

Lifestyle counseling in patients with hypertension in primary health care and its association with antihypertensive pharmacotherapy

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Abstract

The study aimed to investigate differences in hypertensive- and cardio-preventive pharmacotherapy depending on if patients with hypertension received lifestyle counseling or not, including the difference between men and women. Data from the Region Stockholm VAL database was used to identify all patients with a hypertension diagnosis and had visited a primary health care center within the past five years. Data included registered diagnoses, pharmacotherapy, and codes for lifestyle counseling. Logistic regression adjusted for age and comorbidity (diabetes, stroke, coronary heart disease, atrial fibrillation, gout, obesity, heart failure) was used, presenting results as odds ratios (OR) with 99% confidence interval (CI). The study included 130,030 patients with hypertension; 63,402 men and 66,628 women. Patients receiving recommended lifestyle counseling were more frequently treated with three or more hypertensive drugs: women OR 1.38 (1.31, 1.45) and men = 1.36 (1.30, 1.43); certain drug classes: calcium antagonists: women 1.09 (1.04, 1.14) and men 1.11 (1.06, 1.16); thiazide diuretics: women 1.26 (1.20, 1.34) and men 1.25 (1.19, 1.32); and aldosterone antagonists: women 1.25 (1.12, 1.41) and men 1.49 (1.34, 1.65). Patients receiving recommended level of lifestyle counseling with concomitant coronary heart disease, atrial fibrillation, diabetes, or stroke were more frequently treated with statins than those who did not. Further, recommended lifestyle counseling was significantly associated with anticoagulant treatment in patients with atrial fibrillation. Lifestyle counseling according to recommendations in national guidelines was significantly associated with a more thorough pharmacological treatment of hypertension, statins, and antithrombotic drugs as well as anticoagulants, in both men and women.

KEYWORDS

antihypertensive drugs, comorbidities, hypertension, hypertensive care, lifestyle counseling

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1 | INTRODUCTION

Hypertension is a significant global health problem and an independent risk factor of cardiovascular morbidity and mortality.¹ The overall global prevalence of hypertension is estimated to be around 31% in the adult population.² However, hypertension progressively increases with age, with more than 60% of people over 60 years of age having hypertension.³ Hypertension is defined as a systolic blood pressure of at least 140 mmHg and/or diastolic blood pressure values of at least 90 mmHg.⁴ There is a significant gap in the diagnosis and treatment of hypertension as many people with high blood pressure are either undiagnosed, diagnosed but without correct treatment or treated but still not controlled. Of those with a hypertension diagnosis and treatment, about half reach the target blood pressure below 140/90 mmHg.⁵ Hypertension control is important to reduce the risk of coronary heart disease, sudden cardiovascular death, as well as to prevent the development of left ventricular hypertrophy, subsequent heart failure, stroke, dementia, and renal failure.⁴

Pharmacological intervention to reduce cardiovascular risk consists of antihypertensive pharmacotherapy, and medications for high blood lipids, treatment with anticoagulants and antithrombotic drugs in those with comorbid cardiovascular conditions.⁶ Even though a positive trend has been observed regarding improved blood pressure control,⁷ the fulfillment of treatment goals with regard to hypertension is still unsatisfactory.^{8–10} In addition to the use of pharmacological treatment toward fulfillment of treatment goals for hypertension, current international guidelines recommend targeting the overall cardiovascular health profile in each individual by also including non-pharmacological interventions.¹¹ Non-pharmacological interventions include lifestyle modifications and together with pharmacological interventions constitute the base of hypertensive care and it is recommended to initiate antihypertensive treatment with two drugs.^{12,13}

Primary health care (PHC) is crucial in managing hypertension by providing medication and promoting a healthy lifestyle to reduce cardiovascular risk. In Sweden, the majority of hypertension patients receive treatment in PHC,¹⁴ with hypertension being the second most common diagnosis in PHC in Region Stockholm.¹⁵ To increase the use of health promoting actions conducted by health care, the Swedish National Board of Health and Welfare published national guidelines on prevention and lifestyle habits.¹⁶ According to the guidelines different lifestyle habits are ranked according to future risk of illness together with recommendations on action. The guidelines recommend health care professionals to promote a healthy lifestyle through three levels of action: brief advice, counseling, and advanced counseling. The two latter forms of lifestyle counseling are considered person-centered. Further, the guidelines also include a priority of the actions, recommending that health care professionals should offer counseling to those patients with hypertension who have a risk use of alcohol or insufficient physical activity, and advanced counseling to those who are daily smokers, or struggling with unhealthy eating habits.¹⁶ However, little is known about the extent patients with hypertension receive treatment according to recommended guidelines, especially

with regard to non-pharmacological interventions such as lifestyle counseling, and if counseling is associated with better pharmacological treatment of hypertension and cardiometabolic risk.

The aim of this study was to investigate if there are differences in hypertensive care and cardio-preventive pharmacotherapy depending on if patients with a hypertension diagnosis received lifestyle counseling or not, including sex differences.

2 | METHODS

This was a cross-sectional study of all individuals with a registered diagnosis of hypertension in PHC in Region Stockholm, Sweden.

2.1 | Health care in Sweden

Sweden has universal health coverage, and all necessary health care is publicly funded by regional- and municipal-level taxes and grants provided by the central government. The regions set co-payment rates and provider fees at all levels of care, such as PHC visits and hospitalizations. Services are provided by the region, either at public facilities or by private providers, under a contractual agreement with the region. Residents in Region Stockholm can choose to register with a fixed primary health care center (PHCC). As most residents in the region are registered with a PHCC, it enabled us to compare individual-level data on hypertensive care at different PHCCs.

Stockholm has 2.4 million residents, including Stockholm city and surrounding suburban and rural areas, constituting about 24% of the total population of Sweden. This study included all residents 30 years or older on February 29, 2020, with a registered hypertension diagnosis at the PHCC, where they were registered and had a visit during the last five years. Out of the total 2.4 million residents, 1.5 million were 30 years or older. Of these, 15% were excluded as the hypertension diagnosis was registered at another PHCC than they were registered with, 9% were excluded as they were not registered with a PHCC, and 13% were excluded as they did not visit their PHCC during the study period. Of all the remaining residents 30 years or older, 9% ($n = 136\ 609$) had a registered diagnosis of hypertension at a PHCC they were registered within Region Stockholm between 2016-03-01 and 2020-02-29. Of these, 6,579 were excluded as they did not have a visit to their PHCC in the last 18 months.

2.2 | Diagnosis, pharmacotherapy and lifestyle counseling

Hypertension and cardiometabolic diseases, that is, diabetes, stroke, coronary heart disease (CHD), atrial fibrillation (AF), gout, obesity and heart failure, were defined as having one or more of such registered diagnoses in a PHCC in the past 5 years, with diagnosis retrieved according to ICD-10. For detailed definitions of the studied diagnoses, please see Supplementary Table 1. Pharmacotherapy was defined as

having collected prescriptions for the same medicine at least twice in the past 18 months. For detailed information about pharmacotherapy, please see Supplementary Table 2.

Registered lifestyle counseling was obtained from the VAL database and included coding for any form of counseling which is registered by healthcare providers in the medical record. To increase the use of health-promoting actions conducted by health care, the Swedish National Board of Health and Welfare published national guidelines on prevention and lifestyle habits.¹⁶ The guidelines include a priority of the actions, recommending that health care professionals should offer counseling to those patients with hypertension who have a risk use of alcohol or insufficient physical activity, and advanced counseling to those who are daily smokers, or struggling with unhealthy eating habits. We summarized the prioritized level of counseling on lifestyle according to the national guidelines on prevention and lifestyle habits, that is, counseling to those patients with hypertension who have a risk use of alcohol or insufficient physical activity, and advanced counseling to those who are daily smokers, or struggling with unhealthy eating habits.¹⁶ For measures of care, please see Supplementary Table 1.

2.3 | VAL databases

The data was collected from the VAL databases, which are used by Region Stockholm for follow-up, planning, quality assessment, practice remuneration of health care, and administrative healthcare purposes. The VAL database is also used for research purposes after ethical approval. The VAL database contains detailed information on all registered visits within the healthcare provided by the region. In this case, longitudinal data on all individuals with a registered diagnosis of hypertension in a PHCC in Region Stockholm and all visits to PHCCs were obtained from the VAL databases. The data collected included information about the patient (age, sex, caregiver, diagnoses, etc.), the PHCC, actions made by the healthcare provider, such as lifestyle counseling. Information in the VAL database retrieved from the National Prescribed Drug Register about collected prescribed medication was also obtained.¹⁷

2.4 | Analyses

Data from VAL was reported as frequencies in relation to registered diagnosis, pharmacotherapy and lifestyle counseling. Age-adjusted logistic regression models, with 99% confidence intervals, were used to analyze differences in hypertensive and cardio-preventive pharmacotherapy depending on if patients with a hypertension diagnosis received recommended level of lifestyle counseling or any lifestyle counseling, in women and men. Certain models, indicated in tables were also adjusted for comorbidity (including diabetes, stroke, CHD, AF, gout, obesity and heart failure). Statistical significance was defined as a *p*-value lower than 0,01. All analyses and data management were conducted using R Statistical Software (v. 4.2.0; R Core Team 2022).¹⁸

2.5 | Ethics

To conduct this study, ethical approval was granted by the Swedish Ethical Review Authority under act number 2020-07076. The Stockholm Region provided a dataset containing relevant data from several public databases for the study after obtaining approval from the Regional Center for Health Data.

3 | RESULTS

In total, 130,030 patients with a registered hypertension diagnosis at a PHCC which they had visited during the last 5 years were included. Of those, 63,402 were men and 66,628 were women. Characteristics of included patients can be seen in Table 1. Of the total sample, 68% had no registered lifestyle counseling, 29% had registered lifestyle counseling according to recommended level, and 3% had registered counseling not aligned with recommendations. In summary, 25% of the patients had diabetes, 11% had CHD, 12% had AF, 9% had obesity, and 7% had heart failure. The most frequent comorbidities among those who received the recommended lifestyle counseling were diabetes (54,2%), obesity (14,4%), CHD (13,6%), and AF (12,4%).

Most patients were on hypertensive medical treatment irrespective of receiving lifestyle counseling or not. However, those who received the recommended level of lifestyle counseling were less frequently treated with two antihypertensive drugs and more frequently treated with three antihypertensive drugs. A higher frequency of statin dispensation was seen in patients with concomitant CHD, AF, diabetes, or stroke among those who received recommended level of lifestyle counseling.

Logistic regression models with OR are presented, for woman in Table 2 and for men in Table 3. Receiving the recommended level of lifestyle counseling was significantly associated with being more frequently treated with three or more hypertensive drugs, as well as with certain drug classes: calcium antagonists, thiazide diuretics and aldosterone antagonists in both women and men.

Receiving the recommended level of lifestyle counseling was significantly associated with being more frequently treated with statins in patients with concomitant CHD, AF, diabetes, or stroke and patients without concomitant CHD, AF, diabetes, stroke for both men and women, in models adjusted for age and comorbidity. Further, receiving the recommended level of lifestyle advice was significantly associated with anticoagulants in patients with AF in both men and women.

When adjusting for both age and comorbidities a weaker association was seen in relation to frequency of being treated with three or more antihypertensive drugs and thiazide diuretics in both men and women.

4 | DISCUSSION

Our main findings were that patients receiving recommended level of lifestyle counseling were associated with a more thorough pharmacological treatment of hypertension, as well as with statins, antithrombotic drugs, and anticoagulants when indicated.

TABLE 1 Characteristics of men and women with a hypertension diagnosis in Stockholm Region divided into those with recommended level of counseling, no registered counseling, and any registered counseling.

	Men			Women			Total		
	Recommended counseling (N = 19433)	No counseling (N = 42391)	Other counseling (N = 1578)	Recommended counseling (N = 17644)	No counseling (N = 46106)	Other counseling (N = 2878)	Recommended counseling (N = 37077)	No counseling (N = 88497)	Other counseling (N = 4456)
Hypertension									
Age									
Mean (SD)	67.5 (11.4)	67.1 (12.8)	67.8 (12.7)	69.7 (11.5)	70.3 (13.0)	68.9 (12.7)	68.6 (11.5)	68.8 (13.0)	68.5 (12.7)
Median [Min, Max]	69.0 [30.0, 98.0]	68.0 [29.0, 103]	69.0 [31.0, 96.0]	71.0 [30.0, 103]	72.0 [31.0, 109]	70.5 [31.0, 101]	70.0 [30.0, 103]	70.0 [29.0, 109]	70.0 [31.0, 101]
Diabetes	11763 (60.5%)	6284 (14.8%)	329 (20.8%)	8351 (47.3%)	4941 (10.7%)	309 (10.7%)	20114 (54.2%)	11225 (12.7%)	638 (14.3%)
Stroke	752 (3.87%)	1505 (3.55%)	97 (6.15%)	475 (2.69%)	1288 (2.79%)	108 (3.75%)	1227 (3.31%)	2793 (3.16%)	205 (4.60%)
Coronary heart disease, CHD	3387 (17.4%)	5800 (13.7%)	301 (19.1%)	1658 (9.40%)	3483 (7.55%)	239 (8.30%)	5045 (13.6%)	9283 (10.5%)	540 (12.1%)
Atrial fibrillation	2858 (14.7%)	5917 (14.0%)	276 (17.5%)	1847 (10.5%)	4823 (10.5%)	306 (10.6%)	4705 (12.7%)	10740 (12.1%)	582 (13.1%)
Gout	1427 (7.34%)	2721 (6.42%)	125 (7.92%)	548 (3.11%)	1067 (2.31%)	78 (2.71%)	1975 (5.33%)	3788 (4.28%)	203 (4.56%)
Obesity	2639 (13.6%)	2627 (6.20%)	185 (11.7%)	2683 (15.2%)	3159 (6.85%)	346 (12.0%)	5322 (14.4%)	5786 (6.54%)	531 (11.9%)
Heart failure	1762 (9.07%)	3149 (7.43%)	184 (11.7%)	1171 (6.64%)	3110 (6.75%)	194 (6.74%)	2933 (7.91%)	6259 (7.07%)	378 (8.48%)
Antihypertensive therapy	18221 (96.7%)	37578 (96.9%)	1439 (97.1%)	16395 (96.4%)	40753 (96.3%)	2609 (96.6%)	34616 (96.6%)	78331 (96.6%)	4048 (96.8%)
One antihypertensive drug	614 (3.26%)	1215 (3.13%)	43 (2.90%)	605 (3.56%)	1580 (3.73%)	91 (3.37%)	1219 (3.40%)	2795 (3.45%)	134 (3.20%)
Two antihypertensive drugs	5409 (28.7%)	13891 (35.8%)	485 (32.7%)	5665 (33.3%)	17044 (40.3%)	1107 (41.0%)	11074 (30.9%)	30935 (38.1%)	1592 (38.1%)
Three or more antihypertensive drugs	12812 (68.0%)	23687 (61.1%)	954 (64.4%)	10730 (63.1%)	23709 (56.0%)	1502 (55.6%)	23542 (65.7%)	47396 (58.4%)	2456 (58.7%)
Thiazide diuretics	4687 (24.9%)	8103 (20.9%)	316 (21.3%)	4141 (24.4%)	8622 (20.4%)	547 (20.3%)	8828 (24.6%)	16725 (20.6%)	863 (20.6%)
Calcium antagonists	9215 (48.9%)	17988 (46.4%)	668 (45.1%)	7237 (42.6%)	17218 (40.7%)	1122 (41.6%)	16452 (45.9%)	35206 (43.4%)	1790 (42.8%)
Angiotensin receptor blockers	8014 (42.5%)	15898 (41.0%)	657 (44.3%)	8006 (47.1%)	18464 (43.6%)	1234 (45.7%)	16020 (44.7%)	34362 (42.4%)	1891 (45.2%)
ACE inhibitors	8266 (43.9%)	15355 (39.6%)	567 (38.3%)	5584 (32.8%)	12672 (29.9%)	777 (28.8%)	13850 (38.6%)	28027 (34.5%)	1344 (32.1%)
Beta blockers	8290 (44.0%)	15028 (38.7%)	648 (43.7%)	7404 (43.6%)	17096 (40.4%)	1061 (39.3%)	15694 (43.8%)	32124 (39.6%)	1709 (40.9%)
Aldosterone antagonists	1099 (5.83%)	1555 (4.01%)	101 (6.82%)	781 (4.59%)	1622 (3.83%)	111 (4.11%)	1880 (5.25%)	3177 (3.92%)	212 (5.07%)
Aspirin in patients with CHD	2559 (75.6%)	4235 (73.0%)	224 (74.4%)	1189 (71.7%)	2239 (64.3%)	161 (67.4%)	3748 (74.3%)	6474 (69.7%)	385 (71.3%)
Statin in patients with CHD AF diabetes or stroke	9340 (67.8%)	9425 (61.4%)	475 (65.2%)	6082 (61.1%)	6044 (50.9%)	463 (58.0%)	15422 (65.0%)	15469 (56.8%)	938 (61.5%)
Statin in patients without CHD AF diabetes or stroke	1611 (28.5%)	6967 (25.8%)	220 (25.9%)	2036 (26.5%)	8242 (24.1%)	506 (24.3%)	3647 (27.3%)	15209 (24.8%)	726 (24.8%)
Anticoagulants in patients with AF	2337 (81.8%)	4604 (77.8%)	218 (79.0%)	1587 (85.9%)	3843 (79.7%)	252 (82.4%)	3924 (83.4%)	8447 (78.6%)	470 (80.8%)
Anticoagulants aspirin in patients with stroke	685 (91.1%)	1301 (86.4%)	88 (90.7%)	422 (88.8%)	1110 (86.2%)	98 (90.7%)	1107 (90.2%)	2411 (86.3%)	186 (90.7%)

TABLE 2 Logistic regression models in women for recommended level of lifestyle counseling versus no lifestyle counseling with adjustments for age and cardiometabolic diseases.

Variable	Recommended level of lifestyle counseling OR (99% CI)			Any lifestyle counseling except recommended level OR (99% CI)		
	Age-adjusted models	p-value	Age and comorbidity-adjusted models	Age-adjusted models	p-value	Age and comorbidity-adjusted models
Antihypertensive therapy	1.04 (0.92, 1.18)	.5	1.20 (1.04, 1.38)	1.08 (0.82, 1.45)	.5	1.08 (0.82, 1.45)
One antihypertensive drug	0.96 (0.85, 1.09)	.5	0.83 (0.72, 0.96)	0.93 (0.69, 1.22)	.5	0.93 (0.69, 1.22)
Two antihypertensive drugs	0.72 (0.69, 0.76)	<.001	0.88 (0.84, 0.93)	1.00 (0.90, 1.11)	.9	1.03 (0.93, 1.15)
Three or more antihypertensive drugs	1.38 (1.31, 1.45)	<.001	1.16 (1.10, 1.22)	1.01 (0.91, 1.12)	.7	0.98 (0.88, 1.09)
Thiazide diuretics	1.26 (1.20, 1.34)	<.001	1.12 (1.05, 1.19)	1.00 (0.88, 1.13)	.9	0.99 (0.87, 1.12)
Calcium antagonists	1.09 (1.04, 1.14)	<.001	1.02 (0.97, 1.08)	1.05 (0.94, 1.16)	.2	1.05 (0.95, 1.17)
Angiotensin receptor blockers	1.15 (1.10, 1.21)	<.001	1.14 (1.08, 1.20)	1.09 (0.98, 1.20)	.036	1.08 (0.98, 1.20)
ACE inhibitors	1.13 (1.08, 1.19)	<.001	1.01 (0.95, 1.06)	0.93 (0.83, 1.04)	.10	0.92 (0.82, 1.03)
Beta blockers	1.18 (1.12, 1.24)	<.001	1.01 (0.95, 1.07)	1.00 (0.90, 1.11)	.9	0.95 (0.85, 1.06)
Aldosterone antagonists	1.25 (1.12, 1.41)	<.001	1.14 (1.00, 1.31)	1.14 (0.87, 1.46)	.2	1.06 (0.80, 1.38)
Aspirin in patients with CHD	1.32 (1.12, 1.57)	<.001	1.26 (1.02, 1.57)	1.12 (0.78, 1.64)	.4	1.13 (0.74, 1.74)
Statin in patients with CHD, AF or diabetes	1.46 (1.36, 1.57)	<.001	1.34 (1.25, 1.43)	1.31 (1.08, 1.59)	<.001	1.31 (1.08, 1.59)
Statin in those without CHD, AF or diabetes	1.15 (1.07, 1.24)	<.001	1.15 (1.07, 1.24)	1.07 (0.93, 1.22)	.2	1.31 (1.08, 1.60)
Anticoagulants in those with AF	1.59 (1.31, 1.94)	<.001	1.61 (1.31, 2.00)	1.22 (0.83, 1.84)	.2	1.21 (0.83, 1.84)
Anticoagulants or aspirin in those with stroke	1.35 (0.89, 2.12)	.071	1.23 (0.78, 1.98)	1.61 (0.72, 4.36)	.2	1.60 (0.71, 4.33)

Note: Cardiometabolic diseases were defined as diabetes, stroke, coronary heart disease, atrial fibrillation, gout, obesity and heart failure.

TABLE 3 Logistic regression models in men for recommended level of lifestyle counseling versus no lifestyle counseling with adjustments for age and cardiometabolic diseases.

Variable	Recommended level of lifestyle counseling OR (99% CI)			Any lifestyle counseling except recommended level OR (99% CI)			
	Age-adjusted models	p-value	Age and comorbidity-adjusted models	Age-adjusted models	p-value	Age and comorbidity-adjusted models	
Antihypertensive therapy	0.96 (0.84, 1.09)	.4	1.30 (1.12, 1.51)	1.10 (0.75, 1.70)	0.5	1.14 (0.78, 1.76)	.4
One antihypertensive drug	1.04 (0.91, 1.19)	.4	0.77 (0.66, 0.89)	0.91 (0.59, 1.33)	0.5	0.88 (0.57, 1.29)	.4
Two antihypertensive drugs	0.72 (0.68, 0.76)	<.001	0.91 (0.85, 0.96)	0.88 (0.76, 1.02)	0.024	0.98 (0.85, 1.14)	.8
Three or more antihypertensive drugs	1.36 (1.30, 1.43)	<.001	1.14 (1.08, 1.21)	1.14 (0.99, 1.32)	0.015	1.03 (0.89, 1.20)	.5
Thiazide diuretics	1.25 (1.19, 1.32)	<.001	1.09 (1.03, 1.16)	1.03 (0.87, 1.21)	0.7	1.04 (0.88, 1.23)	.5
Calcium antagonists	1.11 (1.06, 1.16)	<.001	1.06 (1.00, 1.11)	0.95 (0.83, 1.09)	0.4	0.97 (0.84, 1.11)	.5
Angiotensin receptor blockers	1.07 (1.02, 1.12)	<.001	1.10 (1.04, 1.16)	1.15 (1.00, 1.32)	0.009	1.16 (1.01, 1.34)	.005
ACE inhibitors	1.19 (1.14, 1.25)	<.001	1.07 (1.01, 1.13)	0.95 (0.83, 1.09)	0.3	0.92 (0.80, 1.06)	.11
Beta blockers	1.25 (1.20, 1.32)	<.001	0.97 (0.91, 1.03)	1.22 (1.06, 1.40)	<.001	1.00 (0.86, 1.17)	.9
Aldosterone antagonists	1.49 (1.34, 1.65)	<.001	1.13 (0.99, 1.29)	1.73 (1.30, 2.26)	<.001	1.33 (0.98, 1.79)	.014
Aspirin in patients with CHD	1.09 (0.95, 1.24)	.10	1.35 (1.13, 1.62)	1.03 (0.73, 1.47)	0.9	1.21 (0.80, 1.87)	.3
Statin in patients with CHD, AF or diabetes	1.35 (1.26, 1.43)	<.001	1.34 (1.25, 1.43)	1.18 (0.96, 1.45)	0.038	1.20 (0.98, 1.47)	.024
Statin in those without CHD, AF or diabetes	1.16 (1.06, 1.26)	<.001	1.14 (1.05, 1.25)	1.00 (0.81, 1.22)	0.9	0.98 (0.79, 1.20)	.8
Anticoagulants in those with AF	1.33 (1.15, 1.55)	<.001	1.33 (1.12, 1.57)	1.07 (0.73, 1.61)	0.7	1.07 (0.73, 1.61)	.6
Anticoagulants or aspirin in those with stroke	1.62 (1.11, 2.40)	.001	1.54 (1.02, 2.36)	1.54 (0.67, 4.39)	0.2	1.56 (0.67, 4.47)	.2

Note: Cardiometabolic diseases were defined as diabetes, stroke, coronary heart disease, atrial fibrillation, gout, obesity and heart failure.

With few previous studies on lifestyle counseling and its association with pharmacotherapy, our findings add knowledge of the association between receiving the recommended level of lifestyle advice and a more thorough pharmacological treatment of hypertension. Lifestyle counseling, combined with education and management strategies, has shown promising effects concerning hypertension control¹⁹ and is recommended in current international guidelines to target the overall cardiovascular health profile.¹¹ However, there is a need to improve its implementation globally. The Selective Prevention of Cardiometabolic Diseases Across Europe project (SPIMEU) proposed an evidence-based toolbox with twelve recommendations to support the implementation of preventive initiatives, for example: the involvement of central stakeholders (e.g., policymakers and healthcare professionals) in the design of preventive initiatives, accommodate health professionals' existing workload and time constraints, and increase patient knowledge.²⁰ The implementation of these recommendations does however pose a challenge to primary care with the existing workload. Health checks and screenings have been suggested as an opportunity to implement lifestyle counseling. However, many individuals of lower socioeconomic status and men at high risk for cardiovascular disease have difficulty reaching screening invitations and lifestyle advice.²¹ Primary care has a pivotal role here to work opportunistically when these individuals seek care.²²

The findings showed that statins were used more often and may be of importance to more groups with high risk than is currently recommended, for example, statins have been associated with reduced mortality in patients with AF and concurrent hypertension.²³

One potential explanation to the findings of the present study could be that using lifestyle counseling helps target the overall cardiovascular health profile in each individual by including both pharmacological and non-pharmacological interventions, as recommended in international guidelines.¹¹ The complex treatment and follow-up of pharmacotherapy and lifestyle, as well as control of cardiometabolic risk factors, is often conducted by both registered nurses and physicians in PHC, which might increase the possibility to target the overall cardiovascular health profile in patients with hypertension. Previous studies have shown that task sharing involving healthcare workers other than physicians in the management of hypertension can improve treatment adherence.²⁴ Moreover, team care and organization have been shown to influence blood pressure control,²⁵ and that a larger focus on nurse-based care could improve hypertension care.^{26,27} Despite this, most patients with hypertension are still managed by physicians only.²⁸ The findings of the present study indicate that a greater focus on lifestyle counseling, which might be facilitated by a collaborative care model, involving both physicians, registered nurses and other healthcare professionals, may lead to more thorough overall care and contribute to a more robust hypertensive pharmacotherapy.¹⁹

The inherent complexity in the combination of treatment and follow-up of pharmacotherapy, control of cardiometabolic risk factors as well as lifestyle counseling calls for interprofessional approaches.²⁹ There is a growing body of evidence suggesting that a multidisciplinary approach is needed to meet the complexity involved in targeting the

different factors needed to improve the fulfillment of treatment goals in hypertensive care.³⁰ Previous studies have shown the connection between lifestyle advice and medication adherence and that the connection between physicians' attitudes and knowledge affects whether hypertension management is delivered according to recommended guidelines.³¹

As this is an observational study, we cannot comment on causality. Although, there may be some potential mechanisms explaining our findings. First, when lifestyle counseling is given according to guidelines, it is likely that other guidelines are followed at the same time, yielding more patients with more antihypertensive drugs as well as other preventive pharmacotherapies. Second, it is possible that registered nurses, when giving lifestyle counseling have more time for the patients than physicians do and that they have routines that assist in the prescribing of recommended drugs.³² Third, it is likely that the patients are more understanding and willing to use pharmacotherapy after having had lifestyle counseling. It could also be that therapy-resistant patients in the present study, to a larger degree were given lifestyle counseling, explaining why a higher number of antihypertensive drugs were collected by patients receiving recommended lifestyle counseling. Furthermore, providing lifestyle counseling and giving effective antihypertensive medication may go together. Another explanation could be that patients who are health-aware and interested in their therapy have more treatment and receive more lifestyle counseling.

4.1 | Clinical implications

The main implication is that recommended levels of lifestyle counseling could be promoted to target the overall cardiovascular health profile and further improve the care of patients with hypertension. As lifestyle counseling is recorded mainly by registered nurses, it is also of importance to involve registered nurses in the care of patients with hypertension, and to strive for collaborative care in PHC.

4.2 | Strengths and limitations

A major strength of the present study was the use of the VAL-data base, which enabled full coverage and access to the collected pharmaceutical drugs, diagnostic codes, and comorbidities, as well as information on registered codes for lifestyle counseling on all patients with hypertension registered with a specific PHCC in a large area such as Stockholm. Coding for lifestyle counseling was reimbursed to the PHCC, which may have increased the reporting. However, as advice on lifestyle needs to be registered in the patients' medical records by the healthcare professional giving the advice, there is a risk that the advice given was not coded in the records. Hence, the exact numbers of given lifestyle counseling might not have been captured through the recorded codes. Further, the data only contains the coding of data and not detailed information about the frequency, time, or length of the counseling. However, the content of the different forms of counseling

are defined in the national guidelines.¹⁶ To stimulate the use of recommended level of lifestyle counseling, PHCC have been reimbursed when these codes are registered. It is possible that this has affected the reported codes.

An important limitation was that we had no access to blood pressure levels and could not make any claims regarding blood pressure control beyond the collection of antihypertensive drugs. However, it is well known that the chance of reaching a target blood pressure is higher with combinational therapy. Further, chronic kidney disease is underreported in Sweden and has not been subject to special interventions and targeted lifestyle counseling to a high extent and was not analyzed in the present study. We warrant studies comparing those with chronic kidney disease to those without chronic kidney disease regarding lifestyle counseling and pharmacotherapy. We did not have access to patients without hypertension, and we believe that it would be interesting to study what the benefits there are with lifestyle counseling in other patient groups, such as those with diabetes or obesity. It would also be of interest to study if lifestyle counseling can be protective against adverse cardiovascular events such as stroke, myocardial infarction, and heart failure. In addition, we did not adjust for socioeconomic status, which should be considered when interpreting the results.

5 | CONCLUSIONS

Lifestyle counseling according to recommendations in national guidelines was significantly associated with a more thorough pharmacological treatment of hypertension, as well as with statins and antithrombotic drugs as well as anticoagulants when indicated. The findings indicate that the use of non-pharmacological interventions, such as lifestyle counseling and multi-professional teams, can contribute to targeting the overall cardiovascular health profile in individuals with hypertension. We warrant studies with clinical variables such as blood pressure, family history and body mass index to assess their effects on lifestyle counseling and pharmacotherapy. Further studies are needed to confirm the findings of the present study as well as to further investigate the associations between registered lifestyle counseling and cardiovascular outcomes such as stroke, myocardial infarction, and heart failure.

AUTHOR CONTRIBUTION

Sebastian Lindblom (S.L), Charlotte Ivarsson (C.I), Per Wändell (P.W), Monica Bergqvist (M.B), Anders Norrman (A.N), Julia Eriksson (J.E), Lena Lunda (L.L), Maria Hagströmer (M.H), Jan Hasselström (J.H), Christina Sandlund (C.S) and Axel C Carlsson (A.C.C). S.L, C.I, P.W, M.B, A.N, J.E, L.L, M.H, J.H, C.S and A.C.C. contributed to the conceptualization, methodology and design of the study. A.C.C and J.E performed data curation and formal analysis. S.L and A.C.C contributed to the visualization and writing of the original draft. All authors, S.L, C.I, P.W, M.B, A.N, J.E, L.L, M.H, J.H, C.S and A.C.C., contributed to the writing, reviewing and editing of the manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Interested parties can contact the corresponding author for potential collaborations. Furthermore, research data from the VAL database can be obtained after ethical approval by contacting the regional Center for Health Data, email: halsodata.rst@regionstockholm.se

PATIENT CONSENT STATEMENT

The Stockholm Region provided a dataset containing relevant data from several public databases for the study after obtaining approval from the Regional Centre for Health Data.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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