Impact of Pharmacist-Led Interventions on Hypertension Management in Cancer Patients Undergoing Chemotherapy

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Abstract

Background: Hypertension (HT) is a common cardiovascular condition, particularly prevalent among cancer patients, with approximately 40% exhibiting concurrent diseases. This study aimed to investigate the relationship between hypertension and cancer, focusing on how anticancer treatments contribute to hypertension and its cardiovascular complications. Methods: A retrospective analysis was conducted at a specialized pharmacy involving adults receiving oral chemotherapy. Participants were divided into control (n=50) and intervention (n=29) groups, based on their enrollment in a pharmacist-led hypertension management program. Data were collected on blood pressure (BP) measurements and interventions, with statistical analyses employed to assess differences between groups. Results: The intervention group demonstrated significant improvement in BP management, with 19 out of 29 patients achieving controlled BP by February 2023 (p=0.04), compared to 21 out of 50 in the control group. Continuous monitoring led to a gradual decline in average BP measurements in the intervention group, indicating effective management.

Pharmacists made recommendations to physicians, achieving a 100% acceptance rate for medication adjustments. Conclusion: Integrating pharmacist-led interventions in managing hypertension among cancer patients significantly improves BP control and patient outcomes. Given the rising prevalence of hypertension in this population, further research is necessary to explore the long-term effects of such interventions and their broader implementation in clinical practice.

Keywords: Hypertension, Cancer, Pharmacist-led interventions, Chemotherapy, Patient outcomes

Significance | This study determines the pharmacists' essential role in managing hypertension, enhancing cancer patient care, and improving overall health outcomes through targeted interventions.

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1. Introduction

Hypertension (HT) is a prevalent cardiovascular condition affecting a substantial portion of the global population (Zhou et al., 2021). It is a significant comorbidity in cancer patients, with around 40% of cases showing concurrent diseases (Staplin et al., 2023). Pharmacists have taken on a crucial role in managing HT, especially among cancer patients, by offering comprehensive clinical services such as blood pressure (BP) monitoring, patient education, medication adjustments, and lifestyle modification guidance (Elnaem et al., 2020). In particular, clinical pharmacy services have demonstrated a significant impact on identifying pre-hypertension and addressing drug-related problems, thereby mitigating the adverse effects of uncontrolled hypertension (Tam et al., 2020).

Hypertension can also arise as a side effect of many cancer therapies. Systemic hypertension, in particular, is a common side effect of anticancer treatments (Chatterjee et al., 2024). Antineoplastic drugs, especially those targeting vascular endothelial growth factors, contribute to a gradual increase in in HT as patients

undergo cancer treatment (Bukowski et al., 2020). Consequently, the incidence of cardiovascular disease (CVD) among cancer patients increases, further compounding their health risks. For instance, childhood cancer survivors exhibit an elevated prevalence of HT compared to the general population, with more than 70% of survivors developing hypertension by the age of 50 (Dieffenbach et al., 2021). As anticancer treatments improve and extend the lifespan of cancer survivors, the long-term consequences of HT, including chronic organ damage and higher mortality, have become increasingly evident (Battineni et al., 2021). Thus, it is critical to identify and manage hypertension early to prevent the short- and long-term cardiovascular complications associated with cancer therapies.

Clinical pharmacists collaborate with physicians to ensure optimal management of hypertension in cancer patients. They review the patient's medical history, assess drug interactions, and educate patients about the importance of BP control, proper medication use, and potential side effects (Alamer et al., 2023). These interventions are vital in promoting adherence to antihypertensive regimens and achieving target BP levels. Pharmacy-led programs that provide continuous BP monitoring and adjustments in antihypertensive medication have proven effective in maintaining controlled hypertension among patients, especially when integrated with lifestyle modification counseling (Christakoudi et al., 2020).

The present study investigates the link between hypertension and cancer, particularly how anticancer treatments contribute to the development of hypertension and its subsequent cardiovascular complications (Surendar et al., 2024). By examining the prevalence of CVD in cancer patients and exploring how targeted anticancer therapies affect BP, this research highlights the importance of clinical interventions in managing HT. The study also addresses strategies for screening, monitoring, and treating HT in cancer patients, emphasizing the integral role of clinical pharmacists in improving patient outcomes and reducing the risks associated with uncontrolled hypertension.

The increased prevalence of hypertension in cancer patients, due to both pre-existing conditions and treatment side effects, calls for vigilant management strategies. Pharmacist-led programs, which focus on comprehensive BP monitoring and medication management, offer promising results in controlling hypertension and improving cardiovascular health in cancer patients (Ramakrishnan et al., 2019). Early detection and intervention are essential for preventing adverse outcomes and enhancing the overall quality of life for individuals undergoing cancer treatment.

2. Materials and Methods

2.1 Selection of Participants

The research was conducted at a single site, focusing on adults who received appropriate oral chemotherapy medications from a specialized pharmacy associated with medical facilities. The study design received approval from the Institutional Review Board (IRB) of the College of Southern California (Zhou et al., 2021). Since the research was retrospective, informed consent was not required from the participants. According to the medication packaging, the study included oral chemotherapy agents with a documented hypertension (HT) rate of at least 5%. Participants were divided into two groups: one group was assessed before implementing a pharmacist-led strategy for managing hypertension, while the other group was assessed afterward (Alamer et al., 2023).

Data for the control group was collected from individuals who refilled qualifying oral chemotherapy medications at the specialized pharmacy between February 1, 2022, and November 31, 2023. Participants were excluded from the control group if they received nine or fewer doses of the qualifying oral chemotherapy drugs in 2022, if they were subsequently enrolled in the hypertension treatment program (to avoid overlap), or if they had died by the time data collection commenced. Data for the treatment group was collected from October 1, 2022, to February 31, 2023. This group comprised individuals using oral chemotherapy drugs who participated in the pharmacy's oral chemotherapy-specific HT treatment program as part of their healthcare. Individuals were deemed ineligible for the treatment group if they lacked follow-up blood pressure (BP) measurements prior to February 31, 2023, if their oral chemotherapy was discontinued before this date, or if they had died by the time of data collection. Participants were identified using the pharmacy's administration and internal records management systems (Christakoudi et al., 2020).

As part of the HT management pilot program, pharmacists in the specialty pharmacy implemented a strategy specifically designed for patients undergoing oral chemotherapy (Tam et al., 2020). This strategy outlined the recommended frequency of BP monitoring, the methods for obtaining BP measurements, and the appropriate actions based on the patient's BP comprehension. The hypertensive protocol was grounded in established hypertensive guidelines, manufacturer recommendations, and previously published studies regarding pharmacist-led or ambulatory hypertensive interventions (Elnaem et al., 2020). Participants were offered the option to enroll in the hypertensive management services if they were starting a new qualifying chemotherapy drug or if they had previously been on a qualifying medication and were identified by the medical pharmacist as having elevated BP. Upper-arm BP cuffs were provided as necessary. During the initial appointment, pharmacists from the specialty pharmacy contacted participants by telephone, explained the program's overview, and emphasized the importance of monitoring BP at home.

Pharmacists guided participants on proper techniques for tracking BP at home and provided information on emergency room preventive measures. Subsequent consultations involved
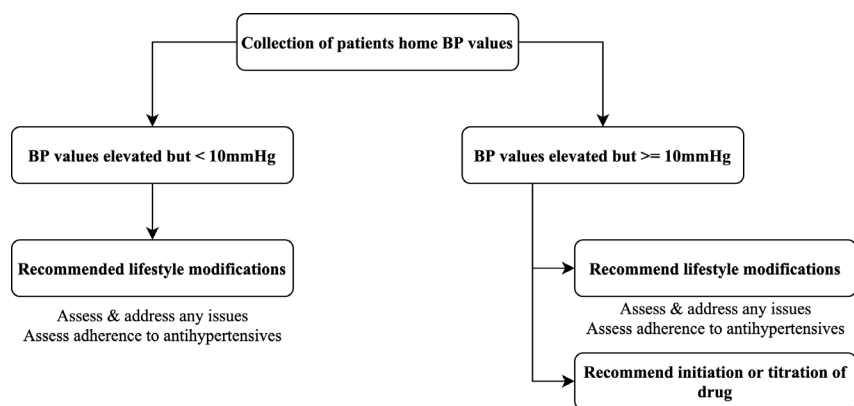
Figure 1: Overview of the hypertension management strategy for chemotherapy patients, detailing BP monitoring, follow-up, and participant engagement procedures.
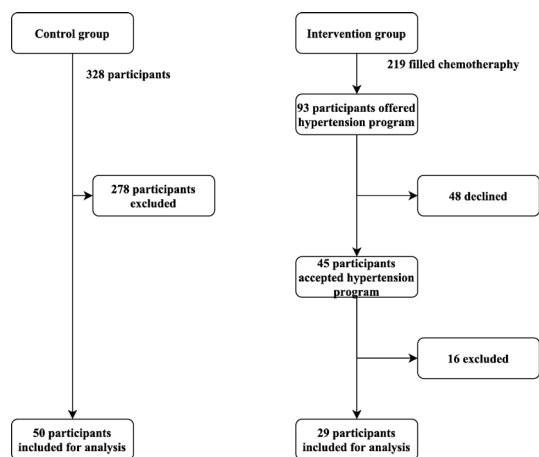
Figure 2: Distribution of patients between the control and intervention categories. The control group consisted of 50 patients, while the intervention group included 29 patients, with prostate cancer being the predominant malignancy in both groups.
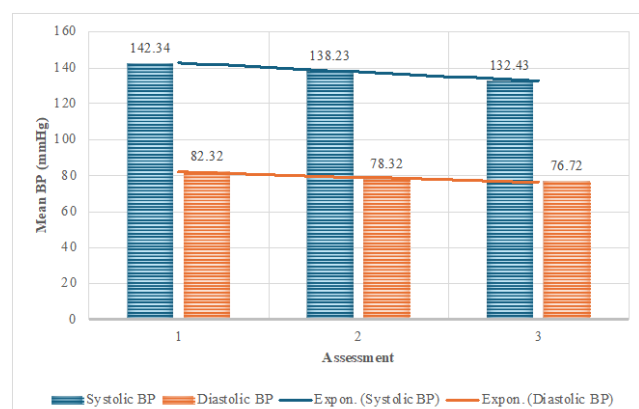
Figure 3: Average blood pressure measurements over time in the intervention group. The graph illustrates a gradual decline in average blood pressure readings with each follow-up evaluation conducted by pharmacists, indicating effective management of hypertension through continuous monitoring.
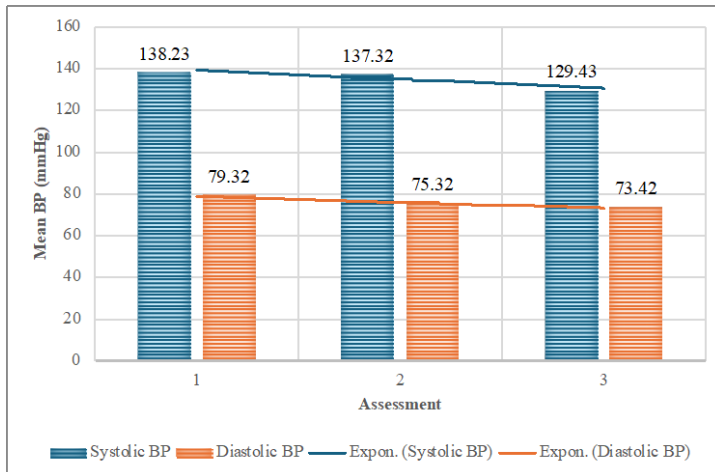
Figure 4: Average blood pressure measurements in patients undergoing three or more evaluations. This figure demonstrates consistent results in average blood pressure among patients (n = 14) who received three or more follow-up evaluations, further supporting the efficacy of pharmacist-led interventions in hypertension management.

pharmacists contacting participants at predetermined intervals to collect BP readings, assess the results, and provide appropriate guidance if needed. Initially, participants were contacted biweekly; however, the frequency of contact was adjusted to every four weeks if their BP readings remained within the target range for two consecutive assessments. Actions were implemented by comparing the participants' BP levels to their desired targets (Figure 1).

2.2 Data Collection and Analysis

The primary objective of the analysis was to evaluate the percentage of individuals with regulated BPs who consistently achieved BP measurements within the desired range during the designated data collection period. In the control group, regulated BP was defined as achieving at least 70% of peripheral BP measurements within the desired range over the span of one year. In the treatment group, controlled HT was determined based on home BP measurements that met the target criteria following the implementation of the HT program, in accordance with the established HT protocols. BP targets were customized according to the parameters of the HT treatment strategy, establishing goals of <140/90 mmHg for older or more fragile individuals with comorbidities, and <130/80 mmHg for younger or more physically capable individuals, as judged by the pharmacist (Battineni et al., 2021).

Secondary outcomes included the number of recommendations provided to patients through the HT management program, the number of medication recommendations made to providers via the hypertension management scheme, and the acceptance rate of therapy suggestions by providers. The de-identified patient demographic data obtained retrospectively included variables such as medication names, cancer types, age, existing medical conditions, and any concomitant medications used (Dieffenbach et al., 2021). The de-identified medical data for both groups contained retrospective information on the dates and BP readings. Throughout the retrospective analysis of the control group's medical records, any BP readings recorded continuously during hospitalization were excluded. The mean of these values was calculated and incorporated into the study for patients with multiple BP measurements recorded during clinic visits. The additional medical data for the treatment group included anonymous information, such as records of pharmacist consultations regarding BP and records of pharmacist recommendations to clinicians concerning antihypertensive therapy. Demographic and health data were obtained through a review of electronic health records and statistical outputs from the pharmacy documenting the program (Ramakrishnan et al., 2019).

2.3 Statistical analysis

The statistical analysis employed descriptive statistics to evaluate the initial demographic and medical information for both groups. The primary outcomes and differences in baseline demographics were analyzed using inferential statistics, specifically the two-sample Z-test for proportions, with an alpha level set at 0.05. The unbiased two-sample T-test was used to examine differences in baseline demographics, with a significance threshold of 0.05. Additional outcomes were analyzed using descriptive statistical techniques, enabling a comprehensive assessment of the effectiveness of the pharmacist-led hypertension management strategy in this population (Chatterjee et al., 2024; Staplin et al., 2023).

2. Results and Discussion

Hypertension (HT) is a prevalent cardiovascular condition affecting a significant portion of the global population, particularly among cancer patients (Zhou et al., 2021). This study aimed to investigate the relationship between HT and cancer, focusing on how anticancer treatments contribute to hypertension and the subsequent cardiovascular complications. Our findings demonstrated a notable difference in the management of hypertension between the control and intervention groups, highlighting the critical role of pharmacists in improving patient outcomes.

The study included a total of seventy-nine patients, with fifty patients in the control category and twenty-nine in the intervention category (Fig. 2). Demographic and illness condition features were similar between the two groups, with prostate cancer being the predominant malignancy treated. This similarity ensures that any differences observed in BP management can be attributed to the pharmacist-led intervention rather than variations in patient characteristics.

In the control group, 21 out of 50 individuals managed to achieve controlled BP in 2022. In contrast, by the end of February 2023, 19 out of 29 individuals in the intervention category maintained controlled BP, resulting in a statistically significant difference (p = 0.04). The number of BP measurements obtained was comparable between the two groups, with 499 readings in the control group and 488 in the intervention group.

Within the intervention category, pharmacists conducted 67 follow-up evaluations over the study period. These evaluations involved the collection of multiple home BP measurements, emphasizing the continuous nature of the monitoring process. Notably, there was a gradual decline in average BP measurements with each subsequent evaluation, as shown in Fig. 3. The results remained consistent when analyzing the average BP measurements in patients who underwent three or more evaluations (n = 14), depicted in Fig. 4. This suggests that the pharmacist-led intervention effectively facilitated BP management through ongoing monitoring and adjustment.

As part of the clinical intervention, pharmacies in the hypertensive treatment program provided recommendations to both patients and healthcare professionals. During the three months analyzed,

pharmacists made four suggestions to physicians regarding the initiation or adjustment of antihypertensive treatments, achieving a 100% acceptability rate from the providers. The recommendations included adding new antihypertensive medications, such as hydrochlorothiazide and amlodipine, as well as increasing the dosages of existing medications, including lisinopril and atorvastatin. This high acceptance rate underscores the collaborative nature of the intervention and highlights the value of integrating pharmacy services into patient care.

The advancement of novel anticancer treatments has substantially improved the prognosis for patients with various malignancies; however, these treatments often result in systemic hypertension, complicating the safe administration of anticancer therapy (Chatterjee et al., 2024). The expanding population of cancer patients is at a higher risk of experiencing end-organ complications related to HT. Our study found that implementing a pharmacist-led HT treatment scheme for patients undergoing oral chemotherapy could effectively reduce BP levels and achieve controlled hypertension, as evidenced by the results.

Clinical pharmacists are well-positioned within healthcare organizations to monitor and manage patients on specialty medications, including oral chemotherapy. Their role includes providing recommendations to healthcare practitioners to optimize antihypertensive therapy. The findings of this study advocate for further research and the expansion of collaborative contracts for pharmacists in outpatient cancer treatment settings, particularly as the need for hypertension management grows among cancer survivors (Dieffenbach et al., 2021; Battineni et al., 2021).

3.   Conclusion

This study underscores the importance of integrating pharmacist-led interventions in managing hypertension among cancer patients. The results demonstrate that proactive monitoring and adjustment of antihypertensive therapy can significantly improve patient outcomes and reduce the risks associated with uncontrolled hypertension. Given the rising prevalence of hypertension in cancer patients, further research is warranted to explore the long-term effects of pharmacist-led interventions and the potential for broader implementation in clinical practice.

Author contributions

PG and RP contributed to conceptualization, fieldwork, data analysis, drafting the original manuscript, editing, funding acquisition, and manuscript review. Both PG and RP were involved in research design, methodology validation, data analysis, visualization, and manuscript review and editing. Additionally, PG took the lead in methodology validation, investigation, funding acquisition, supervision, and final revisions. All authors have reviewed and approved the final version of the manuscript.

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