

The Cost-Effectiveness of Pharmacist-Physician Collaborative Care Models vs. Usual Care on Time in Target Systolic Blood Pressure Range in Patients with Hypertension from the Payer Perspective

Jessica S. Jay, PharmD; Stephen C. Ijioma, PharmD; David A. Holdford, RPh, MS, PhD; Dave L. Dixon, PharmD; Evan M. Sisson, PharmD; Julie A. Patterson, PharmD, PhD
Virginia Commonwealth University School of Pharmacy Center for Pharmacy Practice Innovation, Richmond, VA

Background

- Hypertension is highly prevalent in the United States, affecting nearly half of all adults (43%).¹
- Time in target range (TTR) for systolic BP is a novel measure of BP control consistency that is independently associated with increased cardiovascular (CV) risk.²
- Studies have shown that pharmacist-physician collaborative care models (PPCCM) for hypertension management significantly improve blood pressure (BP) control rates and provide consistent control of BP.^{3,4}

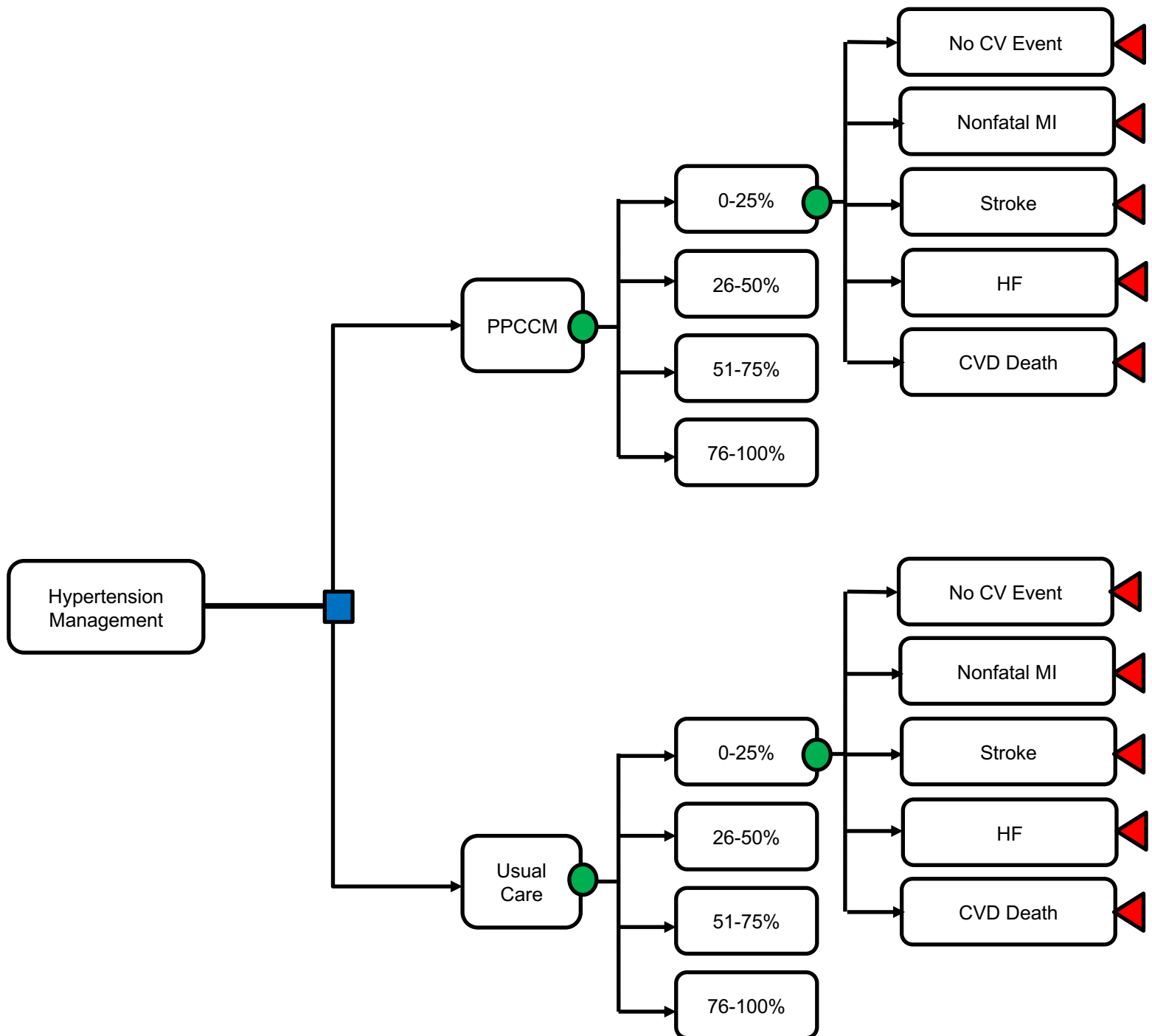
Objective

- The objective of this study was to compare the cost-effectiveness of PPCCM with usual care for the management of hypertension from the payer perspective.

Methods

- We used a decision analytic model with a three-year time horizon based on published literature and publicly available data.
- The population consisted of adult patients who had a previous diagnosis of high BP (office-based BP > 140/90 mmHg) or were receiving antihypertensive medication(s).

Figure 1. Decision Tree Analysis for the Cost-Benefit of PPCCM Compared with Standard Usual Care on Time in Target Range for Systolic Blood Pressure in Hypertension Management



Methods

Table 1. Effectiveness and Cost Inputs

Variables	Base-case value	Range	Reference
Probability of TTR for Systolic BP by Hypertension Management Approach			
PPCCM			
0-25%	0.210	0.170-0.260	Dixon et al, 2020
26-50%	0.360	0.290-0.430	Dixon et al, 2020
51-75%	0.310	0.240-0.370	Dixon et al, 2020
76-100%	0.120	0.098-0.150	Dixon et al, 2020
Usual Care			
0-25%	0.550	0.400-0.600	Dixon et al, 2020
26-50%	0.340	0.270-0.400	Dixon et al, 2020
51-75%	0.050	0.042-0.064	Dixon et al, 2020
76-100%	0.060	0.044-0.066	Dixon et al, 2020
Probability of CV Events by TTR for Systolic BP			
Outcome event rates of patients in TTR for Systolic BP 0-25%			
Nonfatal MI	0.035	0.027-0.045	Wright et al, 2015
Stroke	0.020	0.014-0.028	Wright et al, 2015
Heart failure	0.022	0.016-0.031	Wright et al, 2015
CVD death	0.017	0.012-0.024	Wright et al, 2015
No CV event	0.906	-	Calculation
Hazard ratio of patients in TTR for Systolic BP 26-50%			
Nonfatal MI	0.83	0.57-1.18	Fatani et al, 2021
Stroke	0.83	0.55-1.27	Fatani et al, 2021
Heart failure	1.30	0.94-2.01	Fatani et al, 2021
CVD death	0.69	0.42-1.15	Fatani et al, 2021
No CV event	1.03	-	Calculation
Hazard ratio of patients in TTR for Systolic BP 51-75%			
Nonfatal MI	0.87	0.61-1.24	Fatani et al, 2021
Stroke	0.58	0.36-0.93	Fatani et al, 2021
Heart failure	0.84	0.54-1.29	Fatani et al, 2021
CVD death	0.53	0.30-0.92	Fatani et al, 2021
No CV event	1.12	-	Calculation
Hazard ratio of patients in TTR for Systolic BP 76-100%			
Nonfatal MI	0.69	0.46-1.04	Fatani et al, 2021
Stroke	0.40	0.22-0.73	Fatani et al, 2021
Heart failure	0.59	0.34-1.02	Fatani et al, 2021
CVD death	0.45	0.23-0.86	Fatani et al, 2021
No CV event	1.25	-	Calculation
Programmatic Costs			
Annual PPCCM Pharmacist Visits, No.	6	4-12	Dixon et al, 2020
PPCCM cost per visit	\$24	\$19-\$29	ASHP, 2019
Annual Physician Visits, No.			
PPCCM Group	1	1-2	Assumption
Usual Care	3	1-6	Dixon et al, 2020
Physician cost per visit	\$90	\$72-\$108	CMS, 2019
Total cost of PPCCM	\$702	\$562-\$842	ASHP, 2019
Total cost of usual care	\$810	\$648-\$972	CMS, 2019
Downstream Healthcare Costs			
One-time cost of nonfatal MI	\$24,089	\$15,372-\$32,306	Bress et al, 2017
One-time cost of stroke	\$15,678	\$6,001-\$42,039	Bress et al, 2017
One-time cost of heart failure	\$11,678	\$11,669-\$16,580	Bress et al, 2017
One-time cost of CVD death	\$19,514	\$12,560-\$33,024	Bress et al, 2017

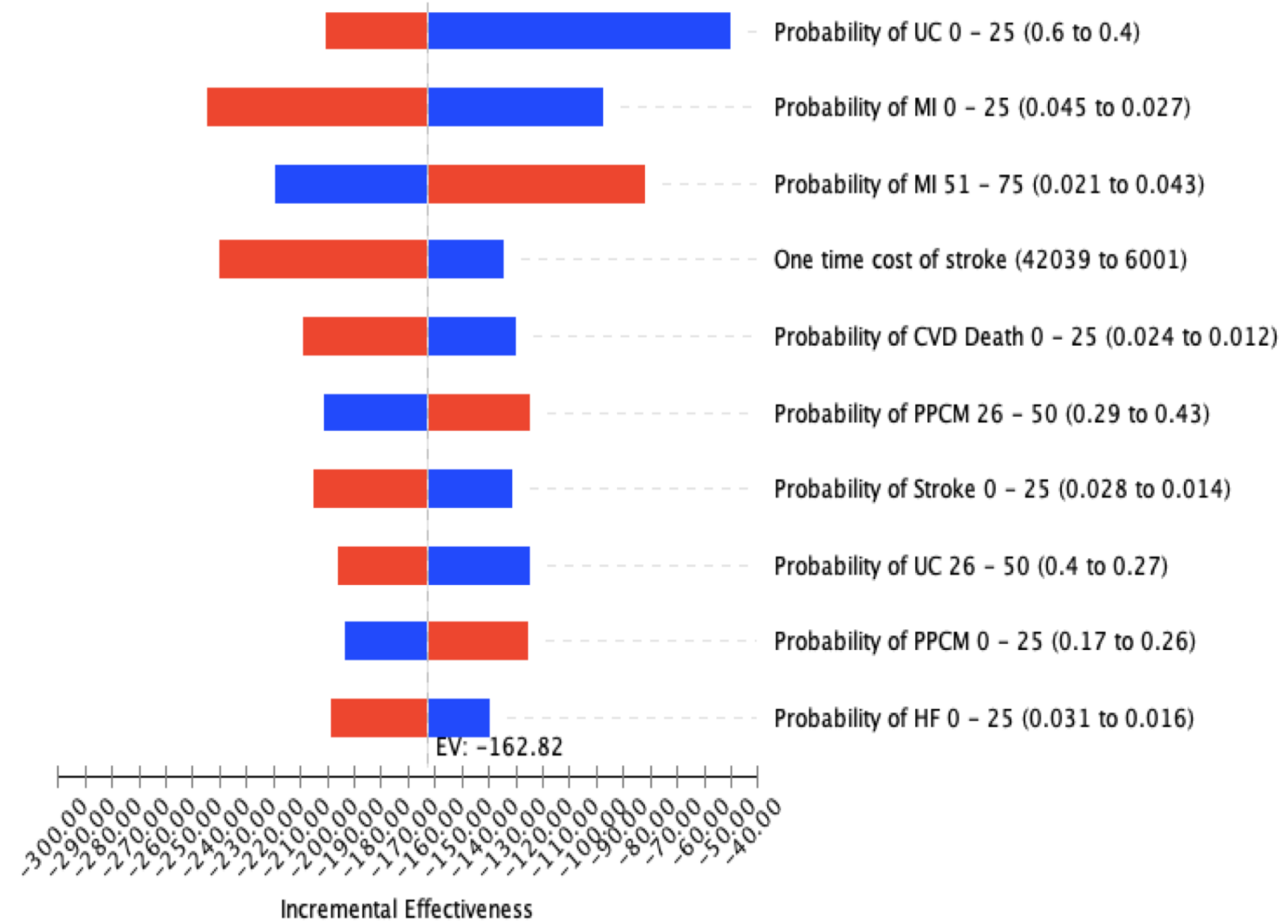
*All costs were inflated to 2020 USD.

Results

Table 2. Cost-Effectiveness Results

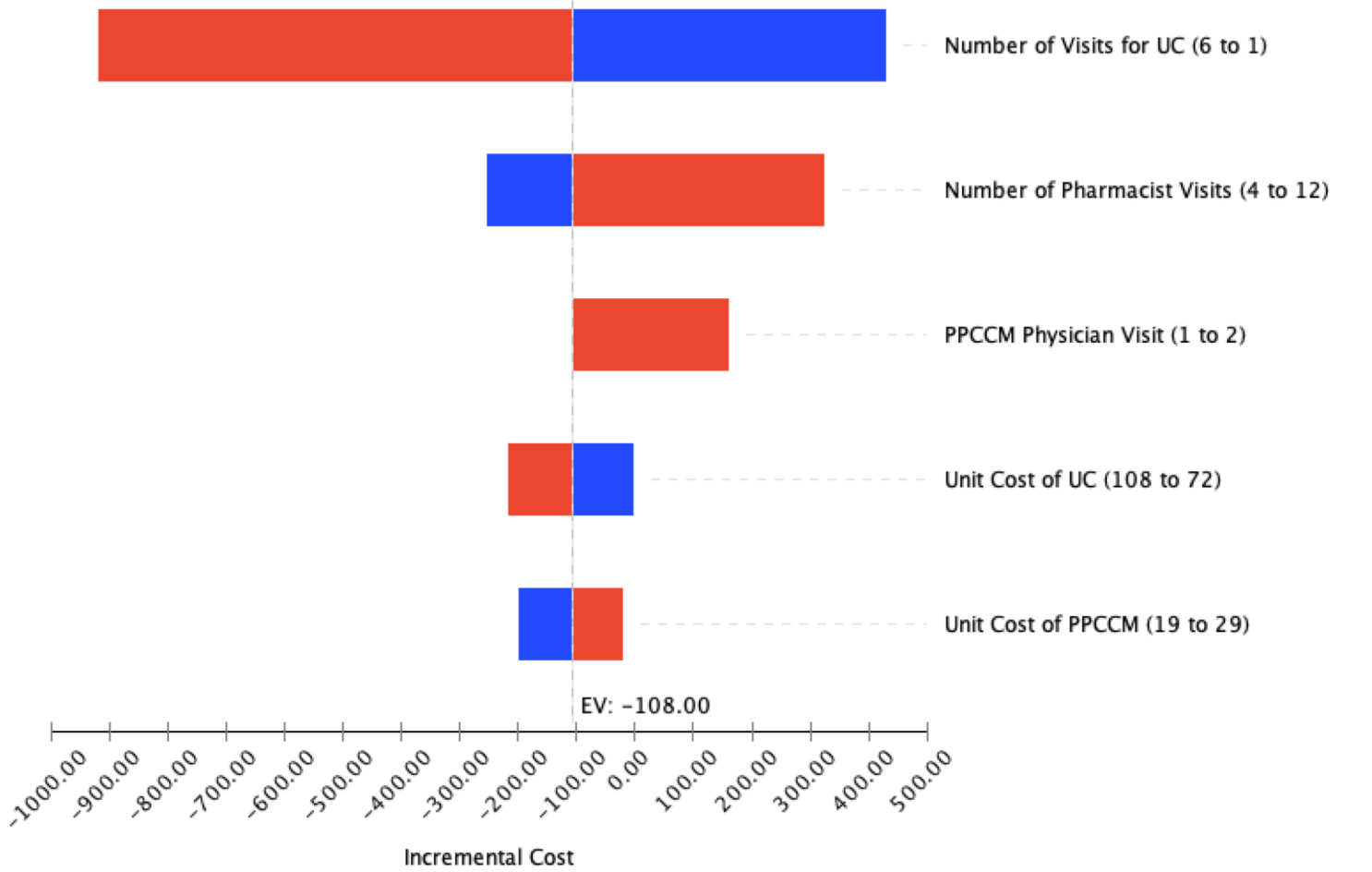
	PPCCM	Usual Care	Difference
Cardiovascular Events			
Nonfatal MI	0.0300	0.0321	21 per 10,000
Stroke	0.0149	0.0178	29 per 10,000
Heart failure	0.0225	0.0237	12 per 10,000
CVD death	0.0116	0.0143	27 per 10,000
Total downstream healthcare expenditures	\$1,535.82	\$1,698.64	- \$162.82
Total program costs	\$702.00	\$810.00	- \$108.00
Cost-benefit ratio	Dominant		

Figure 2. Tornado Diagram of Incremental Downstream Healthcare Expenditures among Patients Receiving PPCCM vs. Usual Care



*Only the top 10 variables are shown.

Figure 3. Tornado Diagram of Incremental Cost of PPCCM vs. Usual Care



Abbreviations Used in Figures and Tables: ASHP, American Society for Health Systems Pharmacists; CMS, Centers for Medicare and Medicaid Services; CV, cardiovascular; CVD, cardiovascular disease; UC, Usual Care; MI, myocardial infarction; PPCCM, pharmacist-physician collaborative care model; HF, heart failure; TTR, time in target range; BP, blood pressure

Discussion & Limitations

- When compared to usual care, PPCCM was associated with lower downstream healthcare expenditures, saving an expected \$162.82 per patient over a three-year time horizon.
- Our finding of downstream healthcare savings is consistent with most long-term economic evaluations of clinical pharmacy services for chronic disease state management.⁵
- The lower PPCCM program costs reflected the significantly lower cost of pharmacist time as billed by “incident to” CPT codes than physician visits for hypertension.
- In threshold analysis, the direct cost of provider time was lower for usual care than PPCCM if usual care patients had fewer than two physician visits per year. However, previous studies suggest that most patients with hypertension have two or more hypertension-focused physician visits per year.⁶
- Limitations included: the TTR for systolic BP was collected from a study with a small population⁷ and exclusion of medication costs due to the lack of information.

Conclusions

- In this decision analytic model, PPCCM was less costly to administer and resulted in fewer downstream adverse CV events and healthcare expenditures relative to usual care.
- Although further research is needed to evaluate the long-term costs and outcomes of PPCCM, payer coverage of PPCCM services may improve patients' CV outcomes and reduce future healthcare costs.

References

- Centers for Disease Control and Prevention. Facts About Hypertension.
- Doumas M, Tsioufis C, Fletcher R, Amdur R, Faselis C, Papademetriou V. Time in therapeutic range, as a determinant of all-cause mortality in patients with hypertension. J Am Heart Assoc. 2017;6(11). doi:10.1161/JAHA.117.007131
- Carter BL, Clarke W, Ardery G, Weber CA, James PA, Weg MV, et al. A cluster-randomized effectiveness trial of a physician-pharmacist collaborative model to improve blood pressure control. Circ Cardiovasc Qual Outcomes. 2010;3(4):418-423. doi:10.1161/CIRCOUTCOMES.109.908038
- Carter BL, Ardery G, Dawson JD, James PA, Bergus GR, Douchette WR, et al. Physician/Pharmacist Collaboration to Improve Blood Pressure Control. Arch Intern Med. 2010;169(21):1996-2002. doi:10.1001/archinternmed.2009.358.Physician/Pharmacist
- Talon B, Perez A, Yan C, Alobaidi A, Zhang KH, Schultz BG, et al. Economic evaluations of clinical pharmacy services in the United States: 2011-2017. J Am Coll Clin Pharm. 2020;3(4):793-806. doi:10.1002/jac5.1199
- Ashman JJ, Rui P, Schappert SM. Age Differences in Visits to Office-based Physicians by Adults With Hypertension: United States, 2013. Natl Cent Heal Stat. 2016;(263):1-8.
- Dixon DL, Parod ED, Sisson EM, Van Tassell BW, Nadpara PA, Dow A. Impact of a pharmacist-physician collaborative care model on time-in-therapeutic blood pressure range in patients with hypertension. J Am Coll Clin Pharm. 2020;3(2):404-409. doi:10.1002/jac5.1115

Contact Information

Dr. Jessica S. Jay (jayj@vcu.edu)
Dr. Julie A. Patterson (japatterson2@vcu.edu)