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Blood pressure measurement knowledge and counselling among hospital pharmacists - an interventional study

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Abstract

Background Pharmacists occupy a vantage position to educate patients with hypertension on self-monitoring of blood pressure (BP). An update on their knowledge and counselling on BP measurement is needful to ascertain proper information dissemination to patients.

Methods An interventional study was carried out for a six-month period among consecutively sampled pharmacists working at a tertiary healthcare facility, using a semi-structured questionnaire for data collection. Sequel to preintervention assessment of pharmacists' knowledge and counselling on BP measurement, an educational intervention comprising didactic lecture, case studies, demonstrations, and interactive question and answer sessions was carried out to address the gaps observed. Knowledge and counselling were then reassessed one-month postintervention to find out the impact of the intervention. Data was summarized with descriptive and inferential statistics with significance level set at $p < 0.05$.

Results One hundred and forty-four pharmacists completed the study. Preintervention knowledge and counselling on BP measurement among the pharmacists was poor. Median scores of pharmacists' knowledge on BP measurement increased significantly from 13.00 preintervention to 25.00 postintervention ($p < 0.001$); while their counselling on BP measurement also increased significantly from 1.00 preintervention to 12.00 postintervention ($p < 0.001$). The knowledge category of the pharmacists' improved as majority who were categorized as having either "poor" (67, 46.5%) or "fair" (68, 47.2%) knowledge preintervention advanced to "excellent" (99, 68.7%) knowledge postintervention. Similarly, the pharmacists' counselling category was upgraded from the majority categorized as poor (141, 97.9%) preintervention to excellent (87, 60.4%) postintervention. Prior to the educational intervention, only 62 (43.1%) pharmacists knew that BP measurement had to be carried out in both arms for a first-time patient. Also, when asked the question "What BP reading will be recorded for a patient whose BP readings when taken thrice were 149/82 mmHg, 141/78 mmHg, and 139/78 mmHg?" only 38 (26.4%) provided the right answer. Similarly, majority of the pharmacists (51, 35.4%) could only state one out of five precautions during blood pressure measurement. In this study, pharmacists' gender, additional educational qualification, and work experience did not significantly influence their knowledge and counselling on BP measurement.

Conclusions The educational intervention significantly improved pharmacists' knowledge and counselling on BP measurement.

Keywords Pharmacist · Blood pressure measurement · Knowledge · Counselling · Interventional study · Point-of care testing

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Abbreviations

BP	Blood pressure
WHO	World Health Organisation
UCH	University College Hospital
JNC VII	The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure
SPSS	Statistical package for social sciences
UI	University of Ibadan

1 Introduction

Hypertension is a global health concern [1], affecting a significant proportion of the global population, with the highest prevalence for mortality [2]. The prevalence of hypertension has significantly increased in Nigeria during the past 20 years, and despite increased awareness on hypertension among the general population, clinical treatment and control rates are still low [3]. According to the WHO (2020), hypertension affected 46% of adults aged 25 and above, with the American region having the lowest prevalence and the African region having the highest [4].

The European Society of Hypertension and the European Society of Cardiology guidelines endorsed home BP measurements which has been reported to give more reliable BP measurements, compared with BP measurements done in hospitals [5, 6]. Nevertheless, the home BP measurements must be properly done so as not to introduce errors. Although many printed detailed information is available on appropriate methods of BP measurements, quite a few patients yet commit errors while taking their BP at home [7, 8].

Inadequate patient training on BP measurement by healthcare professionals has been reported by many studies as a major reason for inaccurate BP measurement by patients [9–11]. Nessler and colleagues found out that only one-third of patients were counselled on appropriate BP techniques from a healthcare professional [12]. In the long run, data provided by patients on their home BP measurements could mislead physicians' judgment on patients' BP management and lead to wrong decision making.

Studies have shown that patients' health outcomes improve when pharmacists get involved in patient counselling. A study reported that only fifty percent of patients with hypertension were counselled by pharmacists on the appropriate use of their BP monitoring device [13]. A tertiary hospital is a referral centre meant to address conditions that could not be successfully managed in primary and secondary healthcare centres. Also, tertiary hospitals in Nigeria undertake postgraduate residency training for healthcare practitioners, making the environment academic. There is therefore little or no margin for errors. It therefore becomes imperative that healthcare professionals, including pharmacists, be involved in patient counselling on BP measurement technique. This study therefore seeks to evaluate pharmacists' knowledge and counselling on blood pressure measurement among pharmacists in a tertiary hospital.

2 Methods

2.1 Study design and setting

An interventional study was carried out among pharmacists at the University College Hospital (UCH), a tertiary healthcare facility in Ibadan, Nigeria. The UCH, a 950-bed hospital, was founded in 1957 and is the foremost Nigerian healthcare institution located in the busy metropolitan city of Ibadan. Pharmacists in the tertiary healthcare facility provide pharmaceutical services to patients in the hospital as well as satellite facilities within and outside the city, under the administration of the UCH.

2.2 Sample size determination

The sample size was determined using Raosoft sample size determination with a margin of error of 5% and a confidence level of 95%, and with an estimated population size of 180 pharmacists at the UCH. An extra 10% of the calculated sample size was added to make allowances for attrition, making a total 135 pharmacists.

2.3 Design and validation of data collection tool

The semi-structured questionnaire utilised as research tool for the study was designed based on the teaching and practice experience of the corresponding author, and sequel to extensive literature search by both authors [7, 10–12, 14–22]. Face validation was done by pretesting among 15 pharmacists at the University of Ibadan Health Services, Jaja, Ibadan to ascertain that the questions were not ambiguous. Content validation was done by five faculties at the Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan. The five faculties, comprising a Professor, an Associate Professor, two Senior Lecturers, and a Lecturer I, all had several years of experience on the practical aspect and didactic lectures in blood pressure measurement. They are well versed in intervention studies aimed at improving quality of care provided by pharmacists for patients. In addition, they have made extensive contributions in Clinical Pharmacy with several publications in both local and international peer-reviewed journals. Changes were made to the original questionnaire based on the face and content validation, such as adding a follow up question under Section B for the participants to explain their response to questions on the appropriate arm to be used for a patient's first-time blood pressure measurement and the blood pressure reading to be recorded. Cronbach alpha coefficient calculated to check the internal consistency reliability for the 15-item knowledge assessment scale and 4-item counselling assessment scale were 0.82 and 6.73, respectively.

The 25-item questionnaire was divided into three sections. Section A addressed sociodemographic characteristics such as gender, years of practice and educational qualification. Sections B and C addressed knowledge and counselling on blood pressure measurement techniques, respectively. Section B comprised seven open-ended questions and eight close-ended questions. Four of the close-ended questions had yes or no responses, two three had options provided, and one was in a tabular form for the blood pressure classification. Section C had four open-ended questions. Pharmacists' counselling ability was evaluated by asking them to state the stepwise procedure for blood pressure measurement with self-monitoring blood pressure device in counselling a patient. Also, they were asked to state the precautions that patients should observe during the measurement. They were also asked to state the recommended time of the day for measurement with reasons. Some of the items included arm to be used for BP measurement, BP reading to be recorded following multiple measurements, precautions for accurate BP measurement, and the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) classification of BP.

2.4 Data collection procedure

The purpose of the study was explained to the pharmacists at the study site. The questionnaire was administered to consented pharmacists, who were consecutively sampled, at their respective units (comprising ward, outpatient, drug information and supply chain management sections) and retrieved immediately after completion. The pharmacists were reassessed with the same questionnaire one-month postintervention. The study period was from December 2022 to May 2023.

2.5 Intervention

An educational intervention was carried out by the corresponding author who had gone through relevant local and international trainings on blood pressure measurement. He is also a doctorate degree holder at the Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan, Nigeria, where he has had over ten years teaching experience as a faculty. The aim of the intervention was to address knowledge and counselling gaps on BP measurement observed among the pharmacists. The intervention comprised didactic lectures, case studies, demonstrations, interactive, question and answer sessions on knowledge and counselling on BP measurement, using both manual and automatic BP monitoring devices. The training, which took place at the seminar room at Pharmacy Department of the University College Hospital, Ibadan, lasted for about an hour.

2.6 Data analysis

Data was analysed using IBM-SPSS for Windows, Version 20. Descriptive statistics such as frequency counts, percentages, median, and mean ± standard deviation were used to summarize data. The data was not normally distributed; therefore, non-parametric inferential statistical analysis was carried out. Inferential statistics was carried out as follows:

Mann–Whitney U test for comparing knowledge and counselling assessment scores with educational qualification, and gender; Kruskal–Wallis test for comparing knowledge and counselling assessment scores with work experience; Wilcoxon signed rank test for comparing knowledge and counselling assessment scores pre and postintervention. Each correct response to the questionnaire was assigned "1" score, while each incorrect response was assigned "0" score. Under the knowledge section, the question on five precautions for manual BP measurement had five correct answers and the one on the JNC VII BP classification had a total of eight marks allocated to it. The remaining 12 questions were allocated a point each, and the total obtainable score was 26 marks. The counselling section was similarly scored; while the question on the stepwise procedure for use of self-monitoring BP monitors had six correct responses, the precautions for its use had five correct responses. The remaining two questions had a point each, and the total obtainable score for counselling on BP measurement was 13 marks.

2.7 Ethics approval

Ethical clearance for research was obtained from the joint UI/UCH Ethics Review Committee with approval number UI/EC/22/0066.

3 Results

One hundred and forty-seven pharmacists participated in the preintervention phase of the study, but 144 pharmacists completed the study. The three dropouts were on leave at the postintervention phase of the study. Gender distribution of the pharmacists was even with 75 (52.1%) being females. Ninety-three (64.6%) pharmacists had 1–5 years of work experience, 25 (17.4%) 6–10 years, and 26 (18.0%) greater than 10 years. Average years of practice was 5.13 ± 5.63 years.

There was an improvement in the knowledge assessment scores of the study participants on blood pressure measurements postintervention. Median scores of pharmacists' knowledge on BP measurement improved significantly from 13.00 preintervention to 25.00 postintervention ($p < 0.001$). While majority of the study participants had "fair" knowledge preintervention, majority had "excellent" score postintervention. Before the educational intervention, only 62 (43.1%) pharmacists knew that blood pressure measurement had to be carried out in both arms for a first-time patient. Also, when asked the question "What BP reading will be recorded for a patient whose BP readings when taken thrice were 149/82 mmHg, 141/78 mmHg, and 139/78 mmHg?" only 38 (26.4%) provided the right answer. Similarly, majority of the pharmacists (51, 35.4%) could only state one out of five precautions during blood pressure measurement. Table 1 shows detailed information on the results from the knowledge assessment of the pharmacists on blood pressure measurements.

The comparison of pharmacists' counselling showed a significant improvement in the median scores from 1.00 preintervention to 12.00 postintervention ($p < 0.001$). Table 2 shows pharmacists' assessment of counselling on self-monitoring blood pressure measurements while Fig. 1 shows the pre and postintervention stepwise counselling on the use of self-monitoring BP monitoring device. Relationships between pharmacists' knowledge and counselling assessment, and variables such as gender, educational qualification and work experience are as shown in Table 3.

4 Discussion

Blood pressure (BP) measurement is an imperative routine hospital assessment utilized for diagnosis and monitoring of hypertension [21]. The need for accurate BP measurement for clinical decision making has been emphasized by clinical guidelines [23]. Regular use of self-monitoring BP (SMBP) device by patients is now encouraged to give a better picture of their BP monitoring progression for improved management by physicians [24]. Cremers and colleagues emphasized the vantage position occupied by hospital pharmacists to counsel patients on appropriate SMBP measurement [25]. Studies have proven that patient counselling by pharmacists, as part of their clinical care practice, leads to improved patient outcomes [26, 27].

The current study observed an improvement in the pharmacists' knowledge and counselling on BP measurement sequel to the educational intervention. Previous intervention studies on medication reconciliation [28], ophthalmic preparations [29], and inhaled asthma medication devices [30] carried out in the same study population all reported similar results, postintervention. This underscores the need for continuous education for hospital pharmacists, especially on patient-focused clinical care activities to improve the quality of service delivered.

Table 1 Pharmacists' knowledge assessment on manual blood pressure measurement

Questions	Frequency (%)	
	Preintervention	Postintervention
Which artery should you pay attention to during BP measurement?	92 (63.9)	144 (100.0)
Can accurate BP readings be taken over clothes?	104 (72.2)	144 (100.0)
Cuff should be positioned at inches above the antecubital crease	74 (51.4)	143 (99.3)
What is the cuff deflation rate during BP measurement?	84 (58.3)	144 (100.0)
What BP reading will be recorded for a patient whose BP readings when taken thrice were 149/82 mmHg, 141/78 mmHg, and 139/78 mmHg?	38 (26.4)	141 (97.9)
Please explain your response for the question above	27 (18.8)	141 (97.9)
Is it appropriate to use mercury level undulation/movement in case someone does not hear the Korotkoff sound for BP measurement?	72 (50.0)	143 (99.3)
Can someone whose BP was 145/94 mmHg on a routine screening and with no prior diagnosis of hypertension be said to be hypertensive?	117 (81.3)	143 (99.3)
The first Korotkoff sound represents the reading for	139 (96.5)	144 (100.0)
The last Korotkoff sound represents the reading for	139 (96.5)	144 (100.0)
On which arm should BP be taken for first-time patients?	62 (43.1)	144 (100.0)
Left arm	66 (45.8)	0 (0)
Right arm	16 (11.1)	0 (0)
Both arms	62 (43.1)	144 (100.0)
Reason(s) for your response to the question above	28 (19.4)	143 (99.3)
Can a reading from a manual sphygmomanometer be averaged with that obtained from a digital BP monitor for a patient?	87 (60.4)	142 (98.6)
List five precautions for accurate manual BP measurements		
No correct answer	38 (26.4)	0 (0)
1 correct answer	51 (35.4)	2 (1.4)
2 correct answers	37 (25.7)	0 (0)
3 correct answers	14 (9.7)	4 (2.8)
4 correct answers	4 (2.8)	71 (49.3)
5 correct answers	0 (0)	67 (46.5)
Please fill the table below based on JNC VII BP classification	4.39 ± 2.41	7.83 ± 1.07
Knowledge category		
Poor (0–9.9%)	67 (46.5)	3 (2.1)
Fair (50–69.9%)	68 (47.2)	0 (0)
Good (70–89.9%)	9 (6.3)	42 (29.2)
Excellent (90–100%)	0 (0)	99 (68.7)

Table 2 Pharmacists' counselling assessment on self-monitoring blood pressure measurement

Questions	Frequency (%)	
	Preintervention	Postintervention
How would you counsel a patient on the stepwise procedure for BP measurement with the electronic self-monitoring blood pressure (SMBP) device?	2 (2)[1]	5 (1)[1]
Battery installation	25 (17.4)	132 (91.7)
Sit correctly	42 (29.2)	131 (91.0)
Apply arm cuff	39 (27.1)	142 (98.6)
Press the "Start/Stop" button	25 (17.4)	141 (97.9)
Remove the cuff and record the reading	6 (4.2)	140 (97.2)
Press the "Stop" button/Wait for 2–3 min before another reading	3 (2.1)	52 (31.6)
State the precautions you would counsel a patient on in the use of SMBP	0 (1)[1]	3 (1)[1]
No correct answer	100 (69.4)	2 (1.4)
1 correct answer	28 (19.4)	1 (0.7)
2 correct answers	13 (9.0)	0 (0)
3 correct answers	6 (4.2)	3 (2.1)
4 correct answers	0 (0)	68 (47.2)
5 correct answers	0 (0)	70 (48.6)
What time(s) of the day would you recommend that patients take their BP readings?	22 (15.3)	143 (99.3)
Please give reasons for your response in the question above	0 (0)	141 (97.9)
Counseling category		
Poor (0–49.9%)	141 (97.9)	3 (2.1)
Fair (50–69.9%)	3 (2.1)	1 (0.7)
Good (70–89.9%)	0 (0)	53 (36.8)
Excellent (90–100%)	0 (0)	87 (60.4)

[1]Median score (Interquartile range)

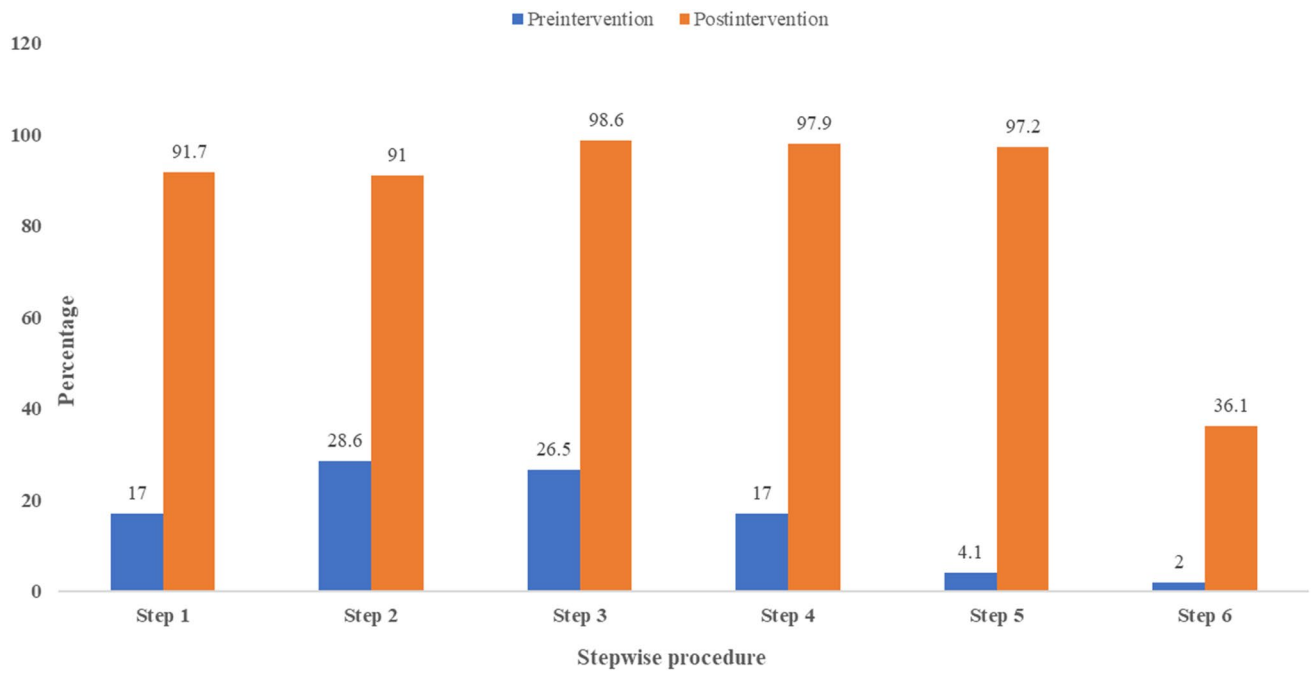

Fig. 1 Stepwise procedure assessment of blood pressure measurement counseling

Table 3 Comparison of pharmacists' knowledge and counselling with gender, education, and work experience

Variables	Median score (Interquartile range)				Median score (Interquartile range)			
	Knowledge				Counselling			
	Preintervention	p value	Postintervention	p value	Preintervention	p value	Postintervention	p value
Gender								
Female	13.00 (5)	0.362[1]	25.00 (1)	0.348[1]	1.00 (3)	0.936[1]	12.00 (1)	0.229[1]
Male	13.00 (5)		25.50 (1)		1.00 (3)		12.00 (1)	
Education								
B. Pharm only	14.00 (5)	0.079[1]	25.00 (1)	0.440[1]	1.00 (3)	0.103[1]	12.00 (1)	0.003[1]
Additional	12.00 (5)		25.00 (1)		1.00 (2)		11.00 (1)	
Work experience								
< 5 years	13.50 (5)	0.192[2]	25.00 (1)	0.531[2]	1.00 (3)	0.489[2]	12.00 (1)	< 0.001[2]
6–10 years	13.00 (5)		25.50 (1)		1.00 (2)		11.00 (1)	
> 10 years	11.50 (8)		25.50 (1)		1.00 (2)		11.00 (1)	

Test statistics: [1]Mann-Whitney U test, [2]Kruskal–Wallis test

In this study, neither work experience nor additional qualification significantly influenced the pharmacists' knowledge and counselling on BP measurement, before the intervention. This contrasts with the study conducted in the same study setting on inhaled asthma medication device [30]. The fact that pharmacists in the study setting do not engage in hands-on BP measurement for patients who access care at the healthcare facility may explain how work experience did not influence their preintervention knowledge and counselling on BP measurements. However, they are involved in counselling patients on asthma inhalation medication devices, which might afford them the opportunity to learn on the job and get to improve with increase in years of work experience. The poor pre-intervention results suggest that it may be necessary to recommend that schools of pharmacy include teaching on this topic in their undergraduate curricula This also calls for curriculum review for postgraduate studies to factor courses aimed at updating pharmacists on patient-oriented clinical care services.

Only one quarter of the pharmacists correctly answered the question, "What blood pressure reading will be recorded for a patient whose BP readings when taken thrice were 149/82 mmHg, 141/78 mmHg, and 139/78 mmHg?" before the intervention. The AHA American Heart Association recommends that only readings within 5 mmHg difference should be averaged [14]. Also, more than one-half of the pharmacists, preintervention, did not know that BP measurements should be carried out on both arms for first timers. According to the American Heart Association, the arm with the higher of the two should be recorded, and that subsequent readings should be done on the arm with the higher reading [14]. However, majority of the pharmacists were aware that someone whose BP was 145/94 mmHg on a routine screening and with no prior diagnosis of hypertension could not be said to be hypertensive. Such a person should be asked to engage in lifestyle modifications and asked to recheck his BP in one or two weeks later, and subsequently referred to a physician for a more comprehensive checkup.

Majority of the pharmacists could not state more than two precautions for accurate blood pressure measurements before the intervention. An earlier study by stated more than five precautions to take while taking blood pressure measurements [18]. Pharmacists counsel patients on precautions for appropriate blood pressure measurements. Although, a significant improvement was seen postintervention, it is important to evaluate quality of clinical care services offered by pharmacists to ascertain whether there is need for intervention or not. Only 15.3% of the pharmacists knew the recommended time for patients to take blood pressure readings during the preintervention phase of the study. According to the European Society of Hypertension guidelines [15] and the American Heart Association [18], it is recommended that patients take their readings in the morning before taking their medication (not immediately after waking up) and in the evening before dinner.

The absence of a control group to ascertain that the improvement observed in the study was on account of the intervention is a limitation to the study. The result of this study is neither generalisable to pharmacists in other tertiary healthcare facilities in Nigeria nor to those in community pharmacies.

5 Conclusions

Baseline knowledge and counselling of the pharmacists on blood pressure measurement was poor. The educational intervention significantly improved the pharmacists' knowledge and counselling on blood pressure measurement.

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Data availability The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate Approval for the study was granted by the joint University of Ibadan/University College Hospital Health Research and Ethics Committee with approval number UI/EC/22/0066. The purpose of the study was explained to the pharmacists and only those who gave informed consent were recruited for this study. The research was carried out in accordance with the Declaration of Helsinki.

Consent for publication Not applicable.

Competing interests There authors declared that there was no competing interest.

References

1. Kim YM, Ohn DW, Kim SH, et al. Direct comparison of an automated oscillometric device with an electronic auscultatory device for epidemiologic survey to evaluate the prevalence of hypertension. Medicine (Baltimore). 2022;101(50): e32299. https://doi.org/10.1097/MD.0000000000032299.
2. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. Nat Rev Nephrol. 2020;16(4):223–37. https://doi.org/10.1038/s41581-019-0244-2.
3. Adeloye D, Owolabi EO, Ojji DB, et al. Prevalence, awareness, treatment, and control of hypertension in Nigeria in 1995 and 2020: a systematic analysis of current evidence. J Clin Hypertens (Greenwich). 2021;23(5):963–77. https://doi.org/10.1111/jch.14220.
4. John O, Campbell NRC, Brady TM, et al. The 2020 "WHO technical specifications for automated non-invasive blood pressure measuring devices with cuff." Hypertens. 2021;77:806–12. https://doi.org/10.1161/HYPERTENSIONAHA.120.16625.
5. Roumie CL, Hung AM, Russell GB, et al. Blood pressure control and the association with diabetes mellitus incidence: results from SPRINT randomized trial. Hypertension. 2020;75(2):331–8. https://doi.org/10.1161/HYPERTENSIONAHA.118.12572.
6. Nessler K, Krztoń-Królewiecka A, Suska A, Mann MR, Nessler MB, Windak A. The reliability of patient blood pressure self-assessments - a cross-sectional study. BMC Prim Care. 2023;24(1):2. https://doi.org/10.1186/s12875-022-01962-x. (**Published 2023 Jan 3**).
7. Stergiou GS, Palatini P, Parati G, O'Brien E, Januszewicz A, Lurbe E, Persu A, Mancia G, Kreutz R. European Society of Hypertension Council and the European Society of Hypertension Working Group on Blood Pressure Monitoring and Cardiovascular Variability. 2021 European Society of Hypertension practice guidelines for office and out-of-office blood pressure measurement. J Hypertens. 2021;39(7):1293–302. https://doi.org/10.1097/HJH.0000000000002843.
8. Kyriakoulis KG, Ntineri A, Niiranen TJ, Lindroos A, Jula A, Schwartz C, Kollias A, Andreadis EA, McManus RJ, Stergiou GS. Home blood pressure monitoring schedule: optimal and minimum based on 2122 individual participants' data. J Hypertens. 2022;40(7):1380–7. https://doi.org/10.1097/HJH.0000000000003157.
9. Bancej CM, Campbell N, McKay DW, Nichol M, Walker RL, Kaczorowski J. Home blood pressure monitoring among Canadian adults with hypertension: results from the 2009 survey on living with chronic diseases in Canada. Can J Cardiol. 2010;26(5):e152-157.
10. Fung CSC, Wong WCW, Wong CKH, Lee A, Lam CLK. Home blood pressure monitoring: a trial on the effect of a structured education program. Aust Fam Physician. 2013;2(4):233–7.
11. Parati G, Stergiou GS, Bilo G, et al. Home blood pressure monitoring: methodology, clinical relevance and practical application: a 2021 position paper by the Working Group on Blood Pressure Monitoring and Cardiovascular Variability of the European Society of Hypertension. J Hypertens. 2021;39(9):1742–67. https://doi.org/10.1097/HJH.0000000000002922.

12. Nessler K, Krztoń-Królewiecka A, Suska A, Mann MR, Nessler MB, Windak A. The quality of patients' self-blood pressure measurements: a crosssectional study. BMC Cardiovasc Disord. 2021;21(1):539.
13. Basheti IA, Khdair A. Home monitoring of blood pressure: patients' perception and role of the pharmacist. Trop J Pharm Res. 2014;13(11):1947–51.
14. Saseen, JJ. Essential Hypertension. In: Alldredge, B.K. et al eds. Koda-Kimbles and young's applied therapeutics: the clinical use of drugs. 10th edition. Williams & Wilkins. 2013; pp. 291–330.
15. Lurbe E, Agabiti-Rosei E, Cruickshank JK, et al. 2016 European Society of Hypertension guidelines for the management of high blood pressure in children and adolescents. J Hypertens. 2016;34(10):1887–920. https://doi.org/10.1097/HJH.0000000000001039.
16. Bakris G, Sorrentino M. Perspective on the new blood-pressure guidelines. Eur Heart J. 2018;39(33):3008–9. https://doi.org/10.1093/eurheartj/ehy280.
17. Hwang KO, Aigbe A, Ju HH, Jackson VC, Sedlock EW. Barriers to accurate blood pressure measurement in the medical office. J Prim Care Community Health. 2018;9:2150132718816929. https://doi.org/10.1177/2150132718816929.
18. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines [published correction appears in Hypertension. 2018 Jun;71(6):e136-e139] [published correction appears in Hypertension. 2018 Sep;72(3):e33]. Hypertens. 2018;71(6):1269–1324. https://doi.org/10.1161/HYP.0000000000000066
19. Casey DE Jr, Thomas RJ, Bhalla V, et al. 2019 AHA/ACC clinical performance and quality measures for adults with high blood pressure: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. J Am Coll Cardiol. 2019;74(21):2661–706. https://doi.org/10.1016/j.jacc.2019.10.001.
20. Dymek J, Gołda A, Polak W, Lisowski B, Skowron A. Effect of education for hypertensive patients with correctly performed self-blood pressure monitoring (SBPM). Pharmacy (Basel). 2019;7(3):75. https://doi.org/10.3390/pharmacy7030075. (**Published 2019 Jun 27**).
21. Campbell NRC, Padwal R, Picone DS, Su H, Sharman JE. The impact of small to moderate inaccuracies in assessing blood pressure on hypertension prevalence and control rates. J Clin Hypertens (Greenwich). 2020;22(6):939–42. https://doi.org/10.1111/jch.13915.
22. Myers MG, Asmar R, Staessen JA. Office blood pressure measurement in the 21st century. J Clin Hypertens (Greenwich). 2018;20(7):1104–7. https://doi.org/10.1111/jch.13276.
23. Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease. Circulation. 2019;140(11):563–95.
24. Stergiou GS, O'Brien E, Myers M, Palatini P, Parati G, STRIDE BP Scientific Advisory Board. STRIDE BP: an international initiative for accurate blood pressure measurement. J Hypertens. 2020;38(3):395–9. https://doi.org/10.1097/HJH.0000000000002289.
25. Cremers AL, Alege A, Nelissen HE, et al. Patients' and healthcare providers' perceptions and practices regarding hypertension, pharmacy-based care, and mHealth in Lagos, Nigeria: a mixed methods study. J Hypertens. 2019;37(2):389–97. https://doi.org/10.1097/HJH.0000000000001877.
26. Milosavljevic A, Aspden T, Harrison J. Community pharmacist-led interventions and their impact on patients' medication adherence and other health outcomes: a systematic review. Int J Pharm Pract. 2018;26(5):387–97. https://doi.org/10.1111/ijpp.12462.
27. Rajiah K, Sivarasa S, Maharajan MK. Impact of pharmacists' interventions and patients' decision on health outcomes in terms of medication adherence and quality use of medicines among patients attending community pharmacies: a systematic review. Int J Environ Res Public Health. 2021;18(9):4392. https://doi.org/10.3390/ijerph18094392. (**Published 2021 Apr 21**).
28. Aje AA, Showande SJ, Fakeye TO. Medication reconciliation knowledge among hospital pharmacists in Nigeria: a non-randomised controlled trial. Pharm Educ. 2021;21(1):528–37.
29. Oyebode AA, Aje AA. Intervention study on pharmacists' knowledge and counselling on ophthalmic preparations in a Tertiary Hospital in South-Western Nigeria. Malaysian J Pharm Sc. 2021;20(1):73–84.
30. Aje AA, Aina OA. An Intervention study of pharmacists' knowledge and patient counselling on metered dose inhalers and nebulizers. Afr J Biomed Res. 2020;23(3):313–9.