

# Evaluation of Blood Pressure Control and Quality Measure Performance Following Pharmacist Hypertension Management in the Primary Care Setting

by Jordyn T. Kettner, 2022 PharmD Candidate, Laura I. Belmonte, PharmD, Katherine J. Hartkopf, PharmD, BCACP, April J. Weaver, PharmD, BCACP, Kristina M. Heimerl, PharmD, BCACP

**N**early 47% of adults in the United States have hypertension or are taking an antihypertensive medication.<sup>1,2</sup>

Hypertension, or high blood pressure, is a significant cause of morbidity and mortality in the United States. In 2019, more than 500,000 deaths in the United States had hypertension as a primary or contributing cause of mortality.<sup>3</sup> Hypertension often has no signs or symptoms, but significantly increases the risk of heart disease and stroke, two of the top five leading causes of death in the United States.<sup>4</sup> While high blood pressure is a leading risk factor for stroke, congestive heart failure, coronary heart disease, and renal disease, adequate blood pressure control can minimize the risk of and help prevent these conditions.<sup>5</sup> Several factors contribute to uncontrolled blood pressure, including competing comorbidities, lack of understanding of hypertension, stress, suboptimal medication adherence due to financial or transportation barriers, and poor diet and sedentary lifestyle.<sup>6</sup> In Wisconsin, about 33% of adults have hypertension, and of those, almost half do not have their hypertension adequately controlled.<sup>4,7</sup> Additionally, in Wisconsin, about 25% of adult patients diagnosed with high blood pressure do not take their blood pressure medications as prescribed, highlighting the need for improved medication adherence and education to optimize hypertension management and treatment.<sup>8</sup>

The incorporation of pharmacists into primary care teams for chronic disease state management, to optimize medication selection and treatment, has been described.<sup>9,10</sup> Pharmacist and physician

## Abstract

**Objective:** The impact of primary care pharmacists practicing under a hypertension management protocol at a health system is captured by the state quality measure benchmark of blood pressure measurement less than 140/90 mmHg. However, this measure does not manage factors that may result in inaccurate reporting of patient hypertension control. This quality improvement project was designed to evaluate why prior pharmacist-managed patients had recent in-clinic blood pressure measurements above goal, and to identify opportunities for improvement.

**Methods:** A report was generated to identify family medicine patients with a most recent blood pressure measurement above goal following participation in the pharmacist hypertension management program. A retrospective chart review was conducted, and reasons for above goal in-clinic blood pressure measurements were categorized. Additional factors were collected for all patients and analyzed for patients categorized as unknown to identify trends.

**Results:** Of the 141 patients evaluated, the most common reason for above goal in-clinic blood pressure was white coat hypertension (38%). Of the patients without an identifiable cause for elevated blood pressure (9%), almost half had a history of non-adherence to medications.

**Conclusions:** For patients with hypertension, there are reasons for above goal in-clinic blood pressures deemed not controlled with the state quality measure. Opportunity exists to capture hypertension control more accurately within health systems with use of home readings, as well as to re-evaluate blood pressure management strategies and adherence for patients without an identifiable reason for uncontrolled hypertension.

team-based, collaborative models have been shown to improve patient care for chronic medical conditions including hypertension. Previous literature has shown positive impact with the incorporation of pharmacist-driven hypertension management into patient care teams for monitoring blood pressure, improving

medication adherence, and optimizing antihypertensive medications.<sup>11</sup> Several other evaluations have found significant, positive impacts on patient blood pressure control, among patients with hypertension, through the use of pharmacist and physician collaborative management. Through these team-based interventions,

pharmacists closely monitor patients and adjust antihypertensive regimens as needed. Previous studies have found the percentage of patients with hypertension and well-controlled blood pressure control to range from 43% to 89% when managed through interventions that leverage pharmacists.<sup>12-16</sup> Therefore, pharmacists are well positioned to improve hypertension quality measures as previously demonstrated for other chronic disease states such as diabetes.<sup>17</sup>

This quality improvement initiative took place at a health system where primary care pharmacists practice under an expanded hypertension management protocol that gives pharmacists the authority to modify antihypertensive medications and counsel on lifestyle management strategies. This protocol gives clinic-based pharmacists the authority to initiate, titrate, and discontinue antihypertensive medications, and the ability to enter orders for labs to monitor therapy for adult patients ages 18 and older with a diagnosis of hypertension who meet protocol criteria. Specific antihypertensive medications and labs are outlined in the protocol, which allows primary care pharmacists to provide hypertension management to patients to optimize blood pressure control. The effectiveness of pharmacist work is captured by the state hypertension quality measure benchmark of proportion of patients with a blood pressure less than 140/90 mmHg, developed by the Wisconsin Collaborative for Healthcare Quality (WCHQ).<sup>18</sup>

The WCHQ reports a variety of health care performance measures for ambulatory and hospital care in the state of Wisconsin, with the purpose of improving health and increasing the value of health care.<sup>5</sup> The WCHQ currently reports one heart care measure pertaining to controlling high blood pressure. This blood pressure control measure assesses the percentage of patients ages 18 to 85 who have a diagnosis of essential hypertension and whose blood pressure is adequately controlled based on the Eighth Report of the Joint National Committee treatment goals of less than 140/90 mmHg for all patients. The WCHQ measure includes only in-clinic blood pressures and does not control for factors that may result in inaccurate reporting of patient blood pressure control. Therefore, it may not capture the full impact of a pharmacist-driven hypertension

**TABLE 1. Definitions of Categories for Above Goal In-Clinic Blood Pressure Measurement**

<i>Categorization</i>	<i>Definitions</i>
<b>White Coat Hypertension</b>	Elevated clinic blood pressure readings, and below goal home readings
<b>Home Blood Pressure Monitoring</b>	Below goal home blood pressure readings and no clinic readings in the past twelve months
<b>Specialty Clinic Visit</b>	Most recent blood pressure reading above goal at a specialty clinic visit (e.g. cardiology, nephrology, neurology)
<b>Isolated Hypertension</b>	Above goal blood pressure reading on one occasion, or on multiple occasions with an identifiable cause (e.g. pain)
<b>Unknown</b>	Above goal blood pressure reading without an identifiable cause and requires additional blood pressure follow-up

management program. Unfortunately, many health care quality measures are imperfect and lack standards that ensure accuracy.<sup>19</sup> Additionally, inaccurate or incomplete documentation of diagnoses and chart data often affect the credibility of electronic health record (EHR) data.<sup>20</sup> Factors found in the literature that may contribute to inaccurate reporting of patient blood pressure control include white coat or masked hypertension.<sup>21,22</sup> White coat hypertension is defined as when an individual who has elevated office blood pressure readings of greater than or equal to 140/90 mmHg also has a 24-hour blood pressure average less than 130/80 mmHg, with ambulatory blood pressure monitoring or home blood pressure readings.<sup>23-25</sup> White coat hypertension occurs in 15% to 30% of patients with an elevated in-clinic blood pressure reading and is more common in women, older adults, non-smokers, pregnant women, patients without evidence of target organ damage, and patients recently diagnosed with hypertension with a limited number of office blood pressure readings.<sup>23</sup> With this in mind, an opportunity exists to capture more accurately the controlled blood pressure of patients with white coat hypertension, within WCHQ hypertension quality control measures.

The objectives of this quality improvement evaluation were to (1) identify reasons that patients who have previously participated in the pharmacist hypertension management program have recent in-clinic blood pressure measurements above goal and (2) identify opportunities for improvement in internal data capture for WCHQ quality measures within a health system.

## Methods

This retrospective quality improvement project reviewed patients in the family medicine department who were enrolled in the pharmacist-led hypertension management program between January 1, 2019, and February 29, 2020. A report was generated from the EHR to identify patients with a most recent in-clinic blood pressure measurement above goal following participation in the program. Patients were included in this quality improvement evaluation if they were previous participants of the pharmacist hypertension management program; received care from the family medicine department; and had a most recent blood pressure of greater than 140/90 mmHg documented in the EHR. Patients were excluded if they were unengaged with the pharmacist program (by never returning phone calls or letters to follow up on their blood pressure), lost to follow-up as the patient had an initial visit but never followed through on getting their blood pressure to goal, or had hypertension management transitioned from the pharmacist-led program to a primary care or specialty provider.

Based on internal multidisciplinary hypertension workgroup findings for opportunities for improved blood pressure control, reasons for above goal blood pressure were identified and denoted by the following categories: white coat hypertension, home blood pressure monitoring, specialty clinic visit, isolated hypertension, or unknown. Definitions for these designations are included in Table 1. The multidisciplinary hypertension workgroup previously identified that white coat hypertension was not captured

routinely on the patient problem list. Additionally, home blood pressure monitoring was not routinely entered in designated EHR flowsheets, leading to missed WCHQ achievement metrics. Specialty clinic staff were not trained to routinely check a second blood pressure reading if a patient's initial clinic reading was elevated. Therefore, these categories were reviewed for further analysis. Patients with above goal readings on multiple occasions without an identifiable reason for a most recent elevated blood pressure reading were assigned to the unknown category. These patients had blood pressure readings indicative of uncontrolled hypertension, which was likely due to factors such as medication non-adherence or weight gain, and required additional blood pressure follow-up to identify contributing factors. A need to re-establish hypertension-focused care was identified for patients in the unknown category.

Additional patient-specific factors were collected for all patients, including: number of antihypertensive medications; documented medication non-adherence; recorded resistance to medication change; and no-show rates. These factors were assessed for all patients at each hypertension visit with the pharmacist. For the subset of patients with an unknown reason for elevated blood pressure, these factors were analyzed to identify potential trends. A sub-analysis based on comorbidity was also performed for these patients. Comorbidities evaluated included obstructive sleep apnea, hypothyroidism, diabetes, obesity, coronary artery disease, chronic kidney disease, anxiety, depression, and dementia. The pharmacist assessed adherence to continuous positive airway pressure (CPAP), routine lab, and disease state monitoring at hypertension visits. If these comorbidities were identified as sub-optimally managed, they might have impacted blood pressure control or medication adherence.<sup>2</sup> Institutional Review Board approval was deemed not necessary for this quality improvement initiative.

## Results

A total of 431 patients were managed by the pharmacist-led hypertension management program during the project period. Of the 431 patients, we identified 141 patients who had a most recent in-clinic

blood pressure measurement above goal following participation in the pharmacist hypertension management program.

White coat hypertension was identified as the most common reason for an above goal blood pressure reading. Of the 53 patients (38%) with white coat hypertension, only 19 of those patients (36%) had white coat hypertension documented on their problem list in the EHR (Table 2). After white coat hypertension, isolated hypertension was the second most common reason identified for most recent in-clinic blood pressure measurements above goal. Isolated hypertension was present in 39 patients (28%). Additional reasons for most recent above goal blood pressure readings in patients who received prior hypertension management from primary care pharmacists were specialty clinic visit (24, 17%) and home blood pressure monitoring (11, 8%). The remaining 13 patients (9%) were identified as having an unknown cause for the above goal blood pressure reading. Of those 13, six patients (46%) had a history of non-adherence to antihypertensive medications. The sub-analysis based on comorbidity revealed that eight of the 13 patients in the unknown subgroup had at least one comorbidity (62%). Comorbidities included diabetes, obesity, and sleep apnea. Of the patients with comorbidities, three patients (37.5%) had one comorbidity, four patients (50%) had two comorbidities, and one patient (12.5%) had three or more comorbidities.

## Discussion

Multiple reasons for above goal in-clinic blood pressures were identified and are not accounted for within the WCHQ hypertension control quality measure, including home blood pressure monitoring, specialty clinic visit, isolated hypertension, white coat hypertension, and unknown causes.

Regarded as a standard of care for hypertension management by major international hypertension societies, home blood pressure monitoring (HBPM) is an important method for evaluating a patient's ambulatory blood pressures.<sup>26-28</sup> Home blood pressure monitoring provides multiple blood pressure measurements from the patient's typical environment and allows for the detection of white coat and masked

**TABLE 2. Reasons for Above Goal In-Clinic Blood Pressure Measurement (n=141)**

<i>Patients per Category of Elevated Blood Pressure, n (%)</i>	
White Coat Hypertension	53 (38)
Home Blood Pressure Monitoring	11 (8)
Specialty Clinic Visit	24 (17)
Isolated Hypertension	39 (28)
Unknown	13 (9)
<i>Sub-Analysis of Comorbidities for Unknown Category (n=13)</i>	
History of Non-Adherence to Antihypertensive Medications	6 (46)
Patients with Comorbidity of Interest	8 (62)
≥3 Comorbidities	1 (8)
2 Comorbidities	4 (31)
1 Comorbidity	3 (23)

hypertension. Additionally, compared to in-clinic blood pressure measurements, HBPM has been shown to have superior prognostic value. While HBPM is an important tool for evaluating a patient's blood pressure control, it can lead to inaccurate pressures when patients have suboptimal technique or if the home monitoring device is not validated.<sup>27,28</sup> Therefore, it is important to educate patients on proper HBPM technique. Pharmacists are well positioned to provide education on HBPM.

As noted, HBPM can be a useful tool for accurately capturing a patient's blood pressure when proper technique is followed. At the time of this quality improvement evaluation, HBPM was not a validated method for data collection for the WCHQ hypertension quality control measure. Our evaluation indicates a need for revisions to the WCHQ hypertension quality measure to control for factors that may lead to inaccurate reporting of patient hypertension control. Since the time of completion of this evaluation, WCHQ now accepts home blood pressure measurements for patients.

Specialty clinic blood pressure readings were another reason for above goal in-clinic blood pressures identified. Previous

literature has demonstrated that blood pressure readings taken at specialty clinic appointments are less likely to demonstrate hypertension control compared to primary care visits. One cohort study demonstrated that for 86,512 patients, patients with their most recent blood pressure measurement taken in a specialty care setting (n=43,364) were significantly less likely to have hypertension control compared to patients with most recent measurement taken in primary care (n=43,148, 63% vs. 68%).<sup>29</sup> This variation in blood pressure measurements can be attributed to differences in blood pressure reading technique used. Additionally, when a patient is found to have high blood pressure, it is rarely addressed in specialty clinics. A previous study demonstrated that blood pressure was not discussed or documented in two-thirds of rheumatology visits when a blood pressure greater than or equal to 160/100 mmHg was taken, and only one in 10 patients received advice regarding follow-up for their elevated blood pressure reading.<sup>30</sup> With this in mind, documented specialty clinic blood pressure readings may not accurately reflect a patient's hypertension control. Within the health system where this evaluation was performed, many specialty clinics check a blood pressure reading but do not check a second blood pressure reading when the first one is elevated, decreasing accuracy. Additionally, when patients are seen by specialty clinics, other factors often exist that may contribute to their blood pressure being above goal. For example, patients seen by a rheumatology clinic may be experiencing pain, and patients seen by oncology clinic may be anxious, which can increase blood pressure. Therefore, specialty clinic blood pressure readings may not accurately reflect a patient's hypertension control. This presents an opportunity for enhanced organizational communication and for improved quality of blood pressure readings taken at specialty clinic visits.

Additionally, patients following up in primary care may have an isolated hypertensive reading. This often occurs when a patient is acutely ill or in pain. For these patients, returning to clinic for a blood pressure check may be inconvenient or unnecessary if blood pressure was previously well-controlled. Home blood pressure monitoring is a way to follow-up on isolated

hypertensive readings to ensure blood pressure control.

A primary reason for elevated clinic blood pressure readings is white coat hypertension, which accounted for 37% of patients with elevated blood pressure readings in-clinic for this project. White coat hypertension contributes to above goal in-clinic blood pressure readings, leading to the inaccurate reporting of patient blood pressure control for quality metrics.<sup>31</sup> For patients with suspected or diagnosed white coat hypertension, ambulatory blood pressure measurement is critical for diagnosis, assessment, and monitoring.<sup>32</sup> For these patients, in-clinic blood pressure readings are not an accurate reflection of hypertension control and HBPM is preferred. When HBPM was not included in the WCHQ hypertension control quality measure, the measure did not adequately reflect patient blood pressure control for patients with white coat hypertension. Therefore, it did not reflect the full impact of this pharmacist-driven hypertension management program.

Lastly, for patients without an identified reason for uncontrolled hypertension, it is important to evaluate other patient-specific factors that may contribute to above goal blood pressure readings, including non-adherence, inappropriate antihypertensive medication classes, drug interactions, and resistance to medication changes.<sup>6</sup> Pharmacists are able to assess and resolve barriers to medication adherence and select evidence-based antihypertensive medications.<sup>11</sup>

This quality improvement evaluation is not without limitations. One limitation of this evaluation is the small sample size, with data collection from a limited number of patients within one health system. This limits the generalizability of this project to other institutions. Second, data was collected via retrospective chart reviews, requiring interpretation due to ambiguous or incomplete documentation in the EHR.

This evaluation showcases the potential for pharmacists to improve organizational quality measures within health systems. Specifically, for the WCHQ hypertension quality control measure, there is an opportunity to improve the capture of controlled blood pressure for patients with white coat hypertension within this health system. Our results also show a need to

improve the accuracy of measurement collections in this health system. Future directions include developing internal protocols to ensure patients with white coat hypertension are appropriately diagnosed and documented in the EHR throughout the health system. Additionally, health system adaptations should be proposed to ensure home blood pressure readings are consistently and accurately collected, reported, and documented, and to improve the accuracy of blood pressure values collected at specialty clinic visits.

## Conclusion

For patients who have previously participated in the pharmacist hypertension management program, white coat hypertension was the most common cause for most recent in-clinic blood pressure elevations followed by isolated hypertension. Of the patients with white coat hypertension, only about one-third had it documented on their problem list in the EHR. This presents the possibility for improvement in the accuracy of capturing hypertension control within health systems, especially for those who have white coat hypertension.

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Jordyn Kettner was a 2022 Doctor of Pharmacy Graduate from the University of Wisconsin-Madison School of Pharmacy in Madison, WI. Laura Belmonte is a PGY1 Acute Care Pharmacy Resident at Froedtert & the Medical College of Wisconsin in Milwaukee, WI. Katherine Hartkopf is the Pharmacy Manager, Ambulatory Care Services at UW Health Pharmacy Services in Madison, WI. April Weaver is a Clinical Pharmacist at UW Health in Madison, WI. Kristina Heimerl is a Clinical Pharmacist at UW Health in Madison, WI.

**Corresponding Author:** Kristina Heimerl  
KHeimerl@uwhealth.org

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