Pharmacist-physician collaboration improves blood pressure control

Abla M. Albsoul-Younes, BSc, PhD, Eman A. Hammad, BSc, MSc, Nada A. Yasein, MD, MRCGP, Linda M. Tahaineh, PharmD, MSc.

ABSTRACT

الأهداف : تقييم تأثير العمل الجماعي بين الطبيب والصيدلي على علاج ومراقبة المرضى المصابين بارتفاع ضغط الدم.

الطريقة : أُجريت هذه الدراسة السريرية العشوائية في عيادة طب الأسرة بمستشفى الجامعة الأردنية، عمان، الأردن وذلك خلال الفترة من مارس إلى نوفمبر 2009م، حيث شملت 253 مريضاً مُصاباً بارتفاع ضغط الدم. لقد تم تقسيم المشاركين في الدراسة عشوائياً إلى مجموعتين وهما: مجموعة التدخل (العدد=136) وتم الإشراف عليها من قبل فريق من الأطباء والصيادلة، ومجموعة التحكم (العدد=130) وتم الإشراف عليها من قبل مجموعة من الأطباء فحسب.

النتائج : أشارت نتائج الدراسة إلى أن 79.4% من المرضى في مجموعة التدخل قد حققوا نتائج مرضية أثناء تحليل ضغط الدم وذلك اعتماداً على الأهداف التي نصت عليها اللجنة المشتركة للوقاية من ارتفاع ضغط الدم وإدارته والكشف عنه وتقييمه وعلاجه، فيما حقق 65.6% فقط من المرضى في مجموعة التحكم هذه النتائج (p=0.01). لقد كان معدل انخفاض ضغط الدم الانقباضي في مجموعة التدخل 16.1±14.6 مم زئبقي، فيما كان هذا المعدل في مجموعة التحكم 10.6±13.5 مم زئبقي (p=0.002). وكان معدل انخفاض ضغط الدم الانبساطي في مجموعة التدخل 10.5±12.9 مم زئبقي، و7.17±13.11 مم زئبقي في مجموعة التحكم (p=0.04).

خاتمة : أثبتت الدراسة مدى فعالية التعاون بين الأطباء والصيادلة أثناء علاج ومراقبة المرضى المصابين بارتفاع ضغط الدم، حيث أن ذلك يقوم بتحسين نتائج تحليل ضغط الدم، كما أنه يؤدي إلى انخفاض واضح في مستويات ضغط الدم الانقباضي والانبساطي، وهذا من شأنه أن ينعكس إيجابياً على صحة الجهاز الوعائي القلبي. إن تقديم العناية الصيدلانية من خلال العيادات الخارجية أمر ممكن في الأردن وقد يؤدي إلى نتائج أفضل للمرضى.

Objectives: To evaluate the effect of teamwork (physician and pharmacist) on the management of uncontrolled hypertensive patients.

Methods: This is a randomized controlled clinical trial conducted from March to November 2009. Patients attending the Family Medicine Clinic at Jordan University Hospital, Amman, Jordan with uncontrolled hypertension were invited to participate in the study. A total of 253 patients were randomly allocated to an intervention (n=130) or control group. In the intervention group, patients were managed by a physician-pharmacist team. In the control group, patients were managed by physician(s) only.

Results: In the intervention group, 79.4% of patients achieved blood pressure (BP) goals specified by the Joint National Committee on Prevention and Management, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII) compared to 65.6% in the control group (p=0.01). Decline in systolic BP was 16.1 ± 14.6 mm Hg in the intervention group, and 10.6 ± 13.5 mm Hg in the control group (p=0.002). Reduction in diastolic BP was 10.5 ± 12.9 mm Hg in the intervention group, and 7.17 ± 13.11 mm Hg in the control group, (p=0.04). Data were presented as mean ± standard deviation.

Conclusions: This study found that the physician-pharmacist collaborative approach to uncontrolled hypertension in Jordan improved the rate of BP control in hypertensive patients, and resulted in more profound decline in both systolic and diastolic BP, and this will probably reflect on better outcomes in cardiovascular diseases. Establishing pharmaceutical care managed clinic in the setting of outpatient-clinics is possible, and provides better management of patients.

Hypertension is defined as a persistent elevation of arterial blood pressure (BP), and controlling BP with antihypertensive agents can reduce cardiovascular complications.[1] Despite the wide availability of drugs controlling BP, hypertension remains prevalent, and BP control rates remain low. The Canadian Heart Health Surveys determined that only 13% of treated hypertensive people surveyed were controlled.[2] In the United States, it is estimated that 37% of hypertensive patients are at their BP goal.[3] In Jordan, the prevalence of chronic diseases has increased largely in recent years including hypertension, diabetes, and dyslipidemia.[4] Among adult Jordanians, the prevalence of hypertension is 15%.[5] Approximately 82% of those patients are aware of their diagnosis, yet a high percentage of 68.5% of them did not achieve control of their BP.[5] There are many factors that contribute to the limited success in the detection and treatment of hypertension. The main factors include failure of healthcare delivery systems, poor patient compliance with treatment regimens, and regimen complexity.[6] Many studies addressed the effect of hospital-based, physician versus pharmacist's care of hypertensive patients in the United States. These studies have shown that pharmacists' involvement improved patient satisfaction, compliance with therapy, and greater success in reaching the target BP.[7-9] Hypertension clinics that are managed by pharmacists have not yet been established in Jordan. The aim of this study was to evaluate the applicability of a physician and pharmacist collaborative model in a family medicine clinic in Jordan, and the effect of this collaboration on achieving BP control.

Methods. This randomized controlled clinical trial was carried out on a sample of 266 uncontrolled hypertensive patients who were attending the Family Medicine Clinics at Jordan University Hospital (JUH), a major teaching hospital in Amman, Jordan. This study was carried out in 9 months, from March to November 2009. This conduction of the study was approved by the JUH Institutional Review Board (IRB). Written informed consents were obtained from all study participants before enrollment in the study, informed consent was written in lay Arabic language.

Patients. The study enrollment occurred over an 8-week period from March to May 2009. Inclusion criteria were: patients having uncontrolled hypertension upon the time of enrollment, receiving 0-3 antihypertensive drugs with no change in the regimen or dose within the past 3 months, and the absence of target organ damages. Uncontrolled BP was defined as BP readings higher than recommend by the seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high BP (JNCVII);[1] a reading of ≥140 mm

Hg for systolic BP and ≥90 mm Hg for diastolic BP, or ≥130 for systolic BP and ≥80 for diastolic BP for diabetic patients. Exclusion criteria were: patients with renal or hepatic diseases, pregnant patients, patients with dementia or cognitive impairment, patients with hypertensive urgency, or emergency with BP readings more than 180/110 mm Hg, or patients who were unable to provide informed written consent. Patients were informed that they would be allocated to either an intervention group (physician-pharmacist teamwork), or a control group (physician only). In both groups, the pharmacist collected information regarding patients' medications, medical conditions, and life style (diet, smoking, and so forth). Patients in both groups met with the pharmacist in a regular monthly visit to obtain follow up measurements. At the time of enrollment, patients were randomized into intervention group (n=136), and control group (n=130) by coin tossing. During the course of the study, patients did not migrate between the 2 study groups. Patients were not informed of their study allocation, neither were the physicians, nor the nursing team. Both study groups received medical care by the same physicians' team. Patients in both study groups were asked to provide a valid contact phone number(s). They were informed that the pharmacist will use this number to remind them of their monthly meeting during their regular follow up visit to the clinic. The patients in the intervention group met with the pharmacist 20-30 minutes before seeing their physician on each monthly visit. During this visit, the pharmacist noted the patient's medication history, answered questions, and encouraged compliance. The pharmacist offered instructions in self-monitoring of BP, advice on tobacco habits, and healthy diet. Educational materials were distributed to the patients. The pharmacist educated and explained to the patients in the intervention group the goals for BP, in order to achieve better treatment outcomes, optimum compliance, and adherence to pharmacological and non-pharmacological therapy. The pharmacist recommended the least costly antihypertensive drug choices most likely to be effective. The choice of antihypertensive drug was based on those recommended by the JNCVII as pertinent to patients' therapeutic needs or compelling conditions. The physician discussed the pharmacist's recommendations

with the pharmacist, and specified whether to accept or reject them as part of the patients' treatment plans, and the ultimate therapy decisions were entitled only to the physician as the health regulations in Jordan are cited. Patients were encouraged if they start to show better compliance and adherence to pharmacological and non-pharmacological therapy. If they admitted being non-compliant, they were questioned for the reason(s) and reinforcement of the importance of drug therapy adherence, physical activity, healthy diet, weight control, and smoking cessation was carried out. In the control group, patients received regular healthcare services provided only by the physicians' team. The patients enrolled in the control group were met monthly by the pharmacist to collect baseline values. The clinical pharmacist did not provide any recommendations or interventions to the participants in the control group.

Measured outcomes. The primary outcome measured was the percentage of patients who achieved BP goals specified by the JNCVII at each group. The goal BP was defined as a systolic BP less than 140 mm Hg and the diastolic BP less than 90 mm Hg, or systolic BP less than 130 mm Hg and the diastolic BP less than 80 mm Hg if patient was diabetic. In addition, the mean reductions in both systolic and diastolic BP readings were measured. The pharmacist recommendations were grouped. The physician's acceptance of the pharmacists recommendations was also evaluated.

All data were processed using the Statistical Package for Social Sciences version 16 software (SPSS Inc, Chicago, IL, USA) working with a confidence level of 95%, and considering differences as being statistically significant at $p<0.05$. All reported *p*-values are 2 sided. Descriptive data are described as mean ± standard deviation (SD). We examined the percentages of patients who achieved BP goals, and compared percentages between both study groups using a 2x2 contingency tables and *p*-values of chi-square (χ^2) were used. We used 2 independent samples (Student t test) to compare absolute changes in systolic and diastolic BP in both study groups. Normality of mean reduction of systolic and diastolic BP, and other clinical or demographic values was determined visually by probability plot (P-P) and quantile-quantile (Q-Q), and examining Kolmogorov-Smirnov-Lilliefors test (K-S test).

Results. A total of 266 patients were initially enrolled in the study. Thirteen patients dropped out from both study groups; 6 dropouts from the intervention group and 7 dropouts from the control group. Baseline levels and different demographic characteristics showed no significant difference among patients randomized to either study groups as shown in **Table 1**. In the intervention group, 104 (79.4%) patients achieved

BP goals specified by JNCVII at the end of the study course, while 80 (65.6%) patients achieved BP goals in the control group (*p*=0.01). We also examined the mean reductions in systolic BP and diastolic BP for both study groups observed over a 6-month period. The mean reduction in systolic and diastolic BP was significantly higher in the intervention group (**Table 2**). The effect observed in BP values among the intervention group was not related to gender (*p*=0.90). Mean systolic BP reduction for male was 16.23 ± 14.3 mm Hg, while it was 15.9 ± 4.97 mm Hg for females. The mean diastolic BP reduction for male was 11.9 ± 14.99 mm Hg, while it was 9.28 ± 10.67 mm Hg for females (*p*=0.25). The BP goal achievement success was not associated with age (*p*=0.53), or weight (*p*=0.42). A total of 299 recommendations were provided over the period of 6 months, with a mean of 2.3 ± 0.96 interventions/patient. One hundred thirty-eight recommendations were provided directly to the patients, which included patient education, and adherence counseling. One hundred sixty-one recommendations were provided directly to the physicians. The physicians agreed and implemented

Table 1 - Various clinical baseline values and demographic characteristics in the intervention and control groups.

Patient characteristics	Intervention group n=130	Control group n=123
Age in years, mean ± SD	56.3 ± 9.6	57.5 ± 11.9
Weight in kg, mean ± SD	85.8 ± 13.4	87.4 ± 9.2
Gender		
Male, n (%)	61 (46.9)	59 (48.0)
Female, n (%)	69 (53.1)	64 (52.0)
Systolic BP (mm Hg), mean ± SD	137.5 ± 15.4	134.8 ± 14.6
Diastolic BP (mm Hg), mean ± SD	85.2 ± 9.7	83.7 ± 8.1
*BP classification**		
Hypertension stage 1, n (%)	113 (87.0)	109 (88.5)
Hypertension stage 2, n (%)	17 (13.0)	14 (11.4)
Smoking status		
Current smoker, n (%)	38 (29.2)	40 (32.5)
Non-smoker, n (%)	92 (70.8)	83 (67.5)

BP - blood pressure, *according to the seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high BP

Table 2 - Mean reductions in systolic and diastolic blood pressure (BP) in 6 months for the intervention and control groups.

BP mm Hg	Intervention (n=130) Mean ± SD	Control (n=123) Mean ± SD	*P*-value
Systolic	16.1 ± 14.6	10.6 ±13.5	0.002
Diastolic	10.5 ± 12.9	7.17 ± 13.11	0.04

101 (62.7%) of the pharmacists' recommendations. Details of recommendations submitted to physicians are as follows: stepping up therapy or adding drug (119 recommendations); laboratory monitoring or prophylaxis therapy to avoid adverse drug reactions (17 recommendations); changing frequency of drug administration for efficacy or compliance reasons (13 recommendations); switching to a less expensive drug (10 recommendations); and stopping a drug due to adverse drug reactions (2 recommendations). Each patient was counseled in private, face to face, in a simple lay language. Patients at the beginning of the study were surprised, but genuinely touched by the pharmaceutical caring services the pharmacist was providing. The patients accepted the pharmacist as an integrated part of their medical team. The clinical pharmacist explained the drug therapy targets and laboratory tests, explained their significance for monitoring treatment efficacy or safety, and disease progress. The pharmacist helped in ensuring knowledge of treatment goals, improving adherence, and increasing awareness of regular follow-ups. With regard to pharmacist-physician collaborative work, the physicians were comfortable with the presence of clinical pharmacist in the team, and they introduced the pharmacist to patients, and often addressed the pharmacist with regard to drug consultation in the patients' presence, nursing team, and medical school (MD) students. They acknowledged the clinical benefits provided by the clinical pharmacist. The physicians stressed their relief for having a colleague to provide drug information, and being able to consult directly during patients' management and drug therapy selection.

Discussion. The involvement of clinical pharmacist in the management of hypertensive patients had a significant impact on BP reduction, and more patients achieved their BP goals in the collaborative work model. Our results are in agreement with previously published studies[7-9] demonstrating that BP control can be improved when clinical pharmacists assists with patient management. The mean reduction in systolic BP was consistent with that reported earlier.[7-11] The results of this study adds to a growing body of literature demonstrating the positive effect of physician-pharmacist collaborative work in the management of hypertension.[7-10] Reducing systolic BP by as much as 6 mm Hg would be expected to yield a 22% reduction in stroke mortality, and a 17% reduction in mortality from ischemic heart disease.[11] Inclusion of a clinical pharmacist on patient's care team represents one possible strategy to address the problem of inadequate BP control.

Clinical pharmacy practice and collaborative physician-pharmacist work is a new concept in Jordan. Pharmaceutical care is not practiced in community pharmacies in Jordan, however, it is currently being introduced in the inpatient's departments of the 2 major educational hospitals in Jordan (Jordan University Hospital and King Abdullah University Hospital).[12,13] In this study, we demonstrate a pharmacist collaborative work with the physicians in the outpatients' clinics. Our works suggest that the physician-patient relationship is not compromised by the pharmacist, and it can be expanded to include the pharmacist as a part of the healthcare team. Physicians in this study were comfortable discussing patient's management options with the pharmacist in the presence of the patient. The clinical setting established during this study suggests a great career opportunity for clinical pharmacists in Jordan to provide pharmaceutical care in the setting of physicians' offices. Also, it provides a practical example that many of the barriers for providing pharmaceutical care can be eliminated or diminished, despite the lack of well-structured authority for clinical pharmacy practices in Jordan.[13]

Although this study has the strengths of a prospective, randomized, controlled design, the pharmacist was not an independent prescriber, and the final decision was for the physician as to patient's medication, and this would probably explain why the BP target was not achieved in approximately 20% of patients in the intervention group. This is in contrast to studies carried in the United States where pharmacists were empowered to change the antihypertensive regimen, according to guidelines, without consulting the physician in advance.[9,14] Empowering the pharmacist as an independent prescriber could add a positive effect on achieving better blood pressure control. The physicians in this study cared for patients in both groups, and they received recommendations regarding the intervention group, and discussed options with the pharmacist. This interaction might have influenced their practice in the control group. Conducting this study in the Family Medicine Clinic at JUH may also provide a source of limitation, as it is a teaching clinic. Physician's team was the same for both study groups. In one hand, this eliminates the physicians' personal variability on clinical values and practice conceptions, but at the same time it may have masked part of the effect of clinical pharmacist interventions. Beside that, physicians were aware of their roles in the study thus, it is possible that they were more cooperative and willing in accepting the pharmacist's recommendations more than it would be in other non-teaching, or usual day-to-day settings. Furthermore, subjects in the control group received phone calls reminding them of their appointments, they were questioned regarding their medications, and they were aware of their BP measurements. These interventions may also cause improved outcomes in

the control group, and a decrease in the difference in outcomes between the 2 groups. The subject withdrawal rate observed in this study was similar in the control and intervention group, and was mainly due to loss of contact information at the beginning of the study.

The recommendations of this study are to include pharmacists as members of the hypertension care teams. It should be acknowledged that for the pharmacist to be an effective addition, he needs to be adequately trained.

In conclusion, the involvement of pharmacy practitioners in the management of hypertension significantly improves BP control. This work could serve as a model for clinical pharmacists in Jordan and the region who wish to establish clinical pharmacy services. The work could inspire decision makers to enforce clinical pharmacy integrations in healthcare system in Jordan. Future studies should address the role of pharmaceutical care services in providing a cost effective treatment, and containing the ever increasing cost of blood pressure management.

References

1. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension* 2003; 42: 1206-1252.
2. Petrella RJ, Campbell NR. Awareness and misconception of hypertension in Canada: results of a national survey. *Can J Cardiol* 2005; 21: 589-593.
3. Ong KL, Cheung BM, Man YB, Lau CP, Lam KS. Prevalence, awareness, treatment, and control of hypertension among United States adults 1999-2004. *Hypertension* 2007; 49: 69-75.
4. Centers for Disease Control and Prevention (CDC). Prevalence of selected risk factors for chronic disease--Jordan, 2002. *MMWR Morb Mortal Wkly Rep* 2003; 52: 1042-1044.
5. Brown DW, Mokdad AH, Walke H, As'ad M, Al-Nsour M, Zindah M, et al. Projected burden of chronic, noncommunicable diseases in Jordan. *Prev Chronic Dis* 2009; 6.
6. Oliveria SA, Lapuerta P, McCarthy BD, L'Italien GJ, Berlowitz DR, Asch SM. Physician-related barriers to the effective management of uncontrolled hypertension. *Arch Intern Med* 2002; 162: 413-420.
7. Borenstein JE, Graber G, Saltiel E, Wallace J, Ryu S, Archi J, et al. Physician-pharmacist comanagement of hypertension: a randomized, comparative trial. *Pharmacotherapy* 2003; 23: 209-216.
8. Von Muenster SJ, Carter BL, Weber CA, Ernst ME, Milchak JL, Steffensmeier JJ, et al. Description of pharmacist interventions during physician-pharmacist co-management of hypertension. *Pharm World Sci* 2008; 30: 128-135.
9. Hunt JS, Siemienczuk J, Pape G, Rozenfeld Y, MacKay J, LeBlanc BH, et al. A randomized controlled trial of team-based care: impact of physician-pharmacist collaboration on uncontrolled hypertension. *J Gen Intern Med* 2008; 23: 1966-1972.
10. Carter BL, Ardery G, Dawson JD, James PA, Bergus GR, Doucette WR, et al. Physician and pharmacist collaboration to improve blood pressure control. *Intern Med* 2009; 169: 1996-2002.
11. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R; Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet* 2002; 360: 1903-1913.
12. Al-Wazaify M, Albsoul-Younes A. Pharmacy in Jordan. *American Journal of Health-System Pharmacy* 2005; 62: 2548-2551.
13. Wazaify M, Al-Bsoul-Younes A, Abu-Gharbieh E, Tahaineh L. Societal perspectives on the role of community pharmacists and over-the-counter drugs in Jordan. *Pharm World Sci* 2008; 30: 884-891.
14. Vivian EM. Improving blood pressure control in a pharmacist-managed hypertension clinic. *Pharmacotherapy* 2002; 22: 1533-1540.