ROLES OF GENERAL PRACTITIONER, NURSES AND PHARMACIST IN MANAGEMENT OF HYPERTENSIVE CRISIS

Dr. Ahmad Hassan Albargi[1]*, Jawaher Awad Almalki[2], Amani Mohammed Alsulmi[3], Saeed Mahdi Alzahrani[4], Talal Mohammed Althalaby[5], Kaeed Sulaiman Alharbi[6], Qassim Mohammad Hadi[7]

Abstract:
Unregulated hypertension has the potential to escalate into a hypertensive crisis, which is characterized by a systolic blood pressure of 180 mm Hg or higher, or a diastolic blood pressure of 120 mm Hg or higher. Hypertensive crisis can be categorized into two types: hypertensive urgency or hypertensive emergency. The classification is based on the extent of damage to organs such as the heart, kidneys, and nervous system. Promptly recognizing a hypertensive emergency by appropriate diagnostic testing and triage will result in effectively lowering blood pressure, hence reducing the occurrence of fatal outcomes. Patients who have severe hypertension and acute damage to their organs (known as hypertensive emergencies) should be admitted to an intensive care unit. They require immediate decrease of blood pressure with a short-acting intravenous antihypertensive medicine that can be adjusted according to their needs. Physicians, nurses, and pharmacists should conduct comprehensive assessments in patients who have a hypertensive crisis in order to successfully reverse, intervene, and rectify the underlying cause, as well as enhance long-term results following the episode.

[1]*Ministry of health in KSA, Jeddah first health cluster at Althager hospital in Jeddah
[2]Ministry of health in KSA, Jeddah first health cluster at Althager hospital in Jeddah
[3]Ministry of health in KSA, Jeddah first health cluster at Althager hospital in Jeddah
[4]Ministry of health in KSA, Jeddah first health cluster at Althager hospital in Jeddah
[5]Ministry of health in KSA, Jeddah first health cluster at Althager hospital in Jeddah
[6]Ministry of health in KSA, Jeddah first health cluster, Althager hospital in Jeddah
[7]Ministry of health in KSA, Jeddah first health cluster, Althager hospital in Jeddah

***Corresponding Author:** Dr. Ahmad Hassan Albargi
*Ministry of health in KSA, Jeddah first health cluster at Althager hospital in Jeddah

DOI: 10.53555/ecb/2022.11.9.111

Introduction:

The prevalence of hypertension is reaching its endemic level. There are about 80 million people in the United States who are affected with hypertension. A well-established risk factor for cardiovascular illnesses, such as heart failure and stroke, is hypertension that is present for an extended period of time [1]. Due to the high demographic prevalence of hypertension, hypertensive emergencies continue to be widespread. It is predicted that between one and two percent of patients who have hypertension may experience a hypertensive emergency at some point in their lives. In order to avoid end-organ damage, serious complications, and even death, it is essential to recognize hypertensive emergencies and emergencies as soon as possible and to provide effective treatment for them [2].

Emergency hypertension and hypertensive urgency are the two subtypes that fall under the umbrella of hypertensive crisis. A hypertensive urgency is described as a considerably raised blood pressure that is "asymptomatic" (meaning there is no damage to the end organs), with a systolic pressure of 180mmHg or higher and/or a diastolic pressure of 120mmHg or higher. The hypertensive emergency does not have a predetermined cutoff in blood pressure; nonetheless, it must contain evidence of harm to the target end-organs, which may include damage to the brain, heart, kidneys, and/or eyes. It is quite improbable that end-organ damage would occur when the diastolic blood pressure is between 130 and 125 mm Hg, with the exception of patients who are pregnant or who are pediatric [3].

There is a lack of clear comprehension regarding the mechanism behind basic hypertension and hypertensive crises. The sudden development of a hypertensive crisis is indicative of the presence of a trigger factor that is superimposed on the chronic hypertension that already exists. There is a hypothesis that suggests that humoral vasoconstrictors are responsible for the rapid increase in blood pressure, which is then followed by an endogenous compensatory mechanism that is an attempt to correct for the vasoreactivity. An additional factor is inflammation, which is responsible for the development of inflammatory markers such as endothelin-1, endothelial adhesion molecules, and cytokines [10]. Endothelial damage and dysfunction are the causes of this phenomenon. Subsequently, volume depletion takes place as a consequence of pressure natriuresis, which further induces vasoconstriction in the target end organ with hypoperfusion and may lead to ischemia [4].

When hypertension encephalopathy is present, there is a disturbance in the autonomous regulation of the cerebral cortex. The blood flow of the normotensive population remains the same, and their mean blood pressure has been shown to be between 60 and 120 mmHg. There is a compensatory vasoconstriction that occurs during hypertensive crises in order to prevent hyper-perfusion to the brain. However, when the mean blood pressure reaches 180 mmHg, the autoregulation is overwhelmed, which results in cerebral vasodilation and edema. One definition of hypertensive encephalopathy describes it as an acute illness that manifests itself as [5].

Review:

Most of the time, patients who are experiencing hypertensive emergencies come to the Emergency Department because they have recently begun experiencing symptoms that are associated with their elevated blood pressure. At this time, it is of the utmost importance to collect a comprehensive medical history that includes the patient's anti-hypertensive treatment regimen, over-the-counter medications, adherence to their medication, usage of illegal drugs such as cocaine or amphetamine, and discontinuance of certain pharmaceuticals such as clonidine. The physician should take the patient's blood pressure in all four extremities, as this is widely encouraged by the medical community. When dealing with obese patients, it is very vital to select the appropriate size of cuff [5]. End-organ damage should be identified during the physical examination, pulses should be taken from all four extremities to look for signs of aortic dissection, lung auscultation should be performed to look for pulmonary edema, heart auscultation should be performed to listen for gallops or murmurs, renal artery auscultation should be performed to listen for bruits, and neurologic examination should be performed to look for any type of hypertensive encephalopathy. Shear mechanical stresses and elevated blood pressure are two factors that can have a particularly detrimental effect on the central nervous system. It is possible for patients to experience symptoms such as stupor, delirium, seizures, encephalopathy, agitation, visual problems, nausea, emesis, or localized impairments [6].

The following are some of the symptoms that can be associated with hypertensive emergency: hypertensive encephalopathy, subarachnoid or intracerebral hemorrhage, acute aortic dissection, acute myocardial infarction, acute coronary syndrome, pulmonary edema, severe pre-eclampsia, hemolysis, elevated liver enzyme and

low platelet syndrome (HELLP), eclampsia, acute renal failure, microangiopathic hemolytic anemia, and antepartum hemorrhage. Vascular phenomena, such as encephalopathy, are a clear indicator that blood pressure should be lowered; nonetheless, it is important to rule out the possibility of an ischemic stroke [7].

In the next twenty-four to forty-eight hours, patients who have severe hypertension and there is no evidence of treatment that has caused harm to the target organ should have their blood pressure steadily dropped. Because of a shift in the curve that represents the relationship between cerebral pressure and flow autoregulation, a rapid drop in blood pressure is linked to an increased risk of premature death. Even if the patient is experiencing hypertensive urgency, hospitalization is not necessarily required. A hypertensive emergency, on the other hand, necessitates admission to the intensive care unit. Alterations in autoregulation are observed in patients who are experiencing hypertensive crises. This is because individuals who have end organ damage are more likely to experience a rapid fall in blood pressure, which can lead to a reduction in perfusion and additional harm. Patients ought to be admitted to the intensive care unit (ICU) and treated with intravenous drugs that have a brief duration of action. Sublingual and intramuscular routes should be avoided because the effects of these routes are highly unpredictable. In the event of a hypertensive emergency, the objective is to get the diastolic blood pressure down by 10 to 15 percent, or to 110 mmHg, during the first hour. After that, the diastolic blood pressure should be reduced by an additional 5 to 15 percent over the next twenty-four hours, with the exception of aortic dissection. A patient who has aortic dissection should aim to achieve a systolic blood pressure of up to 120 and a diastolic blood pressure of up to 80 within the next five to ten minutes because of the impending risk of mortality [8].

Bogden and colleagues [9] conducted an investigation into the impact that having a pharmacist working within a medical resident teaching clinic actually had. The patients who had hypertension that was not under control were randomly assigned to either a control group (n = 46) or an intervention group (n = 49). While the intervention group experienced a decrease in SBP of 23 mm Hg, the control group experienced a decrease of 11 mm Hg (P<.001). 55% of the participants in the intervention group were able to attain control of their blood pressure, while only 20% of the participants in the control group were able to do so (P<.001). Within the context of an integrated health care system, Borenstein and colleagues [10] conducted an evaluation of the comanagement of hypertension by physicians and pharmacists. Patients were assigned at random to either the comanaged group (n=98) that went to a hypertension clinic that was run by pharmacists or the usual care group (n=99). Patients were seen at intervals ranging from two to four weeks, and the pharmacist contacted the attending physician at each appointment to provide the recommended treatment plan, which was derived from an algorithm that was based on evidence. At 6, 9, and 12 months, the comanaged group experienced a significantly lower systolic blood pressure (SBP) than the standard care group did (22 mm Hg versus 9 mm Hg, 25 mm Hg versus 10 mm Hg, and 22 mm Hg versus 11 mm Hg, respectively, with a p-value of less than.01 at all time periods). Patients who were comanaged had a higher rate of successful blood pressure management (60%) compared to those who received the usual treatment (43%) (P =.02). It is [10]. The blood pressure of a patient was compared to that of a control group that was treated by the patient's family physician in one of the earliest published studies of nurses (Logan and colleagues) [11]. This study was carried out in the healthcare facility where the patient worked. In contrast to the study conducted by Borenstein and colleagues, the nurses were responsible for prescribing and modifying pharmacological therapy without the approval of the physician. Meanwhile, the physicians were responsible for reviewing the charts of patients who were handled by nurses on a weekly basis. A total of 457 individuals participated in the study. It was found that patients who were managed by nurses had a higher probability of receiving a new antihypertensive agent (95% versus 63%, P<.001), receiving two antihypertensive agents (44% versus 18%, P<.001), adhering to the medication regimen (68% versus 49%, P<.005), and reaching their desired blood pressure at six months (49% versus 28%, P<.001). A randomized controlled trial (RCT) was carried out by Rudd and colleagues [12], in which they compared nurse case management (n=74) with a control group (n=76). In addition to educating patients on how to use an automated blood pressure device, measures to increase medication adherence, and the identification of adverse drug events, nurses visited patients at the beginning of the study. Additional telephone contacts were made by the nurses at one week, one month, two months, and four months; they independently increased the amount of the medicine; and they contacted the physician to acquire authorization to begin any new blood pressure medication. Notably, only patients who

were randomly assigned to nurse case management were provided with portable blood pressure monitors. These monitors had the potential to enhance blood pressure control independently of nurse functions, as they allowed patients to better monitor their own blood pressure. At six months, the patient's blood pressure (SBP) decreased by 14.2 mm Hg in the intervention group and by 5.7 mm Hg in the control group (P<.01). Patients in the intervention group were taking a considerably higher number of drugs, and they experienced a significantly higher number of medication changes (223 versus 52, P<.01) compared to patients in the control group. At six months, the intervention group had a medication adherence rate of 81%, while the control group had a medication adherence rate of 69% (P =.03).

An intriguing study that was carried out by Mundinger and colleagues [13] compared the services that nurse practitioners provided for the treatment of a number of illnesses, including hypertension, to those that were provided by physicians. All of the patients were enrolled after they had visited an emergency department or urgent care center, and they were randomly assigned to either a nurse practitioner (n=806) or a physician (n=510). The majority of the patients were Hispanic immigrants at the time of enrollment. There was no significant difference between the groups in terms of the primary outcome, which was quality of life. The nurse practitioners and physicians were able to interchangeably perform the responsibilities of prescribing, consulting, referring, or admitting patients. When compared with physicians, the diastolic blood pressure (DBP) given by nurse practitioners was somewhat higher (137/82 mm Hg versus 139/85 mm Hg; P=.28 for systolic blood pressure and P=.04 for diastolic blood pressure) for a period of one year following the baseline. With the aim of enhancing blood pressure control, a number of systematic reviews have been carried out to assess and evaluate different quality improvement (QI) methodologies. In a study that was created for the Agency for Healthcare Research and Quality (AHRQ) and subsequently published in 2006, Walsh and colleagues [14] presented their findings. There were 63 controlled studies of quality improvement initiatives that were aimed at improving hypertension control that they found. A taxonomy was constructed for the purpose of classifying the many approaches to quality improvement, and the majority of the research combined multiple strategies. Audit and feedback (1.3 mm Hg), provider education (2.7 mm Hg), provider reminder systems (6.8 mm Hg), self-management (3.6 mm Hg), patient education (8.1 mm Hg), and organizational change (10.1 mm Hg) were the techniques that experienced the greatest decreases in systolic blood pressure (SBP) across the various approaches. These authors discovered that the most significant statistical benefits were observed with team-based treatment (37 comparisons), where they discovered a median decrease in systolic blood pressure of 9.7 mm Hg and a net increase in systolic blood pressure control of 21.8%. Another meta-analysis of pharmacy-based therapies was carried out by Machado and colleagues in the year 2007 [15].These authors conducted an analysis of thirteen trials that involved a total of two thousand two hundred individuals. They discovered that the interventions of pharmacists considerably decreased the subjects' blood pressure (10.7 standard deviation [SD], 11.6 mm Hg; P=.002), whilst the controls remained unaltered. Several meta-analyses and systematic reviews [15] have found that these findings are in agreement with those findings.

Carter and colleagues (2009) [16] conducted a meta-analysis of team-based treatment in which they investigated the effectiveness of either nurse- or pharmacist-assisted therapy of hypertension. This study discovered that the odds ratio (OR) for managed blood pressure was considerably higher in studies that involved nurses (odds ratio [OR], 1.69; 95% confidence interval [CI], 1.48–1.93), pharmacists working within clinics (OR, 2.17; CI, 1.75–2.68), and community pharmacists (OR, 2.89; CI, 1.83–4.55) as compared to studies that were conducted using the standard care method. These authors endeavored to identify the elements of team-based care that proved to be the most effective. They discovered that the following components contributed to the reduction in systolic blood pressure (in mm Hg): the pharmacist's recommendation of therapy to the physician (-9.3), the patient's education provided by either the nurse or the pharmacist (-8.8), the pharmacist's performance of the intervention (-8.1), the assessment of medication adherence (-7.3), the nurse's execution of the intervention (-4.8), and the utilization of a treatment algorithm (-4.0). There were 72 randomised controlled trials (RCTs) that were discovered in the most recent Cochrane Review (2010) of quality improvement treatments that were used to improve blood pressure control in individuals who had hypertension. [17] These RCTs represented the following six types of interventions: (1) self-monitoring; (2) educational interventions directed to the patient; (3) educational interventions directed to the health professional; (4) patients receiving care from a health professional (such as a nurse or pharmacist); (5) organizational interventions that aimed to improve the delivery of

care; and (6) appointment-reminder systems. As a result of self-monitoring, there was a slight decrease in both systolic blood pressure (SBP) (weighted mean difference [WMD] -2.5 mm Hg; 95% confidence interval [CI], -3.7 to -1.3 mm Hg) and diastolic blood pressure (DBP) (WMD -1.8 mm Hg; 95% CI, -2.4 to -1.2 mm Hg). The results of clinical trials involving educational interventions that were addressed at patients or health professionals did not appear to be related with significant net decreases in blood pressure on their own. Although there were a variety of appointment reminder systems and the results were not entirely clear, it was observed that the majority of trials led to an increase in the proportion of individuals who attended follow-up visits by almost 2.5 times. Furthermore, in two small trials, the intervention also led to an improvement in blood pressure control (odds ratio, 1.85, 95% confidence interval, 1.37–2.44). An structured system of registration, recall, and regular review, in conjunction with a robust stepped-care approach to hypertension drug treatment, appears to be the most likely way to enhance the control of high blood pressure, according to the authors of the Cochrane Review. They also came to the conclusion that care that was directed by a nurse or a pharmacist was promising, with the majority of randomized controlled trials (RCTs) connected to improved blood pressure control and a drop in mean SBP and DBP [18]. Chisholm Burns and colleagues (2010) [19] carried out a meta-analysis, which resulted in the identification of 298 clinical trials in the United States that examined the direct patient care that pharmacists offered for a variety of chronic diseases. The authors of this study discovered noteworthy enhancements in blood pressure, glycated hemoglobin (HbA1c), low-density lipoprotein cholesterol, adverse drug events, medication adherence, quality of life, and patient understanding (P<.05). One of the key focuses of a recent systematic review and meta-analysis conducted by Clark and colleagues [20] on trials of nurse-led interventions for hypertension in primary care was to determine whether or not nurse prescribing is an essential intervention. When compared with the standard care, interventions that comprised a stepped-treatment algorithm demonstrated significantly higher reductions in systolic blood pressure (WMD, −8.2 mm Hg; 95% confidence interval, −11.5 to −4.9). Despite this, there was no correlation between this and a better level of achievement of BP targets. In primary care settings, nurse-led clinics that utilized structured prescribing algorithms were able to achieve better decreases in both systolic and diastolic blood pressure when compared to the standard treatment. Surprisingly, when the findings were combined, it was found that nurse-led interventions had a substantial impact on lowering arterial blood pressure (SBP) in African American participants when compared to the standard care. However, there was not much of a difference for other ethnic minority groups. According to the findings of this research, hypertension care that is led by a nurse is associated with improvements in blood pressure when compared to care that is led by a doctor or the standard care [20].

Conclusion:

Hypertensive crises occur due to malfunction in the renin-angiotensin-aldosterone system and harm to the vascular bed. They frequently develop in the emergency department environment and can result in higher fatality rates if left untreated. Physicians must gather a concentrated and comprehensive medical background of the patient, including any existing medical conditions, to prevent additional difficulties. Choosing the right pharmacological therapy is crucial and should be done carefully, taking into account both the potential dangers and advantages. Nurses have a crucial function in evaluating patients and dispensing medications during episodes of high blood pressure. A nurse or pharmacist specializing in hypertension would offer education, counseling, and likely continuous case management for the majority of patients, particularly those who have successfully gained and sustained control over their blood pressure. Education should encompass comprehensive conversations regarding all lifestyle modifications, including smoking cessation, and how to empower the patient to effectively follow these measures.

References:

1. James, P.A.; Oparil, S.; Carter, B.L.; Cushman, W.C.; Dennison- Himmelfarb, C.; Handler, J.; Lackland, D.T.; LeFevre, M.L.; MacKenzie, T.D.; Ogedegbe, O.; Smith, S.C. Jr.; Svetkey, L.P.; Taler, S.J.; Townsend, R.R.; Wright, J.T. Jr.; Narva, A.S.; Ortiz, E. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA*, 2014, *311*(5), 507-520.
2. Centers for Disease, C. and Prevention, Vital signs: awareness and treatment of uncontrolled hypertension among adults--UnitedStates, 2003-2010. MMWR Morb Mortal Wkly Rep, 2012, *61*, p. 703-709.
3. emergencies. *Am. Heart J.*, 1986, *111*(1), 220-225.

4. Marik, P.E.; Varon, J. Hypertensive crises: challenges and management. *Chest*, 2007, *131*(6), 1949-1962.
5. Rey, E.; LeLorier, J.; Burgess, E.; Lange, I.R.; Leduc, L. Report of the Canadian Hypertension Society Consensus Conference: 3. Pharmacologic treatment of hypertensive disorders in pregnancy. *CMAJ.*, 1997, *157*(9), 1245-1254.
6. Graves, J.W. Prevalence of blood pressure cuff sizes in a referral practice of 430 consecutive adult hypertensives. *Blood Press. Monit*., 2001, *6*(1), 17-20.
7. Hickler, R.B. Hypertensive emergency: a useful diagnostic category. *Am. J. Public Health*., 1988, *78(*6), 623-624.
8. Johnson, W.; Nguyen M.L.; Patel R. Hypertension crisis in the emergency department. *Cardiol. Clin*., 2012, *30*(4), 533-543.
9. Bogden PE, Abbott RD, Williamson P, *et al*. Comparing standard care with a physician and pharmacist team approach for uncontrolled hypertension. *J Gen Intern Med*. 1998;13:740–745.
10. Borenstein JE, Graber G, Saltiel E, *et al*. Physician-pharmacist comanagement of hypertension: a randomized, comparative trial. *Pharmacotherapy*. 2003;23:209–216.
11. Logan AG, Milne BJ, Achber C, *et al*. Work-site treatment of hypertension by specially trained nurses. A controlled trial. *Lancet*. 1979;2:1175–1178.
12. Rudd P, Miller NH, Kaufman J, *et al*. Nurse management for hypertension. A systems approach. *Am J Hypertens*. 2004;17:921–927.
13. Mundinger MO, Kane RL, Lenz ER, *et al*. Primary care outcomes in patients treated by nurse practitioners or physicians: a randomized trial. *JAMA*. 2000;283:59–68.
14. Walsh JM, McDonald KM, Shojania KG, *et al*. Quality improvement strategies for hypertension management: a systematic review. *Med Care*. 2006;44:646–657.
15. Machado M, Bajcar J, Guzzo GC, Einarson TR Sensitivity of patient outcomes to pharmacist interventions. Part II: systematic review and meta-analysis in hypertension management. *Ann Pharmacother*. 2007;41:1770–1781.
16. Carter BL, Rogers M, Daly J, *et al.* The potency of team-based care interventions for hypertension: a meta-analysis. *Arch Intern Med*. 2009;169:1748–1755.
17. Glynn LG, Murphy AW, Smith SM, *et al*. Interventions used to improve control of blood pressure in patients with hypertension. *Cochrane Database Syst Rev*. 2010;CD005182.
18. Fahey T, Schroeder K, Ebrahim S. Interventions used to improve control of blood pressure in patients with hypertension. *Cochrane Database Syst Rev*. 2006:CD005182.
19. Chisholm-Burns MA, Kim Lee J, Spivey CA, *et al.* US pharmacists' effect as team members on patient care: systematic review and meta-analyses. *Med Care*. 2010;48:923–933.
20. Clark CE, Smith LF, Taylor RS, Campbell JL Nurse led interventions to improve control of blood pressure in people with hypertension: systematic review and meta-analysis. *BMJ*. 2011;341:c3995.