Australian Guideline for assessing and managing **cardiovascular disease risk**

Acknowledgement of Country

We acknowledge the Traditional Owners and custodians of country throughout Australia and their continuing connection to land, waters and community. We pay our respects to them and their cultures, and Elders past, present and future.

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About the Australian Chronic Disease Prevention Alliance

The Australian Chronic Disease Prevention Alliance (ACDPA) incorporates the former National Vascular Disease Prevention Alliance (NVDPA) and brings together six leading non-government health organisations to prevent chronic health conditions in Australia.

Cancer Council Australia, Diabetes Australia, Kidney Health Australia, Lung Foundation Australia, National Heart Foundation of Australia and Stroke Foundation work together to collectively advocate for preventing chronic health conditions, integrating risk assessment, and effective management of chronic health conditions. This includes:

- supporting the health system shift towards prevention
- creating supportive food and physical environments
- increasing risk assessment, early detection and management of risk.

Chronic health conditions are Australia's greatest health challenge and the leading causes of illness, disability and death. However, much of the burden could be prevented by addressing modifiable risk factors and providing support to manage risk.

This guideline is a collaboration between four of the ACDPA member organisations: Diabetes Australia, Kidney Health Australia, National Heart Foundation of Australia and Stroke Foundation.

Endorsement

Endorsed clinical guideline RACGP

This guideline is endorsed by the Royal Australian College of General Practitioners (RACGP).

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Further information and resources are available from:

ACDPA Australian Chronic Disease Prevention Alliance — acdpa.org.au

diabetes australia — diabetesaustralia.com.au

Heart Foundation — heartfoundation.org.au

Kidney Health Australia — kidney.org.au

NDSS National Diabetes Services Scheme — ndss.com.au

Stroke Foundation — strokefoundation.org.au

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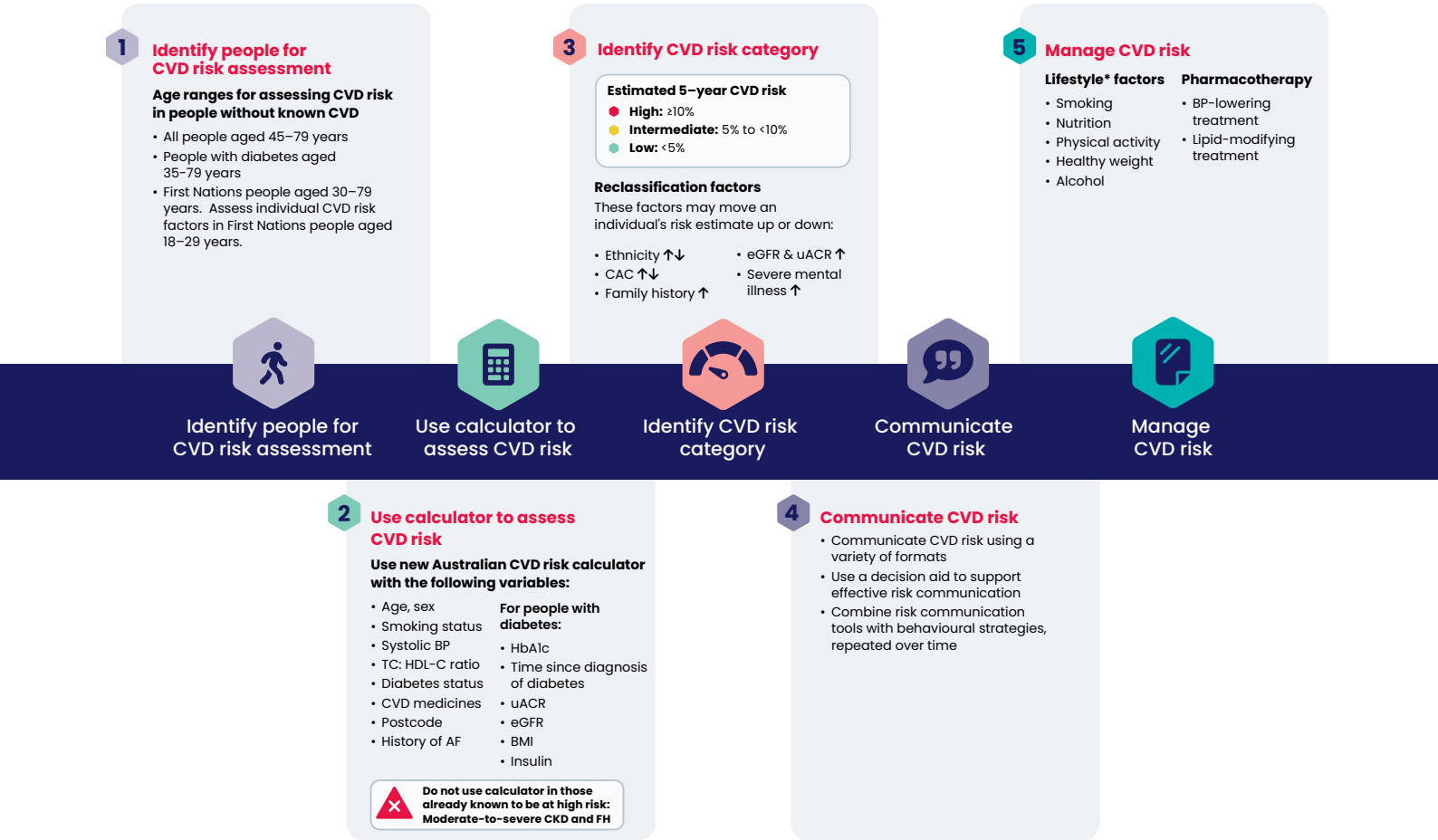
Overview

Cardiovascular disease (CVD) risk assessment and management in people without known CVD involves: identifying the appropriate people to be assessed; using the Australian cardiovascular disease risk calculator (Aus CVD Risk Calculator) to estimate their risk; identifying their risk category (Table 1); communicating their risk to them; and managing their risk.

Figure 1: Overview of cardiovascular disease risk assessment and management



AF: atrial fibrillation; **BMI**: body mass index; **BP**: blood pressure; **CAC**: coronary artery calcium; **CKD**: chronic kidney disease; **eGFR**: estimated glomerular filtration rate; **FH**: familial hypercholesterolaemia; **HbA1c**: haemoglobin A1c; **HDL-C**: high-density lipoprotein cholesterol; **TC**: total cholesterol; **uACR**: urine albumin-to-creatinine ratio. **Family history**: coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years. **Severe mental illness**: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Table 1: Overview of CVD risk management according to risk category

Risk category	Estimated 5-year CVD risk[a]	Management	Reassessment interval
High	≥10%	Encourage, support and advise a healthy lifestyle.[b] Prescribe blood pressure-lowering and lipid-modifying pharmacotherapy.[c]	**Formal reassessment of CVD risk is not generally required.** High-risk status requires clinical management and follow up supported by ongoing communication.
Intermediate	5% to <10%	Encourage, support and advise a healthy lifestyle.[b] Consider blood pressure-lowering and lipid-modifying pharmacotherapy, depending on clinical context.[c]	**Reassess risk every 2 years if not currently receiving pharmacotherapy to reduce CVD risk.** Assess sooner if close to the threshold for high risk, if CVD risk factors worsen, or new CVD risk factors are identified. For First Nations people, reassess every year as part of an annual health check (or opportunistically) or at least every 2 years.
Low	<5%	Encourage, support and advise a healthy lifestyle.[b] Pharmacotherapy is not routinely recommended.	**Reassess risk every 5 years.** Assess sooner if close to the threshold for intermediate risk, if CVD risk factors worsen, or new CVD risk factors are identified. For First Nations people, reassess every year as part of an annual health check (or opportunistically) or at least every 2 years.

[a] Estimated probability of a cardiovascular event within the next 5 years, determined using the Australian cardiovascular disease risk calculator.
[b] This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.
[c] Unless contraindicated or clinically inappropriate, and in discussion with the person on the benefits and harms of treatment. Encourage shared decision-making.

What's new in this guideline

Different age groups for risk assessment

A broader range of people without known CVD aged 45–79 years are recommended to use the new Australian cardiovascular disease risk calculator.

Target age ranges for risk assessment have also been tailored according to diabetes and First Nations status (for people without known CVD):

- People with diabetes should have their CVD risk assessed using the Australian cardiovascular disease risk calculator from age 35–79 years.
- First Nations people should have their CVD risk assessed using the Australian cardiovascular disease risk calculator from age 30–79 years.
- First Nations people aged 18–29 years should have their individual CVD risk factors assessed.

New Australian cardiovascular disease risk calculator

- The new Australian cardiovascular disease risk calculator (Aus CVD Risk Calculator) is based on the PREDICT-1[9] equation, which was developed from a large New Zealand population cohort study. The calculator has been modified and recalibrated for the Australian population and health setting.
- The Aus CVD Risk Calculator includes optional risk factors not included in the previous Framingham-based equation, including geographical area (using postcodes as markers of area-level deprivation) and a diagnosis of atrial fibrillation.
- The Aus CVD Risk Calculator allows for improved CVD risk estimation in people with type 2 diabetes, factoring in glycated haemoglobin (HbA1c), time since diagnosis of diabetes (measured in years), urinary albumin-to-creatinine ratio (uACR), estimated glomerular filtration rate (eGFR), body mass index (BMI) and the use of insulin in the previous 6 months.
- The Aus CVD Risk Calculator can be used for people being treated with blood pressure-lowering, lipid-modifying and/or antithrombotic pharmacotherapy, as it includes a variable that accounts for treatment.

Redefined risk categories

Risk estimates represent the chance of having a cardiovascular event in the next 5 years. New risk categories have been defined according to the new Australian cardiovascular disease risk calculator, which provides a more accurate risk prediction than the previous calculator.

The new categories are not directly interchangeable with previous 2012 *Guidelines for the management of absolute cardiovascular disease risk* equation categories. This difference has resulted in different risk percentile ranges for high, intermediate and low risk classifications.

The new CVD risk categories are:
- high (≥10% risk over 5 years)
- intermediate (5 to <10% risk over 5 years)
- low (<5% risk over 5 years).

A systematic review was undertaken to identify which categories would benefit most from pharmacotherapy. For evidence and rationale see CVD risk categories and Managing risk according to treatment thresholds.

Reclassification factors

New guidance has been provided on factors that may help clinicians refine and reclassify risk estimates when using the Australian cardiovascular disease risk calculator; this is particularly relevant for people whose calculated risk is close to the threshold of another risk category.

Reclassification factors include ethnicity, eGFR and uACR measurements, severe mental illness,[a] coronary artery calcium score and family history of premature CVD.[b]

Communicating risk

There is a new emphasis on communicating CVD risk effectively, with recommendations to use an appropriate decision aid to support communication and using individualised behavioural strategies to achieve informed decision-making.

Considerations for First Nations people

Specific recommendations, resources and practice points for First Nations people have been embedded throughout the guideline.

Pregnancy complications

New information is provided about the association between CVD risk and pregnancy complications such as hypertensive disorders of pregnancy (including pre-eclampsia) and gestational diabetes.

New terminology

The term 'risk estimate' is preferred over 'absolute risk' in this guideline as the output of the new Australian cardiovascular disease risk calculator is an estimate of the overall individual risk of a person that considers multiple CVD risk factors specific to that person.

[a] Severe mental illness: current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

[b] Family history of premature CVD: coronary heart disease or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years.

Summary of recommendations

Recommendation	Strength[a]	Certainty of evidence[a]
Approach to assessing CVD risk		
Age ranges for assessing CVD risk		
For all people without known CVD, assess CVD risk from age 45 to 79 years.	Conditional	[b]
For people with diabetes without known CVD, assess CVD risk from age 35 to 79 years.	Conditional	[b]
For First Nations people without known CVD: • assess individual CVD risk factors from age 18 to 29 years • assess CVD risk using the Australian cardiovascular disease risk calculator from age 30 to 79 years.	Consensus	
Identify people at clinically determined high risk		
Assess CVD risk as high for people with moderate-to-severe chronic kidney disease meeting any of these criteria: • people with sustained eGFR <45mL/min/1.73m^2 or • men with persistent uACR >25mg/mmol or • women with persistent uACR >35mg/mmol.	Consensus	
Assess CVD risk as high for people with a confirmed diagnosis of familial hypercholesterolaemia.	Consensus	
CVD risk assessment frequency and intervals using the Australian cardiovascular disease risk calculator		
Intervals between reassessment of CVD risk using the Australian cardiovascular disease risk calculator should be determined from the most recent estimated risk level.	Conditional	Moderate
For people receiving pharmacological treatment to manage CVD risk, including those previously assessed as being at high risk (≥10%) of a cardiovascular event within 5 years, formal reassessment of CVD risk is not generally recommended, and management should be guided by the clinical context.	Conditional	Very low

Recommendation	Strength[a]	Certainty of evidence[a]
In people with an intermediate risk (5% to <10%) of a cardiovascular event within 5 years who are not receiving pharmacological treatment to reduce CVD risk, reassess after 2 years. Reassess earlier if any of the following apply: • the most recent risk assessment was close to the threshold for high risk (≥10%) • risk factors worsen • new CVD risk factors are identified.	Conditional	Very low
In people with a low risk (<5%) of a cardiovascular event within 5 years who are not receiving pharmacological treatment to reduce CVD risk, reassess after 5 years. Reassess earlier if any of the following apply: • the last risk assessment was close to the threshold for intermediate risk (5% to <10%) • risk factors worsen • new CVD risk factors are identified.	Conditional	Low
For First Nations people, reassess every year as part of an annual health check (or opportunistically), or at least every 2 years.	Consensus	

Consider reclassification factors

Ethnicity

For First Nations people, consider reclassifying estimated CVD risk to a higher risk category after assessing the person's clinical, psychological and socioeconomic circumstances, and community CVD prevalence.	Conditional	Moderate
In people whose estimated CVD risk is close to the threshold for a higher risk category, consider reclassifying estimated CVD risk to a higher risk category for the following groups: • Māori people • Pacific Islander people • people of South Asian ethnicity (Indian, Pakistani, Bangladeshi, Sri Lankan, Nepali, Bhutanese or Maldivian ethnicities).	Conditional	Moderate
For people whose estimated CVD risk is close to the threshold for a lower risk category, consider reclassifying estimated CVD risk to a lower risk category for people of East Asian ethnicity (Chinese, Japanese, Korean, Taiwanese, or Mongolian ethnicities).	Conditional	Moderate

Family history of premature CVD

For people with a family history of premature CVD, consider reclassifying estimated CVD risk to a higher risk category, particularly if calculated risk is close to a higher risk threshold.[c]	Conditional	Moderate

Recommendation	Strength[a]	Certainty of evidence[a]
Chronic kidney disease		
People with moderate-to-severe chronic kidney disease, defined as sustained eGFR <45mL/min/1.73m^2, or a persistent uACR >25mg/mmol (men), or >35mg/mmol (women), are at clinically determined high risk and the Australian cardiovascular disease risk calculator should not be used. Manage as high CVD risk.	Consensus	
For people who do not have diabetes[d] with sustained eGFR 45–59mL/min/1.73m^2 and/or persistent uACR 2.5–25mg/mmol (men), or 3.5–35mg/mmol (women), strongly consider reclassifying estimated CVD risk to a higher risk category, particularly if calculated risk is close to a threshold.	Strong	High
Severe mental illness		
For people living with severe mental illness, consider reclassifying estimated CVD risk to a higher risk category, particularly if calculated risk is close to a higher risk threshold.[e]	Conditional	Moderate
Coronary artery calcium score		
Coronary artery calcium (CAC) score is not recommended for generalised population screening for CVD risk.	Strong	Moderate
Do not consider measuring CAC if: • the person has a history of myocardial infarction or revascularisation, or known coronary heart disease • the person is already known to be at high CVD risk. Treatment to reduce risk is indicated in these people, regardless of the CAC result.	Conditional	Moderate
When assessing CVD risk, reclassifying risk level due to CAC score can be considered when treatment decisions are uncertain, e.g.: • when risk of cardiovascular events is assessed as low or intermediate using the Australian cardiovascular disease risk calculator and other risk concerns are present that are not accounted for by the calculator • when further information is required to inform discussions between practitioner and the person on whether to modify therapy.	Conditional	Moderate

Recommendation	Strength[a]	Certainty of evidence[a]
Other risk considerations		
The ankle-brachial index should not be measured as part of a CVD risk assessment as it provides very little discrimination value beyond that of traditional CVD risk calculators.	Conditional	Moderate
The high-sensitivity C-reactive protein test should not be routinely performed as part of a CVD risk assessment as it provides very little discrimination value beyond that of traditional CVD risk calculators.	Conditional	Moderate
Do not reclassify the estimated CVD risk solely due to the presence of rheumatoid arthritis.	Conditional	Moderate
Communicate risk		
Use a relevant decision aid to support effective risk communication and enable informed decisions about reducing CVD risk.	Strong	Moderate
Combine risk communication tools with behavioural strategies (e.g. motivational interviewing, personalised goal setting and health coaching), repeated over time, to reduce overall CVD risk.	Conditional	Low
Communicate CVD risk using a variety of formats (e.g. percentages, 100-person charts) to enable people with varying health literacy needs and learning styles to understand their risk.	Consensus	
Manage CVD risk		
Lifestyle[f] modification		
Smoking cessation		
Encourage, support and advise people who smoke to quit, and refer them to a behavioural intervention (such as a smoking cessation counselling program) combined with a TGA-approved pharmacotherapy, where clinically indicated.	Strong	Moderate
Nutrition		
Advise people to follow a healthy eating pattern that is low in saturated and trans fats, and incorporates: • plenty of vegetables, fruit, and wholegrains • a variety of healthy protein-rich foods from animal and/or plant sources • unflavoured milk, yoghurt and cheese • foods that contain healthy fats and oils (e.g. olive oil, nuts and seeds, and fish).	Consensus	
Consider recommending restriction of salt intake to reduce blood pressure.	Conditional	Moderate
Consider recommending the Dietary Approaches to Stop Hypertension (DASH) diet to reduce blood pressure.	Conditional	Moderate

Recommendation	Strength[a]	Certainty of evidence[a]
Consider recommending a Mediterranean-style diet to reduce risk of CVD or stroke.	Conditional	Low/ Moderate[g]
Recommend regular consumption of oily fish to reduce risk of coronary heart disease (CHD) and death due to CHD.	Strong	Low
Physical activity		
Encourage, support and advise people to do regular, sustainable physical activity, such as exercise programs, to reduce their risk of CVD.	Conditional	Low
Healthy weight		
Encourage, support and advise people to achieve and maintain a healthy weight.	Consensus	
Alcohol reduction		
Encourage, support and advise people who consume alcohol to reduce their consumption, where necessary, in line with national guidelines, to reduce health risks from drinking alcohol.	Conditional	Low
Pharmacotherapy		
Managing risk according to treatment thresholds		
For people at high CVD risk (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), encourage, support and advise a healthy lifestyle.[f] After discussing the benefits and harms of treatment, prescribe blood pressure-lowering and lipid-modifying pharmacotherapy, unless contraindicated or clinically inappropriate.	Conditional	[h]
For people at intermediate CVD risk (estimated 5-year risk 5% to <10% determined using the Australian cardiovascular disease risk calculator), encourage, support and advise a healthy lifestyle.[f] After discussing the benefits and harms of treatment, consider blood pressure-lowering and lipid-modifying pharmacotherapy, unless contraindicated or clinically inappropriate.	Conditional	[h]
For people at low CVD risk (estimated 5-year risk <5% determined using the Australian cardiovascular disease risk calculator), encourage, support and advise a healthy lifestyle.[f] Pharmacological treatment is not routinely recommended.	Conditional	[h]
Some clinical situations may warrant initiation of pharmacotherapy based on individual risk factors. Very high blood pressure (i.e. blood pressure above 160/100mmHg) or very high cholesterol (i.e. total cholesterol above 7.5mmol/L) warrant initiation of blood pressure-lowering and lipid-modifying pharmacotherapy respectively. Refer to specific hypertension and lipid guidelines for management guidance.	Consensus	

Recommendation	Strength[a]	Certainty of evidence[a]
Blood pressure-lowering treatment		
For people at high risk of CVD (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), prescribe blood pressure-lowering medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle[f]	Strong	Moderate
For people at intermediate risk of CVD (estimated 5-year risk 5% to <10% determined using the Australian cardiovascular disease risk calculator), consider prescribing blood pressure-lowering medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle[f]	Strong	Moderate
Lipid-modifying treatment		
For people at high risk of CVD (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), prescribe lipid-modifying medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle[f]	Strong	Moderate
For people at intermediate risk of CVD (estimated 5-year risk 5% to <10% determined using the Australian cardiovascular disease risk calculator), consider prescribing lipid-modifying medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle[f]	Strong	Moderate

[a] See Table 2: GRADE definitions for strength and certainty of evidence.
[b] Due to a lack of studies specifically addressing starting age, a linked evidence approach was used.
[c] Family history of premature CVD: coronary heart disease or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years.
[d] For people with diabetes, eGFR and uACR are included in the Australian Cardiovascular Disease Risk calculator.[1,2] Suitable data were not available to include eGFR and uACR in the calculation for people without diabetes.
[e] Severe mental illness: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]
[f] This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.
[g] Low for cardiovascular disease and moderate for stroke.
[h] The literature review found no randomised trials comparing outcomes according to different risk thresholds. Therefore, a linked evidence approach was used to answer proxy PICO questions (see Report 1: Evidence Synthesis to Support the Development of the Guidelines for Absolute Cardiovascular Disease Risk).

Introduction

Cardiovascular disease (CVD) is responsible for significant morbidity and premature mortality in Australia. Ischaemic heart disease was the leading cause of death in 2020 and cerebrovascular disease was the third most common cause of death.[3] CVD places a significant burden on the Australian healthcare system.

An individual's risk of developing CVD depends on the combined effect of multiple risk factors. Risk assessment, therefore, remains fundamental to the primary prevention of CVD. It encourages early CVD risk factor modification, helps target pharmacotherapy to those who will benefit most, and informs clinical decision-making.

This guideline replaces *Guidelines for the management of absolute cardiovascular disease risk* (2012), incorporating a new risk calculator and updated evidence-based recommendations on assessing and managing CVD risk to reduce cardiovascular events.

Although CVD risk generally increases with age, the underlying pathology of atherosclerosis begins earlier in life and develops over many years.[4] This guideline recommends targeted CVD risk assessment in age groups where the greatest gains for risk reduction can be achieved.

Managing CVD risk effectively involves communicating risk to the person in a way that they can clearly understand, and collaborating with them to choose and implement strategies to reduce their risk. Communication and raising awareness about CVD risk should commence well before any formal assessment is conducted. Discussion of modifiable lifestyle* factors, and the importance they play in CVD risk reduction, can be woven into consultations throughout life and form the basis of ongoing education.

Specific recommendations, resources and practice points for First Nations people have been embedded throughout the guideline. These specific considerations recognise differential outcomes in health that have resulted from dispossession, discrimination, disadvantage and disempowerment. First Nations people is used throughout the guideline to refer to Aboriginal and Torres Strait Islander peoples on the advice of consultation.

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Purpose

This guideline provides recommendations and advice for assessing and managing CVD risk in Australia. The guideline includes:

- recommendations for when and how to assess CVD risk
- guidance and tools for using the new Australian cardiovascular disease risk calculator (Aus CVD Risk Calculator)
- practical advice on how to apply the recommendations
- tools to support communicating CVD risk
- recommendations on how to manage CVD risk
- a summary of the available evidence supporting the recommended approaches to risk assessment and management, together with the rationale for how available evidence has been interpreted for the Australian setting
- specific recommendations, resources and practice points for assessing and managing CVD risk in First Nations people.

The online Aus CVD Risk Calculator and guideline are available at **cvdcheck.org.au**

Scope

This guideline primarily covers atherosclerotic cardiovascular disease. The term 'cardiovascular disease' used in this guideline refers to the following conditions, which reflect outcomes predicted by the Aus CVD Risk Calculator:

- myocardial infarction (MI)
- angina
- other coronary heart disease (CHD)
- stroke
- transient ischaemic attack
- peripheral vascular disease
- congestive heart failure
- other ischaemic CVD-related conditions.

This guideline makes recommendations for:

- assessing CVD risk in adults without known CVD
- communicating CVD risk
- managing CVD risk with lifestyle modifications and pharmacotherapy.

This guideline does not include detailed guidance for managing related clinical conditions such as hypertension and lipid disorders. Health professionals should refer to existing guidance, where available in these circumstances.

Intended audience

This guideline is intended for use by general practitioners, First Nations health workers and practitioners, nurses and nurse practitioners, allied health professionals, other primary care health professionals and physicians who support the primary prevention of CVD.

It is also intended to provide health system policy makers with the best available evidence as a basis for developing population health policy.

Process for developing the guideline

In June 2020, the Australian Government Department of Health and Aged Care contracted the National Heart Foundation of Australia, on behalf of the Australian Chronic Disease Prevention Alliance (ACDPA), to update the 2012 *Guidelines for the management of absolute cardiovascular disease risk*.[5]

The new guideline has been developed according to the processes and standards outlined in the 2016 National Health and Medical Research Council's (NHMRC) *Guidelines for Guidelines*.[6] While the development of this guideline has been informed by the NHMRC standards for guidelines, this does not imply formal approval of this guideline by the NHMRC itself.

The guideline was developed under the direction and governance of nine expert advisory groups with multidisciplinary clinical and consumer input (see Appendix 1). Expertise was sourced across the disciplines of cardiology, general practice, nephrology, neurology, endocrinology, stroke care, epidemiology, Indigenous health, nutrition, behavioural science, nursing and pharmacy. Special attention was given to First Nation people's health, and the Indigenous Health Expert Subgroup advised on every aspect of the guideline development.

Developing the recommendations

An independent clinical evidence review was conducted. The Expert Steering Group was responsible for developing the clinical questions for the evidence review, which addressed areas of relevance to primary care in Australia, greatest uncertainties, value to current practice and significant developments in research since the previous guideline publication. Questions were expressed in PICO format (patient/population, intervention, comparison and outcomes). For the evidence synthesis report, refer to *Evidence synthesis to support the development of the Guidelines for Absolute Cardiovascular Disease Risk* (Bond University, 2021).

Guideline recommendations were developed and scored based on the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology and the evidence generated by the clinical evidence review. The GRADE approach offers a transparent and structured process for developing and presenting evidence summaries and recommendations (see GRADE handbook).

Using the GRADE approach, guideline developers explicitly state the strength of each recommendation for or against an intervention. The strength is determined by considering the quality of evidence, balance between benefits and harms, trade-offs between improving survival and quality of life, uncertainty or variability in patient values and preferences, and resource considerations. Table 2 provides a summary of GRADE definitions.

Table 2: GRADE definitions

Certainty of Evidence	
The certainty of evidence reflects the extent to which the authors' confidence in an estimate of the effect is adequate to support a particular recommendation.	
Certainty:	**What it means:**
Very low	The authors have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.
Low	The authors' confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.
Moderate	The authors are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
High	The authors are very confident that the true effect lies close to that of the estimate of the effect.
Strength of recommendation	
The strength of a recommendation reflects the extent to which the authors are confident that desirable effects of an intervention outweigh undesirable effects, or vice versa, across the range of patients for whom the recommendation is intended. It is determined by considering the quality of evidence, balance between benefits and harms, trade-offs between improving survival and quality of life, uncertainty or variability in patient values and preferences, and resource considerations (see Developing the recommendations).	
Strength:	**What it means:**
Strong	The authors are confident that the desirable effects of adherence to a recommendation outweigh the undesirable effects. It implies that most or all individuals will be best served by the recommended course of action.
Conditional	The authors concluded that the desirable effects of adherence to a recommendation probably outweigh the undesirable effects, but are not certain. It implies that not all individuals will be best served by the recommended course of action.
Consensus recommendations	
A consensus grading was applied when the supporting evidence was insufficient or of low quality; therefore, the recommendation is based on consensus and the expert opinion of guideline working group members.	

Source: GRADE handbook[7]

In this guideline, the strength of each recommendation (either strong or conditional) was assigned based on considerations in each of the four domains outlined in Table 3. A strong recommendation was made when judgements in all domains supported a recommendation either for or against an intervention or clinical action. A conditional recommendation was made if judgements were equivocal or contradictory. A conditional recommendation applies to most situations, but there may be exceptions (specified where possible), or the decision may depend on the judgement of the healthcare practitioner and patient after considering the potential benefits and risks for the individual.

Table 3: Domains that contribute to the strength of a recommendation

Adapted with permission from GRADE Handbook

Domain	Comment
Balance between desirable and undesirable outcomes (trade-offs), taking into account: • best estimates of the magnitude of effects on desirable and undesirable outcomes • importance of outcomes (estimated typical values and preferences).	The larger the differences between the desirable and undesirable consequences, the more likely a strong recommendation is warranted. The smaller the net benefit and the lower certainty for that benefit, the more likely a weak recommendation is warranted.
Confidence in the magnitude of estimates of effect of the interventions on important outcomes (overall quality of evidence for outcomes)	The higher the quality of evidence, the more likely a strong recommendation is warranted.
Confidence in values and preferences and their variability	The greater the variability in values and preferences, or uncertainty about typical values and preferences, the more likely a weak recommendation is warranted.
Resource use	The higher the costs of an intervention (the more resources consumed), the less likely a strong recommendation is warranted.

The certainty of evidence on which each recommendation was based is indicated as either high, moderate, low or very low (see Table 2). These categories were assigned according to GRADE methodology. Certainty of evidence reflects the degree of confidence in the estimate of effect, including whether it is adequate to support a recommendation for or against an intervention.

A consensus recommendation was made when the supporting evidence was insufficient or of low quality. Consensus recommendations were based on the expert opinion of guideline working group members, with consideration of relevant available evidence, values, preferences and resource use, in consultation with the expert committees.

GRADE methodology takes into account the importance of outcomes. This approach allows for a strong recommendation to be made even if the certainty of the evidence is low, in view of the potential impact of a clinical decision on patients' health status or quality of life. For example, a strong recommendation for or against a clinical action might be made due to safety considerations, even when actual risk cannot be quantified.

A dedicated Consumer Advisory Panel, representing Australian consumers, was drawn upon to help determine the values and preferences domains.

Further details of the guideline development process can be found in Appendix 2.

Conflict of Interest

The Guideline Expert Steering Group acknowledges the importance of both transparency and appropriate management of conflicts of interest.

Conflicting interests were considered within a framework of both the relationship (direct or indirect) of the participating individual to any third party with interest in the topic under consideration within the guideline development process, and the nature (financial and non-financial) of the potential conflict.

The Conflict of Interest Policy was based on the NHMRC's Policy on the disclosure of interests requirements for prospective and appointed NHMRC committee members[8] and the NHMRC *Guidelines for Guidelines Handbook*.[9] A copy of the Conflict of Interest Policy can be supplied upon request.

Conflicting interests among the guideline development groups required appropriate management to ensure clinical recommendations were not compromised. Processes employed by the Heart Foundation aimed to ensure the integrity of guideline developers and to strike an appropriate balance between the existence of interests in a topic under review and the expertise required to make sound and meaningful recommendations.

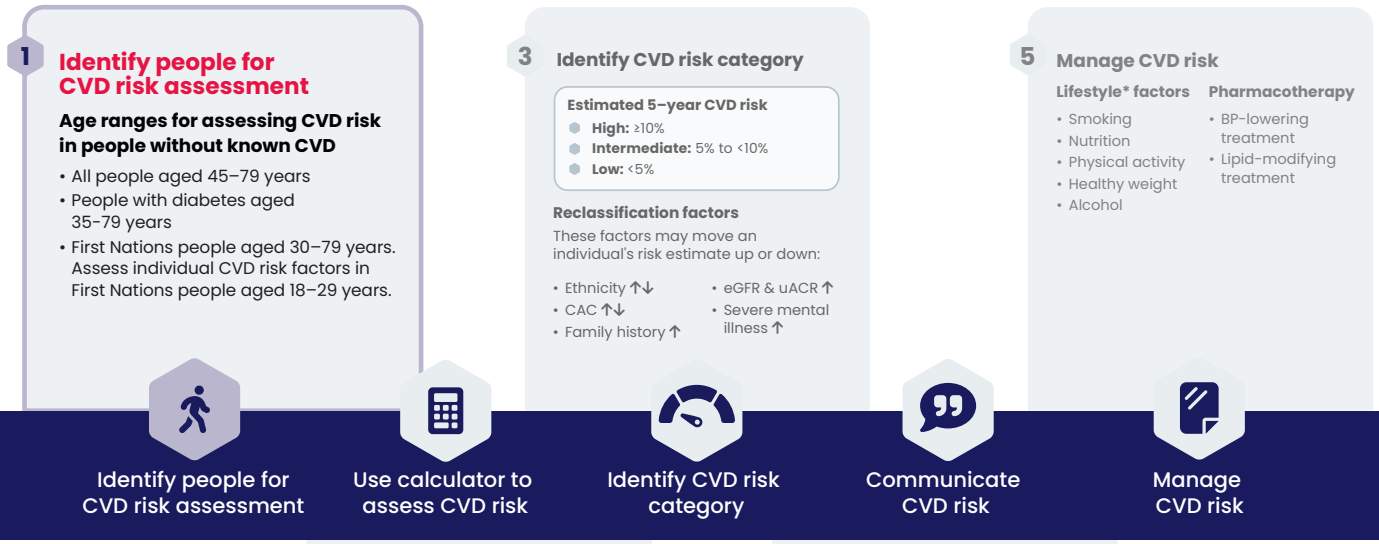
Conflicts of interests were managed by the following processes:

- All guideline working group members were required to disclose potential conflicts of interest at commencement of membership, and to update the working group during the project if there were any changes to this declaration.
- Conflict of interest declarations were revisited at each working group meeting (including the Guideline Advisory Group and Expert Steering Group meetings) to ensure new disclosures were recorded.
- If a declared conflicting interest was deemed significant, the individual was to be restricted from involvement in discussions and decisions on related topics. In circumstances where a conflict of interest was identified, it was managed by ensuring that the member had limited involvement in the working group's deliberation of the evidence (with the possibility of bias noted), or in discussions on the wording, structure, intent or formulation of the clinical recommendation relevant to disclosure of a conflict.

All conflict of interest declarations were regularly reviewed by the Guideline Advisory Group. More information about conflict of interest handling and a summary of the Declarations of Interest register can be found in Appendix 3.

Approach to assessing and managing CVD risk

1 Identify people for CVD risk assessment



AF: atrial fibrillation; **BMI**: body mass index; **BP**: blood pressure; **CAC**: coronary artery calcium; **CKD**: chronic kidney disease; **eGFR**: estimated glomerular filtration rate; **FH**: familial hypercholesterolaemia; **HbA1c**: haemoglobin A1c; **HDL-C**: high-density lipoprotein cholesterol; **TC**: total cholesterol; **uACR**: urine albumin-to-creatinine ratio. **Family history**: coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years. **Severe mental illness**: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Age ranges for assessing CVD risk

Targeting CVD risk assessment to recommended age groups enables people at high risk of CVD to be identified early before they develop overt disease.

This approach helps direct pharmacological strategies for intensive CVD risk factor management to people at high risk and diverts unnecessary interventions away from people at lower risk.

Recommendations	Strength	Certainty of evidence
For all people without known CVD, assess CVD risk from age 45 to 79 years.	Conditional	[a]
For people with diabetes, without known CVD, assess CVD risk from age 35 to 79 years.	Conditional	[a]
For First Nations people without known CVD: • assess individual CVD risk factors from age 18 to 29 years • assess CVD risk using the Australian cardiovascular disease risk calculator from age 30 to 79 years.	Consensus	

[a] Due to a lack of studies specifically addressing starting age, a linked evidence approach was used.

General considerations

There is very limited evidence available from Australian populations to guide starting age for CVD risk assessment. There is also no direct evidence from clinical trials comparing cardiovascular outcomes of risk assessment conducted at different ages in the same population.

The current recommendations are therefore based on population-level observational data and expert consensus in consultation with consumers. However, this does not reduce the importance of considering, assessing and managing CVD risk in people from younger or older age groups, as clinically necessary.

Studies relating to the benefit of commencing blood pressure-lowering and statin medicines at a variety of ages were also reviewed to inform this recommendation.

Sex difference in age-related CVD risk

Although there are differences between men and women in the experience of heart disease, and cardiovascular events are more common in men than women, CVD is a major issue for both sexes. Women have similar CVD risk incidence to men, manifesting approximately 10 years later.[10] Recognition of menopause or perimenopause represents an opportune time to assess CVD disease risk in women.

People 80 years or older

The evidence underpinning the Aus CVD Risk Calculator supports its use up to age 79 years.[1] Risk equations derived from younger cohort equations (30–79 years), such as the Aus CVD Risk Calculator, do not accurately predict risk in older age groups. Individual clinical decision-making should support the assessment and management of CVD risk in people 80 years or older.[11]

Practice points

- People with risk factors such as smoking, diabetes, family history of premature CVD,* kidney impairment, gestational diabetes, pre-diabetes, familial hypercholesterolaemia, severe mental illness,† and severe obesity generally develop CVD at a younger age than the general population. Therefore, earlier monitoring of CVD risk factors may be warranted.[12]
- For people younger than 30 who meet the clinically determined high risk criteria, manage as high CVD risk.

* Family history of premature CVD is defined as coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years.
† Severe mental illness is defined in this guideline as a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

First Nations people

Where possible, cardiovascular risk assessment should be completed as part of a holistic health assessment for First Nations people, with appropriate follow up and management. In alignment with the *National Agreement on Closing the Gap*, all care should be taken to ensure cultural safety, shared decision-making, informed consent and ownership of information.

Recommendations were developed in partnership with First Nations clinicians and researchers, and clinicians and researchers with experience working with First Nations people and communities.

CVD is the single largest contributor to mortality and accounts for a quarter of all deaths among First Nations people.[13]

An estimated 75% of First Nations adults younger than 35 years have one or more risk factors for CVD, and more than 44% of people aged 65–74 years are at high risk of a primary CVD event.[13,14]

MI, stroke and cardiovascular-related death generally occur 10–20 years earlier in First Nations people compared with the non-Indigenous Australian population.[13]

First Nations women experience higher rates of CVD, compared with non-Indigenous women.[15] First Nations women experience a high burden of CVD from a young age, although the drivers of this premature burden are not well understood.[16]

Practice points

- Assess CVD risk as part of an annual health check (or opportunistically) or at least every 2 years.[13]
- The following CVD risk factors should be screened for in people ages 18–29 years:
  - smoking status
  - blood pressure (BP)
  - blood glucose level or glycated haemoglobin (HbA1c)
  - estimated glomerular filtration rate (eGFR)
  - serum lipids
  - urine albumin-to-creatinine ratio (uACR)
  - history of familial hypercholesterolaemia (FH).[13]

Resources

1. Resources to support health checks for Aboriginal and Torres Strait Islander people – RACGP

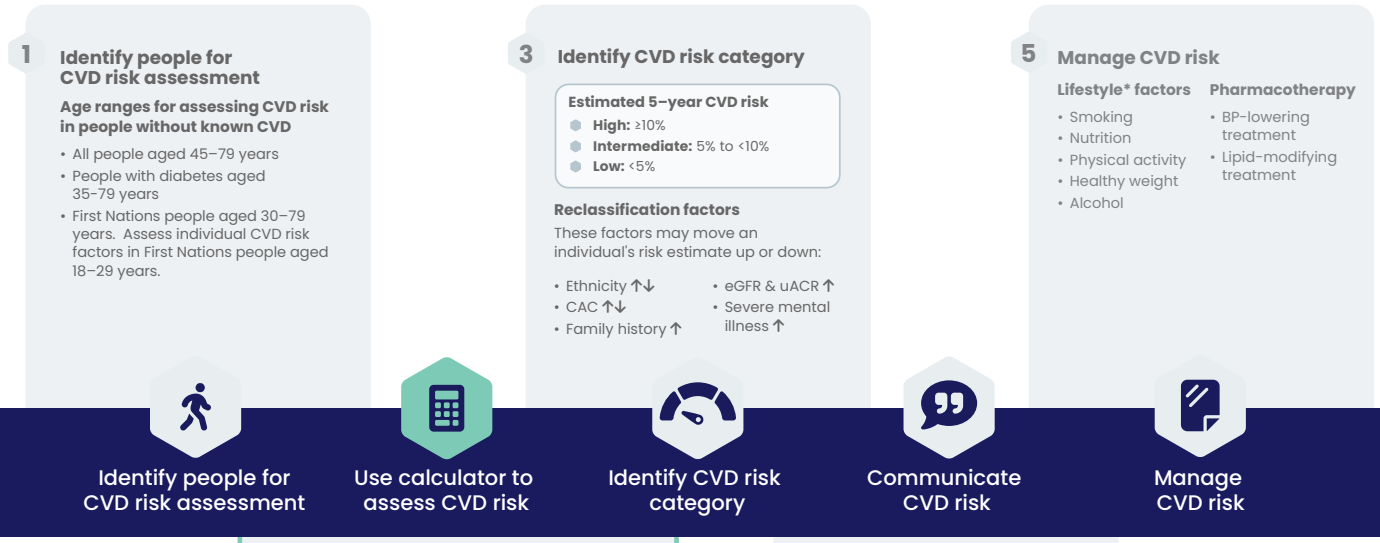
Support for the recommendations

Data from the Australian National Health Measures Survey (applying the National Vascular Disease Prevention Alliance algorithm) and the large New Zealand PREDICT study cohort suggest a small proportion of people aged 18–44 years are at high risk of developing CVD within 5 years (see Appendix 4).[1,12,17]

The recommendation to start routinely assessing CVD risk at age 45 in both males and females is based on sex-specific studies and is intended to balance gender bias and support implementation by minimising complexity for health professionals and consumers.[4,12,18]

The 2020 joint consensus statement by the Australian Chronic Disease Prevention Alliance, National Heart Foundation of Australia, Editorial Committee for Remote Primary Health Care Manuals, National Aboriginal Community Controlled Health Organisation, and the Royal Australian College of General Practitioners, recommends risk factor screening in First Nations people starting at age 18 years at the latest and assessing CVD risk using a calculator from age 30 years at the latest.[13]

2 Use CVD risk calculator to assess CVD risk



AF: atrial fibrillation; **BMI**: body mass index; **BP**: blood pressure; **CAC**: coronary artery calcium; **CKD**: chronic kidney disease; **eGFR**: estimated glomerular filtration rate; **FH**: familial hypercholesterolaemia; **HbA1c**: haemoglobin A1c; **HDL-C**: high-density lipoprotein cholesterol; **TC**: total cholesterol; **uACR**: urine albumin-to-creatinine ratio. **Family history**: coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years. **Severe mental illness**: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Identify people at clinically determined high risk

Recommendations	Strength
Assess CVD risk as high for people with moderate-to-severe chronic kidney disease meeting any of these criteria: • people with sustained eGFR <45mL/min/1.73m^2 or • men with persistent uACR >25mg/mmol or • women with persistent uACR >35mg/mmol.	Consensus
Assess CVD risk as high for people with a confirmed diagnosis of familial hypercholesterolaemia.	Consensus

Moderate-to-severe chronic kidney disease

Chronic kidney disease (CKD) is an independent risk factor for CVD.

Estimated glomerular filtration rate (eGFR) is inversely correlated with CVD risk at a population level; as eGFR decreases, starting from <75mL/min/1.73m^2, the risk of CVD-related mortality increases, up to an approximate three-fold risk in people with eGFR of 15mL/min/1.73m^2.[19]

The increase in risk is even greater for young adults, in whom CVD-related mortality may increase to an approximate ten-fold risk in those with eGFR of 15mL/min/1.73m^2.[20]

Increased albumin excretion is also associated with CVD mortality risk, independent of eGFR.[19]

People with moderate-to-severe CKD (sustained eGFR <45mL/min/1.73m^2 and/or persistent urine albumin creatinine ratio [uACR] >25mg/mmol [men] and uACR >35mg/mmol [women]), are at clinically determined high risk and should be automatically managed as high CVD risk.

Familial hypercholesterolaemia

Familial hypercholesterolaemia (FH) is the most common inherited cause of premature coronary heart disease (CHD), with a prevalence of 1 in 250.[21]

People with diagnosed FH are at clinically determined high risk and should be automatically managed as high CVD risk.

Individuals with FH should be treated according to Australian guidelines for managing FH.[22] FH-specific calculators may be useful.[23,24]

Figure 2: Identifying clinically determined high risk criteria before use of the Aus CVD Risk Calculator

Using the Australian cardiovascular disease risk calculator

The Australian cardiovascular disease risk calculator (Aus CVD Risk Calculator) is available at cvdcheck.org.au

The Aus CVD Risk Calculator is validated for use in people without known CVD aged 30 to 79 years who do not already meet high risk criteria. The accuracy of risk estimates in people aged 80 and over is uncertain and the Aus CVD Risk Calculator is likely to underestimate risk in these people.

The Aus CVD Risk Calculator produces estimated 5-year CVD risk scores, expressed as a percentage representing the person's probability of dying or being hospitalised due to myocardial infarction, angina, other coronary heart disease, stroke, transient ischaemic attack, peripheral vascular disease, congestive heart failure or other ischaemic CVD-related conditions within the next 5 years.

Variables and instructions are shown in Table 4.

Table 4: Aus CVD Risk Calculator variables and instructions for use

Variable	Application	Mandatory
Age	Enter age in years. The Aus CVD Risk Calculator is validated for adults aged 30–79 years.	✓
Sex	Enter sex at birth (There is currently insufficient data to stratify risk for people who are intersex or non-binary sex.)	✓
Smoking status	Choose from three categories: • never smoked • previously smoked • currently smokes	✓
Blood pressure (BP)	Enter systolic blood pressure (SBP) in mmHg. Use the average of the last two seated, in-clinic BP measurements. Convert home and ambulatory blood pressure readings to in-clinic equivalents before entering into the calculator.	✓
Cholesterol	Enter ratio of total cholesterol (TC) to high-density lipoprotein cholesterol (HDL-C). Use most recent measurements (fasting or non-fasting).	✓
Diabetes[a]	Enter diabetes status: YES or NO.	✓

Variable	Application	Mandatory
CVD medicines	CVD medicines used during the 6 months prior to risk assessment (lipid-modifying, BP-lowering, and/or antithrombotic medicines) Note: Relationship between risk and CVD medicines is associative, not causative. Lipid-modifying medicines – atorvastatin, fluvastatin, pravastatin, simvastatin, acipimox, bezafibrate, cholestyramine, clofibrate, colestipol, ezetimibe, ezetimibe with simvastatin, gemfibrozil and nicotinic acid. BP-lowering medicines – angiotensin converting enzyme inhibitors, betablockers, thiazide, angiotensin II receptor blockers and calcium channel blockers. Antithrombotic medicines – aspirin, clopidogrel, dipyridamole, prasugrel, ticagrelor, ticlopidine, warfarin, dabigatran, phenindione and rivaroxaban.	✓
Postcode	Enter postcode. Postcode is used to calculate Socio-Economic Indexes for Areas (SEIFA) ranking, and under the discretion of the clinician, may be manually adjusted to better reflect the socioeconomic status of individual patients.	✗
Medical history of atrial fibrillation	Known history of electrocardiogram (ECG) confirmed atrial fibrillation: YES or NO. Both paroxysmal and persistent AF are included in the definition of AF.	✗
Additional diabetes-specific variables for people with diabetes[a] for a more accurate assessment of risk if selected.		
Time since diagnosis of diabetes	Enter time in years.	✓
Glycated haemoglobin (HbA1c)	Enter HbA1c in mmol/mol or % (single non-fasting).	✓
uACR[b]	Enter urine albumin-creatinine ratio (uACR) (measured in mg/mmol).	✓
eGFR[b]	Enter eGFR in mL/min/1.73m^2. If needed, eGFR should be calculated based on the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. Serum creatinine used in the calculation should be based on the most recent result.	✓
Body mass index (BMI)	Measure weight in kilograms and height in metres. Calculate BMI: kg/m^2.	✓
Insulin	Record use of insulin in the 6 months before risk assessment.	✓

[a] The equation on which the Aus CVD Risk Calculator is based has not been validated for people with type 1 diabetes.
[b] Whilst uACR and eGFR have been shown to independently improve prediction of cardiovascular events, they are only included as variables in the diabetes-specific equation due to lack of availability of data in the general population PREDICT cohort. Instead, they have been incorporated into the overall risk calculation as a reclassification factor. In future, when data is available from the PREDICT population, these measures may be incorporated directly into the risk equation.

Development of the Aus CVD Risk Calculator

The Aus CVD Risk Calculator is based on the NZ PREDICT-1º equation, which was developed from a large, contemporary New Zealand primary care cohort study.[17] The equation has been recalibrated to the Australian population and modified for the Australian healthcare system. See Appendix 4 for details of the recalibration procedure.

A literature review and targeted audit of CVD risk equations recommended for use in major international CVD risk management guidelines was conducted. The NZ PREDICT-1º equation was selected based on pre-specified criteria including:

- use of contemporary data sources
- inclusion of established CVD risk factors such as smoking, cholesterol, BP and diabetes
- measures of ethnicity and social deprivation (to improve health equity)
- global CVD events and deaths as outcomes
- representation of the general or primary care population
- excellent model performance
- external validation in populations similar to the Australian population
- the ability to be recalibrated and modified.

Further detail on how the current equation was selected and adapted to the Australian context is included in Appendix 4.

General considerations

Like most other CVD risk equations, the Aus CVD Risk Calculator includes traditional variables such as age, sex, smoking status, diabetes, BP and lipids.

It also includes other relatively easily measured variables which improve the performance of the equation in predicting CVD risk, above and beyond these variables. This helps avoid risk that might otherwise be underestimated or overestimated.

Diabetes

Type 2 diabetes is independently associated with a two-fold increased risk of developing CVD.[25] Risk is also higher in people with longstanding diabetes, microvascular complications and suboptimal glycaemic control.[26,27] However, due to significant heterogeneity in risk among people living with diabetes, it is important to stratify risk further within this cohort.[28]

A type 2 diabetes-specific CVD risk prediction equation was developed and validated using a contemporary New Zealand diabetes population.[29] This equation has been incorporated into the new Aus CVD Risk Calculator to provide a more accurate CVD risk estimate for people with type 2 diabetes.

Time since diagnosis of diabetes, HbA1c, eGFR, uACR, BMI and insulin use are included in the new Aus CVD Risk Calculator. Newer classes of glucose-lowering medicines, including SGLT2 inhibitors, GLP-1 receptor agonists and DPP4-inhibitors, have not been included in the risk calculator because data were not available.

Type 1 diabetes

Although the same main risk factors (including diabetes duration, presence of kidney disease, glycaemic control) influence CVD risk as for type 2 diabetes, the Aus CVD Risk Calculator is not validated for type 1 diabetes. Using the Aus CVD Risk Calculator in people with type 1 diabetes may give an inaccurate risk estimate.

Socioeconomic factors

In addition to physiological and lifestyle factors, socioeconomic status is also associated with increased CVD risk. In the Australian population, CVD risk varies according to socioeconomic status, with greater disadvantage associated with higher incidences of primary and secondary cardiovascular events.[30]

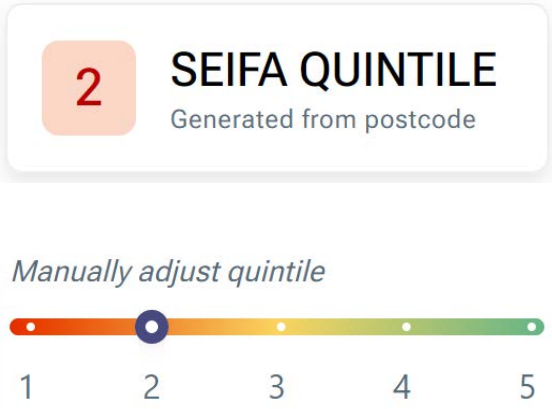
Including socioeconomic status in risk prediction improves accuracy, compared with using other risk factors alone.[1]

The Aus CVD Risk Calculator uses Socio-Economic Indexes for Areas (SEIFA)[31] quintiles obtained from residential postcodes. SEIFA is a population-level summary measure that reflects determinants such as education, housing, employment and income.

SEIFA quintiles based on postcode[31] provide the most readily accessible means of incorporating socioeconomic status into CVD risk assessment in Australia at this time.

Since SEIFA is an average based on postcode, it may not accurately reflect the socioeconomic status of all individuals within that postcode. If the person has a level of disadvantage that differs markedly from that of the average for their postcode, their socioeconomic quintile can be manually adjusted up or down in the risk calculator.

Figure 3: SEIFA quintile derived from postcode (Source: Aus CVD Risk Calculator)



First Nations people

The determinants included in SEIFA may not fully capture the environmental, social, political and economic determinants of CVD and health inequality experienced by First Nations people.

In particular, SEIFA indices will not fully reflect the broad impacts of discrimination and disadvantage that are widely understood to be key drivers of health disparities between First Nations communities and non-Indigenous Australians.[32]

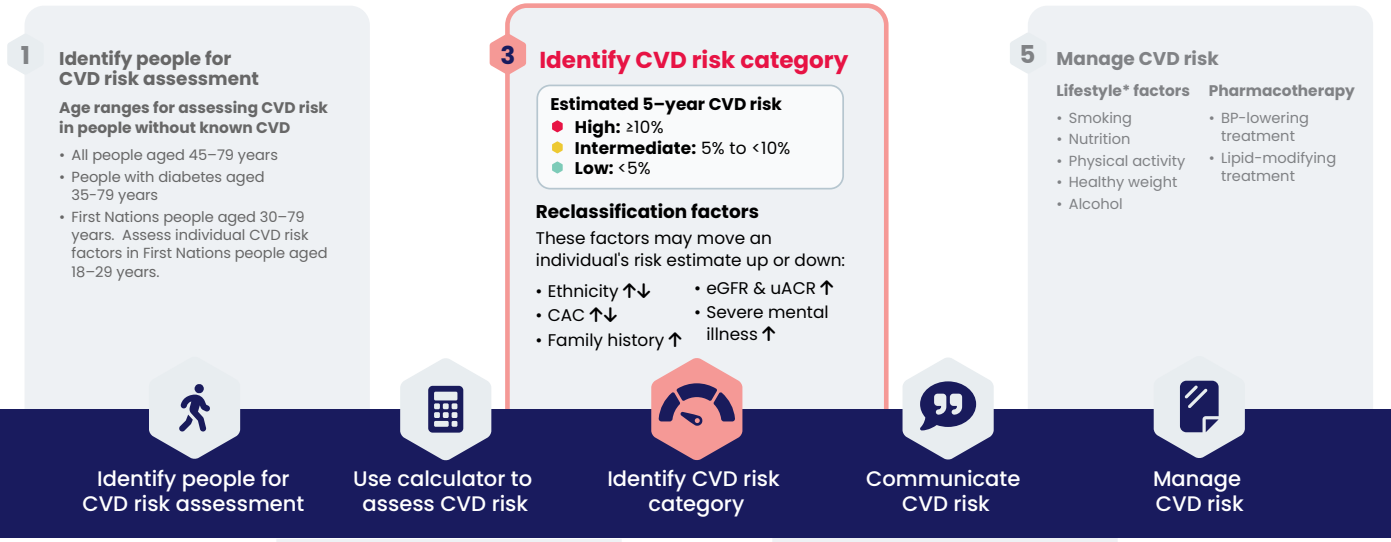
Socioeconomic status may also influence the risk of CVD differentially across First Nations communities.

When considering reclassifying risk for First Nations people (see Recommendation on ethnicity), it may be appropriate to consider a broader range of socioeconomic determinants than those incorporated into the SEIFA measure used in the Aus CVD Risk Calculator.

Resources

1. Management of type 2 diabetes: A handbook for general practice – RACGP and Diabetes Australia
2. Living Evidence Guidelines in Diabetes - The Living Evidence for Diabetes Consortium
3. Type 2 diabetes treatment: A new blood glucose management algorithm for type 2 diabetes – Australian Diabetes Society

3 Identify CVD risk category



AF: atrial fibrillation; **BMI**: body mass index; **BP**: blood pressure; **CAC**: coronary artery calcium; **CKD**: chronic kidney disease; **eGFR**: estimated glomerular filtration rate; **FH**: familial hypercholesterolaemia; **HbA1c**: haemoglobin A1c; **HDL-C**: high-density lipoprotein cholesterol; **TC**: total cholesterol; **uACR**: urine albumin-to-creatinine ratio. **Family history**: coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years. **Severe mental illness**: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

CVD risk categories

The Aus CVD Risk Calculator produces a CVD risk estimate expressed as a percentage probability of dying or being hospitalised due to myocardial infarction, angina, other coronary heart disease, stroke, transient ischaemic attack, peripheral vascular disease, congestive heart failure or other ischaemic CVD-related conditions within the next 5 years. To streamline this terminology for consumer-facing communications and aid implementation, the CVD risk estimate can be simplified to: the probability of experiencing a heart attack, stroke or vascular disease in the next 5 years.

Based on this score, people can be placed into one of three risk categories, which will determine the management approach: low (<5%), intermediate (5% to <10%), or high (≥10%) risk (Table 5).

Although this updated guideline recommends initiating treatment in people at CVD risk ≥10%, this risk level for initiating treatment is likely to be comparable to the previously recommended 15% CVD risk level calculated using the Framingham equation.

For more information on treatment thresholds, refer to the Pharmacotherapy section.

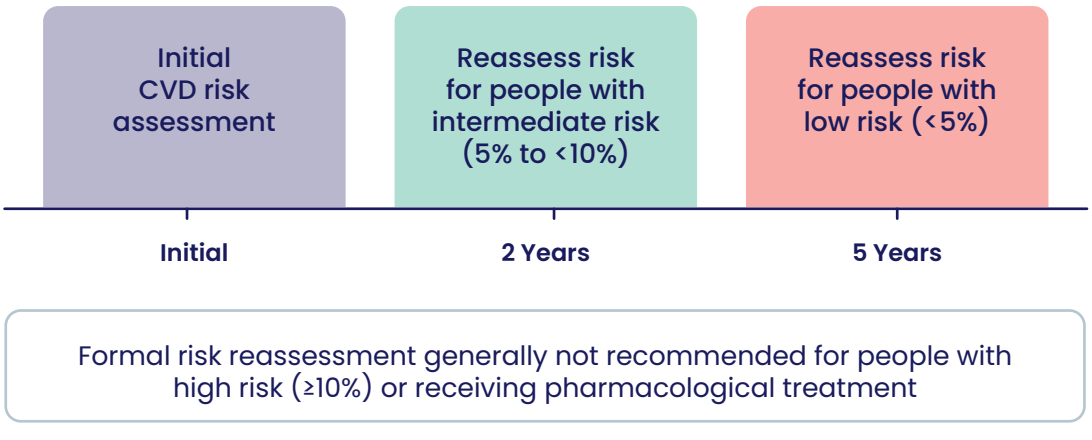
Table 5: Estimated 5-year CVD risk categories based on the Aus CVD Risk Calculator

Risk category	Estimated 5-year CVD risk
High	≥10%
Intermediate	5% to <10%
Low	<5%

CVD risk assessment frequency and intervals using the Aus CVD Risk Calculator

Recommendations	Strength	Certainty of evidence
Intervals between reassessments of CVD risk using the Australian cardiovascular disease risk calculator should be determined using the most recent estimated risk level.	Conditional	Moderate
For people receiving pharmacological treatment to manage CVD risk, including those previously assessed as being at high risk (≥10%) of a cardiovascular event within 5 years, formal reassessment of CVD risk is not generally recommended, and management should be guided by the clinical context.	Conditional	Very low
In people with an intermediate risk (5% to <10%) of a cardiovascular event within 5 years, who are not receiving pharmacological treatment to reduce CVD risk, reassess after 2 years. Reassess earlier if any of the following apply: • the most recent risk assessment was close to the threshold for high risk (≥10%) • risk factors worsen • new CVD risk factors are identified.	Conditional	Very low
In people with a low risk (<5%) of a cardiovascular event within 5 years who are not receiving pharmacological treatment to reduce CVD risk, reassess after 5 years. Reassess earlier if any of the following apply: • the most recent risk assessment was close to the threshold for intermediate risk (≥5% to <10%) • risk factors worsen • new CVD risk factors are identified.	Conditional	Low
For First Nations people, reassess every year as part of an annual health check (or opportunistically), or at least every 2 years.	Consensus	

Figure 4: CVD risk reassessment intervals using the Aus CVD Risk Calculator



General considerations

The optimal interval between baseline CVD risk assessment and subsequent CVD risk reassessments balances the objective of detecting increased risk as early as possible to inform treatment decisions with that of avoiding unnecessary assessments.

Available evidence indicates that, in general, CVD risk increases slowly and gradually.[33,34] Therefore, assessments to detect meaningful increases in risk are best conducted several years apart; more frequent assessments are unlikely to be necessary and may also detect fluctuations in CVD risk factors rather than substantive changes in overall risk.

Those with estimated risk closer to the 5% or 10% thresholds may benefit from earlier reassessment.

Within any risk category, people closer to the upper risk threshold will tend to cross into the next risk category soonest. Accordingly, earlier assessment of people closer to the upper risk treatment threshold will help to detect the need for intervention to reduce CVD risk.

Practice points

- For people in the low risk category whose estimated CVD risk is close to 5%, the decision to reassess risk earlier than 5 years should be made in partnership with the person.
- Similarly, for people in the intermediate risk category whose estimated risk is close to 10%, the decision to reassess risk earlier than 2 years should be made in partnership with the person.
- For people in the high risk category, reassessing CVD risk with the Aus CVD Risk Calculator is not necessary, but can be considered in cases where it may promote continuing pharmacological treatment or lifestyle* modifications (e.g. when the agreed management goal is to reach a lower risk level, rather than to reach a specific BP or lipid target).

First Nations people

Practice points

It is recommended that First Nations people receive a CVD risk assessment as part of an annual health check, (or opportunistically) or at least every 2 years.[35] This recommendation is based on:

- the higher rate of CVD compared with non-Indigenous peers
- greater prevalence and earlier onset of risk factors such as diabetes and CKD
- limited literature on population-specific risk transition and progression of disease.[35]

Support for the recommendations

No evidence specific to the Australian intermediate risk category (5% to <10% probability of a cardiovascular event within 5 years) was identified. The recommendation for assessing risk at 2-year intervals is based on evidence that assessment should be more frequent at higher levels of risk, and this is broadly consistent with the previous guideline.

Cohort study data from people in Japan and the US aged 30–74 years and at low CVD risk (<5% probability of a cardiovascular event within 5 years) suggest that reassessment after 3 years is likely to detect a transition to high risk (≥10% probability of a cardiovascular event within 5 years) in <1% of this group. Reassessment after 8 years is likely to detect transition to high risk in about 0.5–9% of this group.[34] In the absence of more specific evidence, a reassessment interval of 5 years is likely to be sufficient to detect a meaningful change in risk, as well as early detection of progression to a higher risk status.

A UK cohort study in adults aged 40–64 years without CVD, who were screened every 5 years to determine 10-year risk of a major cardiovascular event (fatal CHD, non-fatal MI, and fatal or non-fatal stroke), found that more frequent risk category-based assessments in people with a 5.0–7.5% 10-year risk were associated with prevention of cardiovascular events.[33]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Consider reclassification factors

In addition to the variables included in the Aus CVD Risk Calculator, clinicians should consider other 'reclassification factors' that may help refine CVD risk categorisation.

Reclassification factors have been identified based on which factors are likely to improve risk estimation beyond traditional CVD risk prediction equations (Table 6) including:

- ethnicity
- chronic kidney disease
- coronary artery calcium score
- family history of premature CVD
- severe mental illness

Reclassification factors are of most value when the person's risk lies close to a risk threshold, as a small shift in risk estimate may result in their risk being categorised in a different risk category.

Table 6: Reclassification factors and effect on risk estimates

Factor	Potential to reclassify upward or downward
Ethnicity	↑ or ↓
Family history of premature CVD[a]	↑
Chronic kidney disease	↑
Severe mental illness[b]	↑
Coronary artery calcium score	↑ or ↓

[a] Family history of premature CVD is defined as coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years.
[b] Severe mental illness is defined in this guideline as a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

Reclassification factors were selected based on evidence reviews that sought to identify risk factors that increased or decreased estimated CVD risk, beyond traditional risk calculators, not merely because they are independent risk factors for CVD.

Ethnicity

The following recommendations were derived from the available evidence and do not represent a complete list of ethnicities in a multicultural Australian society.

Recommendations	Strength	Certainty of evidence
For First Nations people, consider reclassifying estimated CVD risk to a higher risk category after assessing the person's clinical, psychological and socioeconomic circumstances, and community CVD prevalence.	Conditional	Moderate
In people whose estimated CVD risk is close to the threshold for a higher risk category, consider reclassifying estimated CVD risk to a higher risk category for the following groups: • Māori people • Pacific Islander people • people of South Asian ethnicity (Indian, Pakistani, Bangladeshi, Sri Lankan, Nepali, Bhutanese, or Maldivian ethnicities).	Conditional	Moderate
For people whose estimated CVD risk is close to the threshold for a lower risk category, consider reclassifying estimated CVD risk to a lower risk category for people of East Asian ethnicity (Chinese, Japanese, Korean, Taiwanese, or Mongolian ethnicities).	Conditional	Moderate

General considerations

First Nations people have an elevated risk of developing, and dying from, CVD.[36,37]

There are currently no empirical data to examine the accuracy of the Aus CVD Risk Calculator when applied to First Nations people. Given the underestimation of CVD risk using existing algorithms, it is difficult to state with confidence the likely impact of modified algorithms and additional CVD risk factors incorporated into the Aus CVD Risk Calculator until data on the new algorithm are available.

In Australian healthcare, there is no standard or accepted practice for collecting data on ethnicity among non-Indigenous people or for classifying non-Indigenous populations into broad ethnic groups. Ethnicity can be self-reported.

Evidence for associations between ethnicity and CVD risk level is, therefore, of moderate certainty, due to the limited application of available data to Australian populations.

The Aus CVD Risk Calculator has a separate equation for people with diabetes, noting that it is not validated for people with type 1 diabetes and may give an inaccurate risk estimate in these people. The Aus CVD Risk Calculator also considers socioeconomic disadvantage (see Socioeconomic factors for context), which may help improve risk prediction for First Nations people and potentially people from other groups and communities.

Practice points

- Irrespective of their country of birth or appearance, ask everyone: "Do you [does the person] identify as being of Aboriginal and /or Torres Strait Islander origin?".
- When reclassifying risk, it is important to account for the presence of kidney disease risk factors and severe mental illness among First Nations people; these conditions are more common among First Nations communities and therefore the person's estimated CVD risk may require reclassification to a higher risk category.

Support for the recommendations

A large New Zealand cohort study of 400,000 adults without known CVD found that, compared with people of European ethnicity, and adjusting for other PREDICT CVD risk factors, the 5-year risk of a major cardiovascular event was higher in self-reported Māori (men: 48%; women: 34% higher), Pacific Islanders (men: 18%; women: 22% higher), and people of Indian ethnicity (men: 34%; women: 13% higher).[1] In contrast, the 5-year risk of a major cardiovascular event was lower in people of Chinese or other East Asian ethnicity (men: 33%; women: 25% lower).[1]

Family history

Recommendation	Strength	Certainty of evidence
For people with a family history of premature CVD, consider reclassifying estimated CVD risk to a higher risk category, particularly if calculated risk is close to a higher risk threshold.	Conditional	Moderate

People with a family history of premature CVD – defined as coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years – are at increased risk of developing CVD.[38]

Although family history of premature CVD has a strong relationship to CVD as a single variable (hazard ratios of 1.59 [95% CI 1.56 to 1.63)] in women and 1.73 [95% CI 1.70 to 1.76] in men),[39] this is largely accounted for by other risk factors in the Aus CVD Risk Calculator.

However, data are conflicting on whether family history adds additional discrimination value when variables are pooled by using traditional CVD risk calculators. For example, it did not add discrimination value to the American College of Cardiology/ American Heart Association Pooled Cohort Equation.[40]

Family history of premature CVD is defined as coronary heart disease or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years.

Based on data from the PREDICT cohort, estimating CVD risk using traditional CVD risk factors (i.e. age, smoking status, diabetes, BP, cholesterol level, socioeconomic status) plus a family history of premature CVD or stroke (as defined above), modestly improves CVD risk estimation in men, but not in women, compared with estimating CVD risk using main CVD risk factors alone.[1]

Data are limited due to the fact that family history is poorly recalled by individuals as it requires knowledge of both age of diagnosis as well as nature of the CVD. This information is often poorly documented in primary care records.[41]

First Nations people

First Nations communities experience morbidity and mortality resulting from CVD when they are on average 10–20 years younger than their non-Indigenous peers.[37]

The same age thresholds for family history of premature CVD in non-Indigenous Australians are applied for First Nations people, noting the premature onset of disease across the population.

Chronic kidney disease

Recommendations	Strength	Certainty of evidence
People with moderate-to-severe chronic kidney disease, defined as sustained eGFR <45mL/min/1.73m^2 or persistent uACR >25mg/mmol (men), or >35mg/mmol (women), are at clinically determined high risk and the Australian cardiovascular disease risk calculator should not be used. Manage as high CVD risk.	Consensus	
For people who do not have diabetes[a] with sustained eGFR 45–59mL/min/1.73m^2 and/or persistent uACR 2.5–25mg/mmol (men) or 3.5–35mg/mmol (women), strongly consider reclassifying estimated CVD risk to a higher risk category, particularly if calculated risk is close to a threshold.	Conditional	Moderate

[a] For people with diabetes, eGFR and uACR are included in the CVD risk algorithm on which the Aus CVD Risk Calculator is based.[1,2]

General considerations

Traditional risk equations may underestimate risk in people with chronic kidney disease (CKD).[42]

People with CKD are at increased risk of CVD compared with the general population, and those with moderate-to-severe CKD are at high CVD risk.[19,43-45]

In people with CKD, assessing both uACR and eGFR levels provides greater accuracy in predicting 5-year CVD risk.[44]

When general population and high-risk cohorts are analysed together, the risks of CHD, stroke and cardiovascular death increase steadily with decreasing eGFR and increasing uACR (see Table 7).[44]

At a population level, CVD risk is lowest at eGFR 95mL/min/1.73m^2 but increases at eGFR levels below this value.[44] The risk of experiencing a CVD event (CHD, stroke, heart failure or death) increases steadily as eGFR decreases to levels below 75mL/min/1.73m^2.[43]

However, in people with CKD, but without CVD, eGFR level >105mL/min/1.73m^2 is associated with an increased 5-year risk of experiencing a CVD event.[40]

Table 7: Approach to CVD risk stratification according to kidney function (for people without diabetes)

Kidney function	Urine ACR (mg/mmol)	eGFR (mL/min/1.73m²)	Recommendation*
Normal	Men: <2.5 Women: <3.5	≥60	Assess CVD risk using Aus CVD Risk Calculator.
Impaired kidney function	Men: 2.5–25 Women: 3.5–35	45-59	Strongly consider reclassifying risk upwards.
Moderate-to-severe CKD	Men: >25 Women: >35	<45	Clinically determined high risk. Do not use Aus CVD Risk Calculator. Manage as high CVD risk.

Practice points

- Consider measuring eGFR and uACR when assessing CVD risk, as these tests independently improve prediction of cardiovascular events beyond traditional CVD risk factors alone.
- eGFR is commonly measured when assessing other CVD risk factors and is automatically reported by Australian pathology laboratories with requests for serum creatinine in people aged ≥18 years.

First Nations people

CKD is a significant health concern for First Nations people, who experience the condition at more than double the rate of the non-Indigenous population.[46]

Studies suggest that adjusting estimated CVD risk based on glomerular filtration and/or persistent uACR measurements is appropriate in these populations.[47-49]

Support for the recommendations

A meta-analysis of cohort studies in people without CVD found that assessing eGFR and uACR in addition to assessing traditional CVD risk factors (including smoking status, age, sex, BP, cholesterol level) significantly improves the ability to discriminate between people who will or will not experience cardiovascular events (e.g. CHD, stroke, and cardiovascular mortality), including in people without diabetes or hypertension.[44]

Resources

Chronic kidney disease (CKD) management in primary care – Guidance and clinical tips to help detect, manage and refer patients in your practice with CKD – Kidney Health Australia

Severe mental illness

Recommendation	Strength	Certainty of evidence
For people living with severe[a] mental illness, consider reclassifying estimated CVD risk to a higher risk category, particularly if calculated risk is close to a higher risk threshold.	Conditional	Moderate

[a] Terminology of 'severe' and 'serious' mental illness varies between conditions and across research, clinical practice and public health policy contexts, and these classifications can overlap. Grouping these under a single term is problematic. The definition used in this guideline is derived from the supporting evidence from the PREDICT cohort.[50]

General considerations

Severe mental illness in this guideline is defined as a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment.

CVD is a leading cause of illness and premature death in people living with severe mental illness.[50–53] Assessing CVD risk is therefore a high priority in all people living with a mental health condition. However, CVD risk equations may particularly underestimate risk in people living with a mental health condition.

Increased CVD risk in people living with a mental health condition may be due, in part, to factors such smoking, poor nutrition, alcohol use, overweight and obesity, sedentary behaviours and lack of physical activity as well as the adverse effects of some medicines used to treat mental health conditions.

The mean age of diagnosis of depressive disorders and bipolar disorder is late twenties, although the onset of symptoms typically occurs before age 20.[51] Early CVD risk factor assessment is warranted in this group, as the person may already be at significant risk of CVD. Smoking rates are particularly high and advising and helping people to cease smoking is a high priority (see Manage CVD Risk).

Treatment with second-generation ('atypical') antipsychotic agents is associated with an approximately 29% increased CVD risk in women and 14% increased CVD risk in men.[39]

The recommendation applies more broadly than the people who are presently receiving specialist treatment for a severe mental health condition, as it is recognised that there are many people who require but are not receiving specialist treatment associated with inequity, living remotely or other factors.

Practice points

- In all adults living with severe mental illness, routinely assess CVD risk and promptly and effectively manage CVD risk factors.
- Communicating CVD risk to an individual living with severe mental illness may cause undue anxiety; carefully explain the risk in a supportive way that, if possible, will educate and motivate them to manage any relevant risk factors.
- When prescribing antipsychotic therapy, routinely monitor and address lifestyle* and metabolic factors, and support the person to adopt and maintain healthy habits. The first 12 months of treatment are critical for avoiding rapid weight gain and metabolic changes. Assess weight at baseline and reassess at 1 month then every 3 months thereafter.
- Current Australian national guidelines for managing psychiatric disorders emphasise managing CVD risk[51,53] and modifying lifestyle* as foundational care for both the mental disorder[51] and to minimise the risk of developing a chronic health condition.[54]

First Nations people

First Nations people experience higher rates of mental health conditions and psychological distress, connected to dispossession, discrimination and disadvantage within the context of ongoing colonisation.

In 2018–19, 24% of First Nations people aged 2 years and older reported having a mental or behavioural condition.[55] Furthermore, 31% of First Nations people aged 18 years and over experience high or very high levels of psychological distress, compared to 13% of their non-Indigenous peers.[55]

Cross-sectional studies in First Nations communities have identified an association between depression and CVD.[56,57] This is likely a bi-directional relationship.

Considering mental health when assessing and managing CVD risk is therefore important given the greater prevalence of mental health conditions and burden of CVD experienced by this population.

Social and emotional wellbeing is a concept that encompasses connection to culture, spirit, community, family and country, and incorporates biomedical perspectives of mental health.[58]

Positioning mental health within the understanding of social and emotional wellbeing held by First Nations people can place a positive emphasis on the subject, facilitate wellness and be a key component of discussing and managing CVD risk and lifestyle* factors.

Practice points

- Instruments developed specifically to measure social and emotional wellbeing in First Nations people should be used in preference to tools developed exclusively in non-Indigenous populations. These tools reflect First Nations people's understandings and concepts of social and emotional wellbeing and mental health issues.[59,60]
- Refer to the mental health section of the *National guide to a preventive health assessment for Aboriginal and Torres Strait Islander people*[35] for recommended tools.

Resources

1. Heart risks resources for Aboriginal and Torres Strait Islander Peoples – National Heart Foundation of Australia
2. National guide to a preventive health assessment for Aboriginal and Torres Strait Islander people (mental health section) – RACGP

Support for the recommendation

A large cohort study in adults without prior CVD found that severe mental illness was associated with a 37% increase in the risk of cardiovascular events at follow-up (maximum 12 years; mean 4.5 years).[50] This risk increase was higher for women (64% higher) than men (29% higher).[50] CVD risk was also increased in people living with a mental health condition that was not considered 'severe'.

Resources

1. Support and resources on physical activity and healthy eating for people living with a mental illness – Beyond Blue
2. Mental illness and chronic conditions fact sheet – ACDPA
3. What is appropriate language when speaking with someone living with a mental health condition? – New South Wales Health
4. Language and stigma – Everymind

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Coronary artery calcium score

Recommendations	Strength	Certainty of evidence
Coronary artery calcium (CAC) score is not recommended for generalised population screening for CVD risk.	Strong	Moderate
Do not consider measuring CAC if: • the person has a history of myocardial infarction or revascularisation, or known coronary heart disease • the person is already known to be at high CVD risk. Treatment to reduce risk is indicated in these people, regardless of the CAC result.	Conditional	Moderate
When assessing CVD risk, reclassifying risk level due to CAC score can be considered when treatment decisions are uncertain, e.g.: • when risk of cardiovascular events is assessed as low or intermediate using the Australian cardiovascular disease risk calculator and other risk concerns are present that are not accounted for by the calculator. • when further information is required to inform discussions between practitioner and the person on whether to modify therapy.	Conditional	Moderate

General considerations

Coronary artery calcium measurement is performed by computed tomography. Unlike coronary angiography, it does not require contrast or intravenous access. Coronary angiography is not considered in this guideline as it is used in people with suspected or known CHD.

The test provides a score related to the amount and density of calcified plaque for each coronary artery.[61]

Results are reported both as total CAC score in Agatston units (Au), representing an absolute measure of coronary calcium, and as a percentile based on the individual's age, sex and ethnicity (representing a relative measure of coronary calcium).

The total CAC score can be useful – in addition to clinical risk assessment – to improve precision in individualised risk prediction of cardiovascular events and to inform pharmacological treatment decisions (Table 8). It has a strong negative predictive value. The percentile score is a measure of risk relative to an age- and sex-matched general population.[61]

Potential consequences of testing for CAC include:

- a low radiation exposure (similar to that of a mammogram)[61]
- the clinical and psychological effects of potentially receiving an unexpected adverse result
- the potential need for further investigations associated with incidental findings (e.g. lung nodules).[62]

Using CAC score to assess CVD risk

- CAC measurement is not recommended as a population screening test. The low yield of CAC scoring in low risk populations makes mass screening impractical.
- It has limited utility for people in whom high CVD risk is identified and in whom evidence-based medical management is therefore indicated, since it is unlikely to change management decisions.
- CAC measurement could be considered in the setting of CVD risk factors not already accounted for in the Aus CVD Risk Calculator as the risk score may be an underestimate. It may also be useful in addressing reluctance to initiate or adhere to medicines, as it assists the person in understanding their coronary atherosclerosis burden.
- While the CAC score indicates the burden of calcium deposits in the coronary vessel, it cannot detect the degree of stenosis. Therefore, it should not be used as a standalone test for symptomatic patients (e.g. presenting with possible cardiac angina).[63]
- A high CAC score (>99 Au), with visualisation and information about what this means, may enhance shared decision-making and promote adherence to preventive treatment (pharmacological and lifestyle* modification strategies) and may help with treatment hesitancy.[64,65]
- In patients with a normal CAC score (zero), it is reasonable to repeat the test within 2–5 years to detect an increase in score and reclassify risk, based on available evidence. A prospective cohort study found that, among patients with a zero CAC score, 25% developed CAC over a period of 5 years.[66]

Table 8: Clinical applications of CAC testing

Clinical situation	CAC testing	Clinical implications
Population screening for CVD	Not recommended	Low yield of CAC scoring in mass population screening
People with high risk of a cardiovascular event in the next 5 years	Not recommended (neither initial nor repeat test)	CAC score would not alter management: preventive treatment indicated.
People with known CVD	Not recommended (neither initial nor repeat test)	CAC score would not alter management: preventive treatment indicated.
CVD risk assessed as low or intermediate in a person with one or more additional risk factors	Can be considered if available and affordable	Detection of CAC may reclassify risk to a higher level. Score of zero may reclassify risk level to low. Score >99 Au (or ≥75th percentile for age and sex) may reclassify risk level to a higher level.
Change in intensity of preventive treatment is under consideration	Can be considered if available and affordable to inform discussions with patient	CAC score may alter management.
Previous score of zero	Consider re-testing in 2–5 years	CAC score provides additional monitoring of risk.

Special considerations

Younger adults

The added diagnostic value of a CAC score of 0 is highly dependent on age.

A CAC score of 0 indicates a very low risk of cardiovascular events and mortality within 5 years,[67,68] but does not rule out non-calcified atherosclerosis, particularly in younger people.[69]

Older adults

CAC increases with age and may have less discriminative value in people older than 75 years as most have high scores.[69]

Practice points

- If CAC measurement is performed, the result could influence assessment of CVD risk in the following situations (Table 8):
  - In people considered to be at intermediate risk, a CAC score of 0 could reclassify them to a lower CVD risk category.
  - In people considered at low or intermediate risk, a CAC score >99 Au, or ≥75th percentile for age and sex, could reclassify a person's CVD risk category to a higher level.
- In either case, carefully explain the estimated risk and manage risk according to current recommendations in discussion with the person and with appropriate follow-up and monitoring (see Manage CVD risk).
- If a CAC score has been obtained previously, the test should only be repeated if CVD risk category or management decisions are uncertain.
- If the initial CAC score was 0, consider reassessing CVD risk in 2–5 years, depending on baseline risk profile (see Assessment frequency and intervals).
- Do not repeat a CAC test if management would not change as a result of the score (e.g. for people already taking long-term BP-lowering and/or lipid-modifying pharmacotherapy).
- When considering obtaining a CAC score or discussing the results, explain to the person why the test is being done and how the results would guide treatment choices. Involve the person in all management decisions and pre-test counselling prior to performing a CAC test.
- Reporting CAC findings may differ according to the software used. Percentiles may be based on different populations. Clarify the report with the imaging provider, if needed.
- CAC testing is not presently subsidised by Medicare. Cost can vary considerably between providers.
- CAC testing is commonly used, and it is possible for people to present having already had the test, often for indications outside the present guideline. The practitioner should consider this result in the context of the Aus CVD Risk Calculator as a potential reclassification factor (e.g. a CAC score of 0 suggests that the calculator could overestimate risk, especially in older people, and a CAC >100 Au could imply underestimation of risk by the calculator).

Support for the recommendations

A systematic review comparing the predictive value of CAC score combined with a traditional CVD risk prediction model (Pooled Cohort Equations or Framingham Risk Score), with a traditional risk prediction model alone, concluded that there were too few well-designed clinical trials to determine its value in guiding management in adults without known CVD.[62]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Other risk considerations

This section provides guidance on several clinical conditions, investigations and blood biomarkers that are associated with increased CVD risk.

Some of these risk markers provide very little discrimination value beyond that of traditional CVD risk factors and are not recommended as part of routine CVD risk assessment.

Others may be considered by clinicians for relevant groups, depending on clinical context.

Recommendations are provided where existing systematic reviews were available or where systematic reviews were conducted for this guideline.

Several other factors that are considered in the literature but may not reclassify risk beyond traditional CVD risk prediction equations, are discussed below.

Ankle-brachial index

Recommendation	Strength	Certainty of evidence
The ankle-brachial index should not be measured as part of a CVD risk assessment as it provides very little discrimination value beyond that of traditional CVD risk calculators.	Conditional	Moderate

General considerations

Ankle-brachial index (ABI) is a predictor of CVD risk in people with no previous history of coronary heart disease,[70] but it provides little additional discrimination value when added to traditional risk calculators.[62]

Practice points

- Although ABI is not recommended for CVD risk assessment, or in routine testing in people who are asymptomatic, it is useful in assessing people with suspected, or at high risk for, peripheral vascular disease.
- ABI should only be performed by suitably trained practitioners. Specific training is required as it is difficult to ensure consistently correct technique; it can be time-consuming and necessitate rest periods, and the test may cause the person discomfort or lead to anxiety or concern when a pulse is not readily found.[71,72]

Support for the recommendation

A systematic review of cohort studies found that adding ABI to CVD risk prediction models results in no or negligible improvement in the model's ability to identify who will or will not have a cardiovascular event.[62]

High-sensitivity C-reactive protein

Recommendation	Strength	Certainty of evidence
The high-sensitivity C-reactive protein test should not be routinely performed as part of a CVD risk assessment as it provides very little discrimination value beyond that of traditional CVD risk calculators.	Conditional	Moderate

General considerations

C-reactive protein (CRP) is a nonspecific marker of inflammation used to monitor bacterial infection, inflammation, neurodegeneration, tissue injury, and recovery.[73] CRP levels are also raised in various chronic inflammatory diseases including CVD (atherosclerosis, chronic heart failure).[73,74]

Evidence supports using the high-sensitivity CRP test (hs-CRP) as a measure of chronic inflammation.[74] It has also been used as a marker of CVD risk in people without known CVD.[74]

However, there is inconsistent evidence that hs-CRP improves rates of appropriate reclassification into clinically meaningful CVD risk strata.[62] Its use is therefore likely to result in more people being incorrectly reclassified to a higher risk category.[62]

While routine hs-CRP testing is unlikely to improve CVD risk assessment in the general population, persistently elevated CRP in people with chronic inflammatory conditions (e.g. systemic lupus erythematosus, rheumatoid arthritis or psoriasis), but no known CVD, may be a useful predictor of an increased risk of cardiovascular events.[75,76]

Support for the recommendation

A systematic review of cohort studies compared cardiovascular risk prediction models using traditional CVD risk factors alone with hs-CRP in addition to traditional risk prediction models (e.g. Framingham Risk Score or Pooled Cohort Equations) in asymptomatic adults with no known CVD. The review reported inconsistent findings, with no (or a very small) improvement in predicting cardiovascular events.[62]

Chronic inflammatory conditions – rheumatoid arthritis

Recommendation	Strength	Certainty of evidence
Do not reclassify the estimated CVD risk solely due to the presence of rheumatoid arthritis.	Conditional	Moderate

General considerations

People with rheumatoid arthritis or other chronic inflammatory conditions characterised by elevated C-reactive protein (CRP) levels are at increased risk of CVD compared with the general population.[77-79]

However, the accuracy of CVD risk prediction is not improved by incorporating the presence of rheumatoid arthritis or by adjusting estimates made by traditional CVD risk calculators. This practice may overestimate CVD risk.

Practice points

- People with rheumatoid arthritis or certain other chronic autoimmune inflammatory conditions are at increased risk of CVD[79] and should be followed up regularly (e.g. annually) for heart health checks and routine CVD risk assessment (noting that the accuracy of CVD risk prediction is not improved by incorporating the presence of rheumatoid arthritis into the calculation).
- A recent cohort study showed that systemic sclerosis, Addison's disease, systemic lupus erythematosus and type 1 diabetes were associated with the highest overall cardiovascular risk.[79]

Support for the recommendation

Pooled data from seven cohort studies in European, American and African populations indicated that, in people with rheumatoid arthritis (but without known CVD), three algorithms that incorporated the presence of rheumatoid arthritis did not predict CVD risk more accurately than risk calculators developed for the general population (mean follow-up approximately 7 years).[80]

History of pregnancy complications

Hypertensive disorders of pregnancy

Hypertensive disorders of pregnancy are associated with an increased risk of CVD. A history of hypertensive disorders during a first pregnancy triples a woman's risk of developing CVD in the following 10 years.[81,82] A thorough pregnancy history should therefore be taken when performing a CVD risk assessment.

Hypertension may begin before or during pregnancy.[83] Hypertension during pregnancy is defined as >140 mmHg systolic or >90 mmHg diastolic BP measured over repeated readings.[84,85]

Hypertension diagnosed after 20 weeks' pregnancy is either gestational hypertension (in the absence of proteinuria and without biochemical or haematological abnormalities) or pre-eclampsia.[83,86]

Women with early-onset (<34 weeks) versus late-onset hypertensive disorders of pregnancy have a greater risk of CVD.[81]

Pre-eclampsia

Pre-eclampsia is a multisystem disorder affecting approximately 2–5% of pregnant women and is a major cause of maternal and perinatal morbidity and mortality.[86,87]

It is defined as new-onset hypertension after 20 weeks' gestation, with evidence of proteinuria and/or acute kidney injury, liver dysfunction, neurological involvement, thrombocytopaenia, haemolysis or foetal growth restriction.[87]

It is unclear whether pre-eclampsia initiates the damage to the mother's cardiovascular system, leading to CVD later in life, or whether pre-eclampsia, and later CVD, share common risk factors preceding the pregnancy.[88]

Women with a history of pre-eclampsia have approximately 1.5–2.7 times higher long-term risk of CVD than women in the general population.[88,89] Evidence shows a higher risk of developing hypertension and CVD in women with recurrent pre-eclampsia compared with women with a single episode of pre-eclampsia.[90] CVD risk is also higher in women who experience pre-eclampsia and another pregnancy complication such as gestational diabetes.

The increased risk of cardiovascular events persists beyond 10 years after pregnancy.[82,89,91,92]

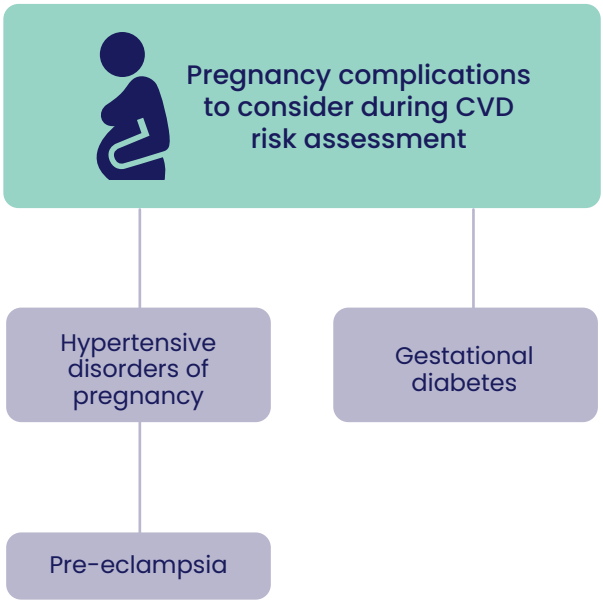
Pre-eclampsia is also associated with more than three times increased risk of developing later hypertension and kidney disease, and double the risk of developing type 2 diabetes, compared with women who were normotensive during pregnancy.[89]

Gestational diabetes

It is estimated that women with a previous diagnosis of gestational diabetes have a two-fold increased risk of developing coronary artery calcification – associated with increased CVD risk – even if they maintain healthy blood glucose levels postpartum.[93]

Despite the increased risk of developing type 2 diabetes following a pregnancy complicated by gestational diabetes, many women with gestational diabetes do not have recommended regular postpartum blood glucose checks.[94]

Figure 5: Other risk considerations - pregnancy complications



Practice points

- Take a thorough pregnancy history when performing a CVD risk assessment.
- For women with a history of hypertensive disorders and/or pre-eclampsia, particularly early-onset pre-eclampsia (<34 weeks), consider an annual BP check and regular assessment of other heart disease risk factors.
- Women with a history of gestational diabetes who are planning another pregnancy should have an oral glucose tolerance test annually. However, if results are normal (i.e. no diabetes or impaired glucose tolerance), then this can be changed to a fasting blood glucose and HbA1c test at least every 3 years.[95,96] Explain this elevated risk and the need for monitoring, and the importance of leading a healthy lifestyle*.

First Nations people

Quasi-national data from 2016–2018, suggested that about 6% of First Nations women giving birth experienced pregnancy-induced hypertension, compared with about 5% of non-Indigenous women.[97]

The limited available evidence suggests that First Nations women experience higher rates of hypertensive disorders and pre-eclampsia during pregnancy, compared with non-Indigenous women.[98,99]

First Nations women also experience higher rates of gestational diabetes compared with non-Indigenous women.[100,101]

Support for the advice

Evidence from a meta-analysis found that early-onset pre-eclampsia (defined as requiring delivery before 34 weeks' gestation) was associated with a more than five-fold higher risk of CVD and cerebrovascular conditions compared with late-onset pre-eclampsia.[89]

Resources

1. Management of type 2 diabetes: A handbook for general practice (gestational diabetes mellitus chapter) - RACGP and Diabetes Australia
2. Diabetes Referral Pathway: Gestational diabetes (GDM)– Australian Diabetes Educators Association (ADEA)
3. Gestational Diabetes (consumer fact sheet) – National Diabetes Services Scheme (NDSS)
4. Our Language Matters – Diabetes Australia
5. Pregnancy and heart disease. Information and resources for health professionals – National Heart Foundation of Australia
6. Heart disease and pregnancy. Information and resources for consumers – National Heart Foundation of Australia

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Premature or early menopause

General considerations

Menopause before 45 years of age is associated with increased risk of CVD, but current evidence does not demonstrate how this factor should be incorporated into CVD risk stratification for women.

The association between premature menopause and increased CVD risk is also seen in women who have undergone hysterectomy, with or without oophorectomy.[102,103]

However, it is unclear whether CVD risk associated with age of menopause is independent of other factors such as blood pressure or lipid profiles.

Current evidence suggests that women who experience premature or early menopause may need earlier and closer monitoring of CVD risk in clinical practice.

Practice points

- For women with a history of premature menopause, consider an annual blood pressure check and regularly assess other heart disease risk factors.
- A discussion about menopause provides an opportunity to explain the elevated risk of CVD associated with early menopause, the need for increased monitoring, and the importance of leading a healthy lifestyle. Refer to an appropriate allied health professional, if required (see section on Approaches to addressing lifestyle risk factors)

Support for the advice

A meta-analysis of observational studies from Australia, Scandinavia, the USA, Japan, and the UK, found that naturally occurring premature (<40 years) and early (40–44 years) menopause are associated with clinically important (1.3–1.5 times) increases in the risk of CHD or stroke events before the age of 60 years, compared with women who experience menopause at age 50–51 years.[104]

These findings are supported by other meta-analyses[105,106] and observational studies.[102,107]

Resources

1. A practitioner's toolkit for the management of the menopause – MONASH University M8 Alliance
2. Menopause treatment options – Australian Menopause Society
3. Making choices at menopause – Australian Journal of General Practice[108]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Lipids

Ongoing research is assessing whether a more accurate prediction of CVD can be achieved by measuring plasma concentrations of other lipid fractions, such as:

- non-high-density lipoprotein (non-HDL) cholesterol
- lipoprotein(a) (Lp(a)), comprised of LDL and apolipoprotein (a)
- apolipoprotein B-100 (apoB).

Routinely measuring these fractions in people without known CVD is not currently recommended for inclusion in risk-estimating algorithms.[88,109,110]

Elevated plasma triglyceride concentrations predict increased CVD risk in people without CVD,[111] but not independently of HDL cholesterol and apoB concentrations.[111,112]

Using non-HDL cholesterol, apoB and apolipoprotein A-I may not be substantially more accurate than using 'traditional' lipid concentrations (i.e. total cholesterol and HDL cholesterol) in discriminating between people who will develop CVD and those who will not.[113] However, non-HDL cholesterol and apoB levels are better predictors of cardiovascular events than LDL cholesterol.[114,115]

High plasma levels of Lp(a) strongly predict atherosclerotic CVD in people with familial hypercholesterolaemia confirmed by genetic testing.[116,117]

Although Mendelian studies show increased CVD risk associated with elevated Lp(a) levels, no randomised controlled trials have investigated the effect of reduced plasma Lp(a) on CVD events.[118]

There is currently no justification for Lp(a) screening in the general population, but it may be considered in a secondary prevention setting, for individuals with familial hypercholesterolaemia, in adults with recurrent or premature CVD events, or if LDL-C lowering is suboptimal or the individual experiences recurrent CVD events despite being on therapy.[119]

Polygenic risk scores

General considerations

A polygenic risk score is a single value that measures the cumulative genetic risk of a person conferred by their genetic variants.[120]

Polygenic risk scores can be applied at any age and have been developed as a strategy for predicting CVD risk years before CVD develops, without relying on traditional risk prediction algorithms.

A substantial proportion of people who develop MI do not have known modifiable CVD risk factors before their diagnosis and so cannot be identified for preventive strategies.[121-123]

Large retrospective cohort studies have demonstrated strong associations between genetic risk scores and CHD events, which are independent of family history of premature CVD and provide a more accurate prediction of cardiovascular events than traditional CVD risk factors.[124-129]

However, risk estimates based on traditional risk algorithms correlate poorly with those from polygenic risk scores,[130] suggesting that these approaches might be complementary.

Practice points

- The large number of polygenic risk scores being developed will require consensus and harmonisation before they can be widely used.[131]
- Effective implementation of polygenic risk scores in practice will require training in interpretation for clinicians, communication of risk to people undergoing the test, and strategies and protocols for ensuring data security.[131]
- People with no conventional CVD risk factors may be unwilling to commit to long-term preventive therapies based on a polygenic risk score alone.

COVID-19

Research carried out since the start of the COVID-19 pandemic has established that COVID-19 infection worsens pre-existing cardiovascular conditions and that people living with pre-existing CVD are more likely to die due to COVID-19 infection.[132,133]

CVD events (including MI, pericarditis, myocarditis, heart failure, arrythmias and stroke) are increased in people who survive COVID-19 infection, regardless of the severity of their infection, their age, race, sex or other risk factors for CVD.[133] The severity of COVID-19 infection can be directly correlated with an increased risk of developing cardiovascular complications including heart failure and stroke.[133]

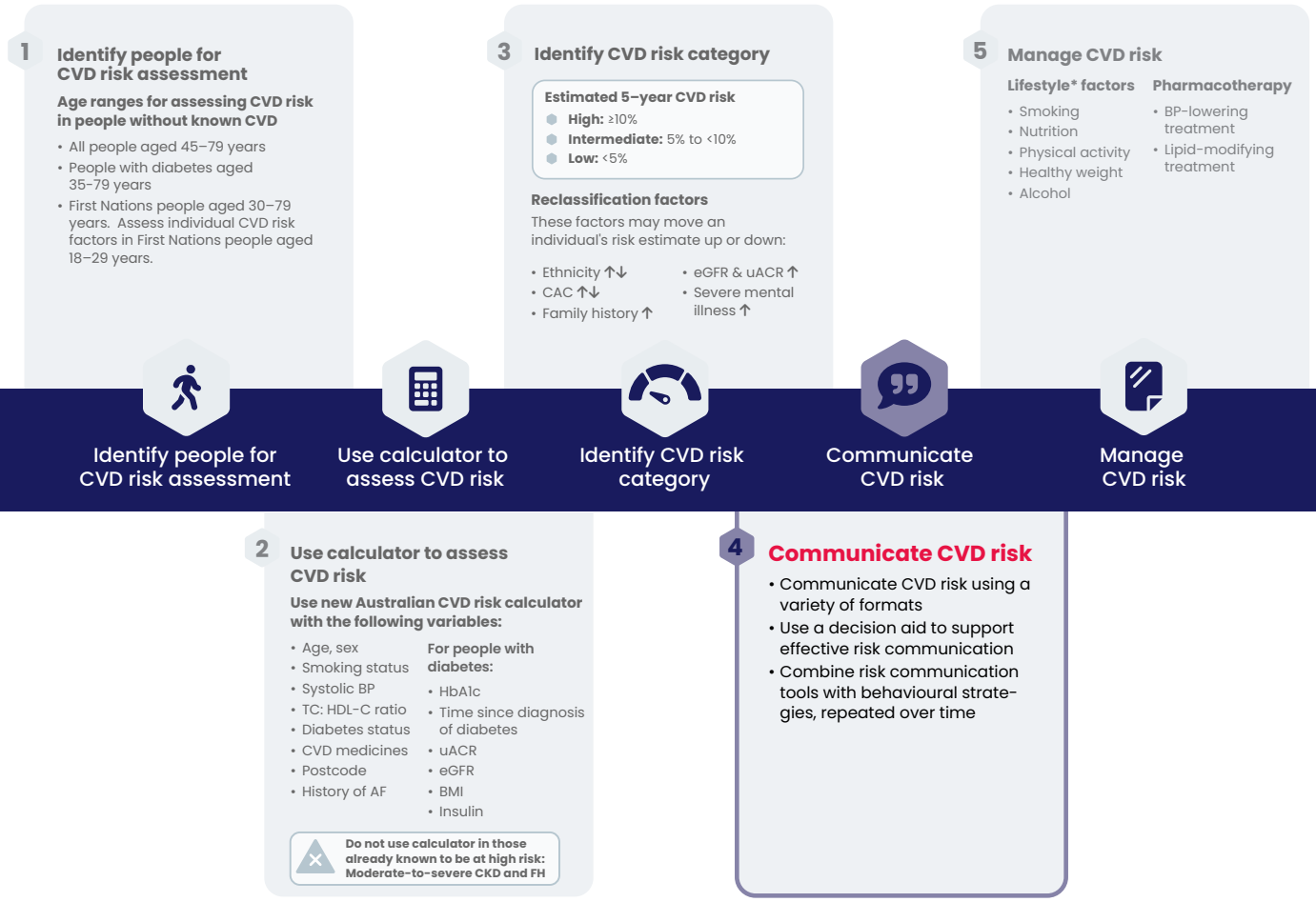
The risk of CVD and complications (including MI, pericarditis, myocarditis, heart failure, arrythmias and thromboembolic events) is highest during the first 30 days after COVID-19 infection. However, this risk remains elevated for up to 12 months and possibly longer.[132,133] The risk of developing CVD and CVD complications is increased even in people considered at low risk of CVD before COVID-19 infection, and therefore previous COVID-19 infection should be considered when assessing CVD risk.[133]

There is still uncertainly about the best way to support, treat and manage people living with long COVID or post-COVID conditions.

Practice points

- Establish whether the person has had a COVID-19 infection in the past.
- Assess CVD risk factors in people who have had a COVID-19 infection or are living with long COVID.
- Refer people with suspected COVID-19-induced myocarditis, pericarditis, cardiomyopathy or heart failure for specialist care.
- Ensure that priority groups including First Nations people, people from cultural and linguistically diverse populations, and people living in remote communities who have had COVID-19 infections or are living with long COVID, have access to and receive, culturally appropriate long-COVID rehabilitation and ongoing cardiac care.

4 Communicate CVD risk



AF: atrial fibrillation; **BMI**: body mass index; **BP**: blood pressure; **CAC**: coronary artery calcium; **CKD**: chronic kidney disease; **eGFR**: estimated glomerular filtration rate; **FH**: familial hypercholesterolaemia; **HbA1c**: haemoglobin A1c; **HDL-C**: high-density lipoprotein cholesterol; **TC**: total cholesterol; **uACR**: urine albumin-to-creatinine ratio. **Family history**: coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years. **Severe mental illness**: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

Recommendations	Strength	Certainty of evidence
Use a relevant decision aid to support effective risk communication and enable informed decisions about reducing CVD risk.	Strong	Moderate
Combine risk communication tools with behavioural strategies (e.g. motivational interviewing, personalised goal setting and health coaching), repeated over time, to reduce overall CVD risk.	Conditional	Low
Communicate CVD risk using a variety of formats (e.g. percentages, 100-person charts) to enable people with varying health literacy needs and learning styles to understand their risk.	Consensus	

General considerations

Communicating risk is essential for informed consent and shared decision-making.

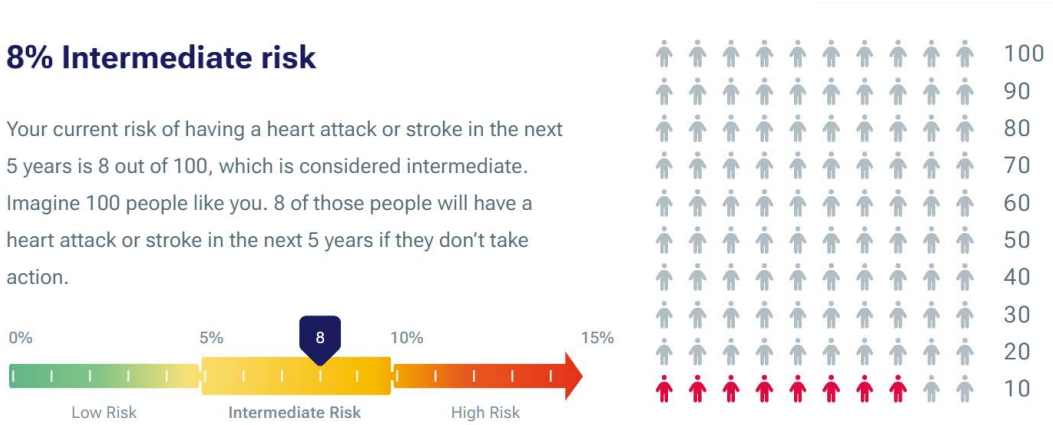
Effective communication should also be part of careful support to reduce CVD risk through lifestyle modifications and prescribing medicines, considering the person's preferences and understanding of their health status.

Risk communication is most effective when the practitioner understands the person, their health literacy, and their social and cultural background, and tailors messages accordingly (Figure 6).

Evidence from other areas of health care supports the principle that healthcare providers should consider people's diverse and often changing health literacy needs and learning styles when communicating risk.[6]

Be aware that an understanding of CVD risk varies from person to person, including what is and is not a risk factor, and the relationship between CVD risk factors and reducing risk or managing their condition.

Figure 6: Risk communication tools (Source: Aus CVD Risk Calculator)



Practice points

When communicating risk:

- Communicate risk as either a percentage or as a frequency (e.g. 15% or "15 out of 100 people like you will have a heart attack or stroke in the next 5 years").[134,135]
- Consider the person's receptivity, understanding and acceptance of risk, health literacy, and learning preferences.
- Provide the information in multiple formats (e.g. numerical percentage, 100-person charts) suitable for the person's receptivity and understanding.
- Use relevant decision aids to improve knowledge and guide management discussions.
- Repeat this discussion about risk over several consultations, where appropriate.
- Emphasise the relevance of the information by relating it to aspects of the person's own experiences such as a recent illness, a new diagnosis in a friend or family member, the person's life stage (e.g. adulthood, pregnancy), or family medical history.
- Discuss relevant CVD risk factors such as smoking, alcohol intake or obesity.
- It may be more effective to emphasise the benefits of treatment and lifestyle* modification to reducing risk, rather than focusing on negative health outcomes.
- Ensure that people with limited health literacy receive information they can easily understand and act upon, considering cultural and linguistic diversity and socioeconomic situation.
- Communicate risk in a culturally safe way. Where appropriate, engage with the person's family members, carers and other members of their community (e.g. community navigators), to help communicate risk information effectively and safely to people whose culture or language is different from your own.
- Consider and communicate the need to refer to other healthcare professionals to support the person in addressing their risk.

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

First Nations people

There is substantial burden of CVD within some First Nations families and communities. In some instances, this can result in perceptions that developing CVD is inevitable.[136]

Effectively communicating CVD risk and how to respond to risk is important for First Nations communities; literature demonstrates that poor understanding affects risk management.[136-139]

Having a positive, trusting relationship with a health practitioner and health service is important for supporting First Nations people receiving CVD risk assessment and management.[138-142]

It is important that a conversation about risk involves identifying and supporting positive actions to reduce risk.

Practice points

When communicating risk with First Nations people consider (in addition to the practice advice above):

- First Nations concepts of health and wellbeing differ from the Western biomedical model of health.
- Engaging an Aboriginal health practitioner/worker to optimise a conversation about risk
- The person's primary language, and engage an interpreter as required
- Using First Nations specific risk communication tools where relevant and available.

Resources

1. Cardiovascular disease risk communication with Aboriginal and Torres Strait Islander Peoples: Toolkit for health professionals – ANU Healthy Heart Communities project

Support for the recommendations

Evidence from four randomised controlled trials (RCTs) suggests that effectively communicating CVD risk may lead to behaviour changes that result in an improvement in predicted CVD risk assessed after 12 months.[143]

A 2021 systematic review found that using 'heart age' did not appear to motivate lifestyle behaviour change more than communicating CVD risk, but found that either approach can improve clinical outcomes when combined with other behaviour change strategies.[144]

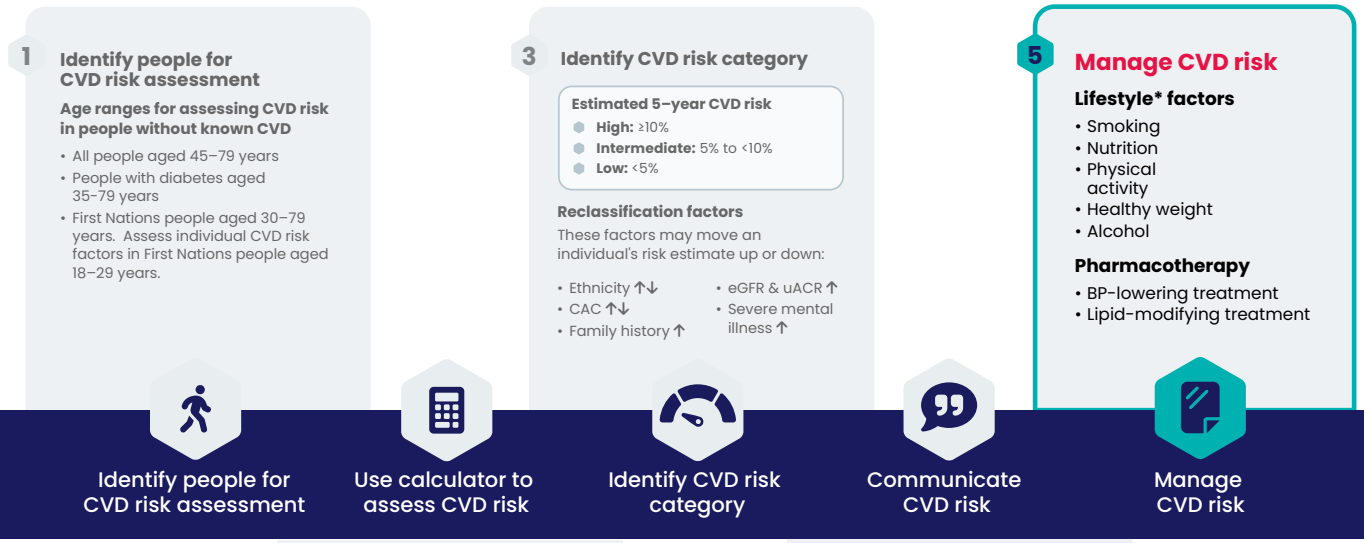
Studies of repeated risk information, or risk information and repeated counselling, showed small reductions (up to 2%) in predicted CHD risk over 10 years. However, studies in which CHD risk was communicated only once seemed to be ineffective in improving knowledge, heart health management or risk.[143]

Systematic reviews have found that decision aids can lead to improved knowledge, compared with usual care.[145] However, this evidence is mainly from studies focusing on conditions other than CVD.

Resources

1. Heart health check toolkit – National Heart Foundation of Australia
2. Risk communication toolkit – The American College of Cardiology
3. Communicating cardiovascular risk effectively – bpac^{NZ}.
4. Risk communication online training module for health professionals – The Australian Commission on Safety and Quality in Health Care
5. Yarning to make health decisions together – the Find Your Way shared decision-making model – Agency for Clinical Innovation

5 Manage CVD Risk



AF: atrial fibrillation; **BMI**: body mass index; **BP**: blood pressure; **CAC**: coronary artery calcium; **CKD**: chronic kidney disease; **eGFR**: estimated glomerular filtration rate; **FH**: familial hypercholesterolaemia; **HbA1c**: haemoglobin A1c; **HDL-C**: high-density lipoprotein cholesterol; **TC**: total cholesterol; **uACR**: urine albumin-to-creatinine ratio. **Family history**: coronary heart disease (CHD) or stroke in a first-degree female relative aged <65 years or a first-degree male relative aged <55 years. **Severe mental illness**: a current or recent mental health condition requiring specialist treatment, whether received or not, in the 5 years prior to the CVD risk assessment. Derived from PREDICT cohort.[50]

* This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

General considerations

Managing CVD risk should always involve encouraging, supporting and advising appropriate healthy lifestyle and behaviours, with or without blood pressure-lowering (BP-lowering) and/or lipid-modifying pharmacotherapy.

Once the recommended management plan is identified according to risk category, this needs to be further refined in collaboration with the person. This process should include a discussion regarding the risks and benefits of treatment options, and their personal values and preferences.

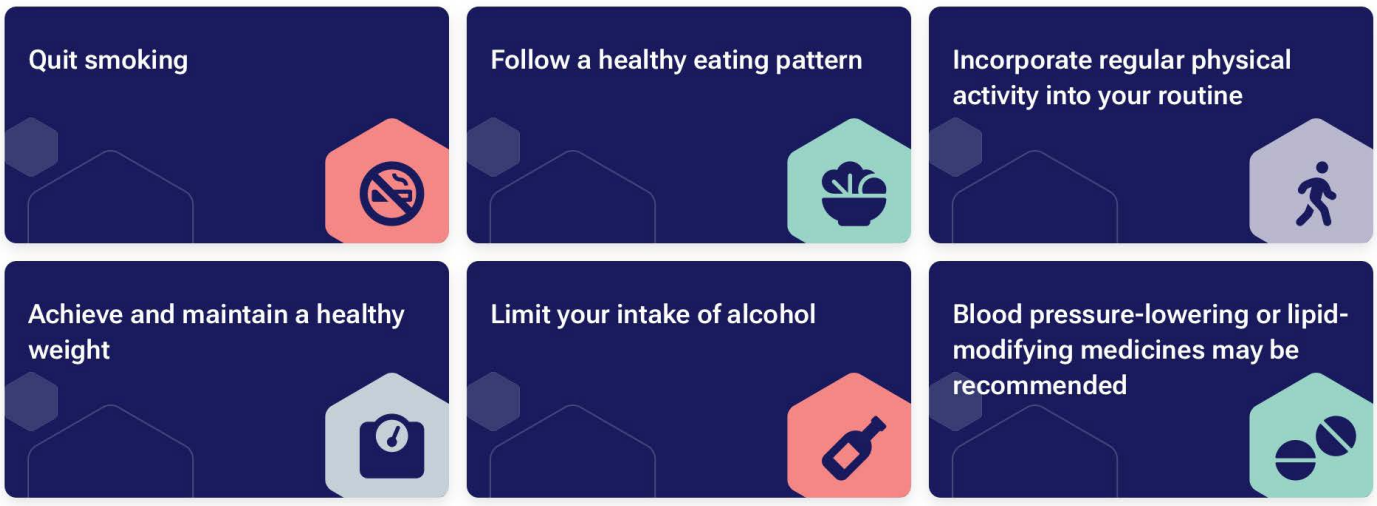
People vary in what they find motivating; for some this is having targets in place. Set targets in consultation with the person according to what is practicable and achievable for them.

Although the pharmacotherapy interventions outlined in this guideline are for BP-lowering and lipid modification, a holistic approach to address clinical factors that contribute to CVD is necessary. This includes good glycaemic control in people with diabetes, good management of renal disease, and addressing other clinical risk factors, which may contribute to CVD risk.

Newer glucose-lowering agents (e.g. SGLT2 inhibitors and GLP-1 analogues) have shown significant reductions in CVD death and all-cause mortality.[146-148] SGLT2 inhibitors have additionally shown reductions in heart failure hospitalisations and progression of CKD, regardless of an individual's diabetes status.[149]

Manage according to risk category

In people without known CVD, the risk category guides optimal management, including monitoring and reassessing risk (Table 1).



(Source: Aus CVD Risk Calculator)

Table 1: Overview of CVD risk management according to risk category

Risk category	Estimated 5-year CVD risk[a]	Management	Reassessment interval
High	≥10%	Encourage, support and advise a healthy lifestyle.[b] Prescribe blood pressure-lowering and lipid-modifying pharmacotherapy.[c]	**Formal reassessment of CVD risk is not generally required.** High-risk status requires clinical management and follow up supported by ongoing communication.
Intermediate	5% to <10%	Encourage, support and advise a healthy lifestyle.[b] Consider blood pressure-lowering and lipid-modifying pharmacotherapy, depending on clinical context.[c]	**Reassess risk every 2 years if not currently receiving pharmacotherapy to reduce CVD risk.** Assess sooner if close to the threshold for high risk, if CVD risk factors worsen, or new CVD risk factors are identified. For First Nations people, reassess every year as part of an annual health check (or opportunistically) or at least every 2 years.
Low	<5%	Encourage, support and advise a healthy lifestyle.[b] Pharmacotherapy is not routinely recommended.	**Reassess risk every 5 years.** Assess sooner if close to the threshold for intermediate risk, if CVD risk factors worsen, or new CVD risk factors are identified. For First Nations people, reassess every year as part of an annual health check (or opportunistically) or at least every 2 years.

[a] Estimated probability of a cardiovascular event within the next 5 years, determined using the Australian cardiovascular disease risk calculator.
[b] This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.
[c] Unless contraindicated or clinically inappropriate, and in discussion with the person on the benefits and harms of treatment. Encourage shared decision-making.

Practice points

- Risk factors that should be managed, regardless of Aus CVD Risk Calculator results include:
  - severe hyperlipidaemia (serum total cholesterol >7.5mmol/L or LDL cholesterol ≥5mmol/L)
  - very high blood pressure (systolic BP ≥160mmHg; diastolic BP ≥100mmHg).
- Pharmacological treatment of the above risk factors is recommended, even if the person is considered at overall low CVD risk.
- For people at intermediate or high risk, treat according to the general recommendations for those risk categories.

First Nations people

Practice points

- For First Nations people, assess CVD risk as part of an annual health review (or opportunistically).
- This recommendation is based on the higher incidence rates of CVD compared with non-Indigenous peoples, the earlier onset of risk factors such as diabetes and CKD, and the limited literature on population-specific risk transition to, and progression of, CVD.
- Although the decision to prescribe pharmacotherapy should be guided by CVD risk estimates, the presence of additional CVD risk factors and clinical indicators may warrant treatment regardless of CVD risk category.

Resources

1. National guide to a preventive health assessment for Aboriginal and Torres Strait Islander people – RACGP and National Aboriginal Community Controlled Health Organisation (NACCHO)

Resources

1. Prevent stroke – Stroke Foundation

Approaches to addressing lifestyle risk factors

Where this guideline refers to certain modifiable factors as 'lifestyle' factors, this term is not intended to imply that these behaviours are necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. The use of the term 'lifestyle' does not attribute blame to a person.

Smoking cessation

Recommendation	Strength	Certainty of evidence
Encourage, support and advise people who smoke to quit and refer them to a behavioural intervention (such as a smoking cessation counselling program) combined with a TGA-approved pharmacotherapy, where clinically indicated.	Strong	Moderate

General considerations

Smoking increases the risk of CVD and is the single leading cause of preventable mortality and morbidity in Australia.[150,151]

Smoking is the most important modifiable determinant of CVD risk and therefore should be addressed at any level of CVD risk.

Successful smoking cessation reduces the risk of CVD. Simple advice from a health professional is a cost-effective intervention to help people quit smoking.

Similarly, the effectiveness of smoking cessation pharmacotherapies is well established. These medicines help people to quit by minimising withdrawal symptoms and reducing cravings.

For people who smoke, interventions can assist with both the emotional and behavioural aspects of dependence.

At the time of writing, e-cigarettes and vaping is an area of intense investigation and key findings are available in the Australian National University's *Summary Brief: Review of Global Evidence on the Health Effects of Electronic Cigarettes* (see Resources).

Practice points

- Ask all people if they smoke and record in their clinical record.
- Use the Ask, Advise, Help (AAH) or RACGP 5As (ask, assess, advise, assist, arrange) models to support people who smoke to quit.
- For people who smoke, offer a referral to a multi-session behavioural intervention e.g. Quitline referral and TGA-approved pharmacotherapy if clinically appropriate. See resources.
- Quitting can be difficult and long-term cessation may require repeated attempts. Support people who smoke (including after relapse) with advice and help to access the evidence-based strategies described above.
- Encourage people who use e-cigarettes (whether the product contains nicotine or not) to quit.[150]
- Reassure people who are anxious about gaining weight after quitting smoking, that the health benefits associated with smoking cessation are likely to far exceed the health risks of being overweight or obese. Consider referral to a relevant allied health professional (e.g. referral to an Accredited Practising Dietitian and/or an exercise physiologist).
- People with a mental health condition may need special support to quit smoking. See the RACGP smoking cessation guidelines[152] for more information on how to support people with a mental health condition.

First Nations people

There have been significant reductions in tobacco use among First Nations people over the last decade.

Recent data shows that 33% of First Nations adults have never smoked, 39% smoke tobacco daily, 3% smoke less than daily and 25% are previous smokers. Whilst there have been significant reductions in tobacco use among First Nations people over the last decade, rates amongst this population remain high.[153,154]

Practice points

- There are a range of smoking cessation resources and programs tailored for First Nations people.
- Quitline is recommended for multi-session behavioural intervention because of their accessibility and because they use tailored protocols for specific groups, including for First Nations people through the 'Aboriginal Quitline' (see Resources).
- The resources and programs are culturally responsive and often developed in partnership with communities to meet the needs of First Nations people. Referral to these resources and programs should be prioritised.

Resources

1. Aboriginal Quitline – offers a smoking cessation service with First Nations counsellors and resources and supports specifically for First Nations people.
2. Medicines to help Aboriginal and Torres Strait Islander people stop smoking: A guide for health workers – Department of Health and Aged Care
3. Australian Indigenous Alcohol and Other Drugs Knowledge Centre – Australian Indigenous HealthInfoNet
4. Heart risks resources for First Nations people – National Heart Foundation of Australia

Support for the recommendation

Clinical trial evidence has consistently demonstrated that the most effective way to quit smoking is a combination of behavioural interventions (smoking cessation counselling delivered over multiple sessions), and pharmacotherapies (varenicline,[155] nicotine replacement therapies[156,157] and bupropion).[155-158]

Resources

1. Quitline – Australian Government's Department of Health and Aged Care
2. Smoking, nutrition, alcohol, physical activity (SNAP) – RACGP guide incorporating 5As model
3. Supporting smoking cessation: A guide for health professionals – RACGP
4. Smoking cessation apps – RACGP
5. Quit Centre – digital hub for health professionals supported by funding from the Australian Government Department of Health and Aged Care.
6. Position statement on smoking and vaping cessation – National Heart Foundation of Australia
7. Summary brief: Review of global evidence on the health effects of electronic cigarettes – Australian National University
8. Smoking and your heart – National Heart Foundation of Australia
9. Tobacco in Australia: Facts and issues – Tobacco in Australia

Nutrition

Recommendations	Strength	Certainty of evidence
Advise people to follow a healthy eating pattern, that is low in saturated and trans fats, and incorporates: • plenty of vegetables, fruit, and wholegrains • a variety of healthy protein-rich foods from animal and/or plant sources • unflavoured milk, yoghurt, and cheese • foods that contain healthy fats and oils (e.g. olive oil, nuts and seeds, and fish).	Consensus	
Consider recommending restriction of salt intake to reduce blood pressure.	Conditional	Moderate
Consider recommending the Dietary Approaches to Stop Hypertension (DASH) diet to reduce blood pressure.	Conditional	Moderate
Consider recommending a Mediterranean-style diet to reduce risk of CVD or stroke.	Conditional	Low/moderate[a]
Recommend regular consumption of oily fish to reduce risk of coronary heart disease (CHD) and death due to CHD.	Strong	Low

[a] Low for CVD and moderate for stroke

General considerations

Healthy eating patterns

Globally, there is a shift in research and guidelines to recognise that whole foods and healthy eating patterns, rather than individual nutrients, can better support nutritional status and counselling to improve overall eating patterns.[159,160]

Based on common features across various diets and healthy eating patterns that are supported by evidence (as summarised below), a heart-healthy pattern of eating is:

- rich in wholegrains, fibre, and antioxidants
- low in salt and added sugars
- naturally low in saturated and trans fats
- rich in unsaturated fats (monounsaturated fatty acids, omega-3 and omega-6 polyunsaturated fatty acids).[161]

Advice for a heart-healthy eating pattern

1. Eat plenty of vegetables, fruit, and wholegrains.
2. Include a variety of healthy protein-rich foods from animal and/or plant sources (e.g. legumes such as chickpeas and lentils).
3. Choose unflavoured milk, yoghurt, and cheese.*
4. Include foods that contain healthy fats and oils (e.g. olive oil, nuts and seeds, and animal sources such as fish).
5. Use herbs and spices to flavour foods instead of salt.
6. Avoid highly processed and discretionary (junk) food items.

* Milk, yoghurt and cheese are included in some, but not all, dietary patterns linked to better cardiovascular health outcomes, therefore can be included in, but are not defining features of a heart-healthy diet.[162] Evidence suggests that dairy fat from cheese and yoghurt does not raise LDL-C in the same way that dairy fat from butter does, and that LDL-C response to dairy fat is higher for those with elevated LDL-C.[162] Therefore, individuals with elevated cholesterol should opt for reduced fat varieties.[163]

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Dietary salt reduction

The World Health Organization (WHO) recommends an intake of less than 5g salt/day (approximately 2000mg of sodium).[164] The present Australian average intake is in the order of 10g/day.

Salt intake can be reduced by:

- avoiding adding salt to food while cooking (e.g. using herbs and spices to flavour food instead)
- avoiding highly processed and discretionary (junk) foods as these often have a high salt content
- where available, buy products labelled as 'no added salt' or 'reduced salt' (e.g. canned vegetables or fish).

Reducing salt intake to recommended levels has no known harms.

DASH diet

The Dietary Approaches to Stop Hypertension (DASH) diet emphasises fruit, vegetables, fat-free or low-fat dairy products, wholegrains, nuts and legumes, and limits total and saturated fat, cholesterol, red and processed meats, confectionary, added sugars, and sugar-sweetened drinks.[163,165]

Whilst DASH diets have been shown to lower BP the direct effects of DASH diets on cardiovascular events or mortality are unknown due to a lack of clinical trials measuring these outcomes.

Mediterranean diet

Mediterranean diets are based on a high ratio of monounsaturated to saturated fats (e.g. using olive oil as main cooking ingredient, or high consumption of other foods high in monounsaturated fats).[166]

Some Mediterranean diets also include:

- high intake of fruits, vegetables and legumes, wholegrains, cereals and fish
- moderate intake of milk and dairy products
- low intake of meat and meat products.[166]

Whilst consuming wine is often associated with the Mediterranean diet, alcohol intake should be avoided or limited to minimise the health risks associated with consuming alcohol (see Alcohol reduction).

This eating pattern is not associated with any known harms.

Fish and fish oil

Current dietary guidelines recommend 2–3 serves per week of oily fish that is high in long-chain omega-3 fatty acids (omega-3), with one serve equal to 100 grams of cooked fish. This provides around 250–500mg of marine-sourced omega-3 (eicosapentaenoic [EPA] and docosahexaenoic acid [DHA]) per day.[167,168]

A variety of fish oil supplements derived from oily fish containing EPA and/or DHA are available without prescription in varying formulations and doses.

Overall, the certainty of the evidence that taking fish oil supplements has any substantial effect on cardiovascular mortality or risk is low. While there is some evidence that increasing intake of omega-3 fatty acids may reduce CHD events and mortality, the effect is small, and number needed to treat for additional beneficial outcome is high.[44,150]

While taking fish oil supplements containing EPA and/or DHA may modestly reduce the risk of CVD,[169,170] it is unclear what the optimal formulation or dose is, or whether higher doses are more effective.

While increasing omega-3 fatty acid intake may benefit people with hypertriglyceridaemia, it does not reduce LDL cholesterol.[171]

Omega-3 fatty acid supplementation and algae-based omega-3 supplements containing alpha-linolenic acid are alternatives for people who do not eat fish or seafood.

Fish oil supplements are generally well tolerated but some people experience minor adverse effects such as heartburn, gastrointestinal upset, or bad breath, especially at high doses. High-dose fish oil supplementation has also been associated with rash and atrial fibrillation, so may not be suitable for some people.[172]

Practice points

- Apply the RACGP 5As model (ask, assess, advise, assist, arrange).
- Encourage healthy eating patterns based on fresh, wholefood meals, prepared with no added salt.
- Advise people to avoid highly processed discretionary (junk) foods as they are unhealthy and may displace core foods.
- Refer to an Accredited Practising Dietitian for personalised support, if needed.
- Encourage people to choose whole foods over supplements. For example, explain that although fish oil supplements are available, eating fish – in particular oily fish such as sardines, whitefish, salmon, and tuna – is recommended as part of a healthy, balanced eating pattern.[173]
- The Heart Foundation's position statement *Heart Healthy Eating Patterns*[161] and online advice on healthy eating[160] incorporate principles of the DASH and Mediterranean diets (see Resources).[174,175]
- The cost and limited availability of some fresh foods may make it harder for people living in regional and remote communities to adopt these eating patterns. Other social equity disadvantages may also impede access to recommended foods. Frozen and canned fruits and vegetables (with no added salt or sugars) are good nutritional alternatives to fresh fruits and vegetables when access to fresh foods is restricted.
- Access to fresh fish is variable across Australia. It is also expensive in some regions. Canned fish is an acceptable alternative.
- The choice of foods eaten as part of a healthy eating pattern should align with sociocultural preferences,[176] and the ingredients must be accessible and affordable.
- To achieve long-term benefits, any recommended eating pattern must be sustainable.[177]

First Nations people

Nutrition advice should be individualised and take a person-centred approach. It is important to contextualise nutrition advice within:

- the cultural relevance of any recommended healthy eating pattern
- the person's primary language
- financial resources and capacity within families to purchase, store and follow recommended food preparation techniques.
- food security and the availability, accessibility and affordability of healthy food, especially in remote settings.[35]

When providing individualised advice, consider the appropriateness of supporting the uptake of First Nations traditional foods that have a highly beneficial nutritional composition.

The Menzies Remote Short-item Dietary Assessment Tool (MRSDAT) has been developed for First Nations women and young children (2-4 years).[178] It has also been validated for use with First Nations children aged 6–36 months.[179] Consider using this tool in preference to tools developed in non-Indigenous populations.

A number of comprehensive nutritional programs addressing the needs of First Nations people have shown promising results. Refer to local resources and supports.[180]

Resources

Review availability and consider use of appropriate resources to promote good nutrition.

1. Nutrition resources – Australian Indigenous HealthInfoNet
2. Aboriginal and Torres Strait Islander guide to healthy eating – Department of Health and Aged Care
3. Cooking in the Pilbara – National Heart Foundation of Australia recipe book
4. Heart risks resources for First Nations people – National Heart Foundation of Australia

Support for the recommendations

- Cohort and observational studies demonstrate that healthy eating patterns are associated with reduced CVD risk[181,182] and cardiovascular mortality.[181]
- RCTs in people with or without hypertension, and a wide range of baseline BP levels, found that the DASH diet results in clinically meaningful reductions in BP, compared with control diets, independent of energy intake restriction, with no evidence of harm.[183]
- One RCT in people at high risk of CVD found that Mediterranean diets reduced stroke risk by approximately 40%, compared with a low-fat diet.[166] Other RCTs provide moderate-quality evidence for small reductions in BP, compared with no or minimal dietary interventions, and for small beneficial effects on lipid profiles, compared with other diets.[166]
- Evidence from RCTs included in a systematic review indicates that reducing dietary salt intake results in decreased systolic and diastolic BP.[184]
- There is insufficient evidence from RCTs included in a Cochrane review and meta-analysis in adults with and without CVD (18 years or older living in North America, Europe, Australia and Asia) to ascertain the benefits of increased fish consumption on CVD risk.[171] No differences were found between trials that compared dietary fish versus supplemental fish oil, however there were too few trials providing or advising consumption of whole fish to provide conclusive evidence.[173]
- The Cochrane review meta-analysis suggests there is little or no effect of increased long-chain omega-3 fatty acid intake on all-cause mortality, cardiovascular mortality, cardiovascular events, stroke or arrhythmias in either primary or secondary prevention compared with usual, lower or no intake of omega-3 fatty acids. Long-chain omega-3 fatty acid doses ranged from 0.5g to more than 5g per day.[171]

Resources

1. Smoking, nutrition, alcohol, physical activity (SNAP) – RACGP guide incorporating 5As model
2. Healthy eating to protect your heart - National Heart Foundation of Australia
3. Position statement: Heart healthy eating patterns – National Heart Foundation of Australia
4. Position statement: Meat and heart healthy eating – National Heart Foundation of Australia
5. Position statement: Eggs and heart healthy eating – National Heart Foundation of Australia
6. Position statement: Dairy and heart healthy eating – National Heart Foundation of Australia
7. Position statement: Fish, seafood and heart healthy eating – National Heart Foundation of Australia
8. Position statement: Alcohol and heart health – National Heart Foundation of Australia
9. Australian guidelines to reduce health risks from drinking alcohol – NHMRC
10. Australian Dietary Guidelines – Australian Government
11. Healthy Eating Quiz – University of Newcastle
12. FoodSwitch – The George Institute for Global Health
13. A rapid review of evidence fats and oils: Dietary recommendations, messaging and consumer understanding in Australia – University of Queensland

Physical activity

Recommendation	Strength	Certainty of evidence
Encourage, support and advise people to do regular sustainable physical activity, such as exercise programs, to reduce their risk of CVD.	Conditional	Low

General considerations

Increasing physical activity above sedentary levels improves lipid and metabolic profiles.[185-187]

Even small reductions in BP reduce the risk of CVD. A reduction of 1–5mmHg due to regular physical activity is likely to reduce the risk of CVD by approximately 4–22% in people with high BP.[188-191]

The World Health Organization's evidence-based guideline on physical activity and sedentary behaviour[192] states that, in adults, physical activity confers benefits for CVD mortality and incident hypertension. Measures of adiposity may also improve.

It also found that in adults, higher amounts of sedentary behaviour are associated with detrimental effects on the following CVD-related health outcomes: all-cause mortality, CVD mortality and incidence of CVD.[192]

Although exercise-based cardiac rehabilitation is known to be effective in reducing the risk of cardiovascular mortality and MI in people with CHD,[193] there is insufficient evidence from RCTs to discern the direct effects of exercise programs specifically, on cardiovascular morbidity and mortality in people without pre-existing CVD. Most clinical trials evaluating exercise programs have been short-term. It is therefore unclear how long they must be sustained to achieve long-term benefits.

Physical activity (including exercise programs), and limiting time spent being sedentary, are unlikely to cause significant harm.

Practice points

- Apply the RACGP 5As model (ask, assess, advise, assist, arrange).
- Ask about the person's typical current daily level of physical activity and sedentary behaviour, and assess according to current guidelines.[194]
- Advise people that increasing physical activity, including exercise programs, and limiting sedentary behaviours can achieve meaningful reductions in BP (even for people with hypertension), help maintain mobility, as well as improving lipid and metabolic disorders, mental health and quality of life.
- Encourage people to reduce the amount of time they are sedentary, and to be as physically active as possible throughout the day, every day of the week, if possible.[186,187] Refer to relevant physical activity guidelines (see Resources).
- Physical activity advice should be tailored to meet individual needs, accounting for factors including comorbidity and cultural values. Refer to relevant physical activity guidelines (see Resources).
- If an exercise or physical activity program is not suitable or available, explore how other forms of physical activity can be incorporated into their daily life as a sustainable alternative to formal exercise programs. Refer to relevant physical activity guidelines (see Resources).
- Cost and accessibility of supervised exercise programs might prevent some people from participating but there are many physical activity programs that do not require payment (e.g. Heart Foundation personal walking plans).

First Nations people

Practice points

- Advice on physical activity should be individualised and take a person-centred approach.
- It is important to contextualise advice within the cultural relevance of any recommended physical activity or exercise program, the person's primary language and their capacity to engage with recommended activities.[195]
- A number of programs supporting the physical activity of First Nations people have shown promising results. Practitioners should familiarise themselves with local resources for appropriate supports.

Resources

1. Heart risks resources for First Nations people – National Heart Foundation of Australia

Support for the recommendation

A systematic review of RCTs found that participating in low- to moderate-intensity exercise training programs (resistance, aerobic or combined training) reduced BP by 1–5mmHg in adults with or without hypertension, compared with no exercise training intervention.[188]

Resources

1. Smoking, nutrition, alcohol, physical activity (SNAP) – RACGP
2. Physical activity resources for health professionals – National Heart Foundation of Australia
3. Free online personal walking plans – National Heart Foundation of Australia
4. Australia's physical activity and sedentary behaviour guidelines – Department of Health and Aged Care
5. World Health Organization 2020 guidelines on physical activity and sedentary behaviour – World Health Organization
6. The collaboration of exercise physiologists and dietitians in chronic disease management. Joint position statement – Exercise & Sports Science Australia (ESSA) and Dietitians Association of Australia (DAA)

Healthy weight

Recommendation	Strength	Certainty of evidence
Encourage, support and advise people to achieve and maintain a healthy weight.	Consensus	

General considerations

Weight-reducing diets can contribute to achieving a healthy weight and reducing BP,[196] however, reductions in cardiovascular morbidity and mortality related to weight loss have not been established because very few high-quality RCTs evaluating these diets measured these outcomes.

It is unclear whether BP reductions achieved by following a weight-reducing diet within a structured program are sustained long term. However, even small reductions in BP can reduce the risk of CVD.

In adults who are living with obesity or overweight, achieving weight loss is associated with statistically significant changes in serum lipids.[197]

Practice points

The following principles apply when encouraging people to achieve a healthy weight:

- Consider referral to appropriate allied health professionals, such as an Accredited Practising Dietitian, for support.
- Apply the RACGP 5As framework (ask, assess, advise, assist, arrange).
- Consider that communication and terminology relating to weight is a highly sensitive topic (see Resources).
- Achieving a healthy weight may be an unachievable target for many, leading to demotivation. Instead, aiming for a healthier weight may be a more achievable approach.
- BMI and waist circumference can both be useful tools to identify people who are living with obesity or overweight and at subsequent risk of developing CVD. Record measurements as part of the person's clinical history.
- Advise people that achieving a healthy – or healthier – weight could help reduce BP and provide metabolic, musculoskeletal and other health benefits.
- Support people to achieve a healthy weight and optimise their health through a healthy eating pattern. Consider referral to an Accredited Practising Dietitian.
- Support the person to develop sustainable healthy eating pattern, in order to achieve and maintain a healthy weight.
- Advise the person that achieving a healthy weight, combined with increased physical activity and reduced sedentary behaviours, can improve overall health and reduce CVD risk. The most effective strategies are comprehensive programs that include reduced energy intake, increased physical activity, and support for behavioural change for a duration of at least 6–12 months, followed by long-term support to maintain a healthy weight.[198]
- Consider that sociocultural preferences are likely to influence adherence to a healthy eating pattern.
- Acknowledge that access to foods that are affordable, nutritious and socioculturally appropriate may be limited for people experiencing socioeconomic disadvantage and for those living in regional or remote areas.
- Inform the person that many organisations in Australia support people to achieve a healthy weight through healthy eating patterns and exercise. However, some may not be accessible to everyone due to cost or availability.
- Advise against following extreme eating patterns that do not follow healthy eating pattern guidance (see Nutrition section), and programs that focus on short-term weight reduction, as these have poor long-term outcomes.
- Consider referral for bariatric surgery for people living with severe obesity to reduce CVD and diabetes risk.

First Nations people

First Nations people are more likely to demonstrate central adiposity than non-Indigenous people for a given body weight or body mass index (BMI).[199,200] There is also significant variation across First Nations communities and between men and women.[201]

Waist circumference has been suggested as a better predictor of CVD than BMI in the First Nations population, however, it is measured to a lower accuracy in clinical practice when compared to research studies.[202,203]

There is evidence that the appropriate BMI range for First Nations people is lower than for non-Indigenous Australians.[199,204]

Practice points

In addition to the practice points above, consider the following:

- BMI and waist circumference can both be useful tools to identify people who are overweight and those with central adiposity, who are at subsequent risk of developing CVD.[203]
- Follow clinical practice guidelines when measuring BMI and waist circumference.
- Record measurements as part of the person's ongoing clinical history.
- Weight change programs addressing the needs of First Nations people have shown promising results. Practitioners should familiarise themselves with local resources for appropriate supports.[205,206]

Resources

1. First Nations people – National Heart Foundation of Australia

Support for the recommendation

- A systematic review and meta-analysis of RCTs in people with hypertension (systolic BP >140mmHg, diastolic BP >90mmHg, or both) found that weight-reducing diets of 6–36 months' duration resulted in a meaningful reduction in body weight (mean 4kg), and reduced BP (mean 3–5mmHg), compared with no weight-reducing diet.[196]
- A systematic review and meta-analysis of 34 RCTs in people with obesity found that weight loss diets (with or without exercise) significantly reduced all-cause mortality, in people with diabetes or known CHD.[207]

Resources

1. Smoking, nutrition, alcohol, physical activity (SNAP) – RACGP
2. Information for patients on achieving and maintaining a healthy body weight – National Heart Foundation of Australia
3. BMI calculator – National Heart Foundation of Australia
4. Language Matters: Obesity – Obesity UK
5. Obesity and chronic disease: Position statement – Australian Chronic Disease Prevention Alliance
6. Ten top tips for weight control – RACGP
7. Weight loss and dieting – healthdirect
8. Weight loss - a healthy approach – Better Health Channel

Alcohol reduction

Recommendation	Strength	Certainty of evidence
Encourage, support and advise people who consume alcohol to reduce their consumption, where necessary, in line with national guidelines, to reduce health risks from drinking alcohol.	Conditional	Low

General considerations

Moderate or high alcohol consumption increases the risks of hypertension, CHD, and stroke.[208,209]

The risk of atrial fibrillation (AF) also increases in proportion to levels of long-term alcohol consumption.[208,209]

Reducing alcohol intake lowers blood pressure in a dose-dependent manner among people who drink more than 2 standard drinks per day.[210] People who succeed in reducing their blood pressure by drinking less alcohol are therefore likely to reduce their CVD risk.

For people who consume alcohol regularly, reducing consumption is also likely to reduce the risk of other health problems, in addition to reducing blood pressure.

Practice points

When supporting people who drink alcohol to reduce their intake:

- Apply the RACGP 5As model (ask, assess, advise, assist, arrange).
- Advise them to reduce their consumption to help reduce the health risks associated with drinking alcohol.[211]
- Emphasise that there is no safe level of alcohol consumption for anyone, and that not drinking at all is the safest option, particularly for women who are pregnant, attempting to become pregnant, or breastfeeding.[211] Women who are pregnant or attempting to become pregnant should be advised not to drink any alcohol.
- Advise people that they should not drink more than 10 standard drinks a week and no more than 4 standard drinks on any one day, to reduce the health risks from drinking alcohol.[211]
- Inform them that a 'standard drink' is a way of measuring the amount of alcohol in the drink. One standard drink contains 10 grams of pure alcohol. A particular drink may contain more or less alcohol than one standard drink. Advise people to read the label on their drink to find out how many standard drinks it contains.[212]
- Encourage at least 2 alcohol-free days every week.
- Explain that a small reduction in blood pressure is likely to have a meaningful effect on heart health.
- People with alcohol dependence or an alcohol use disorder will require specialist help to stop or control their drinking. For these people, ceasing or restricting alcohol consumption has benefits beyond CVD risk reduction.

First Nations people

A greater proportion of the First Nations population abstain from alcohol consumption compared with the non-Indigenous population.

Among those who do drink alcohol, a greater proportion exceed lifetime risk guidelines.[213]

Alcohol consumption may be connected to the historical and current socio-political context for First Nations people and the resulting disadvantage, discrimination and intergenerational trauma.[214,215]

Practice points

There is a range of culturally responsive resources to support reduced alcohol consumption tailored for First Nations people. Referral to these resources should be prioritised.

Resources

1. Resources, publications and programs – Australian Indigenous Alcohol and Other Drugs Knowledge Centre
2. Heart risks resources for First Nations people – National Heart Foundation of Australia
3. Alcohol – Strong Spirit Strong Mind
4. Talking about alcohol: A brief intervention tool for health professionals – Australian Government

Support for the recommendation

A systematic review and meta-analysis found that reducing alcohol intake was associated with short-term blood pressure reductions in people with or without hypertension who drank more than 2 standard drinks per day.[210]

People who drank 6 or more standard drinks per day, who halved their alcohol consumption, reduced their systolic blood pressure by about 5.5mmHg and diastolic blood pressure by about 4mmHg.[210]

Resources

1. Smoking, nutrition, alcohol, physical activity (SNAP) – RACGP
2. Position statement: Alcohol and heart health – National Heart Foundation of Australia
3. Australian guidelines to reduce health risks from drinking alcohol – National Health and Medical Research Council (NHMRC)
4. FARE support services – Foundation for Alcohol Research and Education

Managing risk according to treatment thresholds

Based on current available evidence, the benefits of blood pressure-lowering (BP-lowering) and lipid-modifying treatment outweigh the risk of harm in people whose estimated risk of a cardiovascular event within the next 5 years is high (10% or greater).

Benefits may also outweigh the risk of harms in people at intermediate CVD risk (5 to <10%).

In people whose 5-year CVD risk is low (less than 5%), preventive pharmacotherapy is not routinely recommended. Instead, CVD risk should be managed according to the clinical context and in collaboration with the person.

Recommendations	Strength	Certainty of evidence
For people at high CVD risk (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), encourage, support and advise a healthy lifestyle.[a] After discussing the benefits and harms of treatment, prescribe blood pressure-lowering and lipid-modifying pharmacotherapy, unless contraindicated or clinically inappropriate.	Conditional	[b]
For people at intermediate CVD risk (estimated 5-year CVD risk ≥5% and <10% determined using the Australian cardiovascular disease risk calculator), encourage, support and advise a healthy lifestyle.[a] After discussing the benefits and harms of treatment consider blood pressure-lowering and lipid-modifying pharmacotherapy, unless contraindicated or clinically inappropriate.	Conditional	[b]
For people at low CVD risk (estimated 5-year CVD risk <5% determined using the Australian cardiovascular disease risk calculator), encourage, support and advise a healthy lifestyle.[a] Pharmacological treatment is not routinely recommended.	Conditional	[b]
Some clinical situations may warrant initiation of pharmacotherapy based on individual risk factors. Very high blood pressure (e.g. blood pressure above 160/100mmHg) or very high cholesterol (e.g. total cholesterol above 7.5mmol/L) warrant initiation of blood pressure-lowering and lipid-modifying pharmacotherapy respectively. Refer to specific hypertension and lipid guidelines for management guidance.	Consensus	

[a] This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

[b] The literature review found no randomised trials comparing outcomes according to different risk thresholds. Therefore, a linked evidence approach was used.

General considerations

There is strong evidence for the efficacy of BP-lowering and lipid-modifying treatments in preventing cardiovascular events. However, there is limited evidence to determine the optimal CVD risk threshold for initiating treatment.

There is also a lack of Australian data and no evidence on optimal risk treatment thresholds in First Nations people.

This guideline recommends that BP-lowering and/or lipid-modifying treatment should be considered for people with intermediate CVD risk (5% to <10%) as part of shared decision-making with their health professional. This reflects the fact that CVD risk is a continuum, and that treatment should be guided by CVD risk, individual preference and other clinical factors.

Lipid-modifying and BP-lowering medicines are cost-effective, even at lower levels of risk.[216]

A systematic review of the published, peer reviewed literature relating to different risk treatment thresholds for primary prevention of CVD was conducted (see Appendix 4).

The Aus CVD Risk Calculator and treatment initiation thresholds

All recommendations in this guideline relate to CVD risk level assessed using the Aus CVD Risk Calculator, which includes adjustment due to any reclassification factors. The algorithm underpinning the calculator is based on the New Zealand PREDICT-1º equation, calibrated to relevant Australian populations.

Treatment threshold recommendations in the *Guidelines for the management of absolute cardiovascular disease risk* (2012)[5] were based on the Framingham risk equation, which was not calibrated for the Australian population. The Framingham equation is now known to overestimate CVD risk in the general population.

The 2012 guidelines recommended initiating BP-lowering and lipid-modifying therapy in people with an estimated CVD risk >15%. For people with estimated CVD risk 10-15%, initial behavioural factor modification was recommended, with pharmacotherapy added if CVD risk was not sufficiently reduced.

Although this updated guideline recommends initiating treatment in people at CVD risk ≥10%, this risk level for initiating treatment is likely to be comparable to the previously recommended >15% CVD risk level calculated using the Framingham equation.

Initiating treatment at lower CVD risk thresholds

It is estimated that in people with estimated CVD risk of >10%, one cardiovascular event would be prevented for every 35 people receiving BP-lowering treatment for 5 years. At a risk threshold of >15%, this number of people reduced to 30. The number of people needed to treat in order to prevent one cardiovascular event become less favourable at lower levels of risk (e.g. 5-year risk <5%; see Appendix 4).

A modelling study found that people were more worried about experiencing moderate or severe stroke or MI (the risks of which are reduced by BP-lowering and lipid-modifying medicines) than developing potential adverse effects such as myopathy or diabetes (see Appendix 4). This finding suggests that lower treatment thresholds, which prioritise the benefits of statins in reducing major cardiovascular events, would be acceptable to most people (see Appendix 4).

Potential disadvantages of initiating treatment at lower risk thresholds include:

- people taking unnecessary medicines
- increased costs to people and the health system
- adverse effects of medicines.[216-218]

Elevated single CVD risk factors

Although this guideline recommends initiating pharmacotherapy based on estimated 5-year CVD risk levels, some clinical situations may warrant initiation of therapy based on individual risk factors. Very high blood pressure (e.g. blood pressure above 160/100mmHg) or very high cholesterol (e.g. total cholesterol above 7.5mmol/L) warrant initiation of BP-lowering and lipid-modifying pharmacotherapy, respectively. Refer to specific hypertension and lipid guidelines for management guidance.

Blood pressure-lowering treatment

Recommendations	Strength	Certainty of evidence
For people at high risk of CVD (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), prescribe blood pressure-lowering medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle.[a]	Strong	Moderate
For people at intermediate risk of CVD (estimated 5-year CVD risk 5% to <10% determined using the Australian cardiovascular disease risk calculator), consider prescribing blood pressure-lowering medicines, to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle.[a]	Strong	Moderate

[a] This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

General considerations

Reducing blood pressure reduces CVD risk, in a wide range of age groups, irrespective of baseline blood pressure. However, the higher the initial CVD risk, the greater the benefit.

There is strong evidence for the beneficial effects of BP-lowering and lipid-modifying treatment in people at intermediate or high risk of CVD, and these benefits extend into older age.[219,220] Reductions in major cardiovascular events were larger in older people irrespective of baseline blood pressure.[220]

Studies assessing the benefit of commencing BP-lowering and statin medicines at a variety of ages were reviewed to inform this recommendation.

Reducing blood pressure further may achieve greater benefits,[220,221] but optimal reduction targets remain unclear.

Practice points

- For specific recommendations about choosing BP-lowering medicines and blood pressure targets, refer to national clinical practice guidelines for managing hypertension.[84]
- Prescribe a BP-lowering medicine if clinically appropriate, affordable and acceptable to the person.
- Explain that many people will benefit from reducing their blood pressure, and that reducing blood pressure reduces the risk of heart attacks and stroke regardless of starting blood pressure.[222]
- In older people, monitor for medicine-related adverse effects such as orthostatic hypotension or syncope.
- Combine BP-lowering with other risk reduction strategies, including exercise, healthy eating patterns, and achieving a healthy weight, to achieve the target.
- Advise and support people to increase physical activity, reduce sedentary behaviours, quit smoking (if relevant), adopt healthy eating patterns, achieve a healthy weight, and where needed, reduce blood pressure.
- Although treating to a specific blood pressure target may promote adherence to treatment, consider setting a target based on individual CVD risk factors, in collaboration with the person.
- Encourage adherence by giving practical advice such as making medicines part of a daily routine, setting alarms or reminders, or providing repeated education at consultations.
- The greatest blood pressure reductions are achieved with the initial dose of a BP-lowering agent. However, adding one or more other agents from different pharmacological classes separately or as combination preparations is usually required.

First Nations people

First Nations people of any age are eligible for Closing the Gap PBS Co-payment Program to subsidise access to medicines including BP-lowering medicines.

Refer to the PBS factsheet on the Closing the Gap (CTG) - PBS Co-payment Program for information on access to the scheme.

Support for the recommendations

A large meta-analysis of 51 RCTs in 358,707 people aged 21–105 years (median 65 years) compared BP-lowering medicines with placebo or other classes of BP-lowering medicines. It found that BP-lowering medicines significantly reduced major cardiovascular events (stroke, ischaemic heart disease, heart failure and death) in all age groups, regardless of baseline blood pressure level.[220]

For every 5mmHg reduction in systolic blood pressure, the risk was reduced by approximately 18% in people younger than 55 years, and by 9% in people aged 55 to 84 years.[220] Similar benefits were seen for diastolic blood pressure reductions of 3mmHg.[220]

Resources

1. Guideline for the diagnosis and management of hypertension in adults – National Heart Foundation of Australia
2. REACH resource packs for GPs, nurses and other health care professionals to talk to their patients about alcohol use – Monash University
3. High blood pressure fact sheet – Stroke Foundation

Lipid-modifying treatment

Recommendations	Strength	Certainty of evidence
For people at high risk of CVD (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), prescribe lipid-modifying medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle.[a]	Strong	Moderate
For people at intermediate risk of CVD (estimated 5-year CVD risk 5% to <10% determined using the Australian cardiovascular disease risk calculator), consider prescribing lipid-modifying medicines, to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle.[a]	Strong	Moderate

[a] This guideline refers to certain modifiable risk factors as 'lifestyle' factors. However, it is recognised that these behaviours are not necessarily an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of the term 'lifestyle' does not attribute blame to a person.

General considerations

Reducing plasma concentrations of lipids (total cholesterol, low-density lipoprotein [LDL] cholesterol and triglycerides) reduces CVD risk, irrespective of baseline lipid levels.

The higher the initial CVD risk, the greater the expected reductions in risk. For people with intermediate or high risk of cardiovascular events, any reduction in blood lipid levels reduces this risk.

A large body of high-quality clinical trial evidence indicates that lipid-lowering treatment reduces the risk of cardiovascular events and mortality. Statin therapy effectively reduces LDL cholesterol levels equally in men and women.[223]

It is uncertain whether treating to a specific, lower, plasma lipid target in primary prevention, results in lower cardiovascular morbidity or mortality than a modest target or no specific target.

The intensity of lipid-modifying treatment must be balanced with the prospect of long-term adherence.

Practice points

- For people with an intermediate or high risk of CVD, explain that:
  - different types of fat (e.g. types of cholesterol) have important functions in the body, and that the right proportion of each type in the blood is essential for good health
  - reducing the amount of some types of fat in the blood will help lower their risk of heart attacks and stroke
  - achieving any degree of reduction in LDL cholesterol level is of benefit, compared with no LDL cholesterol reduction.
- Identify people with familial hypercholesterolaemia for closer monitoring and more intensive risk management. Refer to specific guidelines.[224]
- Encourage and support healthy behaviours – including increasing physical activity, reducing sedentary time, quitting smoking (if relevant), following a healthy eating pattern and achieving a healthy weight – and prescribe medicines where clinically indicated, to improve lipid profile.
- Statins are an appropriate first line lipid-modifying therapy.
- Refer to relevant clinical practice guidelines for specific recommendations about choosing lipid-modifying agents and targets.[88,224,225]
- Encourage adherence by giving people practical advice (such as making medicines part of their daily routine, setting alarms or reminders) and providing regular education at consultations.
- For people unable to tolerate a prescribed statin, consider a lower dose, alternate day dosing, or switching to an alternative statin or non-statin therapy. Statin intolerance is often overestimated (true prevalence 8–10%).[226]

First Nations people

First Nations people are more likely to have a normal total cholesterol level but with high triglycerides, low high-density lipoprotein (HDL) cholesterol, and small dense LDL particles compared with non-Indigenous Australians.[227]

This lipid profile has been associated with increased CVD risk.

First Nations people of any age are eligible for Closing the Gap PBS Co-payment Program to subsidise access to medicines including lipid-modifying medicines.

Refer to the PBS factsheet on the Closing the Gap (CTG) - PBS Co-payment Program for information on access to the scheme.

Support for the recommendations

A meta-analysis of clinical trials of statins found that, compared with control, for every 1.0mmol/L reduction in LDL cholesterol, the overall risk of major coronary events, coronary revascularisation, and stroke was reduced (women: 16%; men 22% reduction).[223] Reductions in risk of these outcomes were also similar in men and women with less than 10% predicted 5-year risk.[223]

A large meta-analysis of 11 RCTs in people with or without existing CVD, compared intensive (LDL cholesterol <1.8mmol/L) with less intensive lipid-lowering treatments (statin monotherapy or combinations of statins with ezetimibe or proprotein convertase subtilisin/kexin type 9 inhibitors). It found that more intensive treatment was associated with a reduction in all outcomes (reductions for cardiovascular mortality: 10%; MI: 20%; cerebrovascular events: 19%; major adverse cardiovascular events: 11%; revascularisation: 17%; ischaemic stroke: 23%).[228] The reduction in risk of ischaemic heart disease was independent of baseline LDL cholesterol or drug regimen.[228] Three of the trials were conducted in people without pre-existing CVD; the quality of evidence for most outcomes in this population was very low.

Resources

1. Practical guide to pharmacological lipid management – National Heart Foundation of Australia
2. Guidelines for the management of dyslipidaemias: Lipid modification to reduce cardiovascular risk – European Society of Cardiology/European Atherosclerosis Society
3. Guideline on the management of blood cholesterol – American College of Cardiology/ American Heart Association
4. Treatment guidelines – Familial Hypercholesterolaemia Australasia Network
5. Cholesterol and other lipids – RACGP Red Book
6. Management of cholesterol-lowering therapy for people with chronic kidney disease – CARI guidelines
7. Taking a statin to reduce the risk of coronary heart disease and stroke. Patient decision aid – National Institute for Health and Care Excellence (NICE)

Combination therapies

Population-wide fixed-dose combination treatments (i.e. 'polypills') in unscreened adults are not recommended because the potential benefits have not been shown to outweigh the harms in those at lower CVD risk.

A meta-analysis of RCTs in people without diagnosed atherosclerotic CVD found that, compared with placebo or non-pharmacological intervention, fixed-dose combination treatments (statin, angiotensin-converting enzyme inhibitor or angiotensin II receptor antagonist, and a thiazide diuretic, with or without a beta-blocker or aspirin) reduced composite cardiovascular events by 38% (cardiovascular death, MI, stroke, revascularisation, angina, or heart failure) and cardiovascular death by 35%, irrespective of blood pressure or cholesterol levels.[229]

Risk reduction was greater in people taking combinations containing aspirin, compared with non-aspirin combinations, but the rate of gastrointestinal bleeding was higher in people taking aspirin.[229] It is unclear if the additional benefits of aspirin outweigh the potential harms.

Single-pill combinations can aid adherence to preventative treatment. Consider prescribing combination treatment if available, clinically appropriate, affordable and acceptable to the person.[230,231]

Abbreviations and glossary

Abbreviations

ABI	Ankle-brachial index
ACDPA	Australian Chronic Disease Prevention Alliance
AF	Atrial fibrillation
BMI	Body mass index
BP	Blood pressure
CAC	Coronary artery calcium
CAD	Coronary artery disease
CHD	Coronary heart disease
CKD	Chronic kidney disease
CT	Computed tomography
CVD	Cardiovascular disease
DASH	Dietary Approaches to Stop Hypertension
DHA	Docosahexaenoic acid
eGFR	Estimated glomerular filtration rate
EPA	Eicosapentaenoic acid
FH	Familial hypercholesterolaemia
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
HDL	High-density lipoprotein
hs-CRP	High-sensitivity C-reactive protein
LDL	Low-density lipoprotein
MBS	Medicare Benefits Schedule
MI	Myocardial infarction
NHMRC	National Health and Medical Research Council
NVDPA	National Vascular Disease Prevention Alliance
PBS	Pharmaceutical Benefits Scheme
PCOS	Polycystic ovary syndrome
PICO	Patient/population, intervention, comparison, outcomes
RACGP	The Royal Australian College of General Practitioners
RCT	Randomised controlled trial
SEIFA	Socio-Economic Indexes for Areas
TGA	Therapeutic Goods Administration
uACR	Urine albumin-to-creatinine ratio

Glossary of terms

Albuminuria	The presence of excessive amounts of the protein albumin in urine.
Algorithm	The part of the Australian cardiovascular disease risk calculator that uses the PREDICT equation, recalibrated for the Australian population, to calculate a CVD risk score (see also calculator).
Apolipoproteins	A term for human proteins that allow the formation of the particles that transport lipids in the blood. Harmful apolipoproteins include Apolipoprotein B and Apolipoprotein (a).
Atrial fibrillation (AF)	A common type of abnormal heart rhythm (arrhythmia) where the heart beats irregularly and often fast. AF can increase the risk of blood clots, which can cause a stroke. Since ECG AF was used to define this variable in the PREDICT equation, both paroxysmal and persistent AF are included in the definition of AF.
Aus CVD Risk Calculator	The Australian cardiovascular disease risk calculator.
Blood pressure (BP)	The pressure of the blood against the inner walls of the arteries as it is pumped around the body by the heart. Blood pressure is variable and is affected by factors such as body position, breathing, emotional state, physical activity and sleep.
Body mass index (BMI)	A number used to identify underweight, overweight or obesity, calculated using weight (kg) divided by height (m) squared.
Calculator	Refers to the Australian cardiovascular disease risk calculator, which combines the risk prediction algorithm and other risk considerations (clinically determined high risk and reclassification factors) to determine an estimated CVD risk score/ category and incorporates communication and management of CVD risk (see also 'algorithm').

Cardiovascular disease (CVD)	Broadly, a term commonly used to refer to all conditions affecting the heart and blood vessels, including stroke. However, 'cardiovascular disease' used in this guideline refers only to the following conditions, which reflect outcomes predicted by the Australian cardiovascular disease risk calculator: • myocardial infarction • angina • other coronary heart disease • stroke • transient ischaemic attack • peripheral vascular disease • congestive heart failure • other ischaemic CVD-related conditions.
Cardiovascular events	Group of outcomes that normally includes myocardial infarction, stroke, death from a vascular cause (including coronary, pulmonary embolism, haemorrhage).
Cholesterol	See lipids.
Chronic heart failure	A condition in which the heart does not pump blood effectively, often presenting as oedema and typically resulting in breathlessness and fatigue.
Chronic kidney disease	Long-term inability of the kidneys to function normally, most commonly caused by diabetes, inflammation of the kidneys or high blood pressure.
Clinically determined high risk	When certain clinical presentations automatically put the person in the high-risk category for CVD.
Cohort study	A type of clinical study in which a selected group of people is observed and followed over time, often over a period of several years.
Coronary heart disease (CHD)	A disease of the blood vessels supplying the heart muscle, in which they become blocked or narrowed by a build-up of plaque. CHD can cause angina (chest pain) and heart attacks.
Diabetes	A long-term condition that affects the way body cells take up and use glucose (a type of sugar) from the blood, resulting in abnormally high levels of glucose in the blood.
Electronic cigarettes	E-cigarettes (or vapes) are a diverse group of battery-powered or rechargeable devices that aerosolise a liquid for inhalation.

Familial hypercholesterolaemia (FH)	An inherited condition in which low density lipoprotein (LDL) cholesterol uptake from the blood is reduced, causing high LDL levels and early heart disease.
First Nations people	First Nations people is used throughout the Guideline to refer to Aboriginal and Torres Strait Islander peoples on the advice of consultation.
Healthy eating	Eating a wide variety of foods from each of the 5 major food groups, in the amounts recommended.
Healthy lifestyle	A way of living that encompasses healthy behaviours related to nutrition, alcohol, smoking, exercise and physical activity, including exercise. It is recognised that not all lifestyle factors are an individual's choice, but reflect the complex interplay of social, cultural, and environmental factors, which may be further influenced by clinical conditions. Use of these terms does not attribute blame to a person.
Hypertension	Raised blood pressure.
Lipids	A term to describe fats including biological lipids such as cholesterol, triglyceride and phospholipid.
Lipoproteins	A term to describe the particles in which lipids are transported in the blood. This infers their harmful (LDL cholesterol, non-HDL cholesterol, lipoprotein (a)) or protective (HDL cholesterol) role in coronary disease.
Macroalbuminuria	Persistent uACR >25mg/mmol in males or >35mg/mmol in females
Microalbuminuria	Persistent uACR: 2.5–25mg/mmol in males; and 3.5–35mg/mmol in females
Myocardial infarction (heart attack)	Temporary loss of blood supply to the heart muscle, typically caused by a blood clot that suddenly blocks a narrowed artery. This can result in heart muscle damage.
Number needed to treat (NNT)	Average number of people who need to be treated to prevent one additional bad outcome. The number is the inverse of the absolute risk reduction.
Peripheral arterial disease	A condition affecting the arteries other than those of the heart or brain.
PREDICT	An ongoing, prospectively designed, open cohort study in New Zealand.

PREDICT-1º	Equation derived from PREDICT cohort for predicting risk of cardiovascular disease.
Proteinuria	The presence of excessive amounts of protein (>150mg per day) in the urine. These proteins are typically albumin, but also consist of low molecular weight immunoglobulin, lysozyme, insulin and beta-2 microglobulin.
Risk assessment	Full process to estimate a person's risk of cardiovascular disease, includes use of a risk calculator and any reclassification factors or clinical adjustments.
Risk equation	Statistical predictive model to quantify a person's risk of cardiovascular disease over a given time period.
Socio-Economic Indexes for Areas (SEIFA)	Socio-Economic Indexes for Areas are summary measures of the social and economic conditions of geographic areas across Australia. They use a range of different Census variables including income, education, employment, occupation and housing characteristics. An area with a low score on this index reflects relatively high levels of socioeconomic disadvantage, whilst an area with a high score on this index indicates high levels of advantage. SEIFA scores may be divided into quintiles, where quintile 1 contains the lowest 20% of scores for the most disadvantaged areas and quintile 5 contains the highest 20% of scores for the most advantaged areas.
Stroke	Sudden loss of blood supply to the brain (e.g. due to a blood clot blocking an artery, or an artery breaking or bursting) preventing brain tissue from getting oxygen and nutrients so that brain cells die in minutes causing neurological dysfunction.
The Guideline	*Guideline for assessing and managing cardiovascular disease risk*
Transient ischaemic attack (TIA)	Transient episode of neurologic dysfunction caused by loss of blood flow. TIAs share the same underlying cause as stroke, and the same symptoms, but TIA symptoms resolve within a few minutes or less than 24 hours.
Triglycerides	See Lipids.

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