Trends in Systolic Blood Pressure Control and Management in the USA, 2007 to 2016

J Gen Intern Med 35(8):2510–2
DOI: 10.1007/s11606-020-05812-3

INTRODUCTION

Hypertension is common, present in nearly 50% of adults aged 20 and older and almost 80% of adults 65 and older.[1] We assessed blood pressure (BP) control, prescribing and counseling patterns for hypertensive patients seen in primary care over 10 years (2007–2016).

METHODS

Using the National Ambulatory Medical Care Survey (NAMCS), we identified adults with hypertension based on provider identification of hypertension on the list of chronic diseases. Systolic blood pressure (SBP) control was stratified as SBP < 120 mmHg, 120–129 mmHg, 130–139 mmHg, 140–149 mmHg, 150–159 mmHg, and ≥ 160 mmHg. Diastolic blood pressure (DBP)≥ 90 mmHg was also evaluated. We determined whether medications were antihypertensive and if they were newly prescribed. Frequency of exercise and dietary counseling was also analyzed with appropriate weights using the survey command in STATA (v15.2, College Station, TX). A priori, we analyzed for trend in improvement in BP control and use of multidrug therapy using the nptrend test, a nonparametric test for trend across ordered groups.

RESULTS

During visits between 2007 and 2016, there was a modest improvement in SBP control. Initially, 36–37% of encounters were at or above the currently accepted goal of 140 mmHg. By the end of the study period, 31–33% of encounters were above goal (Table 1), a statistically significant ($p < 0.0001$), though modest, improvement. This change was mostly driven by reductions in SBP above 150 mmHg, with SBP between 140 and 149 mmHg remaining stable over the study period. Diastolic blood pressure also had a clinically small, but statistically significant, improvement ($p < 0.0005$). The use of multidrug therapy increased slightly over the study period ($p < 0.0005$) (Table 2). Angiotensin-converting enzyme (ACE) inhibitors were the most common class of antihypertensives prescribed, followed by calcium channel blockers (CCBs) and beta-blockers. The types of antihypertensive medications prescribed remained consistent except for CCBs and thiazides, which both increased over time (Table 2). Patients with SBP ≥ 140 mmHg infrequently received a new medication, ranging from 4 to 15% of the time (Table 2). Dietary and exercise counseling was invariably low (Table 2).

DISCUSSION

NAMCS focuses on ambulatory visits, and our analysis uniquely focuses on blood pressure control in primary care. Our data shows that blood pressure control has modestly improved among primary care patients over the last decade, mostly in the first 4 years of the study period without clinically significant gains after that. This mirrors National Health and Nutrition Examination Survey (NHANES) data which also found a plateau in improvement after 2010.[2] Similar to NHANES, we used SBP of 140 mmHg to define control throughout our study period for all patients. We did not incorporate the relaxed 2014 Eighth Joint National Committee (JNC 8) guidelines in our results, as the Systolic Blood Pressure Intervention Trial (SPRINT) was published soon after, which challenged more lenient goals for older patients.[3]

We suspect that the improvement in control is likely the result of an increase in the number of medications prescribed, especially multidrug therapy, an important approach to improving hypertension control.[4] The plateau in improvement could be a result of clinical inertia; new medications were prescribed in very few patients who had elevated SBP. Recent publications identify clinical inertia as a major barrier and the need for treatment intensification as a vital component of improving hypertension control.[5] We also saw that counseling was underutilized even when hypertension was the primary reason for the visit.

Our study has several limitations. First is the reliance of NAMCS on provider documentation, which has been found to be accurate for procedures and examinations, but underreports behavioral interventions, such as counseling, compared with direct observation.[6] Even considering the likelihood of underreporting, our data suggests that exercise and dietary counseling are low. Second, we are unable to evaluate changes in medication dosing or adherence. This may incorrectly assume that providers are not addressing uncontrolled blood pressure because they do not prescribe a new medication. Despite these limitations, medication intensification and counseling use are markedly low in our study and we

Received September 30, 2019
Accepted March 19, 2020
Published online May 29, 2020

Table 1 Characteristics and Blood Pressure Control in NAMCS Primary Care Visits, 2007–2016

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Primary care visits (weighted)	3.35E8	3.46E8	3.61E8	3.22E8	3.28E8	2.87E8	3.14E8	2.99E8	3.11E8	2.65E8
Primary care visits (unweighted)	8653	8705	9435	7590	7844	17,916	13,666	12,892	3709	2466
Age in years (mean)	54.1	54.5	54.8	54.0	54.6	54.5	55.2	48.2	56.0	55.1
Sex (% female)	61%	62%	61%	61%	60%	60%	60%	58%	61%	61%
Race										
White	85%	85%	85%	84%	82%	85%	85%	84%	78%	85%
Black	11%	11%	11%	12%	12%	10%	10%	10%	13%	10%
Asian	3%	4%	4%	4%	5%	4%	3%	5%	9%	3%
Other	1%	< 1%	< 1%	< 1%	1%	1%	1%	1%	< 1%	2%
Diagnosis of HTN	38%	38%	44%	40%	43%	37%	40%	41%	48%	44%
HTN as primary reason for visit	11%	6%	11%	10%	9%	9%	5%	10%	11%	10%
Blood pressure control, percent above generally accepted goal										
SBP ≥ 140 mmHg	37%	37%	36%	33%	31%	33%	32%	31%	33%	33%
DBP ≥ 90 mmHg	12%	10%	9%	11%	8%	8%	10%	8%	9%	8%
Systolic blood pressure control categories										
SBP < 120 mmHg	18%	19%	20%	21%	21%	20%	21%	21%	21%	20%
SBP 120–129 mmHg	22%	22%	24%	24%	24%	24%	25%	24%	25%	23%
SBP 130–139 mmHg	23%	22%	21%	22%	24%	23%	23%	24%	22%	25%
SBP 140–149 mmHg	18%	17%	17%	16%	16%	16%	16%	16%	17%	18%
SBP 150–159 mmHg	9%	10%	9%	8%	7%	9%	8%	8%	8%	8%
SBP ≥ 160 mmHg	10%	10%	10%	9%	8%	8%	8%	7%	8%	7%

Table 2 Antihypertensive Medication and Counseling Rates in NAMCS Primary Care Visits, 2007–2016

	2007 (%)	2008 (%)	2009 (%)	2010 (%)	2011 (%)	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)
Number of antihypertensive medications										
0	49	44	44	43	48	39	41	39	38	40
1	27	30	28	29	26	27	29	27	26	26
2	16	16	17	17	16	20	20	20	20	20
3	6	7	8	8	7	9	8	10	10	10
4	2	2	2	2	2	3	2	4	4	4
5	.4	.4	.4	.3	.4	.5	.2	.9	1	1
6–7	.01	.07	.04	.08	.03	.03	.06	.007	.007	.002
Medication class										
ACE inhibitor	41	44	45	51	50	48	49	45	47	50
Aldosterone antag*	1	.9	1	1	1	2	2	2	2	2
Alpha-blocker	4	3	3	3	4	3	3	4	3	3
ARB†	27	27	28	25	22	28	28	29	29	26
Beta-blocker	27	28	30	27	27	32	34	35	28	32
CCB	23	28	27	27	29	31	32	33	42	36
Central-acting	3	3	3	5	4	3	3	4	2	5
Thiazide	15	14	15	20	16	19	22	21	25	21
Loop	10	10	10	8	11	10	10	10	10	11
Vasodilator	0.6	1	0.9	0.9	2	2	2	2	2	3
New medication if SBP ≥ 140 mmHg	10	10	10	11	15	7	6	5	4	5
Received dietary counseling if HTN was primary diagnosis	24	27	27	23	23	14	18	18	32	29
Received exercise counseling if HTN was primary diagnosis	16	20	20	16	16	10	13	12	22	21

*Aldosterone antagonist
†Angiotensin receptor blocker

recommend continued attention to these variables, as well as resisting clinical inertia, as ways to improve blood pressure control in the USA.

Cecilia Scholcoff, MD MPH[1,2]
Cynthia Kay, MD MSc[1,2]
Sarah Nickoloff, MD[1,2]
Jeffrey L Jackson, MD MPH[1,2]

[1]Zablocki VAMC,
Milwaukee, WI, USA
[2]Medical College of Wisconsin,
Milwaukee, WI, USA

Corresponding Author: *Cecilia Scholcoff, MD MPH; Medical College of Wisconsin, Milwaukee, WI, USA (e-mail: cscholcoff@mcw.edu).*

Compliance with Ethical Standards:

Conflict of Interests: *The authors declare that they do not have a conflict of interest.*

Disclaimer: *The opinions expressed in this article reflect those of the authors and should not be construed in any way to be those of the US Government or the Department of Veterans Affairs.*

REFERENCES

1. **Benjamin EJ**, **Muntner P**, **Alonso A**, et al. Heart Disease and Stroke Statistics-2019 update: a report from the American Heart Association. *Circulation.* 2019;139(10):e56-e528.
2. **Fryar CD**, **Ostchega Y**, **Hales CM**, **Zhang G**, **Kruszon-Moran D**. Hypertension prevalence and control among adults: United States, 2015-2016. *NCHS data brief.* 2017(289):1–8.
3. **Group SR**, **Wright JT, Jr.**, **Williamson JD**, **et al.** A randomized trial of intensive versus standard blood-pressure control. *N Engl J Med.* 2015;373(22):2103–2116.
4. **Gu A**, **Yue Y**, **Argulian E**. Age differences in treatment and control of hypertension in US physician offices, 2003-2010: a serial cross-sectional study. *Am J Med.* 2016;129(1):50–58 e54.
5. **Mu L**, **Mukamal KJ**. Treatment intensification for hypertension in US ambulatory medical care. *J Am Heart Assoc.* 2016;5(10).
6. **Gilchrist VJ**, **Stange KC**, **Flocke SA**, **McCord G**, **Bourguet CC**. A comparison of the National Ambulatory Medical Care Survey (NAMCS) measurement approach with direct observation of outpatient visits. *Med Care.* 2004;42(3):276–280.