Clinical Practice Changes in Monitoring Hypertension early in the COVID-19 Pandemic

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Abstract

Background

Clinical practices can use telemedicine and other strategies (e.g., self-measured blood pressure [SMBP]) for remote monitoring of hypertension to promote control while decreasing risk of exposure to SARS-CoV-2, the virus that causes COVID-19.

Methods

The DocStyles survey collected data from primary care providers (PCPs), obstetricians-gynecologists (OB/GYNs), and nurse practitioners/physician assistants (NP/PAs) in fall 2020 (n=1,502). We investigated clinical practice changes for monitoring hypertension that were implemented early in the COVID-19 pandemic and examined differences by clinician and practice characteristics ($p<0.05$).

Results

Overall, 369 (24.6%) of clinicians reported their clinical practices made no changes in monitoring hypertension early in the pandemic, 884 (58.9%) advised patients to monitor blood pressure at home or a pharmacy, 699 (46.5%) implemented or increased use of telemedicine for blood pressure monitoring visits, and 545 (36.3%) reduced the frequency of office visits for blood pressure monitoring. Compared with NP/PAs, PCPs were more likely to advise SMBP monitoring (adjusted prevalence ratios (aPR) 1.28, 95% confidence intervals (CI) 1.11-1.47), implement or increase use of telemedicine (aPR 1.23, 95% CI 1.04-1.46) and reduce the frequency of office visits (aPR 1.37, 95% CI 1.11-1.70) for blood pressure monitoring, and less likely to report making no practice changes (aPR 0.63, 95% CI 0.51-0.77).

Conclusions

We noted variation in clinical practice changes by clinician type and practice characteristics. Clinical practices may need additional support and resources to fully maximize telemedicine and other strategies for remote monitoring of hypertension during pandemics and other emergencies that can disrupt routine health care.

Key Words: Hypertension, self-measured blood pressure, telemedicine, COVID-19, clinical practice

Graphical abstract

Monitoring High Blood Pressure During the COVID-19 Pandemic

Objective

Describe clinical practice changes made early in the COVID-19 pandemic related to monitoring high blood pressure by clinician type and practice characteristics.

Study Population

DocStyles Survey, Fall 2020 (n=1,502)

- Primary Care Providers
- Obstetricians/Gynecologists
- Nurse Practitioners/Physician Assistants

Results

Clinical practice changes made related to monitoring high blood pressure:

25% Made no changes

36% Reduced the frequency of office visits

47% Implemented or increased telemedicine use

59% Advised patients to monitor blood pressure at home or a pharmacy

Conclusions

Many clinicians made practice changes to monitoring high blood pressure early in the COVID-19 pandemic but one in four did not. Clinicians may need additional support and resources to fully maximize strategies to provide remote care during pandemics or other emergencies that can disrupt routine health care.

Background

Hypertension causes more cardiovascular disease deaths in the United States than any other modifiable risk factor,[1] affecting nearly half of all US adults.[2] Improving blood pressure control remains a national priority,[3, 4] and this traditionally requires office visits. To help mitigate spread of SARS-CoV-2, the virus that causes COVID-19, out of clinic interventions, such as self-measured blood pressure (SMBP) monitoring and telemedicine can be used to promote hypertension control.[5] We sought to describe clinical practice changes made early in the COVID-19 pandemic related to hypertension monitoring and we examined differences in these changes by clinician type and practice characteristics.

Methods

We obtained data for this study through Porter Novelli's DocStyles survey, an online, web-based, panel survey of health care clinicians currently practicing in the United States (details available elsewhere).[6] Porter Novelli conducted the survey September-October 2020 with a convenience sample of 1,448 primary care physicians (PCPs) which included internists and family practitioners, 365 obstetricians-gynecologists (OB/GYNs), and 418 nurse practitioners/physician assistants (NP/PAs), who were randomly selected from the Sermo's Global Medical Panel (https://www.sermo.com/business/esomar-28) (response rate = 67.3%). The analytic sample included respondents who completed the survey (n=1,502).

We based the outcome measure on the following survey question: "Since the COVID-19 pandemic, what changes has your practice made for monitoring hypertension?" Respondents selected all that applied from the following response options: 1) Advised patients to monitor

blood pressure at home or a pharmacy, 2) Implemented or increased use of telemedicine for blood pressure monitoring visits, 3) Reduced the frequency of office visits for blood pressure monitoring, and 4) No changes have been made. The Centers for Disease Control and Prevention's determined that this activity was public health surveillance and not human subjects research requiring IRB approval. The data underlying this article are licensed to and were provided by Porter Novelli.

We estimated distributions of clinician characteristics (clinician type, age, gender, race/ethnicity, geographic region of residence, years in practice, weekly patient volume, approximate annual household income of majority of patients, and whether they reported practicing telemedicine at the time of the survey), practice characteristics (practice type, size, location, and how telemedicine was used), and the prevalence of changes in practices for monitoring patients with hypertension. We used multivariable, log-binomial regression to calculate adjusted prevalence ratios (aPR) and 95% confidence intervals (CI) to estimate associations between clinician and practice characteristics with each potential change in practice. Multivariable models included clinician type and practice characteristics hypothesized to be associated with changes in practice, specifically clinician type, age, geographic region of residence, weekly patient volume, practice type, size, and location.

Results

Among 1,502 respondents, 877 were 36-55 years of age, 897 (59.7%) were male, 973 (64.8%) were non-Hispanic White, and a majority (67.4%) represented group outpatient practices (Table 1). Respondents estimated that the majority of their patients' annual household income was

<$50,000 (29%), $50,000-99,999 (38%), and ≥$100,000 (33%). Early in the pandemic, 369 (24.6%) of clinicians reported their clinical practices made no changes in monitoring hypertension. On the other hand, many respondents reported making clinical practice changes in hypertension monitoring, including 884 (58.9%) advised patients to monitor blood pressure at home or a pharmacy, 699 (46.5%) implemented or increased use of telemedicine for blood pressure monitoring visits, and 545 (36.3%) reduced the frequency of office visits for blood pressure monitoring.

Primary care physicians (aPR 1.28, 95% CI 1.11-1.47) and OB/GYNs (aPR 1.28, 95% CI 1.08-1.51) versus NP/PAs were more likely to report their practices' advised patients to monitor blood pressure at home or a pharmacy (Table 1). Clinicians aged ≥36 versus 25-35 years were less likely to report their practices advised monitoring blood pressure at home or a pharmacy. PCPs versus NP/PAs (aPR 1.23, 95% CI 1.04-1.46) and respondents from group outpatient versus inpatient practices (aPR 1.33, 95% CI 1.10-1.60) were more likely to report their practices implemented/increased the use of telemedicine for blood pressure monitoring visits. Clinicians aged ≥56 years versus 25-35 years were less likely to report their practices implemented or increased use of telemedicine (aPR 0.76, 95% CI 0.63-0.91). PCPs versus NP/PAs were more likely to reduce the frequency of office visits for blood pressure monitoring (aPR 1.37; 95% CI 1.11-1.70).

Reports of no clinical practice changes were less likely among PCPs versus NP/PAs (aPR 0.63, 95% CI 0.51-0.77), clinicians with 80-110 patients/week (aPR 0.79, 95% CI 0.64-0.96) and ≥110 patients/week (aPR 0.74, 95% CI 0.59-0.94) versus <80 patients/week, and clinical practices

characterized as group outpatient settings (aPR 0.70, 95% CI 0.54-0.89) versus inpatient. Clinicians aged ≥56 versus 25-35 years were more likely to report no clinical practice changes (aPR 1.51, 95% CI 1.14-2.00).

Discussion

From the beginning of the COVID-19 pandemic in the US through late fall 2020, approximately 25% of clinicians who responded to the survey reported their practice made no clinical practice changes for monitoring hypertension. Older clinicians were more likely to report making no changes, while PCPs, large practices, and group outpatient practices were less likely to report making no changes. Many factors, including reimbursement policies, autonomy in the practice setting, other clinician and practice characteristics, or unmeasured confounding may explain the observed variation.

Our study has limitations. Social desirability bias may have led to biased estimates of reported changes and misclassification was possible given limited response options. Due to the voluntary nature of survey recruitment and participation, selection bias is likely, and generalizability is limited.[7] Uncontrolled confounding is possible, as the data did not include information about patient insurance status, reimbursement policies, or technology for SMBP, which could potentially impact clinical practice changes. Additionally, individual clinicians reported clinical practice-level changes, which could have contributed residual confounding. Finally, because patient-level data were unavailable, the clinical implications of these findings are limited.

Despite these limitations, our findings offer insights into clinical practice changes made early in the COVID-19 pandemic. Our estimate that less than half of respondents increased use of telemedicine early in the pandemic has face validity, as unpublished DocStyles data shows telemedicine was used by 28-36% of surveyed PCPs, OB/GYNs, and NPs/PAs in 2018 compared with 71-81% in 2020.[8]

Clinicians effectively used telemedicine and SMBP monitoring for hypertension management prior to the COVID-19 pandemic.[9, 10, 11] However, a recent literature review of clinical management of hypertension during the COVID-19 pandemic demonstrates new opportunities for better integration into care are emerging from the pandemic.[12, 13] A study in Massachusetts documented a sharp increase in the use telemedicine during the pandemic, although implementation was not uniform across patient characteristics.[13] Another study noted that many physicians who began using telemedicine for monitoring their patients during the pandemic lacked formal training in telemedicine and varied in their use of technology.[14] While 36-59% of the survey respondents in our study reported clinical practice changes for monitoring hypertension early in the pandemic, one-quarter reported making no changes. Clinical support guidance is available to facilitate implementation of SMBP,[15] and healthcare practices could use this opportunity to streamline hypertension management services.[16] However, additional support and resources including expansion of third-party reimbursement for SMBP devices, training, and related services could enhance implementation.[17] Addressing these gaps could promote monitoring of chronic disease in hard-to-reach populations now and during future states of emergency.

Conclusions

This report describes clinical practice changes for monitoring hypertension implemented early in the COVID-19 pandemic. One quarter of clinicians surveyed reported their clinical practices made no changes in monitoring hypertension. While guidance is available to facilitate implementation of SMBP practices, clinicians and clinical practices may need additional support and resources to fully maximize telemedicine, SMBP, and other strategies for remote monitoring hypertension during pandemics and other emergencies that can disrupt routine health care.

REFERENCES

1. Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, Himmelfarb CD, Khera A, Lloyd-Jones D, McEvoy JW, Michos ED, Miedema MD, Muñoz D, Smith SC Jr., Virani SS, Williams KA Sr., Yeboah J, Ziaeian B. 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2019;74(10):e177-e232. Epub 2019/03/22. doi: 10.1016/j.jacc.2019.03.010. PubMed PMID: 30894318; PubMed Central PMCID: PMCPMC7685565.

2. Centers for Disease Control and Prevention. Estimated hypertension prevalence, treatment and control among US adults, Atlanta, GA: US Department of Health and Human Services; 2021. Available from: https://millionhearts.hhs.gov/data-reports/hypertension-prevalence.html. Accessed December 22, 2021.

3. Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, Office of the Secretary, US Department of Health and Human Services. Increase control of high blood pressure in adults — HDS- 05 2020. Available from: https://health.gov/healthypeople/objectives-and-data/browse-objectives/heart-disease-and-stroke/increase-control-high-blood-pressure-adults-hds-05. Accessed December 22, 2021.

4. U.S. Department of Health and Human Services. The Surgeon General's call to action to control hypertension Washington, DC: Office of the Surgeon General; 2020. Available from: https://www.cdc.gov/bloodpressure/CTA.htm. Accessed December 22, 2021.

5. Centers for Disease Control and Prevention. Managing healthcare operations during COVID-19; 2021. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/framework-non-COVID-care.html. Accessed December 22, 2021.

6. Porter Novelli. PN Styles. Available from: https://styles.porternovelli.com/docstyles/. Accessed December 22, 2021.

7. Hays RD, Liu H, Kapteyn A. Use of internet panels to conduct surveys. Behav Res Methods. 2015;47(3):685-90. Epub 2015/07/15. doi: 10.3758/s13428-015-0617-9. PubMed PMID: 26170052; PubMed Central PMCID: PMCPMC4546874.

8. Weber D. PN Styles, PN View and other market research opportunities: Recent DocStyles findings [PowerPoint slides]. 2021.

9. Ferdinand KC, Vo TN, Echols MR. State-of-the-art review: Hypertension practice guidelines in the era of COVID-19. Am J Prev Cardiol. 2020;2:100038. Epub 2020/08/25. doi: 10.1016/j.ajpc.2020.100038. PubMed PMID: 32835351; PubMed Central PMCID: PMCPMC7361040.

10. Jackson SL, Ayala C, Tong X, Wall HK. Clinical implementation of self-measured blood pressure monitoring, 2015-2016. Am J Prev Med. 2019;56(1):e13-e21. Epub 2018/10/20. doi: 10.1016/j.amepre.2018.06.017. PubMed PMID: 30337237; PubMed Central PMCID: PMCPMC6485411.

11. Parker RA, Padfield P, Hanley J, Pinnock H, Kennedy J, Stoddart A, Hammersley V, Sheikh A, McKinstry B. Examining the effectiveness of telemonitoring with routinely acquired blood pressure data in primary care: challenges in the statistical analysis. BMC Med Res Methodol. 2021;21(1):31. Epub 2021/02/12. doi: 10.1186/s12874-021-01219-8. PubMed PMID: 33568079; PubMed Central PMCID: PMCPMC7877114.

12. Omboni S, McManus RJ, Bosworth HB, Chappell LC, Green BB, Kario K, Logan AG, Magid DJ, McKinstry B, Margolis KL, Parati G, Wakefield BJ. Evidence and recommendations on the use of telemedicine for the management of arterial hypertension: An international expert

position paper. Hypertension (Dallas, Tex : 1979). 2020;76(5):1368-83. Epub 2020/09/15. doi: 10.1161/hypertensionaha.120.15873. PubMed PMID: 32921195.

13. Nielsen VM, Song G, Ojamaa LS, Blodgett RP, Rocchio CM, Pennock JN. The COVID-19 pandemic and access to selected ambulatory care services among populations with severely uncontrolled diabetes and hypertension in Massachusetts. Public Health Rep. 2022:333549211065515. Epub 20220128. doi: 10.1177/00333549211065515. PubMed PMID: 35086370.

14. Citoni B, Figliuzzi I, Presta V, Volpe M, Tocci G. Home blood pressure and telemedicine: a modern approach for managing hypertension during and after COVID-19 pandemic. High Blood Press Cardiovasc Prev. 2021:1-14. Epub 20211202. doi: 10.1007/s40292-021-00492-4. PubMed PMID: 34855154; PubMed Central PMCID: PMCPMC8638231.

15. Centers for Disease Control and Prevention. Self-measured blood pressure monitoring: Actions steps for clinicians 2014. Available from: https://millionhearts.hhs.gov/files/MH_SMBP_Clinicians.pdf. Accessed December 22, 2021.

16. Centers for Disease Control and Prevention. Hypertension Control Change Package for Clinicians (2nd ed.) Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services; 2020. Available from: https://millionhearts.hhs.gov/tools-protocols/action-guides/htn-change-package/index.html. Accessed December 22, 2021.

17. Wall HK, Wright JS, Jackson SL, Daussat L, Ramkissoon N, Schieb LJ, Stolp H, Tong X, Loustalot F. How do we jump-start self-measured blood pressure monitoring in the United States? addressing barriers beyond the published literature. Am J Hypertens. 2021;35(3):244-55. doi: 10.1093/ajh/hpab170.

Table 1. Clinical Practice-Level Changes for Monitoring Hypertension early in the COVID-19 Pandemic and Clinician Characteristics[1]

					N (%)
Clinical Practice Changes					
Advised patients to monitor blood pressure at home or a pharmacy					884 (58.9)
Implemented or increased use of telemedicine for blood pressure monitoring visits					699 (46.5)
Reduced the frequency of office visits for blood pressure monitoring					545 (36.3)
No changes made					369 (24.6)
Clinician Characteristics	**N (%)**	**Model 1** Advised patients to monitor blood pressure at home or a pharmacy **aPR (95% CI)**	**Model 2** Implemented or increased use of telemedicine for blood pressure monitoring visits **aPR (95% CI)**	**Model 3** Reduced the frequency of office visits for blood pressure monitoring **aPR (95% CI)**	**Model 4** No changes made **aPR (95% CI)**
Provider Type					
Nurse Practitioner/Physician Assistant	1,000 (66.6)	REF	REF	REF	REF
Primary Care[2]	251 (16.7)	1.28 (1.11 - 1.47)	1.23 (1.04 - 1.46)	1.37 (1.11 - 1.70)	0.63 (0.51 - 0.77)
Obstetrician/Gynecologist	251 (16.7)	1.28 (1.08 - 1.51)	1.15 (0.93 - 1.42)	1.07 (0.81 - 1.41)	0.80 (0.61 - 1.04)
Age, years					
25-35	279 (18.6)	REF	REF	REF	REF
36-45	466 (31.0)	0.84 (0.75 - 0.94)	0.88 (0.76 - 1.03)	0.99 (0.81 - 1.21)	1. 17 (0.89 - 1.53)
46-55	407 (27.1)	0.78 (0.69 - 0.88)	0.88 (0.75 - 1.04)	1.03 (0.83 - 1.27)	1.21 (0.91 -

					1.61)
56+	350 (23.3)	0.87 (0.76 - 0.99)	0.76 (0.63 - 0.91)	0.97 (0.78 - 1.22)	1.51 (1.14 - 2.00)
Geographical region of residence					
Midwest	335 (22.3)	REF	REF	REF	REF
Northeast	325 (21.6)	1.00 (0.88 - 1.14)	1.08 (0.92 - 1.27)	1.11 (0.90 - 1.37)	1.01 (0.78 - 1.31)
South	515 (34.3)	1.00 (0.90 - 1.13)	1.03 (0.89 - 1.20)	1.11 (0.91 - 1.34)	0.89 (0.70 - 1.14)
West	327 (21.8)	1.01 (0.89 - 1.15)	1.09 (0.92 - 1.28)	1.20 (0.98 - 1.47)	0.90 (0.69 - 1.18)
Weekly patient volume (# patients)					
<80	496 (33.0)	REF	REF	REF	REF
80-110	598 (39.8)	1.08 (0.98 - 1.20)	1.07 (0.93 - 1.22)	0.93 (0.79 - 1.09)	0.79 (0.64 - 0.96)
≥110	408 (27.2)	1.09 (0.97 - 1.22)	1.08 (0.93 - 1.24)	0.95 (0.80 - 1.13)	0.74 (0.59 - 0.94)
Clinical Practice Characteristics					
Practice Type					
Inpatient	211 (14.0)	REF	REF	REF	REF
Individual outpatient	278 (37.8)	1.04 (0.87 - 1.25)	1.16 (0.91 - 1.49)	1.03 (0.77 - 1.39)	0.91 (0.66 - 1.24)
Group outpatient	1,013 (67.4)	1.10 (0.96 - 1.27)	1.33 (1.10 - 1.60)	1.25 (1.00 - 1.56)	0.70 (0.54 - 0.89)
Practice size (# practitioners)					
<5	509 (33.9)	REF	REF	REF	REF

5-14	568 (37.8)	1.06 (0.95 - 1.18)	1.09 (0.95 - 1.25)	1.06 (0.89 - 1.26)	0.92 (0.73 - 1.16)
15+	425 (28.3)	1.01 (0.89 - 1.14)	1.01 (0.86 - 1.18)	1.02 (0.84 - 1.24)	1.04 (0.81 - 1.34)
Practice location					
Rural	184 (12.3)	REF	REF	REF	REF
Suburban	792 (52.7)	0.97 (0.85 - 1.11)	1.00 (0.84 - 1.19)	1.03 (0.82 - 1.29)	1.07 (0.81 - 1.41)
Urban	526 (35.0)	0.99 (0.87 - 1.14)	1.01 (0.84 - 1.21)	1.18 (0.93 - 1.49)	0.96 (0.71 - 1.30)

Abbreviations: aPR: adjusted prevalence ratio; CI: confidence interval; REF: reference category.
1: Estimates are adjusted prevalence ratios and 95% confidence intervals. Multivariable models included all characteristics in the table. Data source is the 2020 DocStyles Fall Survey (n=1,502).
2: Defined as family practitioners or internists.