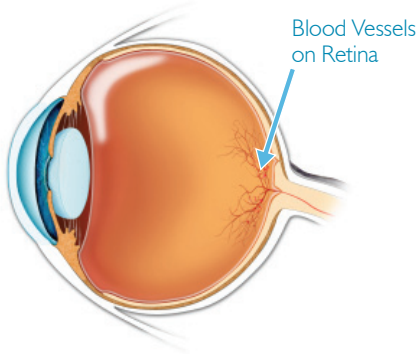
Symptoms may include:

- Blurred vision
- Dim vision
- Poor night vision
- Sensitivity to light
- Loss of vision
- Distorted vision
- Frequent eye glass script changes
- Floating spots in your vision

Types of Eye Disease

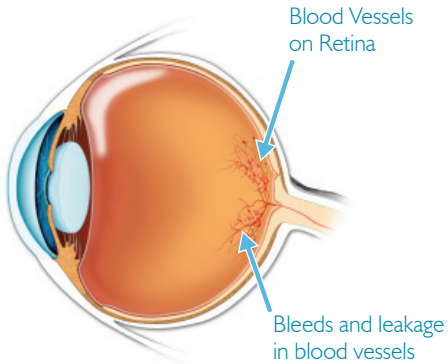
Diabetic Retinopathy

If blood glucose levels are high for an extended period of time, small blood vessels in the retina may be damaged. The blood vessels become weaker and more easily blocked, which causes blood leakage, swelling and reduced oxygen supply in the retina.



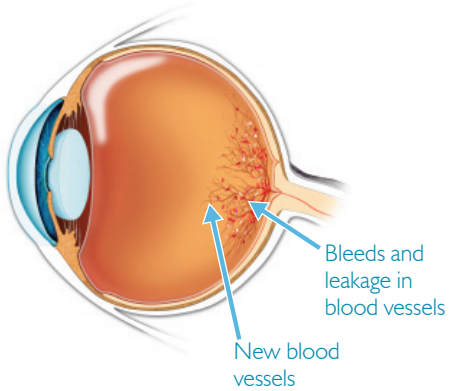
Non Proliferative Retinopathy

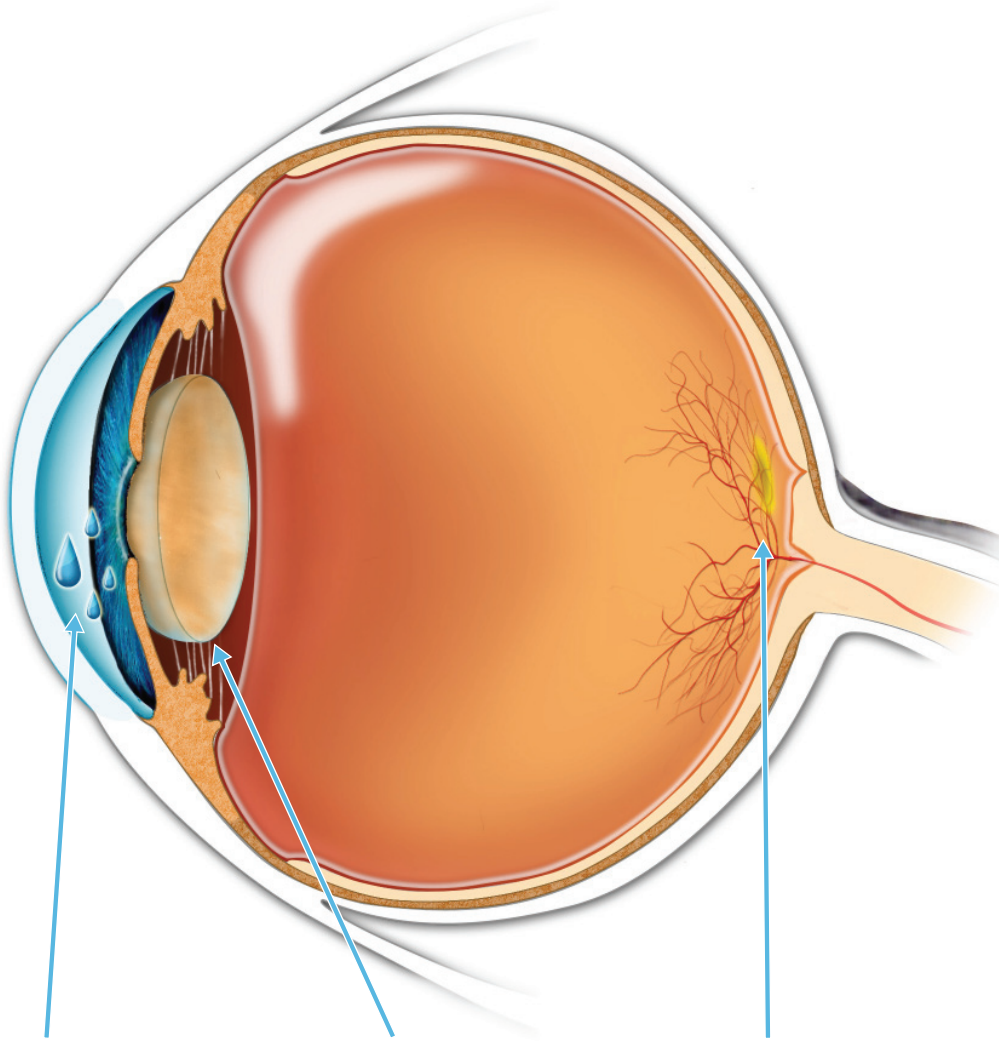
Non proliferative retinopathy is when there are small bleeds, swelling or blockages in the blood vessels of the retina. There are often no symptoms to non proliferative retinopathy. It is diagnosed by looking at the back of the eye and if damage is found close monitoring is recommended but often no active treatment is required. Improving your blood glucose levels, blood pressure and cholesterol control will greatly help reduce the retinopathy progressing. If non proliferative retinopathy is not detected or treated it can progress to proliferative retinopathy.



Proliferative Retinopathy

When areas of the retina are deprived of blood supply for a length of time through blockages or swelling, the body sends signals to grow new blood vessels which extend towards the centre of the eye. This is proliferative retinopathy. The new blood vessels are abnormally fragile, causing even more bleeding and clouding of vision. Proliferative retinopathy requires early treatment to prevent serious vision loss.





Glaucoma

An increase in aqueous humor, a fluid that is naturally and continuously produced in the front of your eye. This then increases pressure within the eye which presses upon the optic nerve leading to a reduction in vision.

Cataracts

A change in the lens that causes cloudiness and a decrease in vision, which often becomes unfocused and blurred. Aging is a key risk factor for developing cataracts, but it is known that living with diabetes can cause cataracts to develop at an earlier age.

Macular Oedema

A thickening of the macula and increased swelling due to leaking vessels (capillaries) causes macular oedema.

Avoiding Eye Disease

All people living with diabetes are at risk of developing retinopathy.

Adopting a healthy life-style with regular exercise, healthy diet and aiming for target levels for your blood glucose, blood pressure and cholesterol will help improve your diabetes management and reduce your risk of complications.

Managing blood glucose levels

Insulin is like a key that opens the door and allows the passage of glucose from the blood into muscles and cells for use as energy. Being inactive and carrying extra weight can increase insulin resistance (like rust forming on the keyholes and hinges making it harder to open the doors). Exercise steps in and acts like oil on the locks and hinges, helping them to work much better, open easier and allow glucose in.

Keeping blood glucose levels within the target range is the most effective way you can decrease your risk, or delay the onset, of complications.

Daily blood glucose monitoring is the most effective tool for management. If you notice your blood glucose levels are out of range it is a key indicator to see your diabetes team for review.

Up to 44% of people with diabetes have some form of diabetic retinopathy at any point in time.[4]

Blood glucose levels target range	
Type 1 Guidelines	
Fasting	4 - 6 mmol/L*
2 hours after the start of a main meal	4 - 8 mmol/L*
Type 2 Guidelines	
Fasting	6 - 8 mmol/L*
2 hours after the start of a main meal	6 - 10 mmol/L*
NHMRC (2009) BGL targets[5]	

*Targets are a guide. Speak with your doctor about what is appropriate for you.

Maintaining a healthy blood pressure

Blood pressure is a measure of the pressure of the blood in the arteries as the heart pumps it around the body.

Maintaining healthy blood pressure is vital to reduce your risk of diabetes related complications. Keeping your blood pressure within the target range will help reduce the stress on your small blood vessels in your eyes.

Blood pressure target	
Normal	≤ 130/80 mmHg
If known to have kidney problems	≤ 125/75 mmHg
NHMRC BP targets[6]	

Who looks after your eyes?

Your GP provides your day to day management and will refer you to other health professionals as required.

Your optometrist is often involved in your general ongoing eye care and screening. Often they will diagnose and manage early eye disease, referring to an eye specialist if required.

Your ophthalmologist (eye specialist) can be involved in your general eye care and will perform specialist treatment such as laser therapy or surgery if required.

Your diabetes team (diabetes specialist/ endocrinologist, GP, diabetes educator and dietitian) are extremely important in helping educate and provide support to help you best self manage your diabetes care.

Treatment

You are able to take steps to help reduce and delay the onset of eye disease by following some of the recommendations in this booklet. Seeking support from your health care team is also vital.

If a problem is detected with the eyes, treatment with laser therapy or surgery may be needed to reduce the risk of vision loss.

Recommendations for eye screening

- Type 1 Diabetes

  Adult - when initially diagnosed followed by 1-2 yearly review.

  Child - 5 years post diagnosis followed by 1-2 yearly review

- Type 2 Diabetes - upon diagnosis followed by 1-2 yearly review.

If active eye disease is detected, more regular screening may be recommended by your health care team.

Diabetes, eye disease and exercise

Exercise is one of the best things you can do to help prevent and manage diabetes, and diabetes related complications.

General Exercise Recommendations

For good health, try to build up to 210 minutes per week, or 30 minutes every day of moderate intensity physical activity. You can break down your exercise bouts into smaller 10 minute intervals if 30 minutes is too long at once. Your 210 minutes should include:

- **Aerobic physical activity** such as walking, jogging, swimming, cycling or dancing – any activities that get the large muscle groups moving and are repetitive.

In addition also include:

- **Resistance exercises** (muscle strengthening) targeting all of the major muscle groups (arms, legs, chest, back and abdominal) – resistance exercises are those that cause the muscles to move against a force such as weight or gravity.
- **Incidental or unstructured activities** - try to limit or break up the time spent sitting and find ways to move more such as taking the stairs and parking further away.

When completing resistance training exercise aim to perform:

- 8-10 different exercises.
- 2-3 sets of 8-10 repetitions. When starting out, perform the exercises with little or no weight. As you get stronger and more confident, work your way up to a weight that is tough to lift on the 10th time
- 2-3 days of the week.

Exercising Precautions

Before starting, it is important to note that some exercises may not be recommended for people with different types and degrees of eye disease.

In the case of specific complications like proliferative retinopathy, exercise may need to be avoided all together. If you are not sure about possible complications, speak with your GP before starting any program more intense than a brisk walk.

Generally, if you have some form of eye disease you should avoid:

- **High impact exercise**
  Excessive leaping and jumping can further harm already damaged tissue.
- **Holding your breath**
  Holding your breath and straining heavily can cause your blood pressure to increase unnecessarily. This can cause damage to the small blood vessels in the eye when pressure is sustained.
- **Exercising with your head below the level of your heart**
  This causes a large increase in blood pressure and pressure within the eyes (intraocular pressure). This can cause the tiny eye blood vessels to rupture in those with severe retinopathy. Other activities that can increase "intraocular" pressure are scuba diving, skydiving and even some yoga and pilates activities.

Eye Health & Nutrition

How does eating a healthy balanced diet help protect your eyes?

As retinopathy is common amongst people with diabetes, the best way to prevent this is by preventing diabetes. It has been proven that you can reduce your risk of diabetes by up to 58% through some simple lifestyle changes such as:

- Reducing your total fat intake
- Reducing your saturated fat (ie. animal fat) intake
- Having a diet that is high in fibre
- Weight loss[7,8]

For those who already have diabetes, the best measures to take are to manage your blood glucose levels and blood pressure as best you can. Managing both of these can reduce your risk of developing retinopathy and help slow the progression of its development.

How do you manage your blood glucose levels through what you eat?

It is important to eat regular meals that contain carbohydrates which are:

- Portion controlled
- High in fibre
- Lower glycemic index (GI)
- Spaced regularly across the day

Try to eat roughly the same amount of carbohydrate at each meal. Eating too much carbohydrate within a meal can cause your blood glucose levels to rise above your target range. Lower GI carbohydrates are broken down to glucose and released into the blood stream slowly. This helps to prevent blood glucose levels rising rapidly. Lower GI carbohydrates include many heavily grained breads, oats, untoasted muesli, pasta, Basmati or Doongara rice, corn, orange sweet potato, Carisma potatoes, baked beans, lentils and most other legumes, most fruits, low fat milks and yoghurt.

Reducing blood pressure

Research suggests that by reducing blood pressure you can slow the progression of diabetic eye disease (retinopathy).[9,10]

Diet plays a key role in reducing blood pressure and preventing complications associated with this disease. Reducing the amount of sodium (salt) you consume is vital in reducing your blood pressure.

This can be done by:

- Eating more fresh foods and reducing your intake of processed foods
- Choosing reduced salt products; Reading food labels and select products that have less than 450mg of sodium per 100g
- Using herbs and spices to flavour your meals instead of adding salt to your cooking or at the table.[5]

Healthy eating recommendations

Eating a variety of foods from each food group ensures your diet is rich in nutrients for optimal health

...and remember to drink plenty of water

Additional healthy eating tips:

- Limit saturated fats (ie. animal fat) and moderate total fat intake.

  Reduce - butter, lard, fatty meat, skin on chicken, biscuits, pastries, palm oil and coconut products.

  Choose - Polyunsaturated and monounsaturated fats; nuts, plant-based oils or margarine, avocado and oily fish.

- Choose foods low in salt.
- Limit your alcohol intake if you choose to drink. The recommendations for both men and women are two standard drinks per day. Aim to have some alcohol free days each week.
- Consume only moderate amounts of sugars and foods containing added sugars.

Also try to include...

ANTIOXIDANTS

Fresh fruits and vegetables are the best source of antioxidant vitamins. These have been shown to have a protective effect in relation to cataract and age related macular degeneration.

Antioxidants include:

- Beta-carotene - carrots, pumpkin, sweet potato, spinach
- Vitamin C - berries, oranges, broccoli, capsicum, kiwi fruit
- Vitamin E – green leafy vegetables, nuts, eggs, wheat germ

OMEGA 3 fatty acids

Omega-3 fatty acids have been proven to help protect your eyes as well as reduce inflammation and improve cholesterol and triglyceride levels.

Some of the best sources of omega-3 are oily fish such as mackerel, salmon, herring, gemfish, sardines, trout and tuna. Try to include two to three serves each week.

Walnuts, chia seeds and flaxseeds are also good sources.

Try and eat two servings of fruit and at least five servings of vegetables each day. (Examples of serving sizes below)

Fruit - 2 serves of:

1 medium fruit (ie. apple)

OR

2 small pieces of fruit (ie. apricots)

OR

1 cup of chopped or canned fruit

Vegetables - at at least 5 serves of:

½ cup cooked vegetables

OR

1 medium potato

OR

1 cup salad vegetables

Maintaining a healthy weight

Excess weight will affect blood pressure, blood cholesterol and blood glucose levels. If you are overweight, reducing your weight by just 5-10% can have significant health benefits.[11]

Waist measurement, what does it indicate?

Distribution of body fat around the waist, or your typical 'pot belly', is associated with an increased prevalence of type 2 diabetes, cardiovascular disease (heart & blood vessels), high cholesterol (blood fats) and hypertension (high blood pressure).[12]

Take a tape measure and measure around your waist at the point of the belly button.

The waist measurements indicated to the right (no matter what your height is) suggest an increased risk of developing diabetes or heart and blood vessel disease:[12]

Increased Risk	
Men	over 102cm
Women	over 88cm
Greatly increased Risk	
Men	over 110cm
Women	over 100cm

Aust T2 Diabetes Risk Assessment Tool[13]

My Waist Circumference is

cm

Diabetes Health Checklist (Annual Cycle of Care)

Ask your doctor as a part of your regular health check to test your:

✔ Blood glucose levels (BGL)

Your diabetes health professional will help you decide how often to check your BGLs and the levels to aim for. Contact your health professional if results are continually outside the recommended levels. Write down the results in your diary and take them to every health professional visit.

✔ HbA1c (Glycosylated Haemoglobin)

The HbA1c test shows an average of your blood glucose level over the past 10-12 weeks. It does not show the highs and lows but gives an overall picture of your blood glucose management. You should get your HbA1c tested every 6 months or more frequently if above target.

✔ Blood pressure (BP)

This is the measurement of the pressure at which your heart pumps blood around the body. High blood pressure can increase the risk of heart disease, stroke, kidney disease. You should have your blood pressure checked at every doctor's visit or at least every 6 months.

✔ Cholesterol (Blood fats-lipids)

This is a type of fat in the blood. Cholesterol problems are common in people with diabetes and too much saturated fat increases the risk of heart disease and stroke. Your cholesterol level should be tested every 12 months.

✔ Feet

People with diabetes can develop a number of foot problems such as changes to the skin, calluses, foot ulcers and nerve damage, which can lead to amputation. For these reasons it is important to take good care of your feet. Your health professional should perform a complete foot examination at least every 6 months. Additionally check your feet daily for any changes.

✔ Urine/Kidneys

Over time, people with diabetes face increased risk of damage to their kidneys (nephropathy). Early signs of kidney problems can be detected through a urine test which is simple and painless.

Your urine should be checked yearly for microalbumin.

✔ Eye health

Diabetes can cause eye problems and may lead to blindness. Complications can include cataracts, glaucoma and retinopathy. Your eyes should be checked every 1-2 years by an optometrist or an eye specialist to detect and prevent complications.

✔ Teeth and Gums

Living with diabetes can increase your risk of gum disease. Have your teeth and gum reviewed regularly by your dentist. Even with dentures checking your gums is still important.

For more information about diabetes, preventing diabetes and managing its complications, please contact Australian Diabetes Council on 1300 DIABETES (1300 342 238), or visit the website australiandiabetescouncil.com

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a shared voice FOR DIABETES

For more information call us on

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