Supplementary Appendix

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Section S1. Participating Primary Care Practices and Doctors.

We thank all the participants, doctors, and administrative staff at each practice for their great contribution to this trial. We thank New Journey Health Technology Group Co.,Ltd and Shenzhen Center for Chronic Disease Control for their coordination in the study operation. We thank Luoyang Dongfang Hospital, the Sixth People's Hospital of Luoyang, Zhongxin Central Hospital, Yankuang Group General Hospital, Shenzhen Nanshan Center for Chronic Disease Control, Shenzhen Baoan Center for Chronic Disease Control, Shenzhen Futian Center for Chronic Disease Control, Shenzhen Longgang Center for Chronic Disease Control, Shenzhen Luohu Center for Chronic Disease Control for their support in the conduct of study. We thank all primary care practices included in the study listed as follows:

Primary Care Practices in Jianxi District, Luoyang

Changan Road Community Health Service Center: Li Wang, Yufei Wang, etc; Gansu Road Second Community Health Service Center: Shuxia Wang, Hongli Guo, etc; Wuhan Road First Community Health Service Center: Yufeng Li, Xiaochun Wang, etc; Zhengzhou Road Second Community Health Service Center: Huixia Zhao, Weibin Jia, etc; Changan Road Second Community Health Service Center: Quncheng Wang, Qian Wang, etc; Longsi Community Health Service Center: Lan Zhang, Wenlian Zhu, etc; Chongqing Road Third Community Health Service Center: Jianjun Wei, Feng Su, etc; Guangwen Road Community Health Service Center: Lili Ling, Miaomiao Li, etc; Changbei Community Health Service Center: Liyun Cheng, Qian qin, etc; Zhujiang Road Xinglong Community Health Service Center: Songtao Li, Rongfang Wei, etc; Qingdao Road First Community Health Service Center: Qiaojun Zhang, etc; Zhengzhou Road Fourth Community Health Service Center: Yonghui Li, Yan Luo, etc; Chuangye Road Community Health Service Center: Zhen Hao, Xueqin Shang, etc; Tianjiu Community Health Service Center: Jun Shi, etc; Huaqiaoxincun Community Health Service Center: Wei Li, Xiaoyan Fan, etc; Shanghaishichang Community Health Service Center: Jinhuan Zhang, Yuanxia Liu, etc; Changqian Second Community Health Service Center: Baohuan Zhai, Haifeng Zhou; Liuye Community Health Service Center: Dongyang Chen, Hengyang Liu, etc;

Primary Care Practices in Yanzhou District, Jining

Tieluyunshuchu Hospital: Haiyan Shang, Wen Luo, etc; Tangcunmeikuang Hospital: Jifu Zhang, Qin Liu, etc; Thirty-seventh Hospital: Xiyan Ren, Shenhe Wang, etc; Jisan Branch Hospital: Jingtao Zhang, Yingli Song, etc; Fujinyuan Community Health Service Center: Huanan Zhai, Hongchang Song, etc; Jiaohuachang Community Health Service Center: Wei Liu, Mei Wang, etc; Haiyue Community Health Service Center: Ling Xiao, Yuxiang Peng, etc; Xiangyangyuan Community Health Service Center: Dong Wang, Tao Yang, etc; Changping Garden Public Health Clinic: Qihong Zhang, Fuying Chu, etc;

Primary Care Practices in Nanshan District, Shenzhen

Nanshui Community Health Service Center: Jing Ruan, Minping Duan, etc; Chiwan Community Health Service Center: Huarong Wu, Yumei Zhang, etc; Taohuayuan Community Health Service Center: Zhongping Peng, Haiyan He, etc; Lanyuan Community Health Service Center: Xiaohong Duan, Zheqing Wu, etc; Shenzhen Bay Community Health Service Center: Zhengrong Zhong, Rui Xu, etc; Dakan Community Health Service Center: Caihang Guo, Xiaoyu Pan, etc; Xili Community Health Service Center: Lin Liu, Lanlan Yang, etc; Songpingshan Community Health Service Center: Xuou Yao, Guiji Zhang, etc; Deyimingju Community Health Service Center: Mintao Luo, Jianpeng Chen, etc; Licheng Community Health Service Center: Ruojun Liao, Jun Liu, etc; Shahe Community Health Service Center: Bangge Fan, Junfeng Zheng, etc; Nanyou Community Health Service Center: Hua Zhou, Yan Zhang, etc; Liwan Community Health Service Center: Rongjun Huang, Jing Liu, etc; Gaoxin Community Health Service Center: Huiting Wang, Peisen Xu, etc; Tianxia Community Health Service Center: Jingfeng Liu, Lili Li, etc;

Primary Care Practices in Baoan District, Shenzhen

Tangwei Community Health Service Center: Dengshan Chen, Lei Wang, etc; Xingwei Community Health Service Center: Chunyu Xu, Yingrong Qin, etc; Jiangbian Community Health Service Center: Yutong Huang, Junyi Yang, etc; Jiyuan Community Health Service Center: Xiaofeng Wu, Xiaoqin Chen, etc; Fuheng Community Health Service Center: Hui Tan, Zhihong Wu , etc; Yintian Community Health Service Center: Guolin Pang, Jinchai Lin, etc; Yikangyuan Community Health Service Center: Ronghua Wang, Hongyu Chen, etc; Liutang Community Health Service Center: Shaoya Yi, Zhe Xiong, etc; Kaixuan Community Health Service Center: Lijun Fu, He Jiang, etc; Zhongzhou Community Health Service Center: Hongshu Cheng, Jianfen Qiu, etc; The Fifth Avenue Community Health Service Center: Yanmei Wei, Lanjun Sun, etc; Longteng Community Health Service Center: Yiting Huang, Lilin Luo, etc; Luozu Community Health Service Center: Haijun Zhou, Lijun Zhou, etc; Shuitian Community Health Service Center: Yongsu Huang, Yanping Zhang, etc; Shasi Community Health Service Center: Qianxin Hu, Jiabing Xu, etc; Heyi Community Health Service Center: Yunfei Luo, Meijuan Fan, etc;

Primary Care Practices in Futian District, Shenzhen

Shangmeilin Community Health Service Center: Yingxuan Yang, Qi Xiao, etc; Xinhua Community Health Service Center: Junhui Liu, Yixin Ouyang; Taiyuan Community Health Service Center: Feng Nie, Fuzhu Hu, etc; Shuiwei Community Health Service Center: Wenting Yu, Xiuyan Liang, etc; Wenshan Community Health Service Center: Yuanshu Luo, Ju Peng, etc; Jingshi Community Health Service Center: Shijie Zhang, Xiaoping Liu, etc; Jingtian Community Health Service Center: Wenzhong Qin, Xiong Yang, etc; Zhonghangyuan Community Health Service Center: Chang Li, Tao Jiang; Zhonghangyuan Community Health Service Center (Tanmian Community Health Service Center): Haifang Yang, Jian Duan, etc; Nantian Community Health Service Center: Xiaoxia Ye, etc; Bihaiyuntian Community Health Service Center: Huishan

Chen, Weifeng Zhao, etc; Lianhuabei Community Health Service Center: Pengxiang Gao, Guilian Ding, etc;

Primary Care Practices in Longgang District, Shenzhen

Huanggecuiyuan Community Health Service Center: Weidong Yi, Qingqing Yu, etc; Zhangbei Community Health Service Center: Zhiping Luo, Yang Yang, etc; Hanlincheng Community Health Service Center: Xingqing Li, etc; Wulian Community Health Service Center: Jianian Huang, Xinyue Yu, etc; Sijihuacheng Community Health Service Center: Qingming Zeng, Junyan Xie, etc; Keyuan Community Health Service Center: Xiaodan Huang, Fei Zhou, etc; Dafen Community Health Service Center: Xiaoying Ma, Hong Xiao, etc; Zhonghaiyicui Community Health Service Center: Guijun Zuo, Fen Xiao, etc; Lecheng Community Health Service Center: Hongwei Wang, Dandan Hu, etc; Yijin Community Health Service Center: Lijun Peng, Shanghao Huang, etc; Dakang Community Health Service Center: Peizhong Liu, Hongxia Peng, etc; Nanling Community Health Service Center: Chunmei Ni, Jungang Wang, etc; Hehua Community Health Service Center: Shuyu Jiang, Limei Li, etc; Fenghuang First Community Health Service Center: Yinniang Wang, Lixian Zhou, etc; Baolishangcheng Community Health Service Center: Cuiping Li, Weijun Xia, etc;

Primary Care Practices in Luohu District, Shenzhen

Hujing Community Health Service Center: Kunzheng Li, Jianfeng Pan, etc; Qingshuihe Road Community Health Service Center: Yanru Zeng, Yang Liu, etc; Dongmen Road Community Health Service Center: Huiqiong Li, Yazhu Wang, etc; Wenhua Community Health Service Center: Yun Lyu, Licheng Zhan, etc; Xianhu Community Health Service Center: Kunyue Peng, Jie Yu, etc; Liantang Road Community Health Service Center: Qiaoguang Huang, Guobin Wu, etc; Honggang Community Health Service Center: Lihong Xu, Jinhe Chen, etc; Caopuxi Community Health Service Center: Jingmei Liang, Xiaorui Gao, etc; Xinxiu Community Health Service Center: Jinrui Liang, etc;

Section S2. Hypertension Management Content for Residents Within the Catchment Areas According to the National Basic Public Health Services Programme.

1. Diagnosis of hypertension: If a resident's systolic blood pressure (BP) ≥140 mmHg and/or diastolic BP ≥90 mmHg of 3 measurements on different days, he/she can be primarily diagnosed as hypertension. Doctors should refer the resident to a higher-level hospital for confirming the diagnosis and obtaining treatment regimen, and should follow up the resident within 2 weeks. The resident with confirming diagnosis of essential hypertension should be included in the hypertension management.

2. Follow-up of hypertensive patients: For patients with essential hypertension, at least four face-to-face follow-up visits per year should be provided.
   (1) For patients with blood pressure controlled, no medication adverse effects, no onset of complication, and no aggravation of the prior complications, an appointment for the next follow-up should be made.
   (2) For patients with inadequate blood pressure control or with adverse effects of medication, uptitrating or switching treatment should be considered if necessary, and follow-up visit within 2 weeks should be provided.
   (3) For patients with two consecutive inadequate blood pressure control or difficulty in controlling medication adverse effects, as well as new complications or aggravation of the prior complications, referral to a higher-level hospital should be advised, and follow-up visit within 2 weeks should be provided.

Section S3. Eligibility Criteria of Participants.

Inclusion criteria

1. Aged ≥ 18 years;
2. Local residents with an established diagnosis of hypertension: systolic blood pressure (BP) ≥140 mmHg and/or diastolic BP≥90 mmHg of 3 measurements on different days, or taking antihypertensive drugs;
3. Registered for hypertension treatment at primary care practices according to the National Basic Public Health Services Programme;
4. Taking 0–2 classes from three classes of antihypertensive drugs (ACEI/ARB, CCB, diuretics).

Exclusion criteria

1. Systolic BP ≥180mmHg and diastolic BP ≥110 mmHg at the screening visit;
2. History of coronary heart disease, heart failure, or chronic kidney disease;
3. Intolerance to 2 or more classes of antihypertensive drugs of ACEI/ARB, CCB, and diuretics;
4. Secondary hypertension diagnosed by physician;
5. Serious medical conditions (e.g., malignant cancer and hepatic dysfunction);
6. Currently in an acute episode of disease;
7. Currently pregnant or breastfeeding, or planning to become pregnant or breastfeeding during the study;
8. Cognitive or communication disorders.

Section S4. Diagram for Use of CDSS.

CDSS icon: The red icon is the trigger of CDSS intervention. After clicking the icon, the recommendation immediately shows in the text box under the icon. If the doctor does not click the icon, he/she is unable to continue to record the prescription.
Referral/Prescribing Confirmation: After viewing the recommendation, the system confirms whether the patient should be transferred to higher-level hospitals and whether he/she needs a prescription for antihypertensive medication. If the referral is needed, the system asks about the indications (not shown below). If a prescription is needed, the doctor continues to record the prescription in the next step.
Prescription: The doctor records the medication in the prescription text according to his/her decision. During prescribing, the dosages and frequencies of drugs can be filled in automatically according to the specific agents entered by doctors. If the doctor decides not to follow the recommendation, a pop-up message appears stating "Your prescription did not match with CDSS recommendation, please re-evaluate the classes/doses/frequencies of drugs." and prescriptions can be modified accordingly. Additionally, if the doctor decides not to follow the CDSS recommendation, relevant reasons (e.g., doctor preference or patient refusal) are recorded.
Submitter: Finally, the doctor could submit the visit record.

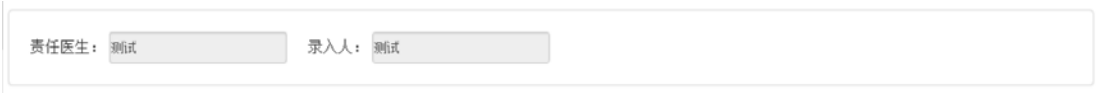
CDSS icon

Referral/Prescribing Confirmation

Prescription


本次就诊后的药物治疗方案
增加
用药剂量及频次提示
药名（输入拼音首字母查询）
单次剂量及单位
用药频次
用法
降压药种类
是否在本机构取药
操作
药库：氨氯地平阿托伐他汀钙片
5mg
qd 每日一次
口服
钙通道阻滞药-二氢吡啶类
是

Submitter


责任医生：
测试
录入人：
测试

Section S5. Number of Practices, Time of Cluster Randomization in Each Region.

Region	No. of Primary Care Practices	Time of Cluster Randomization
Luoyang	18	August 2019
Jining	9	December 2019
Nanshan and Baoan District of Shenzhen	31	March 2021
Futian, Longgang, and Luohu District of Shenzhen	36	April 2021

Section S6. Stratification Factors for Cluster Randomization in Each Region.

1. Region 1 (18 practices in Luoyang):
   (1) Baseline proportion of hypertension visits with appropriate treatment (≥median/<median)
   (2) The hospital to which the practice is affiliated (Dongfang Hospital/Sixth People's Hospital/Zhongxin Central Hospital)
2. Region 2 (9 practices in Jining):
   (1) Baseline proportion of hypertension visits with appropriate treatment (≥median/<median)
   (2) Type of primary care practices (branch of hospital/Community health service station)
3. Region 3 (31 practices in Shenzhen, Baoan District/Nanshan District):
   (1) Baseline proportion of hypertension visits with appropriate treatment (≥median/<median)
   (2) District (Baoan District/Nanshan District)
4. Region 4 (36 practices in Shenzhen, Luohu District/Longgang District/Futian District):
   (1) Baseline proportion of hypertension visits with appropriate treatment (≥median/<median)
   (2) District (Luohu District/Longgang District/Futian District)

Section S7. Specifications of Guideline-accordant/Appropriate Antihypertensive Treatment.

1. Uptitrating or switching treatment for patients with inadequate blood pressure control
   (1) Uptitrating or switching treatment for patients who: a) have systolic BP 140–159 mmHg or diastolic BP 90–99 mmHg; AND b) have established diagnosis of hypertension less than 3 months; AND c) have complications of hypertension (i.e., diabetes, chronic kidney diseases, stroke, myocardial infarction, and heart failure).
   (2) Uptitrating or switching treatment for patients who: a) have systolic BP 140–159 mmHg or diastolic BP 90–99 mmHg; AND b) have established diagnosis of hypertension more than 3 months; AND c) take no antihypertensive medications.
   (3) Uptitrating or switching treatment for patients who: a) have systolic BP ≥160 mmHg or diastolic BP ≥100 mmHg; AND b) take no antihypertensive medications.
   (4) Uptitrating or switching treatment for patients who: a) have systolic BP ≥140 mmHg or diastolic BP ≥90 mmHg; AND b) take at least one antihypertensive medication.
2. Antihypertensive medications used in patients with specific clinical indications for their use
   (1) Use of beta-blockers for patients with myocardial infarction or heart failure.
   (2) Use of angiotensin-converting enzyme inhibitors (ACEI) or angiotensin receptor blockers (ARB) for patients with diabetes, chronic kidney disease, myocardial infarction, or heart failure.
3. Antihypertensive medications used in patients without compelling contraindications for their use
   (1) Use of diuretics for patients without gout.
   (2) Use of beta-blockers for patients without asthma or bradycardia (heart rate <50 beats/min).
   (3) Use of ACEI/ARB for patients without hyperkalemia (potassium >5.5 mmol/L), previous angioneurotic edema, or other contraindications for ACEI/ARB.
4. Antihypertensive medications used in patients without intolerance for their use
   (1) Use of calcium channel blockers (CCB) for patients without intolerance (e.g., CCB-induced edema) to their use.
   (2) Use of ACEI/ARB for patients without intolerance (e.g., ACEI/ARB-induced cough) to their use.
5. Use of guideline-accordant antihypertensive medication
   (1) Any antihypertensive medications beyond ACEI, ARB, beta-blocker, CCB, and diuretics not used.
6. Other
   (1) Agents within the same class of antihypertensive medications not used at the same time.

(2) Referral for patients with full dose of ACEI/ARB, CCB, and diuretics but with inadequate blood pressure control.
(3) Single use of short-acting antihypertensive medications with frequency compliance to that of specified in the instruction.

Section S8. Antihypertensive-Related Adverse Events.

1. Syncope: a transient loss of consciousness and postural tone followed by spontaneous recovery.
2. Injurious fall: a fall that needed to be evaluated in an emergency department or that resulted in hospitalization.
3. Low blood pressure: self-reported symptomatic hypotension or systolic BP < 90 mmHg.
4. Bradycardia: heart rate < 55 beats/min.

Section S9. Assessment of Medication Adherence.

Medication adherence was composited by individual medications prescribed to a patient. Specifically, in the follow-up visit, each patient was asked questions regarding his/her current medications, the corresponding adherence to the prescribed medications, and the main reason for not taking medications as prescribed.

Patients were asked, “In the past two weeks, how often did you take the medications that your doctor prescribed?” A “regular (>80%)”, B “intermittent (10%-80%)”, C “rarely (<10%)”. We assessed medication adherence with the same approach used in previous large international multicenter trials.[1 2] A patient was assigned the median number of the range of medication adherence as an adherence score: 0.9 for a response of “regular (>80%)”, 0.45 for “intermittent (10%-80%)”, and 0.05 for “rarely (<10%)”.

We repeated this assignment for each patient and each medication prescribed to that patient. A patient’s overall adherence score was the average of the scores for the individual medications. An overall score ≥0.80 was considered good adherence.[3]

Section S10. Equation of Generalized Linear Mixed Effect Regression for the Appropriate Antihypertensive Treatment.

The model for the appropriate antihypertensive treatment is given by the following equation:

$$logit\left(\frac{P(Y_{ijk}=1)}{1-P(Y_{ijk}=1)}\right) = \beta_0 + \beta_1(CDSS_{ijk}) + \beta_2(Block_{ijk}) + \beta_3(Baseline\_rate_{ijk}) + \beta_4(Calendar_{ijk}) + \epsilon_i^c + \epsilon_{ji}^p$$

where *i* denotes center, *j* denotes patient and *k* denotes visit. Y_{ijk} = 1 if the appropriate treatment was prescribed; $CDSS_{ijk}$ = 1 in the patient is in a center assigned to the intervention and 0 otherwise. $Block_{ijk}$ denotes implementation regions. $Baseline\_rate_{ijk}$ represents baseline appropriate antihypertensive treatment rates (≥median/<median). $Calendar_{ijk}$ is the calendar time.

ϵ_i^c and ϵ_{ji}^p are random center and participant effects, respectively. To improve computing efficiency, we included the study site (ϵ_i^c) and the patient nested within the study site (ϵ_{ji}^p) as random effects in the model. The variance component model (i.e., random intercept model) was used. We assumed that the residual error at the center level is independent of that at the patient level. The assumptions of ϵ_i^c and ϵ_{ji}^p are

$\epsilon_i^c \sim N(0,\tau^2)$, $\epsilon_{ji}^p \sim N(0,\sigma^2)$, $Cov\left(\epsilon_i^c, \epsilon_{ji}^p\right) = 0$

The absolute difference between the CDSS and usual care group was calculated by the least-squares means of each group (Supplement Table S4), which is directly estimated by residual pseudo-likelihood method. When calculating the least squares means (i.e., population marginal means) of each group, the covariates of implementation Regions, baseline appropriate antihypertensive treatment rates (≥median/<median) and calendar time are assumed to set at the same mean values 0.25, 0.5, 0.25 in each level, respectively. The formula is as follows:

$$\hat{P}_T - \hat{P}_C = \frac{\exp(\alpha_T)}{1+\exp(\alpha_T)} - \frac{\exp(\alpha_C)}{1+\exp(\alpha_C)}$$

where α denotes the least-squares mean estimation of each group on the logit scale. The estimations of average predicted probabilities, denoted by $\hat{P}_T$ and $\hat{P}_C$ are obtained by applying the inverse link function to the least-squares means. The combined standard error on average predicted probability was calculated using the standard error of each group obtained by the delta method. The equation is written as

$$se_{Pcombined} = \sqrt{se_{PT}^2 + se_{PC}^2}$$

Then the absolute average proportion difference ($\hat{P}_T - \hat{P}_C$) between the CDSS and usual care group with corresponding 95% confidence interval were calculated by

$$\left(\hat{P}_T - \hat{P}_C\right) \pm 1.96 \times (se_{Pcombine})$$

Section S11. Adjusted Odds Ratio for Primary Outcome, and Estimation of Relative Risk.

Outcome	CDSS	Usual Care	Odds Ratio	*P* Value
Visits with appropriate treatment — *no./total no. (%)*	17 975/23 113 (77.8)	17 328/27 868 (62.2)	2.17 (1.75 to 2.69)*	<0.001

* Shown is the intervention effect and 95% confidence interval.

The estimation of relative risk (RR) through odds ratio (OR) is obtained by the following equation in the prior literature.[4]

$$RR = \frac{OR}{(1 - P_0) + (P_0 \times OR)}$$

In this equation, P_0 indicates the incidence of the appropriate treatment in the usual care group.

Table S1. Baseline Characteristics of the Primary Care Practices, Doctors, and Participants by Implementation Regions. [a]

Characteristics	Luoyang	Jining	Nanshan and Baoan District of Shenzhen	Futian, Longgang, and Luohu District of Shenzhen	*P* value
Primary Care Practices					
No. of primary care practices	18	9	31	36	
Median no. of residents catered for per site (IQR)	6291 (552–9229)	1806 (561–2779)	32600 (18383–47288)	23388 (17894–27287)	<0.001
Median no. of hypertensive patients managed per site (IQR)	513 (426–624)	350 (282–579)	1240 (926–1609)	943 (753–1157)	<0.001
Median no. of in-service doctors per site (IQR)	2 (2–3)	4 (2–5)	9 (7–11)	10 (8–13)	<0.001
Median of appropriate treatment rate (IQR)	0.56 (0.48–0.63)	0.48 (0.45–0.49)	0.65 (0.57–0.73)	0.64 (0.56–0.70)	<0.001
Participating Doctors					
No. of participating doctors	36	22	156	165	
Median no. of participating doctors per site (IQR)	2 (2–3)	3 (2–5)	7 (5–9)	6 (5–8)	<0.001
Age — yr	49.8±9.1	47.8±6.4	46.9±12.6	43.5±12.9	0.009
Female sex — no. (%)	24 (66.7)	16 (72.7)	96 (61.5)	88 (53.3)	0.15
Education level [b]					
Medical College or above — no. (%)	23 (63.9)	18 (81.8)	151 (96.8)	153 (92.7)	<0.001
Junior medical College — no. (%)	11 (30.6)	4 (18.2)	4 (2.6)	11 (6.7)	<0.001

Technical school — no. (%)	2 (5.6)	0 (0)	1 (0.6)	1 (0.6)	0.20
Licensed — no. (%)	36 (100)	22 (100)	156 (100)	165 (100)	NA
Participants					
No. of participants	2647	1054	4263	4173	
Median no. of participants per site (IQR)	127 (101–188)	89 (77–158)	150 (129–151)	116 (97–133)	0.03
Age — yr	74.1±9.7	69.8±10.4	54.8±10.3	56.3±10.5	<0.001
Female sex — no. (%)	1527 (57.7)	503 (47.7)	1576 (37.0)	1550 (37.1)	<0.001
Education level					
Primary or low — no. (%)	587 (22.2)	329 (31.2)	682 (16.0)	552 (13.2)	<0.001
Middle school — no. (%)	1073 (40.5)	384 (36.4)	1310 (30.7)	1217 (29.2)	<0.001
High school or above — no. (%)	987 (37.3)	341 (32.4)	2271 (53.3)	2404 (57.6)	<0.001
Current smoker — no. (%)	265 (10.0)	73 (6.9)	729 (17.1)	727 (17.4)	<0.001
Disease history					
Diabetes mellitus — no. (%)	537 (20.3)	227 (21.5)	634 (14.9)	783 (18.8)	<0.001
Hyperlipidemia — no. (%)	230 (8.7)	78 (7.4)	925 (21.7)	796 (19.1)	<0.001
Stroke — no (%)	294 (11.1)	100 (9.5)	52 (1.2)	53 (1.3)	<0.001
Systolic BP — mmHg	139.9±16.1	141.0±15.1	131.3±13.3	131.3±13.6	<0.001
<140 mmHg— no (%)	1323 (50.0)	498 (47.2)	3195 (74.9)	3128 (75.0)	<0.001
≥140 and <160 mmHg — no (%)	997 (37.7)	432 (41.0)	958 (22.5)	922 (22.1)	<0.001
≥160 mmHg — no (%)	327 (12.4)	124 (11.8)	110 (2.6)	123 (2.9)	<0.001
Diastolic BP — mmHg	75.3±10.6	80.1±11.0	80.6±9.7	79.9±9.8	<0.001
<90 mmHg— no (%)	2401 (90.7)	835 (79.2)	3530 (82.8)	3495 (83.8)	<0.001
≥90 and <100 mmHg — no (%)	208 (7.9)	183 (17.4)	625 (14.7)	569 (13.6)	<0.001

≥100 mmHg — no (%)	38 (1.4)	36 (3.4)	108 (2.5)	109 (2.6)	<0.001
BP controlled (<140/90 mmHg) — no. (%)	1288 (48.7)	450 (42.7)	2914 (68.4)	2872 (68.8)	<0.001
BP controlled (<130/80 mmHg) — no. (%)	630 (23.8)	160 (15.2)	1295 (30.4)	1334 (32.0)	<0.001
Classes of antihypertensive medication use [c]					<0.001
None — no. (%)	309 (11.7)	140 (13.3)	255 (6.0)	230 (5.5)	<0.001
One class — no. (%)	1785 (67.4)	731 (69.4)	2427 (56.9)	2406 (57.7)	<0.001
Two classes — no. (%)	553 (20.9)	183 (17.4)	1581 (37.1)	1537 (36.8)	<0.001

a Plus–minus values are means ± standard deviations. BP denotes blood pressure, CDSS clinical decision support systems, and IQR interquartile range.

b Medical college: 5-year education after 12 years of primary and secondary education; junior medical college: 3-year education after 12 years of primary and secondary education; technical school: 3 years of medical education after 9 years of primary and secondary education.

c From four classes of antihypertensive drugs [angiotensin-converting enzyme inhibitors (ACEI)/angiotensin receptor blockers (ARB); calcium channel blockers (CCB); diuretics; and other antihypertensive drugs (beta-blockers were not included as antihypertensive drugs)]

Table S2. Covariance Parameter Estimates of Model for Appropriate Antihypertensive Treatment.

Parameter	Estimate	Standard error
Random effect (center)	0.2461	0.04157
Random effect [patient (center)]	1.3470	0.03631

Table S3. Details of Least-squares Mean Calculation for Treatment Group.

Group	Estimate	Standard error	DF	t value	P value	Lower	Upper	Mean	Standard error mean	Lower Mean	Upper Mean
CDSS	1.3737	0.08476	88	16.21	<.0001	1.2052	1.5421	0.7980	0.01367	0.7695	0.8238
Usual care	0.6002	0.08213	88	7.31	<.0001	0.4370	0.7634	0.6457	0.01879	0.6076	0.6821

The “Estimate” column displays the least-squares mean estimate on the logit scale (calculated by residual pseudo-likelihood method), i.e., α_T , α_C, and the “Mean” column represents its mapping onto the probability scale, i.e., $\hat{P}_T$, $\hat{P}_C$. The “Standard error mean” column displays the standard error of the average predicted probabilities for CDSS and Usual care which were calculated by delta method.

Table S4. Rates of Follow-up.

Rate of Follow-up	CDSS	Usual care
Visit at 3m — no./total no. (%)	4791/5753 (83)	5694/6382 (89)
Visit at 6m — no./total no. (%)	4634/5746 (81)	5384/6375 (84)
Visit at 9m — no./total no. (%)	4952/5740 (86)	5845/6373 (92)

Table S5. Difference in Mean Change in Systolic BP and Change in BP Control Rate Among Patients with Baseline BP ≥140/90 mmHg.[a]

Outcomes	CDSS	Usual Care	Intervention Effect	*P* Value
Change in systolic BP — mmHg	-11.1±15.6	-8.6±15.7	-1.9 (-3.6 to -0.3)[c]	0.02
BP controlled at 9 mo (<140/90 mmHg) — *no./total no. (%)*	1037/1873 (55.4)	1115/2262 (49.3)	5.0 (-1.0 to 11.1)[b]	0.08

a Plus–minus values are means ±standard deviations. BP denotes blood pressure, CDSS clinical decision support system. For visit-level analysis, both practice and participant were included as random intercepts. For participant-level analysis, practice was included as random intercepts. The region, baseline appropriate antihypertensive treatment rate (≥median/<median), and calendar time were included as fixed effects in all models.

b Shown is the absolute difference and 95% confidence interval.

c Shown is the difference in mean change in blood pressure and 95% confidence interval.

Table S6. Difference of Mean Change in Systolic BP and BP Control Rate After Multiple Imputation.[a]

Outcomes	Intervention Effect	P Value
Change in systolic BP — mmHg	-1.5 (-2.5 to -0.4)[b]	0.006
BP controlled at 9 mo (<140/90 mmHg) — no./total no. (%)	4.1 (3.5 to 4.8)[c]	<0.001

a Number of imputations is 100. BP denotes blood pressure. Practice was included as random intercepts. The region, baseline appropriate antihypertensive treatment rate (≥median/<median), and calendar time were included as fixed effects.

b Shown is the difference in mean change in blood pressure and 95% confidence interval

c Shown is the absolute difference and 95% confidence interval.

Table S7. Effectiveness of CDSS on BP Control by Using Different Definitions of BP Control.[a]

Outcomes	CDSS	Usual Care	Intervention Effect	*P* Value
BP controlled at 9 mo (<140/90 mmHg) — *no./total no. (%)*	3415/4952 (69.0)	3778/5845 (64.6)	4.4 (-0.7 to 9.5)[b]	0.07
BP controlled at 9 mo (<130/80 mmHg) — *no./total no. (%)*	1506/4952 (30.4)	1544/5845 (26.4)	3.6 (-0.4 to 7.5)[b]	0.07

a BP denotes blood pressure, CDSS clinical decision support system. Practice was included as random intercepts. The region, baseline appropriate antihypertensive treatment rate (≥median/<median), and calendar time were included as fixed effects.

b Shown is the absolute difference and 95% confidence interval.

Table S8. Effectiveness of CDSS on BP Control Among Patients with Different Levels of Medication Adherence.[a]

Outcomes	CDSS	Usual Care	Intervention Effect	*P* for Interaction
BP controlled at 9 mo (<140/90 mmHg) — *no./total no. (%)*				0.001
Good medication adherence [c]	2070/2756 (75.1)	2814/4253 (66.2)	7.7 (2.6 to 12.8)[b]	
Poor medication adherence [c]	1325/2174 (60.9)	918/1527 (60.1)	2.1 (-3.9 to 8.1)[b]	

a BP denotes blood pressure, CDSS clinical decision support system. The practice was included as random intercepts. The region, baseline appropriate antihypertensive treatment rate (≥median/<median), and calendar time were included as fixed effects. The analysis was based on the available data.

b Shown is the absolute difference and 95% confidence interval.

c During the follow-up visit, patients were asked, “In the past two weeks, how often did you take the medications that your doctor prescribed?” A patient was assigned an adherence score of 0.9 for a response of “regular (>80%),” 0.45 for “intermittent (10%-80%),” and 0.05 for “rarely (<10%). We repeated this assignment for each patient and each medication prescribed to that patient. A patient’s overall adherence score was the average of the scores for the individual medications. An overall score ≥0.80 was considered good adherence.

Table S9. Safety Outcomes.

Outcomes	CDSS	Usual Care
Syncope — *no./total no. (%)*	1/5755 (0.0%)	2/6382 (0.0%)
Injurious fall — *no./total no. (%)*	11/5755 (0.2%)	4/6382 (0.1%)
Low BP — *no./total no. (%)*	1/5755 (0.0%)	2/6382 (0.0%)
Bradycardia — *no./total no. (%)*	15/5755 (0.3%)	28/6382 (0.4%)

BP denotes blood pressure, CDSS clinical decision support system.

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