Guideline for the diagnosis and management of hypertension in adults — 2016

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Blood pressure (BP) is an important common modifiable risk factor for cardiovascular disease. In 2014–15, 6 million adult Australians were hypertensive (BP ≥ 140/90 mmHg) or were taking BP-lowering medication.[1] Hypertension is more common in those with lower household incomes and in regional areas of Australia (http://heartfoundation.org.au/about-us/what-we-do/heart-disease-in-australia/high-blood-pressure-statistics). Many Australians have untreated hypertension, including a significant proportion of Aboriginal and Torres Strait Islander people.[1]

Cardiovascular diseases are associated with a high level of health care expenditure.[2] Controlled BP is associated with lower risks of stroke, coronary heart disease, chronic kidney disease, heart failure and death. Small reductions in BP (1–2 mmHg) are known to markedly reduce population cardiovascular morbidity and mortality.[3,4]

Method

The National Blood Pressure and Vascular Disease Advisory Committee, an expert committee of the National Heart Foundation of Australia, has updated the *Guide to management of hypertension 2008: assessing and managing raised blood pressure in adults* (last updated in 2010)[5] to equip health professionals across the Australian health care system, especially those within primary care and community services, with the latest evidence to prevent, detect and manage hypertension.

International hypertension guidelines[6-8] were reviewed to identify key areas for review. Review questions were developed using the patient problem or population, intervention, comparison and outcome(s) (PICO) framework.[9] Systematic literature searches (2010–2014) of MEDLINE, Embase, CINAHL and the Cochrane Library were conducted by an external organisation, and the resulting evidence summaries informed the updated clinical recommendations. The committee also reviewed additional key literature relevant to the PICO framework up to December 2015.

Recommendations were based on high quality studies, with priority given to large systematic reviews and randomised controlled trials, and consideration of other studies where appropriate. Public consultation occurred during the development of the updated guideline. The 2016 update includes the level of evidence and strength of recommendation in accordance with National Health and Medical Research Council standards[10] and the Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology.[11] No level of evidence has been included where there was no direct evidence for a recommendation that the guideline developers agreed clearly outweighed any potential for harm.

Summary

The National Heart Foundation of Australia has updated the *Guide to management of hypertension 2008: assessing and managing raised blood pressure in adults (updated December 2010)*.

Main recommendations

- For patients at low absolute cardiovascular disease risk with persistent blood pressure (BP) ≥ 160/100 mmHg, start antihypertensive therapy.
- The decision to treat at lower BP levels should consider absolute cardiovascular disease risk and/or evidence of end-organ damage, together with accurate BP assessment.
- For patients at moderate absolute cardiovascular disease risk with persistent systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg, start antihypertensive therapy.
- Treat patients with uncomplicated hypertension to a target BP of < 140/90 mmHg or lower if tolerated.

Changes in management as a result of the guideline

- Ambulatory and/or home BP monitoring should be offered if clinic BP is ≥ 140/90 mmHg, as out-of-clinic BP is a stronger predictor of outcome.
- In selected high cardiovascular risk populations, aiming for a target of < 120 mmHg systolic can improve cardiovascular outcomes. If targeting < 120 mmHg, close follow-up is recommended to identify treatment-related adverse effects including hypotension, syncope, electrolyte abnormalities and acute kidney injury.

Why the changes have been made

- A 2015 meta-analysis of patients with uncomplicated mild hypertension (systolic BP range, 140–159 mmHg) demonstrated that BP-lowering therapy is beneficial (reduced stroke, cardiovascular death and all-cause mortality).
- A 2015 trial comparing lower with higher blood pressure targets in selected high cardiovascular risk populations found improved cardiovascular outcomes and reduced mortality, with an increase in some treatment-related adverse events.

Most of the major recommendations from the guideline are outlined below, together with background information and explanation, particularly in areas of change in practice. Key changes from the previous guideline are listed in Box 1. The full Heart Foundation *Guideline for the diagnosis and management of hypertension in adults — 2016* is available at http://heartfoundation.org.au/for-professionals/clinical-information/hypertension. The full guideline contains additional recommendations in the areas of antiplatelet therapy, suspected BP variability, and initiating treatment using combination therapy compared with monotherapy.

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▪ doi: 10.5694/mja16.00526 ▪
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1 Key changes from previous guideline

- Use of validated non-mercury sphygmomanometers that are regularly maintained is recommended for blood pressure (BP) measurement.
- Out-of-clinic BP using home or 24-hour ambulatory measurement is a stronger predictor of outcome than clinic BP measurement.
- Automated office blood pressure (AOBP) provides similar measures to home and ambulatory BP, and results are generally lower than those from conventional clinic BP measurement.
- BP-lowering therapy is beneficial (reduced stroke, cardiovascular death and all-cause mortality) for patients with uncomplicated mild hypertension (systolic BP, 140–159 mmHg).
- For patients with at least moderate cardiovascular risk (10-year risk, 20%), lower BP targets of < 120 mmHg systolic (using AOBP) provide benefit with some increase in treatment-related adverse effects.
- Selection of a BP target should be based on informed, shared decision making between patients and health care providers considering the benefits and harms, and reviewed on an ongoing basis. ◆

Recommendations

Definition and classification of hypertension

Elevated BP is an established risk factor for cardiovascular disease. The relationship between BP level and cardiovascular risk is continuous, therefore the distinction between normotension and hypertension is arbitrary.[12,13] Cut-off values are used for diagnosis and management decisions but vary between international guidelines. Current values for categorisation of clinic BP in Australian adults are outlined in Box 2.

Management of patients with hypertension should also consider absolute cardiovascular disease risk (where eligible for assessment) and/or evidence of end-organ damage. Several tools exist to estimate absolute cardiovascular disease risk. The National Vascular Disease Prevention Alliance developed a calculator for the Australian population, which can be found at http://www.cvdcheck.org.au.

Treatment strategies for individuals at high risk of a cardiovascular event may differ from those at low absolute cardiovascular disease risk despite similar BP readings. It is important to note that the absolute risk calculator has been developed using clinic BP, rather than ambulatory, automated office or home BP measures.

Some people are not suitable for an absolute risk assessment, including younger patients with uncomplicated hypertension and those with conditions that identify them as already at high risk.[14]

Blood pressure measurement

A comprehensive assessment of BP should be based on multiple measurements taken on several separate occasions. A variety of methods are available, each providing different but often complementary information. Methods include clinic BP, 24-hour ambulatory and home BP monitoring (Box 3).

Most clinical studies demonstrating effectiveness and benefits of treating hypertension have used clinic BP. Clinic, home and ambulatory BP all predict the risk of a cardiovascular event; however, home and ambulatory blood pressure measures are stronger predictors of adverse cardiovascular outcomes (Box 4).[15,16]

Automated office BP measurement involves taking repeated blood pressure measurements using an automated device with the clinician out of the room.[17,18] This technique generally yields lower readings than conventional clinic BP and has been shown to have a good correlation with out-of-clinic measures.

The British Hypertension Society provides a list of validated BP monitoring devices.[19] Use of validated and regularly maintained non-mercury devices is recommended as mercury sphygmomanometers are being phased out for occupational health and safety and environmental reasons.

2 Classification of clinic blood pressure in adults

Diagnostic category*	Systolic (mmHg)		Diastolic (mmHg)
Optimal	< 120	and	< 80
Normal	120–129	and/or	80–84
High-normal	130–139	and/or	85–89
Grade 1 (mild) hypertension	140–159	and/or	90–99
Grade 2 (moderate) hypertension	160–179	and/or	100–109
Grade 3 (severe) hypertension	≥ 180	and/or	≥ 110
Isolated systolic hypertension	> 140	and	< 90

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Treatment thresholds

Although the benefits of lowering BP in patients with significantly elevated BP have been well established, the benefit of initiating drug therapy in patients with lower BP with or without comorbidities has been less certain. A meta-analysis of patients with uncomplicated mild hypertension (systolic BP range, 140–159 mmHg) indicated beneficial cardiovascular effects with reductions in stroke, cardiovascular death and all-cause mortality, through treatment with BP-lowering therapy.[20] Corresponding relative reductions in 5-year cardiovascular disease risk were similar for all levels of baseline BP.[21]

Decisions to initiate drug treatment at less severe levels of BP elevations should consider a patient's absolute cardiovascular disease risk and/or evidence of end-organ damage together with accurate blood pressure readings.

Treatment targets

Optimal blood pressure treatment targets have been debated extensively. There is emerging evidence demonstrating the benefits of treating to optimal BP, particularly among patients at high cardiovascular risk.[17,20]

The recent Systolic Blood Pressure Intervention Trial investigated the effect of targeting a higher systolic BP level (< 140 mmHg) compared with a lower level (< 120 mmHg) in people over the age of 50 years who were identified as having a cardiovascular 10-year risk of at least 20%.[17] Many had prior cardiovascular events or mild to moderate renal impairment and most were already on BP-lowering therapy at the commencement of the study. Patients

3 Criteria for diagnosis of hypertension using different methods of measurement

Method of measurement	Systolic (mmHg)		Diastolic (mmHg)
Clinic	≥ 140	and/or	≥ 90
ABPM daytime (awake)	≥ 135	and/or	≥ 85
ABPM night-time (asleep)	≥ 120	and/or	≥ 70
ABPM over 24 hours	≥ 130	and/or	≥ 80
HBPM	≥ 135	and/or	≥ 85

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4 Recommendations for monitoring blood pressure (BP) in patients with hypertension or suspected hypertension

Method of measuring BP	Grade of recommendation*	Level of evidence†
If clinic BP is ≥ 140/90 mmHg or hypertension is suspected, ambulatory and/or home monitoring should be offered to confirm the BP level	Strong	I
Clinic BP measures are recommended for use in absolute cardiovascular risk calculators. If home or ambulatory BP measures are used in absolute cardiovascular disease risk calculators, risk may be inappropriately underestimated	Strong	–
Procedures for ambulatory BP monitoring should be adequately explained to patients. Those undertaking home measurements require appropriate training under qualified supervision	Strong	I
Finger and/or wrist BP measuring devices are not recommended	Strong	–

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with diabetes, cardiac failure, severe renal impairment or previous stroke were excluded. The method of measurement was automated office BP,[18] a technique that generally yields lower readings than conventional clinic BP. Patients treated to the lower target achieved a mean systolic BP of 121.4 mmHg and had significantly fewer cardiovascular events and lower all-cause mortality compared with the other treatment group, which achieved a mean systolic level of 136.2 mmHg. Older patients (> 75 years) benefited equally from the lower target BP. However, treatment-related adverse events increased in the more intensively treated patients, with more frequent hypotension, syncopal episodes, acute kidney injury and electrolyte abnormalities.

The selection of a BP target should be based on an informed, shared decision-making process between patient and doctor (or health care provider), considering the benefits and harms and reviewed on an ongoing basis.

Recommendations for treatment strategies and treatment targets for patients with hypertension are set out in Box 5.

Acknowledgements: We thank Jinty Wilson for her contribution to the development of the guideline.

Disclaimer: The guideline is designed to provide information to assist clinical decision making and is based on the best available evidence at the time of development. The information and recommendations in the guideline may not be appropriate for use in all situations and the decision to apply recommendations cited here must consider the individual patient circumstances, the wishes of patients, clinical expertise and resources. The National Heart Foundation takes no responsibility for damages arising out of the use or non-use of the information or recommendations contained herein.

Competing interests: Genevieve Gabb has received speaker fees from AstraZeneca. Arduino Mangoni has received speaker fees and/or educational grants from Pfizer, Sanofi-Aventis and Servier, travel and accommodation expenses to attend scientific meetings from AstraZeneca and Sanofi-Aventis, and royalties from Wiley and Sons. Craig Anderson has received travel support and honoraria for stroke lectures from Boehringer Ingelheim and Takeda China and advisory board fees from AstraZeneca and Medtronic, and has provided consultancy to General Electric and expert testimony for Henry Davis York. Jonathan Golledge has been awarded a number of research grants from the National Health and Medical Research Council and the Queensland Government for unrelated research studies. Graeme Hankey does not have stocks, equity, a contract of employment or a named position on a company board with any company or competitor relevant to this article. In the past 3 years, he has received honoraria from AC Immune for chairing the data safety monitoring committee of two clinical trials of vaccines for Alzheimer disease, from Bayer for lecturing about stroke prevention in atrial fibrillation at sponsored scientific symposia, and from Medscape, Web MD for participating in a discussion about stroke prevention in atrial fibrillation for theheart.org. Faline Howes was a board member of the National Heart Foundation (Tasmania Division) from 2013 to 2015 and is on an ongoing member of the Health Advisory Committee. She is also a member of the High Blood Pressure Research Council of Australia and the International Society of Hypertension and has received speaker fees from MSD. Markus Schlaich has been on steering committees and advisory boards for, and has received speaker fees from, Abbott Pharmaceuticals, Medtronic, AstraZeneca, Novartis, Servier and Boehringer Ingelheim. Vlado Perkovic has provided consultancy to, and has been on steering committees and received speaker fees from, Medtronic, Baxter, Boehringer Ingelheim, Vitae, Johnson and Johnson, Abbott Pharmaceuticals, Servier, Roche, AstraZeneca, Merck and Boehringer Ingelheim. Leonard Arnolda has received speaker fees for meetings sponsored by Merck and Boehringer Ingelheim.

Provenance: Commissioned; not externally peer reviewed. ■

5 Recommendations for treatment strategies and treatment targets for patients with hypertension, with grade of recommendation and level of evidence*

A healthy lifestyle, including not smoking, eating a nutritious diet and regular adequate exercise is recommended for all Australians including those with and without hypertension.

- Lifestyle advice is recommended for all patients (grade: strong; level: –).
- For patients at low absolute cardiovascular disease risk (5-year risk, < 10%) with persistent blood pressure (BP) ≥ 160/100 mmHg, antihypertensive therapy should be started (grade: strong; level: I).
- For patients at moderate absolute cardiovascular disease risk (5-year risk, 10–15%) with persistent systolic BP ≥ 140 mmHg and/or diastolic ≥ 90 mmHg, antihypertensive therapy should be started (grade: strong; level: I).
- Once decided to treat, patients with uncomplicated hypertension should be treated to a target of < 140/90 mmHg or lower if tolerated (grade: strong; level: I).

(continued over)

5 Recommendations for treatment strategies and treatment targets for patients with hypertension, with grade of recommendation and level of evidence* (continued)

- In selected high cardiovascular risk populations where a more intense treatment can be considered, aiming for a target of < 120 mmHg systolic BP can improve cardiovascular outcomes (grade: strong; level: II).
- In selected high cardiovascular risk populations where a treatment is being targeted to < 120 mmHg systolic BP, close follow-up of patients is recommended to identify treatment-related adverse effects including hypotension, syncope, electrolyte abnormalities and acute kidney injury (grade: strong; level: II).
- In patients with uncomplicated hypertension, angiotensin-converting enzyme (ACE) inhibitors or angiotensin-receptor blockers (ARBs), calcium channel blockers and thiazide diuretics are all suitable first-line antihypertensive drugs, either as monotherapy or in some combinations unless contraindicated (grade: strong; level: I).
- The balance between efficacy and safety is less favourable for β-blockers than other first-line antihypertensive drugs. Thus β-blockers should not be offered as a first-line drug therapy for patients with hypertension that is not complicated by other conditions (grade: strong; level: I).
- ACE inhibitors and ARBs are not recommended in combination due to an increased risk of adverse effects (grade: strong; level: I).

Treatment-resistant hypertension

Treatment-resistant hypertension is defined as a systolic BP ≥ 140 mmHg in a patient who is taking three or more antihypertensive medications, including a diuretic at optimal tolerated doses. Contributing factors may include variable compliance, white coat hypertension or secondary causes for hypertension.

Few drug therapies specifically target resistant hypertension. Renal denervation is currently being investigated as a treatment option in this condition; however, to date, it has not been found to be effective in the most rigorous study conducted.[22]

- Optimal medical management (with a focus on treatment adherence and excluding secondary causes) is recommended (grade: strong; level: II).
- Percutaneous transluminal radiofrequency sympathetic denervation of the renal artery is currently not recommended for the clinical management of resistant hypertension or lower grades of hypertension (grade: weak; level: II).

Patients with hypertension and selected comorbidities

Stroke and transient ischaemic attack:

- For patients with a history of transient ischaemic attacks or stroke, antihypertensive therapy is recommended to reduce overall cardiovascular risk (grade: strong; level: I).
- For patients with a history of transient ischaemic attacks or stroke, any of the first-line antihypertensive drugs that effectively reduce BP are recommended (grade: strong; level: I).
- For patients with hypertension and a history of transient ischaemic attacks or stroke, a BP target of < 140/90 mmHg is recommended (grade: strong; level: I).

Chronic kidney disease:

Most classes of BP-lowering drugs have a similar effect in reducing cardiovascular events and all-cause mortality in patients with chronic kidney disease (CKD). When treating with diuretics, the choice should be dependent on both the stage of CKD and the extracellular fluid volume overload in the patient. Detailed recommendations on how to manage patients with CKD are available.[23]

- In patients with hypertension and CKD, any of the first-line antihypertensive drugs that effectively reduce BP are recommended (grade: strong; level: I).
- When treating hypertension in patients with CKD in the presence of microalbuminuria or macroalbuminuria, an ARB or ACE inhibitor should be considered as first-line therapy (grade: strong; level: I).
- In patients with CKD, antihypertensive therapy should be started in those with BP consistently > 140/90 mmHg and treated to a target of < 140/90 mmHg (grade: strong; level: I).
- Dual renin-angiotensin system blockade is not recommended in patients with CKD (grade: strong; level: I).
- For patients with CKD, aiming towards a systolic BP < 120 mmHg has shown benefit, where well tolerated (grade: strong; level: II).
- In people with CKD, where treatment is being targeted to less than 120 mmHg systolic BP, close follow-up of patients is recommended to identify treatment-related adverse effects, including hypotension, syncope, electrolyte abnormalities and acute kidney injury (grade: strong; level: I).
- In patients with CKD, aldosterone antagonists should be used with caution in view of the uncertain balance of risks versus benefits (grade: weak; level: –).

Diabetes:

- Antihypertensive therapy is strongly recommended in patients with diabetes and systolic BP ≥ 140 mmHg (grade: strong; level: I).
- In patients with diabetes and hypertension, any of the first-line antihypertensive drugs that effectively lower BP are recommended (grade: strong; level: I).
- In patients with diabetes and hypertension, a BP target of < 140/90 mmHg is recommended (grade: strong; level: I).
- A systolic BP target of < 120 mmHg may be considered for patients with diabetes in whom prevention of stroke is prioritised (grade: weak; level: –).
- In patients with diabetes, where treatment is being targeted to < 120 mmHg systolic BP, close follow-up of patients is recommended to identify treatment-related adverse effects including hypotension, syncope, electrolyte abnormalities and acute kidney injury (grade: strong; level: –).

5 Recommendations for treatment strategies and treatment targets for patients with hypertension, with grade of recommendation and level of evidence* (continued)

Myocardial infarction:

- For patients with a history of myocardial infarction, ACE inhibitors and β-blockers are recommended for the treatment of hypertension and secondary prevention (grade: strong; level: II).
- β-Blockers or calcium channel blockers are recommended for symptomatic patients with angina (grade: strong; level: II).

Chronic heart failure:

- In patients with chronic heart failure, ACE inhibitors and selected β-blockers are recommended (grade: strong; level: II).
- ARBs are recommended in patients who do not tolerate ACE inhibitors (grade: strong; level: I).

Peripheral arterial disease:

- In patients with peripheral arterial disease, treating hypertension is recommended to reduce cardiovascular disease risk (grade: strong; level: –).
- In patients with hypertension and peripheral arterial disease, any of the first-line antihypertensive drugs that effectively reduce BP are recommended (grade: weak; level: –).
- In patients with hypertension and peripheral arterial disease, reducing BP to a target of < 140/90 mmHg should be considered and treatment guided by effective management of other symptoms and contraindications (grade: strong; level: –).

Older people:

- Any of the first-line antihypertensive drugs that effectively reduce BP can be used in older patients with hypertension (grade: strong; level: I).
- When starting treatment in older patients, drugs should be commenced at the lowest dose and titrated slowly as adverse effects increase with age (grade: strong; level: –).
- For patients > 75 years of age, aiming towards a systolic BP of < 120 mmHg has shown benefit, where well tolerated, unless there is concomitant diabetes (grade: strong; level: II).
- In older people whose treatment is being targeted to < 120 mmHg systolic BP, close follow-up is recommended to identify treatment-related adverse effects including hypotension, syncope, electrolyte abnormalities and acute kidney injury (grade: strong; level: II).
- Clinical judgement should be used to assess benefit of treatment against risk of adverse effects in all older patients with lower grades of hypertension (grade: strong; level: –).

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1 Australian Bureau of Statistics. National Health Survey. First results, 2014–15. www.abs.gov.au/ausstats/abs@.nsf/mf/4364.0.55.001 (accessed June 2016).

2 Heart Foundation. Cardiovascular disease fact sheet. http://heartfoundation.org.au/about-us/what-we-do/heart-disease-in-australia/cardiovascular-disease-fact-sheet (accessed May 2016).

3 Stamler J, Rose G, Stamler R, et al. INTERSALT study findings. Public health and medical care implications. *Hypertension* 1989; 14: 570-577.

4 Verdecchia P, Gentile G, Angeli F, et al. Influence of blood pressure reduction on composite cardiovascular endpoints in clinical trials. *J Hypertens* 2010; 28: 1356-1365.

5 National Heart Foundation of Australia (National Blood Pressure and Vascular Disease Advisory Committee). Guide to management of hypertension 2008: assessing and managing raised blood pressure in adults. Updated December 2010. http://heartfoundation.org.au/for-professionals/clinical-information/hypertension (accessed May 2016).

6 James PA, Oparil S, Carter BL, et al. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA* 2014; 311: 507-520.

7 National Institute of Clinical Excellence (NICE). Hypertension in adults: diagnosis and management 2011. https://www.nice.org.uk/guidance/cg127 (accessed May 2016).

8 European Society of Hypertension and European Society of Cardiology (ESH/ESC). Guidelines for the management of arterial hypertension. *Blood Pressure* 2013; 22: 193-278.

9 Sackett D, Richardson WS, Rosenburg W, Haynes RB. How to practice and teach evidence based medicine. 2nd ed. Churchill Livingstone, 1997.

10 National Health and Medical Research Council. NHMRC additional levels of evidence and grades for recommendations for developers of guidelines. 2009. https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf (accessed Mar 2016).

11 Guyatt GH, Oxman AD, Vist GE, et al; GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008; 336: 924-926.

12 Mancia G, Fagard R, Narkiewicz K, et al. 2013 ESH/ESC Guidelines for the management of arterial hypertension: the Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *J Hypertens* 2013; 31: 1281-1357.

13 Lewington S, Clarke R, Qizilbash N, et al. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet* 2002; 360: 1903-1913.

14 NVDPA National Vascular Disease Prevention Alliance. Guidelines for the management of absolute cardiovascular disease risk. Melbourne: National Stroke Foundation, 2012. https://strokefoundation.com.au/what-we-do/treatment-programs/clinical-guidelines/guidelines-for-the-assessment-and-management-of-absolute-cvd-risk (accessed May 2016).

15 Bliziotis IA, Destounis A, Stergiou GS. Home versus ambulatory and office blood pressure in predicting target organ damage in hypertension: a systematic review and meta-analysis. *J Hypertens* 2012; 30: 1289-1299.

16 Niiranen TJ, Asayama K, Thijs L, et al. Outcome-driven thresholds for home blood pressure measurement: international database of home blood pressure in relation to cardiovascular outcome. *Hypertension* 2013; 61:27-34.

17 The SPRINT Research Group. A randomized trial of intensive versus standard blood-pressure control. *N Engl J Med* 2015; 373: 2103-2116

18 Myers MG, Kaczorowski J, Dawes M, Godwin M. Automated office blood pressure measurement in primary care. *Can Fam Physician* 2014; 60: 127-132

19 British Hypertension Society. BP monitors. www.bhsoc.org/bp-monitors/bp-monitors (accessed Apr 2016).

20 Sundström J, Arima H, Jackson R, et al. Effects of blood pressure reduction in mild hypertension: a systematic review and meta-analysis. *Ann Intern Med* 2015; 162: 184-191.

21 Blood Pressure Lowering Treatment Trialists' Collaboration; Sundström J, Arima H, Woodward M, et al. Blood pressure-lowering treatment based on cardiovascular risk: a meta-analysis of individual patient data. *Lancet* 2014; 384: 591-598.

22 Bhatt DL, Kandzari DE, O'Neill WW, et al. A controlled trial of renal denervation for resistant hypertension. *N Engl J Med* 2014; 370: 1393-1401.

23 Kidney Disease Improving Global Outcomes. Blood pressure in CKD: KDIGO clinical practice guideline for the management of blood pressure in chronic kidney disease. http://kdigo.org/home/guidelines/blood-pressure-in-ckd (accessed May 2016). ■