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ARTICLE

Health care utilisation and out-of-pocket expenditure associated with hypertension: an analysis of Australian adults from the 45 and Up Study

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Abstract

Hypertension is a common condition worldwide that significantly increases morbidity and mortality rates in the older population. A number of treatment options are available to control blood pressure. The purpose of this study was to assess the use of health services and self-care amongst people with hypertension and to estimate the out-of-pocket expenses associated with such health care use. A sub-study of the 45 and Up Study was conducted amongst 1300 individuals who had earlier reported a clinical diagnosis of hypertension in 2017. A total of 753 (57.9%) individuals with hypertension returned a completed questionnaire. In the last 12 month, for their hypertension management, 84% of participants consulted a doctor, 19% of them consulted an allied health practitioner and 9% of them consulted a complementary medicine practitioner. The average total out-of-pocket expenditure for hypertension-related health care was Australian $461.8 per annum, with an estimated Australian $941 million per annum if extrapolated to all Australians aged 55 years and over with hypertension. Older people with hypertension use a wide range of health services to control their blood pressure including conventional medicine, allied health and complementary medicine practitioners as well as various self-care practices. A substantial amount of out-of-pocket expenditure has been spent on hypertension care annually. Given the global health and economic burden of hypertension, there is an urgent need for more research exploring cost-effective management(s) for hypertensive patients.

Introduction

Recent figures show more than 1.4 billion people globally have hypertension—a common chronic condition, defined when systolic or diastolic blood pressure remains higher than 140 and 90 mmHg, respectively [1]. Hypertension is considered a key modifiable risk factor of the main causes of death, contributing to 18 million cardiovascular deaths annually [2]. In addition, hypertension significantly affects a patient's quality of life due to complications such as cardiovascular diseases, renal failure and stroke [3].

Regular monitoring of blood pressure is pivotal to hypertension diagnosis and management [4]. Blood pressure control is important for decreasing the mortality rate and hypertension-related adverse outcomes [5]. In spite of various effective pharmaceutical treatments, the control rate of hypertension is still undesirable in patients in both high income and low to mid-income countries [5, 6]. It has been reported that only one-third of the US population with hypertension is able to achieve adequate control of blood pressure [7]. It has been suggested that a lack of adequate blood pressure control is due to a number of reasons including difficulty in adhering to long-term treatment and medication regimens, uncomfortable side effects of drugs like diuretics and a lack of health insurance and/or financial challenges [6, 8, 9].

In addition to conventional medical treatments, national guidelines recommend individuals perform various forms of self-care behaviours for the management of hypertension [10, 11]. Commonly recommended hypertension self-care includes healthy behaviours (e.g., smoking cessation), physical activity, controlling diet, stress reduction and home blood pressure monitoring [10–12]. Studies reveal self-care training can modify the cost of patients' care by reducing the number of inpatient and outpatient visits and unnecessary medication use [13, 14]. Along with doctors, allied health practitioners such as pharmacists, physiotherapists, psychologists and nurses have an important role in improving

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self-care outcomes through direct clinical services delivery and supporting patients' decision-making, positive education and behaviour changes [15–17]. Moreover, people with hypertension have been reported to utilise a wide range of complementary medicine (CM) for the treatment of their hypertension, either via CM practitioner consultations (e.g., acupuncturist, naturopath, massage therapist) and/or CM product use (e.g., dietary supplements, herbal medicine) and engaging in CM practices (e.g., meditation, yoga, tai chi) as forms of self-care [15, 18]. Although evidence for using CM to manage hypertension is limited, studies suggest that people usually use CM alongside conventional treatments, the use of CM remains a safety concern regarding such issues as potential adverse effects and polypharmacy with conventional medications [15, 19].

Despite the diversity of treatment options available for people with hypertension, to date, no comprehensive study reporting broad health care utilisation and self-care practices of people with hypertension have been undertaken. In direct response to this knowledge gap, this article reports findings from an observational study examining the utilisation of practitioner-led and self-care treatments including conventional, allied and complementary health care in people diagnosed with hypertension as well as the related out-of-pocket expenditure associated with such utilisation.

Materials and methods

Sample

The Sax Institute's 45 and Up Study is the largest aging-focused ongoing study in the Southern Hemisphere (https://www.saxinstitute.org.au/our-work/45-up-study). The baseline questionnaire of the 45 and Up Study collected data from 267,153 men and women aged 45 and above from New South Wales, Australia between January 2006 and December 2009. Participants joined the 45 and Up Study by completing this questionnaire and they gave signed consent for follow-up and linkage of their information to routine health care databases. The details of the 45 and Up Study have been described elsewhere [20]. Briefly, participants were randomly sampled from the Department of Human Services (formerly Medicare Australia) enrolment database, which provides near-complete coverage of the population. People aged 80 and above and those living in rural and remote areas were oversampled. Participants included about 11% of the New South Wales population aged 45 years and over. The 45 and Up Study was approved by the University of New South Wales Human Research Ethics Committee.

A sub-study of the 45 and Up Study was undertaken between April and October 2017 in Australia. For this sub-study, 1300 participants who had previously reported at baseline survey that a doctor had diagnosed them as having hypertension were mailed a questionnaire, with 753 (57.9%) returning a completed questionnaire. All these 753 participants indicated that they had hypertension. Ethical approval for the use of the sub-study dataset from the 45 and Up Study was obtained from the Human Research Ethics Committees at the University of Technology Sydney.

Characteristics of participating individuals

The characteristics of participated individuals with hypertension included age, gender, marital status, the ability to manage on their income, highest educational qualification completed and their private health insurance status. The area of residence was based on participants' postcodes and assigned according to the Accessibility Remoteness Index of Australia Plus score (i.e., major city, inner regional area, outer regional or remote area) [21].

Health care utilisation

The participants were provided with a list of three types of conventional medical practitioner (i.e., general practitioner, cardiologist, hospital doctor) and nine types of allied health practitioner (i.e., nurse, pharmacist/chemist, counsellor, psychologist, dietitian, physiotherapist, occupational therapist, exercise physiotherapist, personal trainer) and asked to indicate if they consulted any of these practitioner types for their hypertension in the previous 12 months as well as how often they consulted this type of practitioner. Participants were also provided with a list of 12 types of CM practitioner (i.e., acupuncturist, chiropractor, naturopath/herbalist, homoeopath, massage therapist, meditation instructor, yoga instructor, nutritionist, osteopath, traditional Chinese medicine practitioner, tai chi instructor and 'other' CM practitioner option), and asked to indicate if they consulted with any such practitioner type(s) for their hypertension in the previous 12 months. Participants were also asked to list any prescription medications they had used for their hypertension during the previous 12 months.

The participants with hypertension were provided with a list of 18 types of CM product/practice (i.e., aromatherapy oils, Coenzyme Q10, folic acid, ginkgo, garlic, herbal medicines, homoeopathic remedies, meditation by yourself (i.e., without instructor), mindfulness, multi B vitamin, multivitamins/minerals, omega 3/fish oil, physical activities/exercises, tai chi by yourself (i.e., without instructor), vitamin E, yoga by yourself (i.e., without instructor) and two 'other' CM product/practice options) and asked if they used any such product(s)/practice(s) for their hypertension during the previous 12 months.

With regard to each of the health care options for hypertension examined, participants were questioned as to

how much expense they incurred (i.e., out-of-pocket expense) during the previous 12 months.

Hypertension status

The participants were asked to specify the time (years/months) since their initial hypertension diagnosis. The participants were also asked to rate the severity of their hypertension during both the previous 4 weeks and the previous 12 months, on a ten-point scale ranging from 0 (least severe) to 10 (most severe).

Statistical analyses

Characteristics and health care utilisation were analysed via chi-square tests and student's t tests, where appropriate. Spearman's correlation coefficient was used to examine the association between two continuous variables. Out-of-pocket expense reported in this sub-study of 45 and Up Study represent self-reported payments for cash spending for health services/products and related other items not covered by Medicare or private health insurance [22, 23]. The out-of-pocket costs for hypertension care consisted of cost for medical/allied health professional visits, cost for [self-written] prescription medications specifically for his/her hypertension, cost for CM practitioner visits and cost for [survey-listed and self-written] CM products during the past 12 months. These costs were categorised as 'up to $100', '$100–499', '$500–999', '$1000–1499' and '$1500 or above'. All analyses were conducted using the statistical software Stata, version 14. The statistical level of significance was set at 0.05.

Results

Characteristics of participating individuals

The characteristics of the study participants are presented in Table 1. The average age of respondents was 72.4 (SD = 9.0) years. There were slightly more males (53.5%) than females (46.5%). Almost half of the participants (45.3%) resided in a major city and the majority of the participants (71.7%) were married or in a de facto relationship. A university degree was attained by 27.7% of the participants, while 31.2% gained a certificate or diploma, 32.1% a high school education and 9.0% had no formal education. In terms of ability to manage on available income, 72.8% had no or little difficulty, 20.4% had some difficulties and 6.8% found it difficult to manage. The majority of the participants (67.3%) had private health insurance.

Amongst the participants with hypertension, the average time since the first clinical diagnosis of hypertension was 17.1 (SD = 11.9) years. In terms of self-rated severity of hypertension (out of 10; with 10 being most severe), the average severity for the participants was 2.9 (SD = 2.0) over the past 12 months and 2.6 (SD = 1.9) over the past 4 weeks. It is worth noting that the 12-month and 4-week self-rated severity of hypertension was highly correlated ($\rho = 0.890$, $p < 0.001$).

Table 1 Characteristics of participants who have been diagnosed with hypertension ($n = 752$).

Characteristics	%
Gender	
Male	53.5
Female	46.5
Area of residence	
Major cities	45.3
Inner regional	39.3
Outer regional or remote	15.4
Marital status	
Married/de facto relationship	71.7
Separated/divorced/widowed	23.2
Single	5.1
Education	
No formal schooling	9.0
School only	32.1
Trade/apprentice/diploma	31.2
University	27.7
Manage on available income	
No or little difficulties	72.8
Some difficulties	20.4
Struggles with income	6.8
Private health insurance	
Yes	67.3
No	32.7
	Mean (SD)
Age (in years)	72.4 (9.0)

Number of participant with missing data: 1.
SD standard deviation.

Consultations with health care practitioners

The majority of participants with hypertension (85.1%; $n = 640$) consulted at least one health care practitioner in the previous 12 months for their hypertension. Specifically, 84.4% ($n = 635$) consulted a doctor, 19.1% ($n = 144$) consulted an allied health practitioner and 9% ($n = 68$) consulted a CM practitioner in the previous 12 months.

Table 2 shows the consultations with health care practitioners by hypertension characteristics over the past 12 months. Participants diagnosed with hypertension who rated their severity of hypertension as being 5 points or more

Table 2 Consultations with health care practitioners over the past 12 months by hypertension characteristics.

Hypertension characteristics			Average number of consultations			
			Doctor Mean (SD)	Allied health practitioner Mean (SD)	CM practitioner Mean (SD)	Total Mean (SD)
Years since diagnosis	<10 years	($n = 174$)	2.9 (2.3)	1.0 (3.0)	0.6 (2.2)	4.5 (5.1)
	≥10 years	($n = 578$)	3.3 (2.6)	0.9 (2.4)	0.6 (2.6)	4.7 (5.1)
	p value		0.057	0.585	0.823	0.586
Severity of hypertension[a]	<5 points	($n = 580$)	2.9 (2.3)	0.8 (2.4)	0.6 (2.6)	4.2 (4.9)
	≥5 points	($n = 156$)	4.4 (2.7)	1.5 (3.2)	0.7 (2.2)	6.6 (5.5)
	p value		<0.001	0.003	0.505	<0.001
Total		($n = 752$)	3.2 (2.5)	0.9 (2.6)	0.6 (2.6)	4.7 (5.2)

Number of participant with missing data regarding their diagnosis of hypertension: 1.

Number of participant with missing data regarding their severity of hypertension: 17.

CM complementary medicine, *SD* standard deviation.

[a]Self-rated severity score out of 10 (1 = least severe and 10 = most severe).

(out of 10) had a greater number of consultations with health care practitioners ($p < 0.001$), specifically doctors ($p < 0.001$) and allied health practitioners ($p = 0.003$), compared with participants who rated their severity of hypertension as being less than 5 points. Overall, the participants with hypertension had on average 4.7 consultations with health care practitioners in the previous 12 months specifically for their hypertension.

Use of prescription medications

The use of prescription medications over the past 12 months by years since diagnosis of hypertension and the severity of hypertension is presented in Table 3. Three categories of prescription medications were determined based on the information provided by participants with hypertension: (1) lipid-lowering agents such as Atorvastatin, Caduet, Lipitor and Rosuvastatin; (2) antihypertensives such as Atacand, Avapro, Coversyl and Micardis; and (3) anticoagulant or antiplatelet such as Cartia, Plavix, Pradaxa and Warfarin. Despite the statistically non-significant associations between hypertension characteristics and these three categories of medications, a greater percentage of participants either who had been diagnosed with hypertension for more than 10 years or who rated their severity of hypertension for more than 5 points used these medications, compared with participants with less than 10 years since diagnosis or those with less than 5 points severity of hypertension, respectively (all $p > 0.05$).

Use of complementary medicine products and practices

Table 4 shows the use of CM products and practices over the past 12 months by hypertension characteristics. Approximately 3 quarters of participants with hypertension who had been diagnosed with hypertension for more than 10 years and who rated their severity of hypertension for less than 5 points used more than three types of CM products/practices. However, there were no statistically significant associations identified between the number of different CM products and practices used for hypertension and years since diagnosis with hypertension, nor severity of hypertension.

Out-of-pocket expenses

The out-of-pocket expenses over the past 12 months by characteristics of hypertension are presented in Table 5. Participants who rated their severity of hypertension as being 5 or more points (out of 10) had a greater out-of-pocket expenditure ($p < 0.001$), specifically for doctors and allied health practitioners ($p < 0.001$) and for prescription medications ($p = 0.009$), compared with participants who rated their severity of hypertension as being less than 5 points.

On average, the total health care out-of-pocket expenditure over the past 12 months by participants with hypertension was Australian $461.8 per annum. In Australia, in 2017, there were 6,634,785 persons aged 55 years and over [24], with an estimated 2,038,592 (31%) with hypertension [25]. Extrapolating from these figures, we estimate the total out-of-pocket expenditure for Australians aged 55 years and over to be ~Australian $941 million per annum for hypertension-related health care.

Discussion

This paper provides a comprehensive analysis of the different types of practitioner-led health care and self-care

Table 3 Use of prescription medications over the past 12 months by hypertension characteristics.

Hypertension characteristics			Prescription medication							
			Lipid-lowering agent[a]		Antihypertensive[b]		Anticoagulant or antiplatelet[c]		Total	
			Yes ($n = 33$) %	No ($n = 719$) %	Yes ($n = 114$) %	No ($n = 638$) %	Yes ($n = 105$) %	No ($n = 647$) %	Yes ($n = 106$) %	No ($n = 646$) %
Years since diagnosis	<10 years	($n = 174$)	27.3	22.9	22.1	29.0	21.9	23.3	22.3	28.3
	≥10 years	($n = 578$)	72.7	77.1	77.9	71.0	78.1	76.7	77.7	71.7
	p value		0.565		0.110		0.747		0.174	
Severity of hypertension[d]	<5 points	($n = 580$)	81.3	78.7	78.6	79.8	75.5	79.3	78.6	80.2
	≥5 points	($n = 156$)	18.7	21.3	21.4	20.2	24.5	20.7	21.4	19.8
	p value		0.729		0.787		0.378		0.718	

Number of participant with missing data regarding their diagnosis of hypertension: 1.

Number of participant with missing data regarding their severity of hypertension: 17.

[a]Lipid-lowering agent such as Atorvastatin, Caduet, Lipitor and Rosuvastatin.

[b]Antihypertensive such as Atacand, Avapro, Coversyl and Micardis.

[c]Anticoagulants or antiplatelets such as Cartia, Plavix, Pradaxa and Warfarin.

[d]Self-rated severity score out of 10 (1 = least severe and 10 = most severe).

Table 4 Use of complementary medicine products and practices over the past 12 months by hypertension characteristics.

Hypertension characteristics			Number of different CM products and practices used				*p* value
			None ($n = 442$) %	1 ($n = 137$) %	2 ($n = 73$) %	3 or more ($n = 100$) %	
Years since diagnosis	<10 years	($n = 174$)	20.8	28.5	24.7	25.0	0.282
	≥10 years	($n = 578$)	79.2	71.5	75.3	75.0	
Severity of hypertension[a]	<5 points	($n = 580$)	78.0	85.7	75.3	75.8	0.167
	≥5 points	($n = 156$)	22.0	14.3	24.7	24.2	

Number of participant with missing data regarding their diagnosis of hypertension: 1.

Number of participant with missing data regarding their severity of hypertension: 17.

CM complementary medicine.

[a]Self-rated severity score out of 10 (1 = least severe and 10 = most severe).

utilisation amongst adults with hypertension and the estimation of the associated out-of-pocket expenses. Participants in our study had, on average, 4.7 consultations with health care practitioners over the previous 12 months. The mean number of consultations with doctors, allied health practitioners and CM practitioners was 3.2, 0.9 and 0.6, respectively. The average total out-of-pocket expenditure by hypertensive patients in our study was Australian $461.8 per annum, of which an average Australian $148.5 related to consultations with a doctor or allied health practitioner, Australian $202.3 related to prescription medications, Australian $34.7 related to consultations with a CM practitioner and Australian $76.3 related to the cost of CM product/practice use.

In our study, the majority of hypertensive patients utilised a variety of prescription medications regardless of the severity and duration of their condition that can put them at risk of polypharmacy. A review in the literature indicates the negative outcomes of polypharmacy leading to high morbidity and mortality. Although aspirin therapy in patients with hypertension was reported to reduce myocardial infarction, it also led to an increase in the incidence of serious haemorrhagic events (e.g., gastrointestinal and intracranial bleeding) [26]. Other available information supports the role of statins as lipid-lowering agents in the reduction of blood pressure in hyperlipidemic–hypertensive patients [27], but no controlled clinical trial has examined the effect of statins on the treatment of hypertension as a single therapy. In contrast, clinical guidelines recommend administration of low doses of multiple hypertensive drugs rather than a high dose of monotherapy in higher stages of hypertension to enhance efficacy and tolerability [11, 28]. The burden of the complexity of medication regimens is associated with an increased risk of drug adverse effects, drug interactions and poor adherence to treatment as well as greater medical costs [29]. The risk of multiple drug therapies must be evaluated based on individuals' condition and balanced against their possible benefits [30]. Medical professionals, therefore, need to consider different aspects of hypertension care in clinical practice (i.e., hypertension severity, chronicity and co-morbidities).

Table 5 Out-of-pocket expenses over the past 12 months by hypertension characteristics.

			Average cost				
			Doctor/allied health practitioner Mean (SD)	CM practitioner Mean (SD)	Prescription medications Mean (SD)	CM products and practices Mean (SD)	Total Mean (SD)
Hypertension characteristics							
Years since diagnosis	<10 years	($n = 174$)	$158.6 (230.9)	$42.8 (175.1)	$181.0 (195.3)	$70.7 (164.7)	$453.1 (450.7)
	≥10 years	($n = 578$)	$145.4 (230.3)	$32.4 (150.6)	$208.7 (246.5)	$77.9 (189.5)	$464.4 (509.2)
	p value		0.508	0.440	0.175	0.649	0.793
Severity of hypertension[a]	<5 points	($n = 580$)	$130.5 (205.4)	$32.1 (150.8)	$193.3 (224.7)	$79.8 (190.0)	$435.7 (464.9)
	≥5 points	($n = 156$)	$223.4 (297.1)	$46.5 (181.8)	$249.0 (270.2)	$66.3 (167.2)	$585.3 (585.8)
	p value		<0.001	0.312	0.009	0.420	<0.001
Total sample		($n = 752$)	$148.5 (230.4)	$34.7 (156.5)	$202.3 (235.8)	$76.3 (184.0)	$461.8 (496.0)

Number of participant with missing data regarding their diagnosis of hypertension: 1.
Number of participant with missing data regarding their severity of hypertension: 17.
CM complementary medicine, *SD* standard deviation.
[a]Self-rated severity score out of 10 (1 = least severe and 10 = most severe).

The high costs of hypertension-related health care have been identified worldwide [31]. Previous research indicated that the severity of hypertension and relative complications could lead to concomitant rising in total expenditure [32, 33], which is in line with the finding of our study. Moreover, our study also found the severity of hypertension appears to impact on health care needs—participants in our study who rated greater severity of hypertension were more likely to consult a doctor and/or allied health care practitioner when compared with patients rated lower severity of hypertension. Meanwhile, our data confirmed that the total out-of-pocket expenditure was higher in patients with increased severity of hypertension compared with patients with lower severity of hypertension, specifically relating to consultation with doctors, allied health practitioners and the use of prescription medications. This finding is in line with previous research in which prescription medications were found to be a great portion of total expenses for hypertension treatment [34]. The high economic burden of hypertension for government and wider society indicates the importance of efforts to help influence a move to cost-effective medical prescribing for lowering health care costs attributed to hypertension.

Four limitations should be considered when interpreting our results. Firstly, the survey data are based on participants' self-report that may have the potential recall bias, particularly in the scale of hypertension severity and the estimated health care expenses. Secondly, the extrapolation of estimated out-of-pocket expenses for the larger hypertensive population of Australian aged 55 years and over may vary to some extent from the current sample. Thirdly, the health care seeking behaviour of our hypertensive participants may vary compared with other individuals with hypertension who did not participate in the 45 and Up Study. Lastly, as the original 45 and Up Study participants were recruited via oversampling of people aged 80 and people living in rural and remote areas, then our sub-study sample is also likely to be oversampled. Therefore, caution is needed when generalising our findings to the Australian population. Despite these limitations, this study is the first to explore comprehensive health service utilisation for hypertension in older people and highlights potential clinical research and policy-making topics in the hypertension field.

In conclusion, this is the first study reporting a comprehensive analysis of health care utilisation (including self-care) and associated estimates of out-of-pocket expenses among a sample of older hypertensive individuals. People with hypertension use a wide range of practitioner-led health services and self-care to control their high blood pressure and this health-seeking behaviour is associated with significant annual out-of-pocket expenditure. Further interventions addressing cost-effective treatment(s) for hypertension are required.

Summary

What is known about topic

- A proportion of older people with hypertension are not able to control their high blood pressure.
- People's out-of-pocket costs for hypertension are increasing and can affect treatment adherence.

What this study adds

- Older people used a wide range of health services to control their hypertension including Western medicine, allied health, complementary medicine and self-care practices.
- The estimated total out-of-pocket costs for hypertension-related health care were Australian $941 million per annum if extrapolated to all Australians aged 55 years and over with hypertension.

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Author contributions DS and JA conceived this study and obtained ethical approval. DS and WP conducted data analysis. JA and MH wrote the first draft of the paper. DS and WP revised the paper. All authors approved the submitted version of the paper.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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References

1. Egan BM, Kjeldsen SE, Grassi G, Esler M, Mancia G. The global burden of hypertension exceeds 1.4 billion people: should a systolic blood pressure target below 130 become the universal standard? J Hypertens. 2019;37:1148–53.
2. World Health Organization. Cardiovascular diseases (CVDs). 2017. https://www.who.int/en/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).
3. Soni RK, Porter AC, Lash JP, Unruh ML. Health-related quality of life in hypertension, chronic kidney disease, and coexistent chronic health conditions. Adv Chronic Kidney Dis. 2010;17:e17–26.
4. Baral-Grant S, Haque M, Nouwen A, Greenfield S, McManus R. Self-monitoring of blood pressure in hypertension: a UK primary care survey. Int J Hypertens. 2011;2012:582068.
5. Okin PM, Hille DA, Kjeldsen SE, Dahlöf B, Devereux RB. Impact of lower achieved blood pressure on outcomes in hypertensive patients. J Hypertens. 2012;30:802–10.
6. Ibrahim MM, Damasceno A. Hypertension in developing countries. Lancet. 2012;380:611–9.
7. Merai R, Siegel C, Rakotz M, Basch P, Wright J, Wong B, et al. CDC grand rounds: a public health approach to detect and control hypertension. MMWR Morb Mortal Wkly Rep. 2016;65:1261–4.
8. Lo SH, Chau JP, Woo J, Thompson DR, Choi KC. Adherence to antihypertensive medication in older adults with hypertension. J Cardiovasc Nurs. 2016;31:296–303.
9. Rochefort CM, Morlec J, Tamblyn RM. What differentiates primary care physicians who predominantly prescribe diuretics for treating mild to moderate hypertension from those who do not? A comparative qualitative study. BMC Fam Pract. 2012;13:9.
10. Centers for Disease Control and Prevention. Self-management support and education. 2017. https://www.cdc.gov/dhdsp/pubs/guides/best-practices/self-management.htm.
11. The Ministry of Health and Medical Services, Fiji Health Sector Support Program, Australian Aid. Cardiovascular therapeutic guidelines. 2015. http://www.health.gov.fj/wp-content/uploads/2018/03/Cardiovascular-Drug-Guidelines.pdf.
12. Royal Australian College of General Practitioners. Guidelines for preventive activities in general practice. 2019. https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/red-book/prevention-of-vascular-and-metabolic-disease/blood-pressure.
13. Penaloza-Ramos MC, Jowett S, Mant J, Schwartz C, Bray EP, Sayeed Haque M, et al. Cost-effectiveness of self-management of blood pressure in hypertensive patients over 70 years with suboptimal control and established cardiovascular disease or additional cardiovascular risk diseases (TASMIN-SR). Eur J Prev Cardiol. 2016;23:902–12.
14. Logan AG. Transforming hypertension management using mobile health technology for telemonitoring and self-care support. Can J Cardiol. 2013;29:579–85.
15. Sibbritt D, Davidson P, Peng W, Adams J, Hickman L. Hypertension: what are the self-care and health-care-seeking behaviours in women over time? J Hum Hypertens. 2016;30:783–7.
16. Potthoff SA, Vonend O. Multidisciplinary approach in the treatment of resistant hypertension. Curr Hypertens Rep. 2017;19:9.
17. Harris MF, Williams AM, Dennis SM, Zwar NA, Powell Davies G. Chronic disease self-management: implementation with and within Australian general practice. Med J Aust. 2008;189:S17–20.
18. Hu H, Li G, Duan J, Arao T. Prevalence, purposes, and perceived effectiveness of complementary and alternative medicine use in a hypertension population: a questionnaire survey. Int Sch Res Not. 2013;2013:137472.
19. Rahmawati R, Bajorek BV. Self-medication among people living with hypertension: a review. Fam Pract. 2017;34:147–53.
20. 45 and Up Study Collaborators, Banks E, Redman S, Jorm L, Armstrong B, Bauman A, et al. Cohort profile: the 45 and up study. Int J Epidemiol. 2008;37:941–7.
21. Australian Institute of Health and Welfare. Rural, regional and remote health: a guide to remoteness classifications. Canberra: Australian Institute of Health and Welfare; 2004.
22. Hwang W, Weller W, Ireys H, Anderson G. Out-of-pocket medical spending for care of chronic conditions. Health Aff. 2001;20:267–78.
23. Karter AJ, Stevens MR, Herman WH, Ettner S, Marrero DG, Safford MM, et al. Out-of-pocket costs and diabetes preventive

services: the Translating Research Into Action for Diabetes (TRIAD) study. Diabetes Care. 2003;26:2294–9.
24. Australian Bureau of Statistics. Australian demographic statistics. 2017. https://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/0DEC5B368C5C2D72CA2581F5001011EB/$File/31010_jun%202017.pdf.
25. Australian Institute of Health and WelfareCardiovascular disease. 2019. https://www.aihw.gov.au/reports/heart-stroke-vascular-disease/cardiovascular-health-compendium/contents/how-many-australians-have-cardiovascular-disease.
26. Lip GY, Felmeden DC, Dwivedi G. Antiplatelet agents and anticoagulants for hypertension. Cochrane Database Syst Rev. 2011;12:CD003186.
27. Borghi C, Dormi A, Veronesi M, Immordino V, Ambrosioni E. Use of lipid-lowering drugs and blood pressure control in patients with arterial hypertension. J Clin Hypertens. 2002;4:277–85.
28. Kim KI, Ihm SH, Kim GH, Kim HC, Kim JH, Lee HY, et al. 2018 Korean society of hypertension guidelines for the management of hypertension: part III-hypertension in special situations. Clin Hypertens. 2019;25:19.
29. Elliott WJ. Improving outcomes in hypertensive patients: focus on adherence and persistence with antihypertensive therapy. J Clin Hypertens. 2009;11:376–82.
30. Guthrie B, Payne K, Alderson P, McMurdo ME, Mercer SW. Adapting clinical guidelines to take account of multimorbidity. BMJ. 2012;345:e6341.
31. Constant AF, Geladari EV, Geladari CV. The economic burden of hypertension. In: Andreadis EA (editors). Hypertension and cardiovascular disease. 1st ed. Springer: Switzerland; 2016. p. 351–60.
32. Kirkland EB, Heincelman M, Bishu KG, Schumann SO, Schreiner A, Axon RN, et al. Trends in healthcare expenditures among US adults with hypertension: national estimates, 2003–2014. J Am Heart Assoc. 2018;7:e008731.
33. Nakamura K, Okamura T, Miura K, Okayama A. Hypertension and medical expenditure in the Japanese population: review of prospective studies. World J Cardiol. 2014;6:531–8.
34. Zhang D, Wang G, Zhang P, Fang J, Ayala C. Medical expenditures associated with hypertension in the US, 2000–2013. Am J Prev Med. 2017;53:S164–71.