



The Patient-Provider Gap: A Cross-sectional Survey to Understand Barriers and Motivating Factors for Home Blood Pressure Monitoring in a CKD Cohort

Canadian Journal of Kidney Health and Disease
Volume 10: 1–7
© The Author(s) 2023
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/20543581231156850
journals.sagepub.com/home/cjk



Megan Borkum¹ , Adeera Levin^{1,2}, Janet Williams²,
and Micheli Bevilacqua^{1,2} 

Abstract

Background: Blood pressure (BP) management can decrease morbidity and mortality in chronic kidney disease (CKD) patients. Evidence-based hypertension guidelines endorse home BP monitoring (HBPM), and the growing use of virtual health has highlighted the need for HBPM. A comprehensive understanding of HBPM adoption in our province is lacking.

Objective: To identify the baseline practices, perspectives, barriers, and enablers in both providers and patients in our kidney care clinics regarding HBPM. Ultimately, this will inform the development of a provincial intervention that empowers providers to both increase patient understanding and equip them for accurate and reliable home BP measurement.

Design: Cross-sectional, descriptive study using online survey methodology.

Setting: Kidney care clinic network in the province of British Columbia, Canada.

Patients or Sample or Participants: Kidney care clinic staff and patients who perform HBPM.

Methods: Data were collected using semi-structured online surveys, one for staff and one for patients and/or caregivers. These surveys were developed by an interdisciplinary working group that included patient partners and addressed some key components of the implementation of an HBPM program (including perceived barriers to uptake, education, and adoption of best practices).

Results: In all, 46 patients and 43 staff responded to the survey from 16 kidney care clinics. Of the patients 53% were women, and the most common age range was 60 to 69 years (25%); 93% of the staff respondents were women and 63% were nurses. We identified numerous areas of discordance between providers and patients and the need for improvement from the perspective of implementing best practices from hypertension guidelines, both in staff teaching and patient usage of HBPM. Blood pressure targets were not known to 18% of patients and 39% of patients had received a BP target from their kidney care clinic team; 89% of patients had not had their upper arm circumference measured for cuff size. Furthermore, 54% of patients knew what to do when their BP is off-target. All recognized the benefits of HBPM, providers were more likely to perceive anxiety as a barrier relative to patients, and patients were more likely to report expense as a barrier than providers.

Limitations: This study includes only a single provincial health care system limiting generalizability to other jurisdictions and sampled a small subset of patients and providers.

Conclusions: The systematic evaluation of education, understanding, implementation of best practices, and barriers and motivating factors for HBPM from both patient and clinician perspectives is an important step in designing strategies to improve the use of HBPM. Given differences in staff and patient perspectives, targeted interventions based on these responses may lead to improved use of HBPM, and ultimately enhance hypertension self-management and BP control in our CKD patients.

Abrégé

Contexte: La gestion de la pression artérielle (PA) peut réduire la morbidité et la mortalité chez les patients atteints d'insuffisance rénale chronique (IRC). Les lignes directrices pour l'hypertension fondées sur des données probantes appuient



la surveillance de la pression artérielle à domicile (SPAD). En outre, le recours croissant à la médecine virtuelle a mis en évidence la nécessité de la SPAD. Une bonne compréhension de ce qui entoure l'adoption de la SPAD dans notre province est manquante.

Objectifs: Connaître les pratiques usuelles de SPAD, les facteurs qui favorisent ou freinent son adoption et les perspectives des prestataires de soins et des patients de nos cliniques de soins rénaux. Éventuellement, ces données serviront à orienter l'élaboration d'une intervention provinciale qui permettra aux prestataires de soins d'améliorer la compréhension des patients et de les équiper pour une mesure précise et fiable de la PA à domicile.

Conception: Étude transversale descriptive utilisant une méthodologie de sondage en ligne.

Cadre: Le réseau des cliniques de soins rénaux de la Colombie-Britannique (Canada).

Participants: Le personnel des cliniques et les patients effectuant la SPAD.

Méthodologie: Les données ont été recueillies à l'aide de sondages semi-structurés en ligne; un premier destiné au personnel des cliniques, un autre aux patients et/ou aux soignants. Les sondages ont été élaborés par un groupe de travail interdisciplinaire qui comprenait des patients partenaires; ils traitaient de certains éléments clés de la mise en œuvre d'un programme de SPAD (obstacles perçus à l'adoption, enseignement et adoption des meilleures pratiques).

Résultats: En tout, 46 patients (53 % de femmes; groupe d'âge le plus représenté: 60 à 69 ans [25 %]) et 43 membres du personnel (93 % de femmes; 63 % d'infirmières), provenant de 16 cliniques, ont répondu au sondage. Nous avons observé de nombreux points de divergence entre les prestataires de soins et les patients, de même qu'en ce qui concerne le besoin d'amélioration du point de vue de la mise en œuvre des meilleures pratiques des lignes directrices pour l'hypertension, tant dans l'enseignement fait par le personnel que dans la pratique de la SPAD par les patients. Seuls 18 % des patients ignoraient les cibles de PA et 39 % avaient reçu une cible de PA de leur équipe soignante à la clinique. La mesure de la circonférence brachiale, qui sert à établir la taille du brassard, n'avait pas été mesurée chez la grande majorité des patients (89 %). En outre, seulement 54 % des patients savaient quoi faire lorsque la PA est hors cible. Tous les répondants ont reconnu les avantages de la SPAD. Les prestataires de soins étaient plus susceptibles de percevoir l'anxiété comme un obstacle pour les patients, et les patients étaient plus susceptibles que les prestataires de percevoir les dépenses comme un obstacle.

Limites: Cette étude examine un seul système de santé provincial, ce qui limite la généralisabilité à d'autres administrations. L'étude porte sur de petits sous-ensembles de patients et de prestataires.

Conclusion: L'évaluation systématique de l'enseignement, de la compréhension et de la mise en œuvre des meilleures pratiques de SPAD, de même que des obstacles et facilitateurs à son adoption perçus par les patients et les cliniciens, constitue une étape importante dans la conception de stratégies visant à améliorer l'utilisation de la SPAD. Compte tenu des divergences de point de vue entre les prestataires de soins et les patients, des interventions ciblées fondées sur ces réponses pourraient augmenter la SPAD et, éventuellement, améliorer l'autogestion de l'hypertension et le contrôle de la PA chez nos patients atteints d'IRC.

Ce que nous savons: La SPAD est un outil pratique et efficace pour optimiser le contrôle de la PA chez les patients; elle peut aider à réduire l'atteinte de leur organe cible et les résultats cliniques défavorables.

Interventions: Cette enquête provinciale montre des discordances entre les patients et les prestataires de soins, de même qu'une hétérogénéité dans l'application et la connaissance des pratiques de SPAD, de même qu'en ce qui concerne les obstacles et facilitateurs perçus pour son adoption. Nous soulignons le besoin pour une intervention complète et ciblée de la SPAD dans nos cliniques.

Keywords

hypertension, home blood pressure monitoring, CKD, patient-centered care, patient education

Received November 23, 2022. Accepted for publication January 7, 2023.

¹Division of Nephrology, The University of British Columbia, Vancouver, Canada

²BC Renal, Vancouver, Canada

Corresponding Author:

Megan Borkum, Division of Nephrology, The University of British Columbia, Room 5273, 2775 Laurel Street, Vancouver, BC V6Z 1Y6, Canada.

Email: mborkum@gmail.com

What was known before

Home blood pressure monitoring is a convenient, effective tool to optimize blood pressure control in patients and can help reduce their target organ disease and adverse clinical outcomes.

What this adds

This provincial survey demonstrated heterogeneity, and patients and provider discordance, in the application of, and familiarity with HBPM practices as well as perceived barriers and motivating factors. The need for a comprehensive, targeted HBPM intervention in our clinics is emphasized.

Introduction

Out-of-office blood pressure (BP) monitoring, which includes 24-hour ambulatory BP monitoring (ABPM) and home BP monitoring (HBPM), has emerged as the gold standard for diagnosing hypertension, assessing BP control and elucidating white coat and masked hypertension.^{1,2} Home BP monitoring is more practical, convenient, relatively accessible, and preferred by patients over ABPM.³ In the 2021 Kidney Disease Improving Global Outcome (KDIGO) BP in chronic kidney disease (CKD) guidelines, HBPM is only suggested, with grade 2B evidence, as a tool to complement standardized office BP readings.⁴ However, the benefits of HBPM are numerous. Patients are empowered through patient-centric autonomous participation in their health.⁵ Home BP monitoring can help overcome physician inertia by the provision of multiple readings which allow for better treatment decision-making and informed medication titration thereby improving BP control.^{2,6} Furthermore, HBPM is an important predictor of target organ damage and provides better prognostic information than office BP and, although the evidence base is still developing, HBPM is suggested by Hypertension Canada to be used in conjunction with standardized office measurement for long-term BP monitoring.^{2,6-12} There exists a paucity of data on uptake, barriers, and facilitators of HBPM in non-dialysis CKD patients, a group likely to benefit from improved BP control due to a high prevalence of hypertension and cardiovascular disease and BP control slowing the trajectory of kidney function decline.^{4,13-16}

Patient-centered care, which focuses on enabling patients to self-manage aspects of their health care, is encouraged in many CKD management guidelines.⁵ COVID-19 emphasized the need to support kidney patients in HBPM, so they may take a more active role in their health care as well as having these measurements at hand for virtual (phone/video) visits.^{8,17} To get accurate home BP readings, patients require training and support from a health professional.¹⁸ However, for health care staff to effectively implement HBPM, infrastructure for cohesive education and communication is required.¹⁹ We recognized variable utilization and uptake of

HBPM, as well as gaps and inconsistencies in knowledge, application, and resources in the different CKD clinics across our provincial network. To address these challenges and to inform methods for our clinics to promote, educate, and facilitate HBPM among patients in a manner that is effective and relevant for them, we developed a survey to understand current practices, perspectives, barriers, and enablers of HBPM for both health care providers and patients in our CKD clinics.

Methods

Study Setting and Design, Participant Recruitment, and Data Collection

This cross-sectional evaluation was conducted in all kidney care clinics (KCCs), a multidisciplinary non-dialysis CKD care structure in British Columbia (BC), Canada. Currently, there are 15 KCCs across 5 geographic health authorities and 1 provincial pediatric program which together deliver CKD care for more than 17 000 CKD patients. A working group was formed to assess HBPM in BC KCCs and to guide this evaluation. The group comprised of 4 nephrologists, 1 nurse practitioner, 1 dietitian, 4 registered nurses, a pharmacist, 2 Kidney Foundation of Canada representatives, a project manager, and 5 patient partners (with lived experience of CKD care in our province). Although our clinics do not provide BP machines routinely, a program is in place with local Kidney Foundation of Canada branches to support provision of BP monitors for those with cost barriers.

Evaluation of baseline HBPM knowledge and practice was performed using separate, but complementary, semi-structured online surveys, one for staff and one for patients and/or caregivers. The KCC staff survey (Supplemental Appendix 1) consisted of 19 questions, and the patient equivalent (Supplemental Appendix 2) had 25 questions. The patient survey was revised after a pilot run with our patient partners. Both surveys evaluated relevant demographic and occupation information such as, from the staff's perspective, length of time working in the KCC and their role, patients' age, sex, and education level. Domains assessed included the following:

1. HBPM knowledge and adherence to various guideline-directed aspects of HBPM required for accurate readings (target setting, ensuring correct cuff size for upper arm circumference, required frequency of readings, correct time of day for HBPM, and the knowledge of what action to take when readings are off-target).
2. Patient and provider beliefs and perceptions and barriers and enablers to HBPM.

An email was sent to clinic managers to encourage staff's voluntary participation and help recruit clinic patients (aided

by weekly social media posting). The material sent out included a poster with a QR code linking to the questionnaire, and staff were prepared to assist patients to access the questionnaire. Most questions either required checking all statements that applied to the respondent or rating their level of agreement with the assertion raised. Respondents had the opportunity to skip the question. The survey was active online for a period of 11 weeks (January 11-April 6, 2022) and was completed anonymously with no patient-specific identifiers required.

Ethics was waived as our institutional research ethics board (REB) reviewed the evaluation study protocol and approved to proceed as a limited risk study exempt from full REB review. Consent was obtained from all patients and care providers who volunteered to participate.

Analysis

Data collection via the online survey tool was to be collated and displayed descriptively and in themes due to the qualitative nature of the analysis. As such, no sample size calculation was done. Any missing data were not imputed and no cases were omitted; all questions answered were included in the analysis.

Results

Table 1 describes the demographics of the 43 KCC staff and 46 patients (36 of whom completed the survey in full).

We found that 86% of patients monitored their BP at home (self/caregiver) and most, apart from 1 respondent who used a wrist device, used a monitor with an upper arm cuff. Figure 1 displays patient and provider knowledge and practices elicited from the questionnaires; 18% of patients reported never having been given a BP target, 39% got their target from their KCC team, 21% got their target from their family doctor, and of the remainder most answered “other” (eg, cardiologists, use of the targets built into the machine). Of the staff, 81% provided their patients with a target when recommending HBPM and 14% measured arm circumference for all patients and 47% measured “sometimes”; 89% of patients reported that they had not had their upper arm circumference measured by a health professional when buying a BP device. Regarding the frequency of HBPM, 69% of staff respondents recommended HBPM 1 to 2 times a week, and 14% of staff estimated that >75% of KCC patients take their BP as suggested. A total of 81% of patients reported that they did HBPM at the frequency suggested. For off-target BP readings, 54% of patients reported knowing what action to take; 8% of patients reported self-adjusting their treatment based on their HBPM readings.

Home BP monitoring was perceived by providers as anxiety-provoking for patients by 78% of providers, difficult for patients to use by 52%, and time-consuming by 43% (Figure 2). In all, 55% of providers saw HBPM devices as expensive

Table 1. Provider and Patient Characteristics.

	Provider
Total	n = 43
Sex, female, n (%)	40 (93%)
Length of time working in kidney care clinic, n (%)	
<1 year	5 (12%)
1-5 years	13 (30%)
>5 years	25 (58%)
Role/discipline, n (%)	
Registered nurse	27 (63%)
Registered dietitian	4 (9%)
Social worker	3 (7%)
Pharmacist	2 (5%)
Nephrologist	7 (16%)
	Patient
Total	n = 46
Age, n (%)	
<50 years	8 (22%)
50-59	8 (22%)
60-69	9 (25%)
70-79	5 (14%)
80-89	5 (14%)
Sex, female	19 (53%)
Highest education level completed, n (%)	
Less than high school	1 (3%)
Graduated from high school	10 (28%)
Some college/university	5 (14%)
Graduated from college/university	10 (28%)
Some graduate school	9 (25%)

compared with 86% of patients; 21% of providers and 15% of patients said HBPM would result in fewer trips to the doctor. A total of 71% of clinic providers believed HBPM would engender positive lifestyle modification; however, 27% of patients surveyed agreed with this belief. Although HBPM helps engage patients in their care, only 50% supported that HBPM informs them when to notify their health care team compared with 86% of providers endorsing this statement. Home BP monitoring was seen by 54% of patients, compared with 88% of providers, as a tool that helps patients to take control of their health.

Discussion

We conducted surveys for providers and patients to assess knowledge and implementation of HBPM, including perceived barriers and motivators. Blood pressure target setting and upper arm circumference measurement were not occurring routinely in our cohort. Prognostically, BP control is paramount for CKD clinical outcomes, and standardized BP monitoring including proper technique and using a validated device with an appropriately sized cuff for the upper arm circumference ensures precision but requires teaching prior to

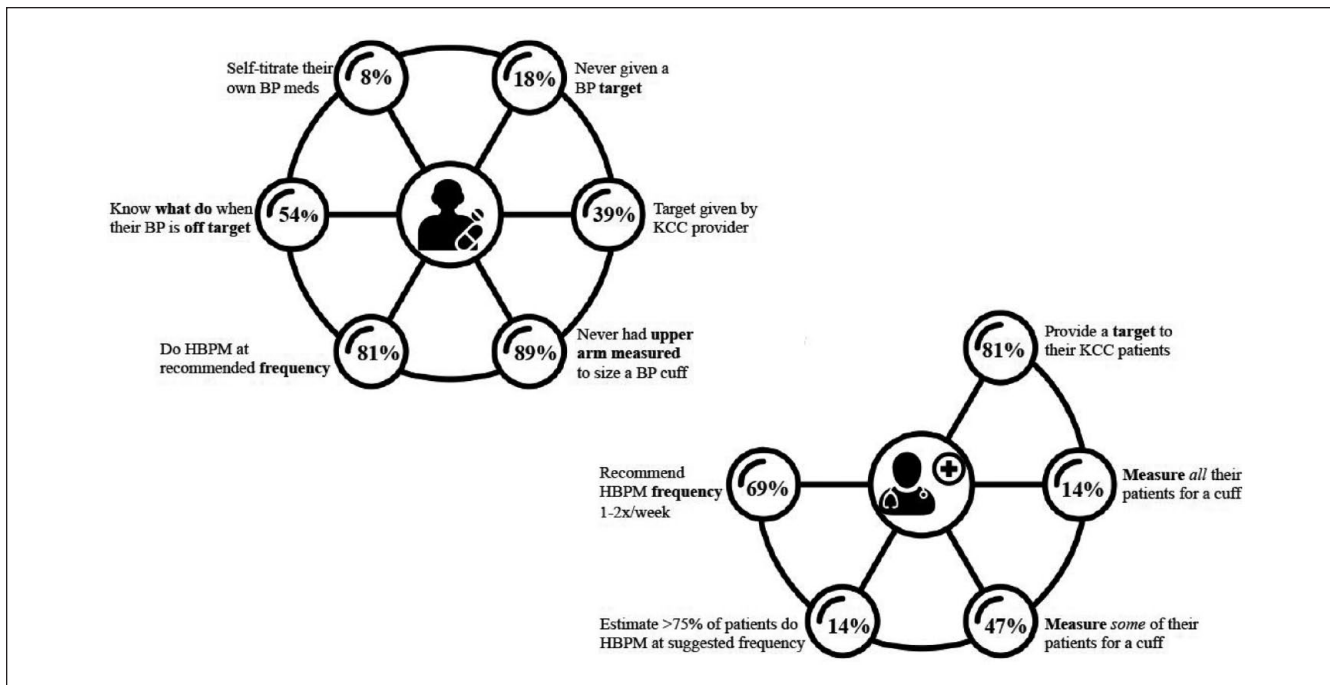


Figure 1. Kidney care clinic patient and provider HBPM knowledge and practices.
 Note. HBPM = home blood pressure monitoring; BP = blood pressure; KCC = kidney care clinic.

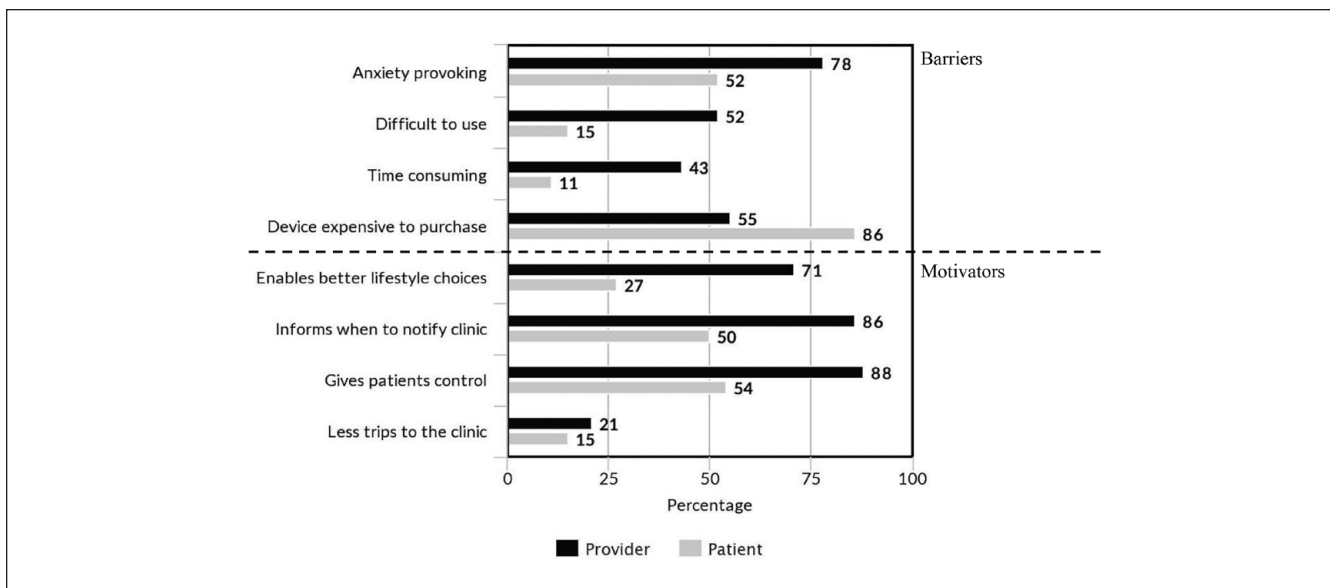


Figure 2. Barriers and motivators for home blood pressure monitoring among kidney care clinic providers and patients.

patients performing HBPM.^{18,20,21} Hypertension Canada recommends BP be taken before breakfast and medication and 2 hours after dinner. They advise measuring it twice in the morning and twice in the evening for 7 days before a doctor’s appointment (or after a change in medication).¹⁰ Similar guidelines exist internationally, though not specifically for the CKD population, and generally recommend, that once

BP is controlled and stable for several months, monitoring 1 to 3 days every week is acceptable.¹⁹ Most patients adhered to these recommendations despite providers’ perceptions that this was not done.

Our CKD clinics’ current Guidance for off-target BP readings is for patients to either call the clinic or emergency services, dictated by levels and associated symptoms. Of concern,

54% of patients reported knowing what to do when their BP is off-target. Furthermore, only about half of our patient respondents felt in control of their BP, the most common facilitator for hypertension management.²² This finding is consistent with other work which found that despite owning a BP device, patients often do not recall how to interpret their results and what action to take when confronted with high readings.²³ Lack of knowledge and self-confidence in CKD self-management, including HBPM, was identified as a key barrier to behavior prioritization and performance in patient engagement.⁵ Therefore, KCC staff need to further clarify how to take BP correctly, what to do with the results, and when to call for support. This is more pertinent as our patients with CKD may not physically come to the clinic and still prefer virtual visits which do not have the safety net of clinic BP checks.²⁴ A small number of our patients reported using HBPM to self-titrate their BP meds; evidence for this practice, particularly in CKD patients, is limited. In a UK randomized clinical trial of 552 patients (approximately 30% of which had CKD), an individualized self-titration algorithm resulted in a clinically significant reduction in systolic and diastolic BP without an increase in adverse effects events.⁸ Due to the paucity of evidence, self-titration of BP meds is currently not outlined in the KDIGO guidelines and is not included in our educational material, but these responses represent another important aspect for staff to include when teaching patients about HBPM.

Most patient and clinician respondents felt that HBPM is a useful tool and an important part of kidney care. Of interest, KCC staff perceived anxiety, time constraints, and technical challenges in using the device as significant barriers for patients. Strikingly, this was an overestimation by >25% of these barriers compared with patient response. The staff, however, underestimated the financial burden of acquiring a device for the patients. The cost of a self-measurement BP device is consistently cited as a limitation to HBPM adoption in the literature.^{5,19,25} Awareness of unique barriers and facilitators from the patient perspective can better equip staff to advocate for financial support for our patients in acquiring a device and encouraging and teaching HBPM in a more targeted and impactful way.

It is recognized that the implementation of effective self-monitoring in hypertension needs to consider social and behavioral factors and be accompanied by co-interventions such as lifestyle counseling for sustained results.^{18,26} Most providers felt this was a motivator for HBPM, but only a minority of our patients responded that HBPM enabled better lifestyle choices. This is consistent with a systematic review and meta-analysis which found that HBPM had some impact on medication adherence but did not affect lifestyle habits, particularly diet and levels of physical activity.²⁷ As such, focusing on the role of the interplay between HBPM and lifestyle modifications may be another focal point to include in HBPM education and counseling. Understanding these factors will enable us to equip staff to meaningfully discuss and promote lifestyle modifications and motivate our patients.

Limitations

There are limitations to this qualitative study from a single provincial health system. Our interviews were voluntary and non-incentivized, which could have limited participation. Recruitment was mostly passive; therefore, those sampled may not be representative of all in the kidney clinic community, and we are unable to quantify the number of patients who elected not to participate in the survey. By the nature of the patient participation, selection bias could have been introduced where self-motivated, interested patients would voluntarily choose to complete the survey. Generalizability is further limited as most patients had higher education, and the surveys were only offered in English. Surveys were exclusively available online limiting participation from those without Internet access.

Specifics of the BP devices currently being used by our patients were not asked as this was not the focus of the survey and, regardless of current practice, was planned to be included as essential information in the HBPM educational material.

Conclusion

Blood pressure measurement is a routine task in kidney clinics and with the increased dependence on HBPM as clinics have integrated virtual care during the COVID-19 pandemic, clinic staff need to be able to promote HBPM in a manner that resonates with patients' values, and both patients and staff need to be harmonious on how to take accurate home BP measurements. Substantial discordance in attitudes and beliefs between our patient and provider cohorts is apparent, and inconsistencies exist in our patient practice. Understanding clinician and patient perceptions of HBPM in our setting will help inform more impactful patient-centered strategies and tools to equip clinic staff to accurately and effectively teach patients how to measure their own BP and act on their results.

Ethics Approval and Consent to Participate

This study was reviewed by The University of British Columbia research ethics board and exempted from full board review.

Consent for Publication

All authors provided their consent for publication of the manuscript.

Availability of Data and Materials

Data and materials are available by contacting the corresponding author.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Megan Borkum  <https://orcid.org/0000-0003-0082-554X>

Micheli Bevilacqua  <https://orcid.org/0000-0001-8321-7413>

Supplemental Material

Supplemental material for this article is available online.

References

1. Padwal RS, Wood PW, Ringrose JS. How a cloud based platform can make ambulatory blood pressure monitoring more efficient, accessible, and evidence based. *Conn Health*. 2022;1(1):36-45.
2. Kario K. Home blood pressure monitoring: current status and new developments. *Am J Hypertens*. 2021;34(8):783-794.
3. Nasothimiou EG, Karpettas N, Dafni MG, Stergiou GS. Patients' preference for ambulatory versus home blood pressure monitoring. *J Hum Hypertens*. 2014;28(4):224-229.
4. Cheung AK, Chang TI, Cushman WC, et al. KDIGO 2021 clinical practice guideline for the management of blood pressure in chronic kidney disease. *Kidney Int*. 2021;99(3):S1-S87.
5. Schrauben SJ, Rivera E, Bocage C, et al. A qualitative study of facilitators and barriers to self-management of CKD. *Kidney Int Rep*. 2022;7(1):46-55.
6. Ihm SH, Park JH, Kim JY, et al. Home blood pressure monitoring: a position statement from the Korean Society of Hypertension Home Blood Pressure Forum. *Clin Hypertens*. 2022;28(1):38.
7. Costa D, Aguiar F. Self-management of blood pressure control at home in chronic kidney disease: nursing interventions and health gains. In: Zaman GS ed. *Ultimate Guide to Outpatient Care*. Rijeka: IntechOpen; 2022. doi:10.5772/intechopen.96416.
8. McManus RJ, Mant J, Haque MS, et al. Effect of self-monitoring and medication self-titration on systolic blood pressure in hypertensive patients at high risk of cardiovascular disease: the TASMIN-SR randomized clinical trial. *JAMA*. 2014;312(8):799-808.
9. Spirk D, Noll S, Burnier M, Rimoldi S, Noll G, Sudano I. Effect of home blood pressure monitoring on patient's awareness and goal attainment under antihypertensive therapy: the factors influencing results in anti-hypertensive treatment (FIRST) study. *Kidney Blood Press Res*. 2018;43(3):979-986.
10. Rabi DM, McBrien KA, Sapir-Pichhadze R, et al. Hypertension Canada's 2020 comprehensive guidelines for the prevention, diagnosis, risk assessment, and treatment of hypertension in adults and children. *Can J Cardiol*. 2020;36(5):596-624.
11. Ho JK, Carnagarin R, Matthews VB, Schlaich MP. Self-monitoring of blood pressure to guide titration of antihypertensive medication—a new era in hypertension management? *Cardiovasc Diagn Ther*. 2019;9(1):94-99.
12. Nagaraju SP, Shenoy SV, Rao IR, Bhojaraja MV, Rangaswamy D, Prabhu RA. Measurement of blood pressure in chronic kidney disease: time to change our clinical practice—a comprehensive review. *Int J Nephrol Renovasc Dis*. 2022;15:1-16.
13. Jankowski J, Floege J, Fliser D, Böhm M, Marx N. Cardiovascular disease in chronic kidney disease: pathophysiological insights and therapeutic options. *Circulation*. 2021;143(11):1157-1172.
14. Bangalore S, Maron DJ, O'Brien SM, et al. Management of coronary disease in patients with advanced kidney disease. *N Engl J Med*. 2020;382(17):1608-1618.
15. Joo YS, Kim HW, Nam KH, et al. Association between longitudinal blood pressure trajectory and the progression of chronic kidney disease: results from the KNOW-CKD. *Hypertension*. 2021;78(5):1355-1364.
16. Yannoutsos A, Kheder-Elfekih R, Halimi JM, Safar ME, Blacher J. Should blood pressure goal be individualized in hypertensive patients? *Pharmacol Res*. 2017;118:53-63.
17. White CA, Kappel JE, Levin A, et al. Management of advanced chronic kidney disease during the COVID-19 pandemic: suggestions from the Canadian Society Of Nephrology COVID-19 rapid response team. *Can J Kidney Health Dis*. 2020;7:2054358120939354.
18. Tucker KL, Sheppard JP, Stevens R, et al. Self-monitoring of blood pressure in hypertension: a systematic review and individual patient data meta-analysis. *PLoS MED*. 2017;14(9):e1002389.
19. Shimbo D, Artinian NT, Basile JN, et al. Self-measured blood pressure monitoring at home: a joint policy statement from the American Heart Association and American Medical Association. *Circulation*. 2020;142(4):e42-e63.
20. Padwal R, Berg A, Gelfer M, et al. The hypertension Canada blood pressure device recommendation listing: empowering use of clinically validated devices in Canada. *J Clin Hypertens (Greenwich)*. 2020;22(5):933-936.
21. Jackson SL, Gillespie C, Shimbo D, Rakotz M, Wall HK. Blood pressure cuff sizes for adults in the United States: National Health and Nutrition Examination Survey, 2015–2020. *Am J Hypertens*. 2022;35(11):923-928.
22. Heinert S, Escobar-Schulz S, Jackson M, et al. Barriers and facilitators to hypertension control following participation in a church-based hypertension intervention study. *Am J Health Promot*. 2020;34(1):52-58.
23. Vadeboncoeur A, Marciel MJ, Cyr S, et al. Trajectory of patients consulting the emergency department for high blood pressure values. *CJEM*. 2022;24(5):515-519.
24. Krueger KM, Ison MG, Ghossein C. Practical guide to vaccination in all stages of CKD, including patients treated by dialysis or kidney transplantation. *Am J Kidney Dis*. 2020;75(3):417-425.
25. Kronish IM, Kent S, Moise N, et al. Barriers to conducting ambulatory and home blood pressure monitoring during hypertension screening in the United States. *J Am Soc Hypertens*. 2017;11(9):573-580.
26. Dzau VJ, Balatbat CA. Future of hypertension: the need for transformation. *Hypertension*. 2019;74(3):450-457.
27. Fletcher BR, Hartmann-Boyce J, Hinton L, McManus RJ. The effect of self-monitoring of blood pressure on medication adherence and lifestyle factors: a systematic review and meta-analysis. *Am J Hypertens*. 2015;28(10):1209-1221.