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Contacts to general practitioners and renewal of antihypertensive medication - a four-year follow-up in primary health care, Turku, Finland

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Abstract

Background Persistence with medication is central to the effectiveness of antihypertensive therapy. Electronic communication between patients and doctors may have potential to improve medication persistence among patients with hypertension. Our objective was to examine the use of antihypertensive medication in subjects with hypertension in primary health care in Finland in a longitudinal setting.

Methods From the primary health care register of the city of Turku in Southwestern Finland, subjects with the diagnosis of hypertension were identified. Data of number and type of antihypertensive medication was gathered in a 4-year follow-up.

Results Sixty-one percent of the subjects with hypertension had 1-4 antihypertensive medications in regular use. Ten percent did not use antihypertensive medication at all. Higher age, higher number of GP (general practitioner) visits, telephone contacts and electronic communication and presence of diabetes were associated with regular use of antihypertensive medication.
The most common antihypertensive medication group in regular use was ACE inhibitor/ARB-blocker (41%), followed by beta blockers (18%), diuretics (16%) and calcium channel blockers (15%).

Conclusions Regular use of antihypertensive therapy was associated with the use of frequent GP contacts during the 4-year follow-up.

Keywords Antihypertensive medication, Follow-up, Combination therapy, Changes in antihypertensive medication, Adherence to antihypertensive therapy

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Background

The number of adult people with hypertension has doubled worldwide from 1990 to 2019 [1]. The global age-standardized prevalence of hypertension was estimated to be 31% in 2010, increasing by 5% between 2000 and 2010 [2]. In Finland, the prevalence of hypertension is 43% among adult population according to the Finnish national health examination survey in 2017 [3].

Hypertension is one of the most paramount modifiable risk factors for cardiovascular diseases [4]. According to the current European Society of Hypertension guideline for management of arterial hypertension most patients with hypertension should be treated with a combination of both lifestyle and pharmacological intervention [5].

Antihypertensive medication is a corner stone in treatment of individuals with hypertension. Dual pharmacological combination therapy should be started in most patients. The majority of subjects with high blood pressure need two or more antihypertensive drugs to achieve normotension [5]. However, suboptimal and complex antihypertensive medication in hypertensive patients may predispose to reduced adherence to antihypertensive therapy [6, 7].

A recent meta-analysis of studies on adherence involving 27 million patients with hypertension suggested that the global prevalence of anti-hypertensive medication non-adherence is 27% to 40%, and non-adherence is associated with poor control of blood pressure, hypertensive complications, hospitalizations, and even all-cause mortality [8].

Several factors have been associated with poor compliance of antihypertensive medication.

Besides treatment-related factors, adherence to drug therapy is associated with patient-related factors (age, gender, symptoms, beliefs, socioeconomic status), conditions-related factors (comorbidities, type and severity of the disease, disabilities), system-related factors (access to care, drug reimbursement), and physician-related factors (communication skills, knowledge of the issue) [9].

In Finland, the majority of the patients with hypertension receive their care through public health care centres [10]. Thus, GPs usually have good knowledge about hypertension-related issues. But besides knowledge, the quality of the relationship between the patient and clinician, particularly communication skills, and patients´ perceptions of patient-centeredness have been shown to be associated with adherence to antihypertensive medication [10–17].

In recent years, access to primary care has been enhanced by electronic communication allowing text messaging or web-based messaging between patients and general practitioners (GPs). It is currently not known if telephone contacts and usage of electrical communication methods have an impact on persistence with medication among patients with hypertension. In this follow-up study we examined the use of antihypertensive medication in patients with hypertension treated in primary health care. We tried to estimate how common regular and non-use of antihypertensive medication is and tried to identify factors associated with them including contacts with GPs.

Methods

In our study we used the Wellbeing Services County of Southwest Finland, Turku primary health care register. There are approximately 200 000 inhabitants in Turku city. We had access to all of the six primary health care centres in Turku city which uses the same joint primary care electronic health record (EHR) registry. We extracted data from subjects with hypertension in primary care in Turku city only. Data of subjects who were diagnosed with hypertension (ICD-code: I10) and had at least any contact to primary health care (GP visit, telephone contact or electronic communication) or renewed at least one prescription (any prescription) during the follow-up years of 2019 to 2022 were included in the study.

The type of antihypertensive medication was assessed using Anatomical Therapeutic Chemical (ATC) -codes level data from the Turku primary health care register of six health centres. The type of antihypertensive medication was classified into four categories which were ACE/ARB blockers, beta blockers, diuretics and Ca-channel blockers. Antihypertensive medication including drug from more than one category, was classified into all of the above-mentioned categories. We have clarified this in more detail in the Methods section of the manuscript.

Regular use of antihypertensive medication was defined as follows: the prescription has been renewed during the follow-up period appropriately (every or every second year). In Finland, prescriptions can be made for the maximum of two years. This practice has been in use since 1.1.2017. Irregular use of antihypertensive medication means that the prescription has been made, but it has not been renewed every or every second year. Non-use of antihypertensive medication was defined that the prescription has not been made during any of the follow-up years.

In 2019 there were 22 260, in 2020; 20 960, 2021; 22 992; and in 2022; 23 427 subjects who had at least one contact to primary health care. In total, there were 29 804 study subjects during the follow-up time who had a contact to primary health care.

Registered telephone consultations were calls from a GP to a patient. Electronic communication included one-way text messages from a GP to a patient (a patient could not answer to the text message) and web-based messaging (Secured two-way text-based messaging integrated to electronic health record. Attaching files is not currently

possible). Using web-based services/messaging requires a strong authentication from the patients' side.

Alluvial plot showing categorical data flows in six different antihypertensive medication groups and changes across different groups in four time points (2019, 2020, 2021 and 2022) is presented in Fig. 3. In Fig. 3, regular use of antihypertensive medication (1–4 antihypertensive medications) means that the prescription has been renewed during the follow-up period appropriatelly (every or every second year). Non-use of antihypertensive medication (No medication) was defined that the prescription has not been made during any of the follow-up years.

Statistical analysis

Database management and statistical analysis were performed with SAS 9.4 (SAS Institute, Cary, North Carolina, USA). P-values less than 0.05 were considered statistically significant.

Chi-squared test was used to compare differences across multiple categorical variables during the follow-up years. Linear regression models were used to compare the differences between continuous variables during the follow-up years [18]. As we categorized the use of antihypertensive medication into two groups, we used general linear model (GLM) to analyze the factors associated with regular and non-use of antihypertensive medication (Table 2) [18]. The covariants included were sex, age, number of GP visits, number of telephone contacts, number of electronic communication, presence of diabetes (yes/no), presence of coronary artery disease (yes/no), and presence of atrial fibrillation (yes/no). Yes = 1, No = 0.

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Results

In the primary health care centres of the city of Turku there were 1184 (year 2019), 1123 (year 2020), 1052 (year 2021) and 992 (year 2022) outpatient medical visits to GPs per 1000 inhabitants.

Hypertension was the main cause of the GP visit in 6.8% (year 2019), 7.1% (year 2020), 6.9% (year 2021) and 7.4% (year 2022) of all outpatient medical visits.

Characteristics of the study population are presented in Table 1.

Sixty-one percent ($n = 18166$) of the subjects with hypertension ($n = 29804$) had 1–4 antihypertensive medications in regular use (Fig. 1).

Thirty-one percent ($n = 9238$) used antihypertensive medication regularly, but the number of antihypertensive medications varied between 1 and 4 throughout the follow-up period.

Table 1 Population characteristics

Variable	2019	2020	2021	2022	p
Hypertensive patients (n)*	22260	20960	22992	22427	-
Men (%)	42 %	42 %	43 %	42 %	0.6
Mean age (years) (SD)	74 (11)	73 (11)	73 (12)	73 (12)	<0.001
Diabetes (%)	36 %	36 %	35 %	35 %	<0.001
Coronary artery disease (%)	17 %	16 %	15 %	15 %	<0.001
Atrial fibrillation (%)	19 %	18 %	17 %	17 %	<0.001
*Patients with hypertension diagnostic code (ICD-10: I10) and at least one prescription of any drug during the calender year					

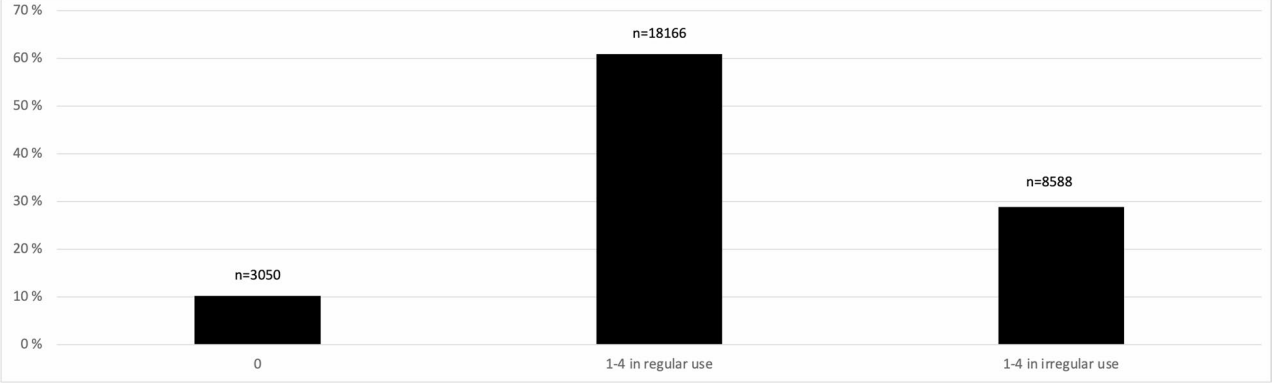

Fig. 1 Number of antihypertensive medications in use during the follow-up period

Thirty percent ($n = 8928$) had a constant number of antihypertensive medications in use throughout the follow-up period.

Fifteen percent ($n = 4480$) had one, 10% ($n = 2970$) had two, 4% ($n = 1201$) had three and 1% ($n = 277$) had four antihypertensive medications in regular use.

Ten percent ($n = 3050$) did not use antihypertensive medication at all.

The most common antihypertensive medications in regular use

The most common antihypertensive medication group in regular use was ACE inhibitor/ARB-blocker 41% ($n = 12270$), followed by beta blockers 18% ($n = 5488$), diuretics 16% ($n = 4743$) and calcium channel blockers 15% ($n = 4506$) (Fig. 2).

Changes in the antihypertensive therapy during follow-up

The flow of antihypertensive medication treatment of the subjects with hypertension across the observation period is presented in Fig. 3.

Factors associated with use of antihypertensive medication

Regular use of antihypertensive medication was associated with higher age, higher number of GP visits, telephone contacts and electronic communication and presence of diabetes. These factors explained 13.4% of regular use of antihypertensive medication (Table 2).

Non-use of antihypertensive medication was associated with lower age, lower number of GP visits, telephone contacts and electronic communication, absence of diabetes, absence of coronary artery disease or absence of atrial fibrillation.

Factors associated with non-usage of antihypertensive medication explained only 3.5% of the factors in the model.

Discussion

Our study indicates that persistence on usage of antihypertensive medication is suboptimal in primary care setting. This might be enhanced with more frequent contacts with GPs, including GP visits, telephone contacts, and electronic communication.

In primary care, many patients with hypertension are symptomless and quite healthy, which may explain why 10% had not renewed their prescriptions. Indeed, a meta-analysis showed that approximately half of patients without coronary artery disease adhere to antihypertensive medication or a statin prescribed as a preventive measure [19] and therefore it is important to address antihypertensive drug adherence in hypertension management to prevent cardiovascular events [9, 20]. Our results are in line with a Swedish study which reported that among patients with a first prescription of an antihypertensive drug, 26% discontinued treatment during the first year, and a further 9% during the second year [21]. In our study population, a substantial proportion (24%, $n = 7165$) of patients with 1–2 antihypertensive drugs did not renew their prescriptions during the 4-year follow-up (Fig. 3). The most common antihypertensive medication group in regular use was ACE inhibitor/ARB-blocker. Yet, it is known that non-adherence is little related to class of drug, suggesting that side effects are not the main cause of non-adherence [19].

Antihypertensive medication is usually prescribed for years or even for decades. It is only natural that adherence may vary depending on patients´ life situations. For

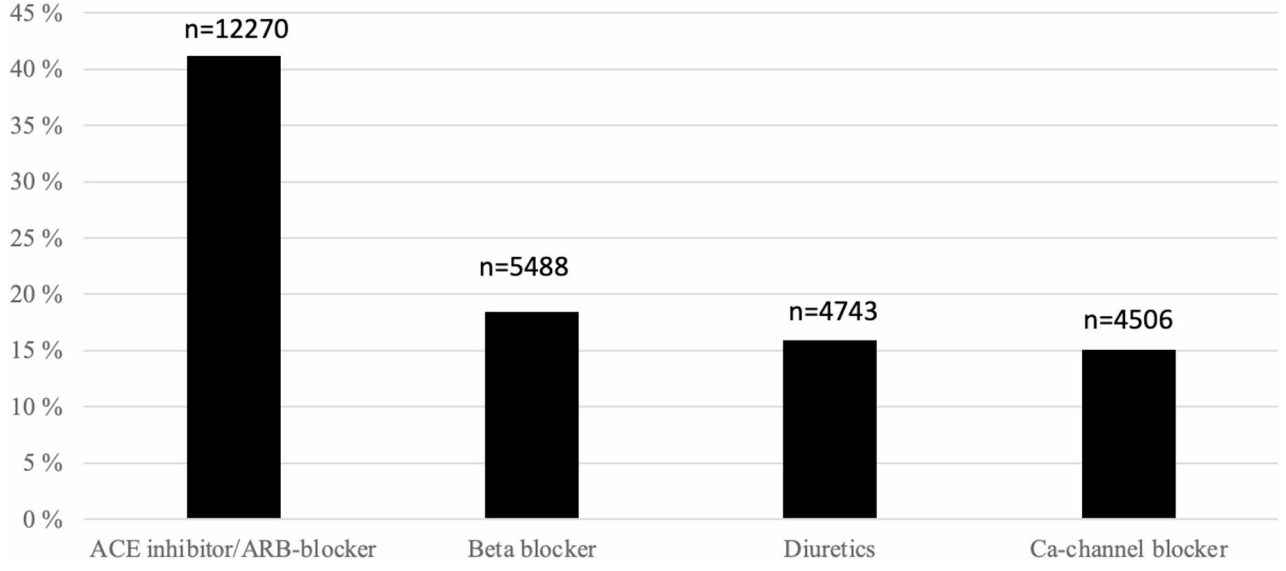

Fig. 2 Distribution of four most common antihypertensive medication groups in regular use

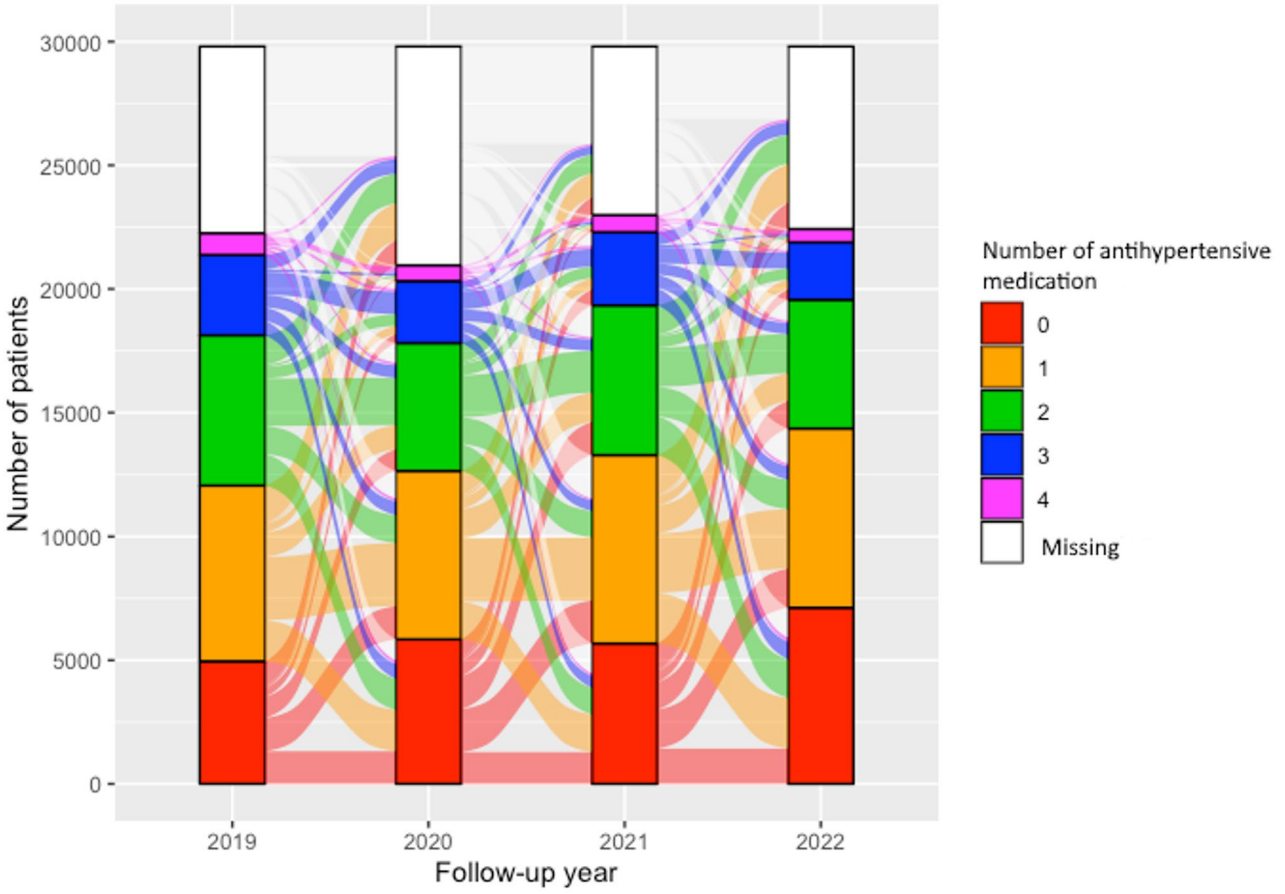

Fig. 3 Changes in the antihypertensive therapy during follow-up

a physician, it is difficult to detect irregular drug usage. In a survey conducted among healthcare professionals treating patients with hypertension in the European Society of Hypertension Centres of Excellence, three out of four physicians considered that the identification of non-adherent patients is at least moderately difficult [22]. The method used in our study, i.e. following prescription renewals through electronic health records, might offer a simple tool to detect non-adherence to drug therapy. Nowadays the most frequently used method to detect non-adherence is interviews with patients, but the average time dedicated to discuss medications is 1–5 min [22]. A deeper discussion with a non-adherent patient would be necessary to understand the patient´s view. Promoting continuity of care and mutual trust in doctor-patient relationships is of outmost importance to improve adherence to therapy.

In Finland, the healthcare system is based on public healthcare services to which everyone permanently residing in the country is entitled. Primary healthcare services are mainly provided at health care centres and specialised medical care usually at hospitals depending on the level of care they require. Private health services complement public services but the costs are markedly higher for the patients than in public services. Thus, our results can be generalized to other countries having a strong public health care system.

Limitations of the study

The present study is register-based and many factors contributing to medication renewals such as socioeconomic status, education, duration of hypertension diagnosis, and polypharmacy could not be taken into account. This probably explains the low explanation percentages of regular (13.4%) and non-use (3.5%) of antihypertensive medications in our models. It should be noted that renewal of prescription does not denote actual adherence to medication. We did not have access to pharmacy database in this study which is a major weakness. This could have extended possibility to study the use of antihypertensive therapy in more detail and made also possible to assess antihypertensive drug adherence as well. It was not possible to acquire blood pressure levels of the hypertensive subjects and thus we cannot report whether the patients were adequately treated or not. We could neither exclude whether subjects with hypertension used other health care services, e.g. private sector or specialized health care to renew prescriptions. However, we think that this

Table 2 Factors associated with regular and non-use of antihypertensive medication in subjects with hypertension using general linear model

1-4 antihypertensive medications in regular use	Estimate	SE	p
Male sex	0.007	0.005	0.19
Age	0.004	0.0002	<0.001
GP visits	0.007	0.0003	<0.001
Telephone contacts	0.01	0.0004	<0.001
Electronic communication	0.009	0.0006	<0.001
Diabetes	0.04	0.006	<0.001
Coronary artery disease	-0.008	0.008	0.32
Atrial fibrillation	-0.02	0.007	0.04
R^2 (%)	13.4		
Antihypertensive medication not in use	Estimate	SE	p
Male sex	0.005	0.0004	0.13
Age	-0.002	0.0002	<0.001
GP visits	-0.002	0.0002	<0.001
Telephone contacts	-0.003	0.0003	<0.001
Electronic communication	-0.003	0.0004	<0.001
Diabetes	-0.01	0.004	<0.001
Coronary artery disease	-0.005	0.005	0.27
Atrial fibrillation	-0.02	0.005	<0.001
R^2 (%)	3.5		

General linear model (GLM) was performed to analyze the factors associated with regular and non-use of antihypertensive medication. The covariants included were gender, age, number of GP visits, number of telephone contacts, number of electronic communication, presence of diabetes (yes/no), presence of coronary artery disease (yes/no), and presence of atrial fibrillation (yes/no). No=0,Yes=1

applies only a small number of subjects with hypertension because in Finland primary health care is responsible for the treatment of most patients with hypertension [10]. A study conducted in Finland investigated patterns before initiation of novel antidiabetic medicines in public, occupational and private healthcare. They concluded that 76% received prescriptions from public healthcare and 6% from private healthcare [23].

Our data was partly collected during the COVID-19 pandemic. We have data indicating that electronic communication among patients with hypertension increased from 2019 to 2022, whereas telephone contacts decreased in the primary health care centres in Turku (unpublished data).

Conclusions

Renewal of antihypertensive therapy was associated with the use of frequent GP contacts, i.e., more frequent GP visits, higher amount of telephone contacts and electronic communication, during the 4-year follow-up. These results suggest that patients with hypertension would benefit from frequent contacts with GPs or other physicians with knowledge of hypertension.

Abbreviations

GP general practitioner
ACE angiotensin-converting enzyme
ARB angiotensin receptor blocker
ICD international classification of diseases

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-025-03104-5.

Supplementary Material 1.

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Authors' contributions

Both JJ and PK designed the study, drafted and wrote the manuscript.JJ acquired and analyzed the data. All authors read and approved the final manuscript.

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Data availability
The data that support the findings of this study are available from the Wellbeing Services County of Southwest Finland, Turku, Finland but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Declarations

Ethics approval and consent to participate
This register-based study was authorised by the institutional review board of the Hospital District of Southwest Finland and the Turku Municipal Health Care Centre review board. Since routinely recorded administrative health records were used, informed consent was not required, nor were the participants contacted. Legal grounds for data handling are public interest and scientific research (EU General Data Protection Regulation 2016/679 (GDPR), Article 6(1)(e) and Article 9(2)(j); Data Protection Act, Sects. 4 and 6.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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