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Factors influencing blood pressure control in patients with atrial fibrillation and hypertension in Australian primary care

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ABSTRACT

Objective This study explored factors that may influence blood pressure (BP) control in patients with atrial fibrillation (AF) with hypertension.

Methods Cross-sectional retrospective analysis of the MedicineInsight database which includes de-identified electronic health records from general practices (GPs) across Australia. BP control was assessed in patients with diagnosed AF and hypertension (controlled BP defined as <140/90 mm Hg). We explored BP control, factors influencing BP control and likelihood of receiving guideline-recommended treatment.

Results 34 815 patients with AF and hypertension were included; mean age was 76.9 (10.2 SD) years and 46.2% were female. 38.0% had uncontrolled BP. Women (OR 0.72; 95% CI 0.68, 0.76; p<0.001) and adults ≥75 years (OR 0.78; 95% CI 0.70, 0.86; p<0.001) were less likely to have controlled BP. Greater continuity of care (CoC; that is, visits with the same clinician) and having frequent GP visits were associated with higher odds of controlled BP (model 1: CoC, OR 1.29; 95% CI 1.20, 1.40, p<0.001; GP visits, OR 1.71; 95% CI 1.58, 1.85, p<0.001) and a greater likelihood of being prescribed ≥2 types of BP-lowering medicines (model 2: CoC, OR 1.12; 95% CI 1.03, 1.23; p=0.011; GP visits, OR 1.80; 95% CI 1.63, 1.98; p<0.001).

Conclusions Uncontrolled BP was more likely in women and adults ≥75 years. Patients who had frequent GP visits with the same clinician were more likely to have BP controlled and receive guideline-recommended antihypertensive treatment. This suggests that targeting these primary care factors could potentially improve BP control and subsequently reduce stroke risk in patients with AF.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Hypertension increases the risk of cardiovascular events and further exacerbates the risk of stroke by an additional twofold to threefold in patients with atrial fibrillation (AF). Poor blood pressure (BP) control rates are a global issue, and it is particularly concerning in a group that has higher rates of hypertension than the general population.

WHAT THIS STUDY ADDS

⇒ This large-scale contemporary examination of general practice (GP) medical records found BP control is poor (38% uncontrolled BP) among a population with AF and hypertension. Women and older adults (≥75 years) were least likely to have controlled BP. Patients who were visiting the same GP more frequently were more likely to be on treatment and have their BP controlled.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Targeting BP control of high-risk populations, such as patients with AF, in primary care could help reduce stroke.

INTRODUCTION

Atrial fibrillation (AF) impacts an estimated 33.5 million individuals globally and approximately 3%–5% of the Australian adult population.[1] The most challenging problem is managing the risk of stroke in patients with AF as they are susceptible to a fivefold increased risk.[2] Hypertension is another leading risk factor for stroke,[2] and managing both AF and blood pressure (BP) seems a promising target in improving overall stroke rates.

Hypertension is the leading cause of preventable morbidity and mortality globally and is the most common comorbidity in patients with AF affecting up to 80% of individuals.[3 4] It further increases the risk of stroke in patients with AF by twofold to threefold.[5] Prevention and management of modifiable cardiometabolic AF risk factors, such as hypertension, provide the greatest population impact to reduce the burden of AF. Therefore, identifying how to improve BP control among this high-risk population could reduce cardiovascular events, and other complications such as chronic kidney disease and heart failure.[6]

Hypertension control rates are poor globally, with studies suggesting as few as one in five have BP control despite knowing they have hypertension.[7] One approach that could improve BP control and medical adherence, and reduce unplanned hospitalisation, emergency presentations and cardiovascular events is more frequent and regular preventative management in primary care.[8] With hypertension and AF being leading causes of stroke, there is a need to explore factors that lead to poor achievement of BP targets in very high cardiovascular risk cohorts such as those with AF.

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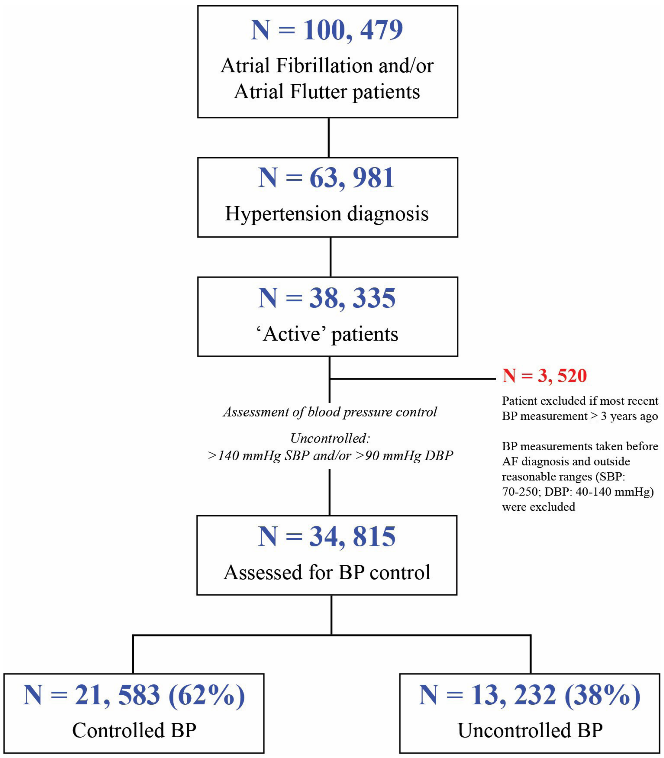

Figure 1 Study sample flow chart. AF, atrial fibrillation; BP, blood pressure; DBP diastolic BP; SBP, systolic BP.

The aim of this study was to examine BP control and factors influencing BP control in patients with AF with hypertension being managed in an Australian primary care setting. Our specific objectives included: (1) determining what proportion of patients with AF with hypertension have their BP controlled, and (2) examining the relationship of factors with BP control accounting for patient characteristics.

METHODS

This is a cross-sectional study based on the MedicineInsight database, an Australian primary care database consisting of longitudinal de-identified electronic health records (EHRs) from consenting general practices (GPs) across the country.[9] EHR data included patient demographics, diagnosis, prescribed medications, pathology test results, observations and clinical encounters. MedicineInsight was established in 2011 by NPS MedicineWise; it used non-random sampling methods to recruit GPs across Australia and had recruited 419 practices meeting quality data selection by October 2018.[9]

A subset of the MedicineInsight database was requested, which included patients with cardiovascular risk factors (chronic kidney disease, diabetes mellitus, hypertension, hyper/dyslipidaemia) or diagnosed with cardiovascular disease prior to the extraction date of 01 March 2021.

Study sample

We selected a study sample that included patients who were (1) ≥18 years old, (2) had a recorded diagnosis of AF/atrial flutter and hypertension, (3) had ≥3 consultations at the same practice within a 2-year period ('active patient') (figure 1). To characterise BP control within this population, we used the average systolic BP (SBP) and average diastolic BP (DBP) over the last 3 years. If the patient's most recent BP measurement was taken ≥3 years ago, they were excluded from the current analysis due to inability of assessing recent BP control. Data were checked to ensure BP measurements were within reasonable limits (SBP=70–250; DBP=40–150 mm Hg) and were taken post-AF diagnosis.

Variables

AF/atrial flutter and hypertension diagnoses were defined by using dataset codes. SBP and DBP were calculated as an average of the previous 3 years from extraction date. Our primary outcome of controlled BP was defined as <140 mm Hg SBP and/or <90 mm Hg DBP.[10] Medical treatment of hypertension using BP-lowering medications was defined as prescription of ≥2 antihypertensive medications in the last 3 years from extraction date. Antihypertensive medications were grouped by drug classes based on active ingredients (online supplemental table 1).

Care level variables, namely the number of GP visits, regularity of GP visits and continuity of care (CoC), were based on an observation period of 2 years from each individual's most recent visit date (occurring within previous 3 years). GP visits were defined as any professional interchange between a patient and a general practioner/practice nurse; these excluded any non-clinical/administrative encounters. The number of GP visits was the total number of visits within the same 2-year observation period, excluding same-day visits. The regularity of GP visits variable was the consistency of each patient's visits within the observation period and was calculated using the formula[11]:

$$\text{Regularity} = \frac{1}{1+\frac{\text{SD (days between encounters)}}{\text{mean(days between encounters)}}}$$

,derived from the mean and SD of days between GP visits. CoC, indicative of visits to the same clinician, was calculated using the Bice-Boxerman index[12]:

$$\text{CoC} = \frac{\left(\sum_{i=1}^{p} n_i^2\right) - n}{n\ (n-1)}$$

,where $n=\sum_i n_i$ is the total number of GP visits, n_i is the number of GP visits to provider i and p is the number of providers. CoC values range from 0 (ie, all visits to different clinicians) to 1 (ie, all visits to the same clinician).

Rurality was based on the GP location, according to postcodes provided by the Geography Standard Remoteness Area,[13] which divides states and territories into several regions based on their access to services. The Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD) reflects an individual's socioeconomic status; it ranges from 1 (most disadvantaged) to 5 (most advantaged).[13] The Index of Education and Occupation (IEO)[13] is designed to reflect the educational and occupational level of communities; it ranges from 1 (low) to 5 (high).

Anthropometric variables and their calculations are defined below. For body mass index (BMI) calculations, we used a median height (across the entire study period) and the most recent weight measurement. If two weight measurements were recorded on the same day, an average of the two was used. Smoking status was divided into two categories: non-smoker and ever smokers; the latter included current smokers and ex-smokers.

The CHA_2DS_2-VASc (Congestive heart failure, Hypertension, Age ≥75 years (double weight), Diabetes, previous Stroke (double weight), Vascular disease, Age 65–74 years, female Sex category score) is a point-based system used to stratify the risk of stroke in patients with AF, and is the sum of 1 point each for the presence of heart failure, hypertension, diabetes, vascular disease, age 65–74 years and female gender, and 2 points each for the presence of previous stroke/thromboembolism and age ≥75

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years.[14] Multimorbidity was calculated using an adapted version of methodology used by Harrison *et al*,[15] and was defined as ≥3 body systems affected. Conditions were categorised into body systems using NPS MedicineInsight codes provided in the online supplemental table 2.

Data analysis

All statistical analyses were performed using R V.4.0.2 (R Core Team 2020). Descriptive analyses of the characteristics of patients with AF with hypertension with controlled and uncontrolled BP were undertaken. To address the primary objective of determining factors that are associated with controlled BP, a logistic regression model was used to analyse the binary outcome of controlled BP (yes/no), with random effects for GP clinic. To assess factors that were associated with prescription of two or more BP-lowering medications, a logistic regression model was used to analyse the binary outcome of ≥2 antihypertensive prescription (yes/no), with random effects for GP clinic. Covariates explored in models were sex, age, BMI, smoking status, Indigenous status, socioeconomic status, education level, CHA_2DS_2-VASc score, multimorbidity, prescription of ≥2 antihypertensive medications, GP visits, regularity and CoC. A p value of <0.05 was considered statistically significant.

Patient and public involvement

There was no patient and public involvement in the conduct of this study.

RESULTS

A total of 34 815 patients with AF and hypertension were included in this study; mean age was 76.9 (10.2 SD) years and 46.2% were female (table 1). Only 62.0% had controlled BP in this patient population. In the controlled BP group, a larger proportion were male (56.4%). A small percentage (1.9%) of the cohort were Aboriginal/Torres Strait Islander and of these, more had controlled (n=405) compared with uncontrolled (n=166) BP. All other demographic factors (remoteness area, state, IRSAD, IEO) were similar in both groups. Among the controlled BP group, mean BP was 127.6/73.9 (8.8/7.5 SD) mm Hg, compared with 149.1/80.3 (9.4/9.9 SD) mm Hg in the uncontrolled group. CHA_2DS_2-VASc scores were similar in both groups; 85.1% and 83.2% had a score ≥3 in controlled and uncontrolled BP groups, respectively. A larger proportion of patients had a history of heart failure in the controlled BP group (controlled BP=27.3%, uncontrolled BP=18.4%). Multimorbidity (defined as ≥3 body systems affected) was 78.8% and 74.6% in the controlled and uncontrolled BP groups, respectively. Majority of patients in both groups were prescribed antihypertensive medication (total=97.7%, controlled BP=97.5%, uncontrolled BP=98.1%) and 79.1% of these patients were prescribed two or more BP-lowering medicines. The mean number of GP visits was higher in the controlled BP group (33.3±22.2) compared with the uncontrolled BP group (29.8±20.4). Regularity between GP visits was similar between the two groups. Mean (SD) CoC was higher in the controlled BP group (0.5±0.2) compared with the uncontrolled BP group (0.4±0.2). A detailed patient characteristics table is provided in online supplemental table 3.

Mean and median number of GP visits were higher in the controlled BP group compared with the uncontrolled BP group (table 1), respectively, and this difference is highlighted in figure 2. CoC, higher number of GP visits, obese BMI, Aboriginal/Torres Strait Islander status, CHA_2DS_2-VASc ≥3 and multimorbidity were predictors of controlled BP, whereas female sex, patients aged ≥75 years, regularity and IEO of 5 were less likely associated with controlled BP (figure 3). CoC, higher number of GP visits, overweight and obese BMIs, and CHA_2DS_2-VASc ≥3 were associated with receiving treatment of ≥2 antihypertensive medications, whereas female sex and ≥75 years age were associated with lower likelihood of receiving treatment of ≥2 antihypertensive medications (figure 4). Full logistic regression results are provided in online supplemental tables 4 and 5.

DISCUSSION

The main finding of this analysis is that about one-third of people with both AF and known hypertension had uncontrolled BP, and that uncontrolled BP was more likely if they were female and older (≥75 years). The likelihood of achieving controlled BP was improved in patients who had higher CoC measures and higher frequency of exposure to primary care. This suggests that there is a modifiable gap in care among those at highest of risk of stroke which could be addressed by a greater focus on BP management and greater connection with their primary care doctors.

The high prevalence of poor BP control among Australian primary care patients with AF is concerning given hypertension is known to increase stroke rate by twofold to threefold in patients with AF who are already at high risk of stroke.[5] Inadequate control of BP is a global problem, and although hypertension treatment and detection rates in high-income countries are improving, control rates remain low.[7] In Australia, it is estimated that more than half of those treated for hypertension remain uncontrolled[7] and this is despite the available pharmacological agents, subsidised healthcare in Australia and large funding initiatives to improve these poor control rates. There has been a push for systematic management which includes follow-up, regular review and a stepped-care approach to antihypertensive therapy for those who do not achieve control.[16] Prescription resistance to dose intensification and single-pill combination therapy,[17] physician or treatment inertia,[18] along with patient adherence,[19] need to be addressed to improve control rates in patients with hypertension.

The current paper demonstrates that care level factors such as CoC and the frequent GP visits influenced BP control. High CoC is when a patient usually sees the same clinician in primary care[12] and is not a feature of all medical practices in Australia. A similar relationship was observed for patients with chronic kidney disease and hypertension in another analysis of NPS MedicineInsight dataset describing the association of CoC with BP control.[20] Other cross-sectional studies have also found increased continuity to be associated with improved rates of diabetic control, hypertension control, screening colonoscopy and mammography.[21] Along with the continuity of relationship with the same physician, we also found a significant relationship between the number of GP visits to be associated with having BP controlled. Continuity and frequent clinical visits are core attributes of primary care highlighting the importance of the longitudinal and continuous relationship between physicians and patients.[22] A recent Lancet paper has highlighted the importance of CoC and follow-up as one of five main domain drivers that can guide quality improvement processes to achieve population BP control.[23] In a population with significantly high rates of hypertension and uncontrolled BP leading to adverse AF-related events, a focus on the doctor–patient relationship, along with a systematic approach to BP management in primary care, is paramount in achieving good control.

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Table 1 Characteristics of 34 815 patients with atrial fibrillation with hypertension grouped by achievement of blood pressure (BP) control (controlled BP defined as <140/90 mm Hg)

	Controlled BP N=21 583	Uncontrolled BP N=13 232	Total N=34 815
Age, mean (SD)	76.8 (±10.0)	77.1 (±10.5)	76.9 (±10.2)
Sex	N=21 580	N=13 229	N=34 809
Male	12 181 (56.4%)	6558 (49.6%)	18 739 (53.8%)
Female	9399 (43.6%)	6671 (50.4%)	16 070 (46.2%)
Indigenous status	N=19 406	N=11 627	N=30 763
Non-Indigenous	18 731 (97.9%)	11 461 (98.6%)	30 192 (98.1%)
Aboriginal/Torres Strait Islander	405 (2.1%)	166 (1.4%)	571 (1.9%)
Socioeconomic status (IRSAD)	N=21 511	N=13 202	N=34 713
1=most disadvantaged	4767 (22.2%)	2705 (20.5%)	7472 (21.5%)
2	4459 (20.7%)	2914 (22.1%)	7373 (21.2%)
3	4823 (22.4%)	2854 (21.6%)	7677 (22.1%)
4	3244 (15.1%)	2066 (15.6%)	5310 (15.3%)
5=most advantaged	4218 (19.6%)	2663 (20.2%)	6881 (19.8%)
Index of Education and Occupation	N=21 511	N=13 202	N=34 713
1=low education	5080 (23.6%)	2869 (21.7%)	7949 (22.9%)
2	5183 (24.1%)	3313 (25.1%)	8496 (24.5%)
3	3845 (17.9%)	2278 (17.3%)	6123 (17.6%)
4	3507 (16.3%)	2126 (16.1%)	5633 (16.2%)
5=high education	3896 (18.1%)	2616 (19.8%)	6512 (18.8%)
BP	N=21 583	N=13 232	N=34 815
Systolic, mean (SD)	127.6 (±8.8)	149.1 (±9.4)	135.8 (±13.8)
Diastolic, mean (SD)	73.9 (±7.5)	80.3 (±9.9)	76.3 (±9.1)
Body mass index	N=19 216	N=11 649	N=30 865
Mean (SD)	30.5 (±8.8)	29.9 (±8.0)	30.3 (±8.5)
Smoking status	N=20 848	N=12 724	N=33 572
Non-smoker	11 031 (52.9%)	7363 (57.9%)	18 394 (54.8%)
Smoker	9817 (47.1%)	5361 (42.1%)	15 178 (45.2%)
CHA_2DS_2-VASc, mean (SD)	4.2 (±1.6)	4.0 (±1.6)	4.1 (±1.6)
Score ≥3	18 372 (85.1%)	11 012 (83.2%)	29 384 (84.4%)
Heart failure history	5901 (27.3%)	2441 (18.4%)	8342 (24.0%)
Hypertension history	21 583 (100.0%)	13 232 (100.0%)	34 815 (100.0%)
Stroke history	4647 (21.5%)	2571 (19.4%)	7218 (20.7%)
Vascular disease history	7847 (36.4%)	4241 (32.1%)	12 088 (34.7%)
Diabetes type 2 history	3239 (15.0%)	1587 (12.0%)	4826 (13.9%)
Multimorbidity by body systems			
Number of body systems affected, mean (SD)	3.5 (±1.3)	3.4 (±1.2)	3.5 (±1.3)
Multimorbidity (≥ 3 body systems affected)	17 017 (78.8%)	9875 (74.6%)	26 892 (77.2%)
Antihypertensive medications	20 579 (97.5%)	12 599 (98.1%)	33 178 (97.7%)
Mean (SD)	2.4 (±1.2)	2.6 (±1.3)	2.5 (±1.2)
≥2 antihypertensive medications	16 419 (77.8%)	10 444 (81.3%)	26 863 (79.1%)
Missing	486	386	872
GP visits	N=21 582	N=13 231	N=34 814
Mean (SD)	33.3 (±22.2)	29.8 (±20.4)	32.0 (±21.6)
Median (Q1, Q3)	29.0 (18.0–43.0)	25.0 (15.0–39.0)	27.0 (17.0–42.0)
Regularity	N=21 410	N=13 070	N=34 480
Mean (SD)	0.5 (±0.1)	0.5 (±0.1)	0.5 (±0.1)
Median (Q1, Q3)	0.5 (0.4–0.5)	0.5 (0.4–0.5)	0.5 (0.4–0.5)
Continuity of care	N=21 582	N=13 231	N=34 814
Mean (SD)	0.5 (±0.2)	0.4 (±0.2)	0.4 (±0.2)
Median (Q1, Q3)	0.4 (0.3–0.6)	0.4 (0.3–0.6)	0.4 (0.3–0.6)

Multimorbidity by body systems—conditions are grouped into body systems affected (online supplemental table 2). Vascular disease—carotid artery stenosis, coronary heart disease and atherosclerosis, peripheral vascular disease and renal artery stenosis.
CHA_2DS_2-VASc, Congestive heart failure, Hypertension, Age ≥75 years (double weight), Diabetes, previous Stroke (double weight), Vascular disease, Age 65–74 years, female Sex category score; GP, general practice; IRSAD, Index of Relative Socio-Economic Advantage and Disadvantage.

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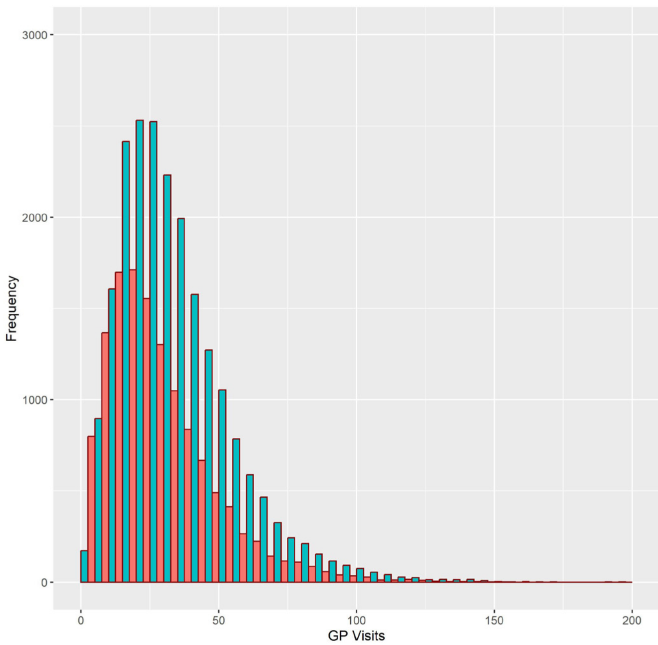

Figure 2 Frequency distribution of general practice (GP) visits grouped by blood pressure (BP) control (uncontrolled BP in red; controlled BP in blue) of patients with atrial fibrillation with hypertension; range of 0–200 shown.

We found patients who had more frequent and regular contact with their GPs, and visited the same GP practice, were more likely to be prescribed two or more BP-lowering medications, which is aligned with guideline recommendations for achieving BP control.[10] Many patients with hypertension continue to remain on single-drug treatment, despite guideline suggestions of combination therapy for BP control.[10] Achieving BP control can be a time-intensive process, requiring multiple visits to the doctor to find the optimal treatment option and obtain adequate control; monotherapy may be initiated, as well as uptitration of doses, switching drugs due to intolerance and adding other active agents if needed. Previous guideline-recommended initiation of monotherapy has been ineffective, shifting the focus on combination therapy. A combination of drugs that work via different mechanisms of action is required to reduce BP in most people with hypertension; hence, monotherapy is likely to be inadequate in most patients.[24]

Women were more likely to have uncontrolled BP in the current study, similar to data from the National Health and Nutrition Examination Survey, which showed that women with hypertension were more likely to be treated than men, but less likely to have achieved BP control.[25] Women are at significantly higher risk of stroke, and both AF and hypertension are independent risk factors for stroke; the current analysis underwrites the importance of optimal BP control in women. Gender inequities have shown to influence delivery of healthcare, especially with regard to cardiovascular health in women, including under-recognition, underdiagnosis and undertreatment.[26] Sex-related differences in clinical presentation and comorbidities can contribute to this gap in guideline-recommended care, and sex-specific strategies may be a needed solution to provide optimal care for women. The Lancet Women and Cardiovascular Disease Commission states that the management of high BP is of utmost priority for reducing the burden of cardiovascular disease in women, and a global approach to education, screening and treatment for hypertension is one of the most crucial priorities.[26]

Older patients (≥75 years) had higher rates of uncontrolled BP, a finding that is well supported by previous research in

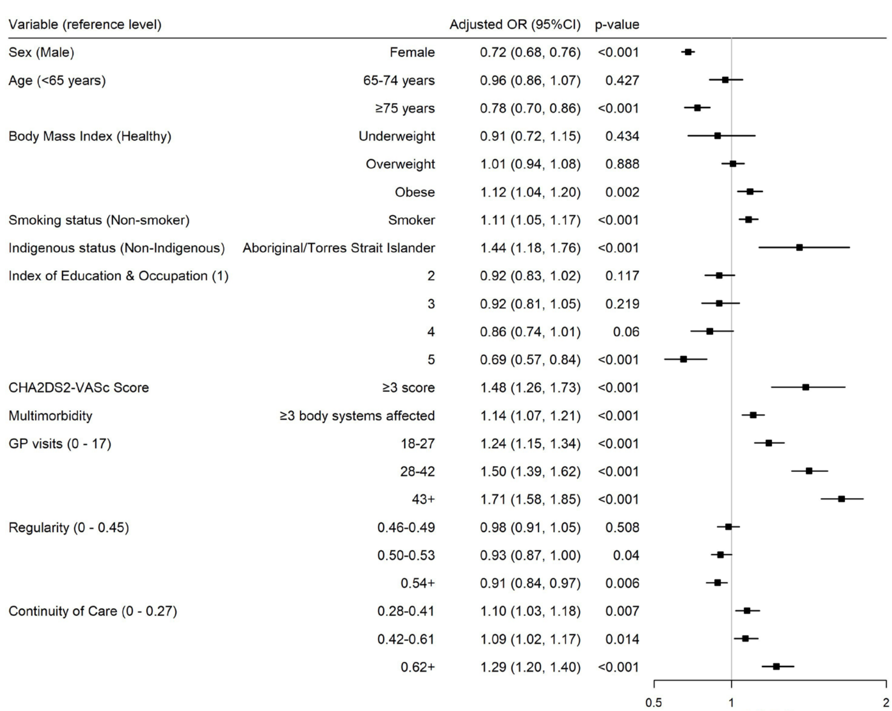

Figure 3 Factors influencing controlled blood pressure in patients with atrial fibrillation with hypertension using multivariable logistic regression model (random effects for GP clinic); significant covariates shown and reference levels in brackets (full results in online supplemental table 4). CHA_2DS_2-VASc, Congestive heart failure, Hypertension, Age ≥75 years (double weight), Diabetes, previous Stroke (double weight), Vascular disease, Age 65–74 years, female Sex category score; GP, general practice.

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Variable (reference level)		Adjusted OR (95%CI)	p-value
Blood Pressure	Systolic	1.01 (1.01, 1.02)	<0.001
	Diastolic	0.99 (0.98, 0.99)	<0.001
Body Mass Index (Healthy)	Underweight	1.04 (0.79, 1.37)	0.756
	Overweight	1.29 (1.19, 1.40)	<0.001
	Obese	1.83 (1.69, 1.99)	<0.001
CHA2DS2-VASc Score	≥3 score	1.35 (1.12, 1.62)	0.001
GP visits (0 - 17)	18-27	1.27 (1.16, 1.38)	<0.001
	28-42	1.59 (1.45, 1.74)	<0.001
	43+	1.80 (1.63, 1.98)	<0.001
Continuity of Care (0 - 0.27)	0.28-0.41	1.09 (1.00, 1.19)	0.038
	0.42-0.61	1.19 (1.10, 1.30)	<0.001
	0.62+	1.12 (1.03, 1.23)	0.011

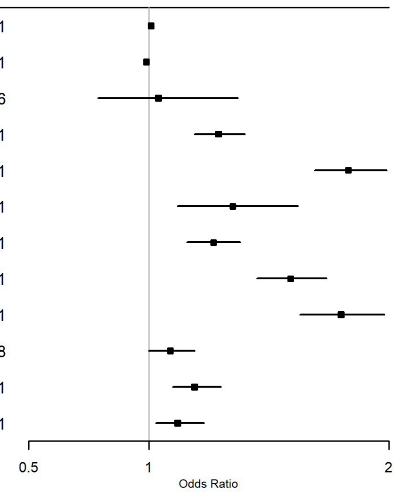

Figure 4 Factors influencing treatment with ≥2 antihypertensive medications for patients with atrial fibrillation with hypertension using multivariable logistic regression model (random effects for GP clinic); significant covariates shown and reference levels in brackets (full results in online supplemental table 5). CHA_2DS_2-VASc, Congestive heart failure, Hypertension, Age ≥75 years (double weight), Diabetes, previous Stroke (double weight), Vascular disease, Age 65–74 years, female Sex category score; GP, general practice.

primary care.[27] Uncontrolled BP rates are known to increase with age, and despite evidence for the safety and efficacy of BP lowering in older people, the risk–benefit of stroke prevention and the adverse effect of falls are still major concerns for GPs,[28] along with poor adherence due to remembering multiple medications and comorbidities.[29] Age-related risk of poor BP control suggests a greater need to address inequities and requires greater attention to these higher-risk and more vulnerable populations.

This study has various strengths and limitations that need to be considered. Previous literature has focused primarily on the risk of developing incident AF in patients with pre-existing hypertension, however, has failed to explore BP control in patients with AF and known hypertension. Limitations to this cross-sectional analysis include the use of BP measurements across the past 3 years to characterise recent BP control; it is possible that some individuals had a singular measurement that may not have been indicative of their overall BP control overtime. Given how variable individual BP control is, our aim was to get the best measure of overall BP control by using the maximum number of measurements available over 3 years, rather than focus on a single time point at which control may have been achieved but not sustained, as one would do in a longitudinal analysis. We also did not look at other BP characteristics (eg, single high measurement) to define BP control due to the limitations in the dataset (eg, inability to assess the accuracy of the measurements) and cross-sectional nature of the study. We categorised all patients based on the BP target of 140/90 mm Hg, regardless of their age and comorbidities, and this may have influenced the results. However, in the case of patients with AF, there are no specific BP targets for this patient population,[30] and hence we defined the target for the purposes of analysis as control if BP <140/90 basing this on what is a common cut-off for BP control in several guidelines. We were also unable to ascertain whether patients were not on medicine because they did not tolerate them due to limitations in the dataset. Other limitations include the calculation of care level factors (encounters, regularity, CoC); these variables were based on data available from only NPS-participating GP practices and it is possible that we may have missing data from patient visits to non-NPS-participating medical practices. As CoC was calculated based on a 2-year observational period, it is possible that some patients with a lower number of visits in that period to have a CoC of 1 indicating that all their visits were to the same doctor, and this may have not been reflective of their CoC outside of the study period.

This study provides a framework for identifying patients with AF who are at high risk of uncontrolled BP, and many of the factors outlined may be amenable for improvement, especially the importance of the doctor–patient relationship and the need for a systematic approach to BP management that encourages regular visits. It also highlights the disparity in BP control in women and older adults in an Australian primary care dataset. Whether the question of additional funding is required to support primary care to allow for increased continuity and frequent monitoring is unknown, and perhaps a shift from a fee-of-service management system to community and self-monitoring interventions is required to improve BP control rates in this population.

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