Review Article

HYPERTENSIVE PATIENT COMPLIANCE WITH PHARMACIST INTERVENTION: A SYSTEMIC REVIEW

Abstract

Background: Pharmacist and physician can work together to improve patient compliance especially for hypertension management. Medication adherence leads to advance health and reduce hospitalizations (morbidity), death (mortality) and healthcare costs.

Objectives: Involvement of pharmacist in treatment intervention can result in improved understanding about hypertension and it can increase medication adherence to antihypertensive therapy which ultimately advance overall quality of life.

Study design and methods: A comprehensive research study was conducted using two eminent databases i.e. PUBMED and EMBASE. The research articles from 1996 to 2015 were analyzed. All the selected articles were about pharmacist intervention" and "hypertensive patient compliance and hypertension medication adherence.

Results: Some studies shows though no control in BP however there was significant difference in the systolic and diastolic BP pre and post pharmacist intervention (Systolic from 158.1±14.4 to 143.8 ± 10.7, Diastolic from 100.6 ±11.5 to 89.8 ± 9.7). Conversely in some studies BP was controlled for about 29.9% of control group while 63% of intervention group.

Conclusion: Results showed, many methods can improve medication adherence and blood pressure including, counseling patients in person, collaboration between pharmacists and physicians, and using technology like telecommunication to intensify patients counseling.

Pharmacist intervention can significantly increase disease-related knowledge, blood pressure control and medication adherence in patients with hypertension.

Keywords: Pharmacist; Hypertension; Counseling

1. Introduction

Hypertension is a non-communicable chronic disease frequently asymptomatic or sometimes with minor symptoms [1]. When there is no obvious underlying cause of hypertension it can be classified as essential hypertension, secondary hypertension, Cushing syndrome and malignant hypertension [2].

Hypertension disease is the major risk factor for cardiovascular disease and affects approximately 20% of adults in North America [3]. Hypertension is defined as blood pressure at 140/90 mmHg or greater. In the United States, 29% of the population, 85.4 million individuals have been diagnosed with hypertension [4].

Hypertension is a well-known risk factor for many chronic diseases including cardio-cerebrovascular, metabolic and kidney diseases and a leading risk factor for mortality due to these complications [5].

Due to poor medication adherence and compliance to current therapeutic guidelines, hypertension is poorly managed [6].

Pharmacists can play an important role in helping patients with hypertension to manage their condition. Helping as a partner and instructor, pharmacists can provide medication therapy management services and can educate patients about Hypertension [7].

Pathophysiologicaly, hypertension can be stated in terms of systolic blood pressure, which replicates the blood pressure when the heart is contracted (systole), and diastolic blood pressure, which replicates the blood pressure during relaxation (diastole). Hypertension can be diagnosed when whichever systolic pressure, diastolic pressure, or both are elevated [8].

New guidelines issued by the National Committee on Prevention, Detection, Evaluation, and Treatment of Blood Pressure (JNC 7) encourage health providers to help those who have uncontrolled blood pressure. Moreover, guidelines have been issued by American Diabetes Association (ADA) and World Health Organization-International Society of Hypertension (WHO-ISH) that emphasize the need to control blood pressure [9]. Complications, such as renal failure [10], myocardial infarction, heart failure and stroke, can occur as a result of uncontrolled hypertension. [11]

A study was conducted where the pharmacist and the physician worked together to improve patient compliance especially for patients diagnosed with hypertension and showed that there was a significant improvement from baselines of the mean BP [12-14].

Furthermore, medication adherence leads to improved health and reduced hospitalizations (morbidity), death (mortality), and the healthcare costs. Addressing factors that positively affect medications adherence for hypertension patients is very important to reduce the burden of hypertension disease and other diseases that may be caused by hypertensions such as chronic kidney diseases [15].

2. Method

2.1. Information sources:

A comprehensive research study has been conducted by using two databases; PUBMED and EMBASE (1996-2015). Search terms that had been used in PUBMED were “pharmacist intervention” and “hypertensive patient compliance” and using MeSH terms to do the advanced research for each term and then combined them by using AND coin to include the two terms in the research. After that, searching on EMBASE was performed by using “hypertension medication adherence” and to narrow the

research, it was joined to pharmacist intervention and the language that has been used was the English for both databases.

2.2. Inclusion Criteria:

The inclusion criteria are hypertensive patients with other *comorbidities*, including *cardiovascular* diseases, *kidney diseases* or *diabetes mellitus*. Pharmacist intervention was defined as *counseling the patients in person* or using *technology (telecommunications, emails, etc.*). Blood pressure is the primary outcome.

3. Data collection & study selection:

The abstracts with titles were reviewed to determine if the article met predetermined inclusion criteria (see Figure 1). Some of them were eliminated if they did not include an intervention where the pharmacist interacted with patients to improve high blood pressure and medication adherence/compliance as outcomes.

List 1: Searching strategy:
▪ MeSH Hypertension patient ▪ MeSH Pharmacist intervention ▪ MeSH hypertension patient compliance ▪ Text word: hypertension medication adherence ▪ Text word: pharmacist intervention

- **Process for Eligible Articles:**

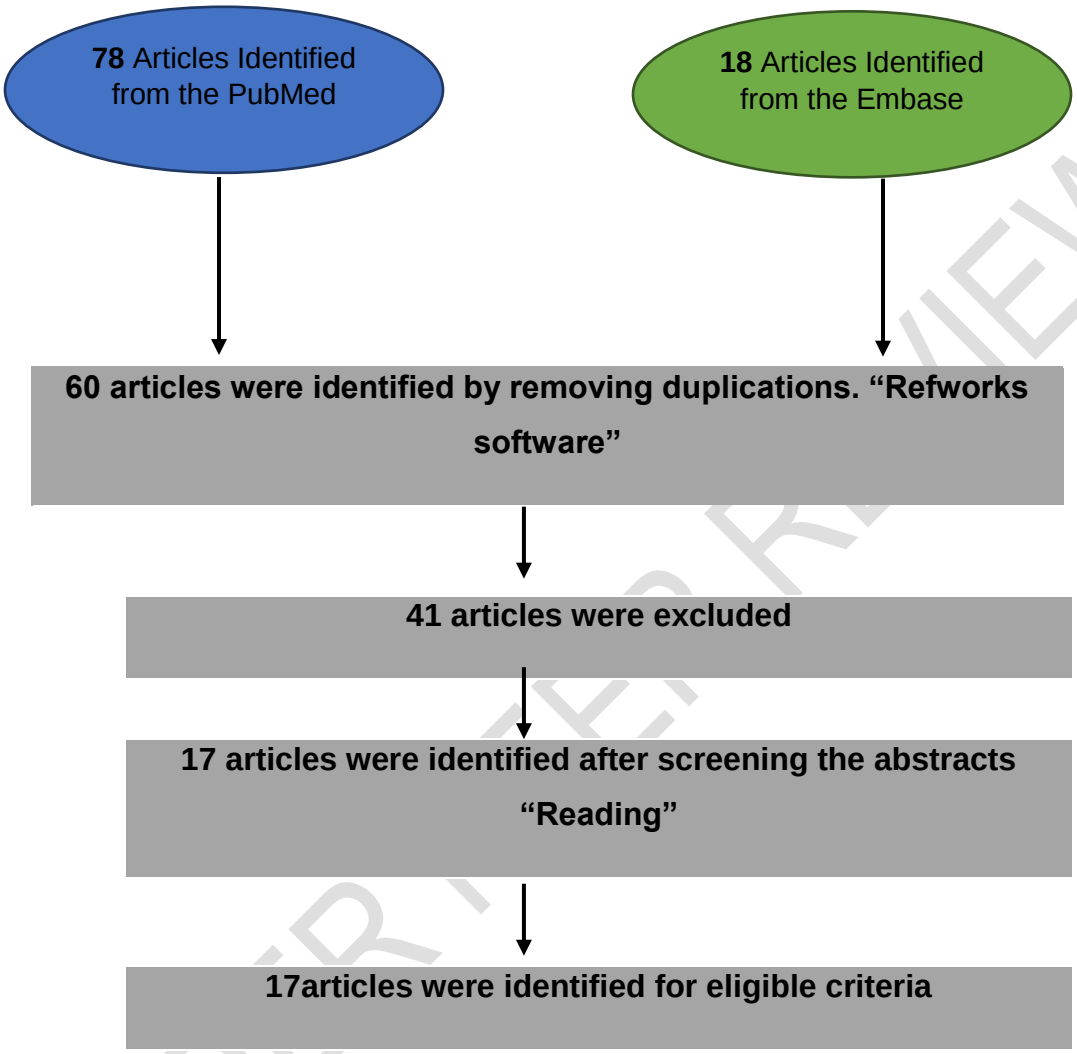

Figure 1: Process for Eligible Articles

4. Discussion on Results

4.1. Study selection

Based on the eligibility criteria and removing the duplicate citations a total of 60 articles were found (see Figure 1). Then, titles and abstracts were examined and 17 were selected for full text review. There were 10 articles that showed a statistical significant in reducing the blood pressure. Six articles were identified that mentioned a significant

improvement in medication adherence. Finally, a one article showed both a statistically significant improvement in blood pressure and medication adherence.

4.2. Study characteristics & results of individual studies:

Table 1 provides a summary of 17 studies that met the eligible criteria that mentioned above. These studies differ from one another according to the sample size, sample population, study design, duration, studies sites, and intervention and control groups description. Sample size in 17 studies ranged from forty to five hundred and eighty-four patients. The length of duration was from one month and eleven days to thirty-six months. Regarding to the sites, places of studies, there were six international studies. Randomized control trials were the most common study design [8,9,3,18,21]. Other study designs included case control study [2], qausi-experimental study with a control group [10], prospective and controlled design [19], non-randomized cross-over design [7,20], nonrandomized retrospective comparison [17]. All studies focused on adult patients who are over 55 years.

Table 2 shows the medications adherence and blood pressure levels in all studies at the baselines and at the end of each study. There are fluctuations and wide range of mean baselines of blood pressure and medications adherence according to various study design. For most of them, to detect medication adherence, qualitative methods like interviewers or self reported surveys were used to determine whether the patient was more adherent to pharmacist and physician instructions for medications adherence. Physical measuring blood pressure as a directly to detect blood pressure included in [8,3,17,19]. However, indirect methods like self-report using a questionnaire or Morisky method to detect the medication adherence along with measuring blood pressure was also used [21].

5. Conclusion

According to the results, pharmacists had a positive impact on medication adherence and hypertension measurements as an outcome. However, results showed many methods can improve medication adherence and blood pressure including, counseling patients in person, collaboration between pharmacists and physicians, and using

technology like telecommunication to intensify patients counseling. However, additional research is needed to develop standards for guidelines and interventions that assist patients with hypertension who have trouble with medication adherence.

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Competing interests

The authors declare that they have no competing interest.

Author's contribution

All authors contributed equally.

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Table 1: Studies meeting inclusion criteria

Study(Y)	Patients (n)	Sample population	Duration	Setting	interventions	Study design	Type of control	Ref.
Aguwa et. al. (2007)	40	Hypertensive patients	10 months	Nigeria Community Pharmacy	Implementing a pharmaceutical care program	Non-randomized, single site, and crossover design	Patients served as their own control	16
Bodgen et. al. (1998)	95	Patients failed to meet JNC-V criteria	6-months	Queen Emma Clinics, Hawaii.	Physician and pharmacist as team working together	Single blind Randomized control trail	Standard medical Care	17
Carter BL et. al. (2009)	402	Patients of community-based medical offices	6-months	Davenport, Des Moines, Mason city, Sioux city, and Waterloo, Iowa	Recommendations came from pharmacists to physicians, and nurses measured the BP within 24-H with monitoring	Prospective, cluster randomized, controlled clinical trial.	Uncontrolled hypertension patients receiving usual care	18
Chabot, I.	100	Patients visit	9-months	Quebec city	By using	Case control	Performed	19

et. al. (2003)		community pharmacy			PRECEDE-PROCEED model, computerized-aid tool used by the pharmacists	study	usual care	
Criswell T. J., *et. al.* (2010)	584	Uncontrolled primary hypertension	6 and 9 months respectively	12 university affiliated-primary care clinics	Intensified hypertension management and drug counseling by pharmacist	Randomized controlled trials	Usual care	20
Fikri-benbrahim N., *et. al.* (2012)	176	Patients visit community pharmacy	20 weeks	Jean and Granada in Spain	Patient education about hypertension, home BP monitoring, and referral to physician if it necessary	A quasi-experimental study with a control group	Standard Care	10
Gum TH., *et. al.* (2015)	539	Patients have uncontrolled	24 months	15 states in USA	pharmacist-patient encouraging:	Prospective, cluster, randomized	Usual care	21

		BP, patients with diabetes or chronic kidney disease			medication history, assessment of patient knowledge of medication, contraindication, and adherence	study		
Graco JA., *et. al.* 2002	100	Hypertensive patients with a previous using anti-hypertensive medications at least for 6 months(rural Portuguese population	6 months	Private pharmacy, rural Portuguese population	Monthly appointment with the pharmacist for management.	Randomized control study	Receiving the usual care	12
Hunt JS., *et. al.* (2008)	463	Patients with hypertension and having	12 months	"*Providence Primary Care Research Network in*	Pharmacist-Physician collaborative model and	Prospective, single blind, randomized, controlled	Usual care	22

		uncontrolled blood pressure		*Oregon*"	Network-approved collaborative hypertension management guidelines	trial		
Kuhmmer R., *et. al*. (2015)	380	Public emergency department	2 months	Restinga district, Porto, Alegre, Southern Brazil	Structured individual counseling session by the pharmacist	Randomized control trial	Just receive a written information about the disease	23
Morgado M., *et. al*. (2011)	197	Hypertensive patients attending to the clinic for routine follow up	12 months	University teaching hospital of Cova da Beira Hospital center, Portugal	Quarterly follow-up by the pharmacist during a 9 months long	Randomized control trial	No pharmaceutical care	24
Neto PR., *et. al*. (2011)	194	Hypertensive or diabetic patients	36 months	Public health care in Sao Paolo, Brazil	Receiving the pharmaceutical care from the clinical pharmacist	Prospective, randomized control trial	Receiving usual care from medical and nurse staff	16

O'Neill JL., *et. al.* (2014)	126	Patient poorly controlled hypertension	1 month and 11 days	Large Midwestern Veterans Affairs (VA) medical center, USA	Patients get benefits from clinical pharmacy specialist instead of physician	Non-randomized, retrospective comparison	Patients get management from the physician	25
Ramanath K., *et. al.* (2012)	52	Inpatients and out patients dept. and they were diagnosed over 6 months	7 months	Adichunchanagiri Hospital and Research Center, B G Nagara, India	Patients get counselling, leaflets information(PILS), and frequent telephone reminding	Randomized, prospective and interventional study	Patients did not get counselling and PILS at the baselines and in the first follow-up	26
Robison JD., *et. al*. (2010)	376	Patients visit 18 chain community pharmacy	Over 12-months	Tampa, Florida, region, USA	Hypertension pharmaceutical care (PC) guidelines that had been developed by college of pharmacy, University of	Prospective, and controlled design	Usual Care (UC)	27

					Florida			
Saleem F., *et. al.* (2015)	412	Patients with medical diagnosis of hypertension in previous 6 months	3 months	2 cardiac Units of two hospitals, UK	Patients get educational through hospital pharmacists	Non-randomized control trial	Usual care	28
Svarstad BL., *et. al*. (2013)	576	Patients with hypertension in community pharmacies	27 months (Dec 2006-Feb 2009)	Five Wisconsin cities USA	Implementing 6-month intervention by the schedule visit, brief medication questionnaire, and novel toolkits to patients by pharmacists and give feedback to them and to physicians	Cluster randomized trial	Patients received information only	29

Table 2: Medication adherence of studies meeting inclusion criteria

Study (Year)	Mean ± SD baseline medication adherence	Intervention mean ± SD change in medication adherence	Control mean ± SD change medication adherence	Statistical significance	References
Aguwa *et. al.* (2007)	Sys:158.1 ±14.4 Dia.: 100.6 ± 11.5	Sys: 143.8 ± 10.7 Dia. : 89.8 ± 9.7	No control	Significant reduction in both systolic and diastolic BP; pharmaceutical p care program can give a beneficial effect to the patients	7
Bodgen *et. al*. (1998)	Intervention: Sys: 155 (42), Dia.:96 (8) Control: Sys: 156(18), Dia.: 95(10)	Sys: Declined 23±22 Dia. : Declined 14±11	Sys: Declined 11±23 Dia. : Declined 3±11	Patient failed to get benefits from standard care and they could get the benefits from physician-pharmacist team	30
Carter BL *et. al.* (2009)	Intervention: Sys: 153.6(12.8), Dia.:	Sys: Declined 132.9(15.5), Dia.: 77.7(11.2)	Sys: Declined 143.8(20.5), Dia.: Declined 79.1(14.3)	BP was controlled for about 29.9% of control group,	31

	87.4(11.9), Control: Sys: 150.6(14.1), Dia.: 83.6(12.3)			and 63% of intervention group	
Chabot, I. *et. al*. (1998)	Intervention: Sys: 141, Dia.: 78, Control: Sys: 139, Dia.: 78	High income; Sys: Declined -7.8; 133.2, Dia.: Declined -6.5; 71.5	High income; Sys: NOT declined 139.5, Dia.: Declined 74	A significant results showed a reduction in both systolic and diastolic BP and especially to the high income patinets	32
Criswell T. J., *et. al*. (2010)	Intervention: Sys: 153.3±11.9, Dia.: 86.5±11.9, Control: Sys: 150.5 ± 12.9 Dia.: 84.1±12	Sys: Declined 129.7±14.2, Dia.: Declined 76.6±10.7	Sys: Declined 150.5±12.9, Dia.: Declined 78.9±13.4	Social support and self-efficacy improved at the end of the pharmacist intervention	33
Fikri-benbrahim N., *et. al*. (2012)	Intervention: Sys: 140.5±16.1, Dia.: 78.4±9.1, Control: Sys: 139.5±15.1, Dia.: 79.6±9.2	Sys: Declined -6.8; 133.7±13.7, Dia.: Declined -2.1; 76.3±8.9	Sys: Declined -2.1; 137.4±8.9, Dia.: NOT declined and (not significant), 0.1; 79.7± 6.2	A protocol-based community pharmacist intervention was significantly reduced the	10

				DBP and SPD in combination with HBPM	
Gum TH., *et. al.* (2015)	Intervention: Sys: 148(14.4), Dia.: 85(12), Control: Sys: 149.8(15.2), Dai.: 83.6(12.8)	Not found	Not found	There is a significant improvement to the BP by PPCM and by involving the pharmacist in intervention arm that have affected for decreasing the doses and removing medications	34
Graco JA., *et. al.* 2002	Intervention: Sys: 151.68(23.16), Dia.: 85.66(13.16), Control: Sys: 147.71(15.98), Dia.: 83.9(9.19)	Sys: Declined 128.54(15.06), Dia.: Declined 73.32(8.2)	Sys: Declined 142.9(20.42), Dia.: Declined 78.59(8.55)	Pharmaceutical care program are played an important role for decreasing the BP by a significant results	12
Hunt JS., *et. al.* (2008)	Intervention: Sys: 173(15), Dia.: 90(14), Control: Sys: 174(15), Dia.: 92(14)	Sys: Declined 137(17), Dia.: Declined 75(9)	Sys: Declined 143(18), Dia.: Declined 78(17)	Collaborative primary care-pharmacist management was significantly	35

				better to improve PB without difference in QoL or satisfaction	
Kuhmmer R., *et. al*. (2015)	Inclusion criteria: Sys: over 160mmHg, and Dia.: over 100	Not found	Not found	Pharmaceutical care intervention has a feasible and effective to increase medication adherence in hospitals and community pharmacy	36
Morgado M., *et. al*. (2011)	Intervention: Sys: 141.6(16.3), Dia.: 85.2(10.2), Control: Sys: 141.9(16.8), Dia.: 86.4(11.7)	Sys: Declined 134(16), Dia.: Declined 82.2(8.7)	Sys: Declined 141.1(18), Dia.: Declined 85.3(8.9)	Pharmacist can improve the adherence to the medication for controlling BP	37
Neto PR., *et. al.* (2011)	Intervention: Sys: 156.7(21.8), Dia.: 106.6(17.7), Control: Sys:	Sys: Declined 133.7, Dia.: Declined 91.6	Sys: Declined 155.5, Dia.: Declined 106.8	In a better clinical measurements, the pharmaceutical care program	38

	155.9(20.8), Dia.: 108.7(16.9)			could significantly reduced the risk of cardiovascular scores in elderly patients	
O'Neill JL., *et. al*. (2014)	CPS Sys: 149(12), Dia.: 78(12), Physician: Sys: 145(9), Dia.: 78(11)	Clinical pharmacy specialists: Sys: Declined 135(14), Dia.: Declined 72(11)	Physician: Sys: Declined 135(11), Dia.: Declined 73(11)	Patients who received CPS had a great improvement in the both systolic and diastolic BP compared to those receiving physician-directed RNCM	17
Ramanath K., *et. al*. (2012)	Intervention: Sys: 147.54(20.45), Dia.: 86.62(11.35)., Control: Sys: 138.85(16.03), Dia.: 81.12(7.16)	Sys: Declined 128.27(6.35), Dia.: Declined 77.73(3.63)	Sys: Declined 131.08(5.16), Dia.: 78.46(4.14)	The pharmacist showed in this study has a positive impact on patients counseling which led to medication adherence improvement	18
Robison JD., *et. al.* (2010)	Pharmaceutical Care, PC: Sys: 151.5(14), Dia.:	PC: Sys: Declined -9.9: 141.6(2), Dia.:	Sys: Declined -2.8: 148.7(2.3)	Community pharmacists could positively	39

	82.4(13.2), Usual Care UC: Sys: 151.5(14.9), Dia.: 87.4(9.9)	Declined -2.9: 79.5(1.3)	Dia.: Declined -1: 86.4(1.5)	affect patients adherence within 6-months and improve PB	
Saleem F., *et. al*. (2015)	Intervention: Sys: 144.5(17.2), Dia.: 90.5(10.2), Control: Sys: 144.1(16.5), Dia.: 90.9(11.1)	Sys: Declined 137.5(17.2), Dia.: Declined 84.6(9.9)	Sys: Declined 143.9(19.4), Dia.: Declined 90.1(10.5)	Pharmacist can increase medication knowledge, medication adherence in hypertensive medication	40
Svarstad BL., *et. al.* (2013)	Intervention; TEAM: Sys: 151.2(15.2), Dia.: 92(10.1), Control; Sys: 153.1(16.6), Dia.: 92.9(10)	Sys: Declined 137.46(16.16), Dia.: Declined 82.69(11.69)	Sys: Declined 143.37(20.41), Dia.: Declined 84.71(13.03)	Team Education and Adherence Monitoring involving community chain pharmacists led to a significant and sustained improvement in SBP	41