Effects of Tele-Education on Adherence to Healthy Lifestyle Among Hypertensive Healthcare Workers in a Tertiary Government Hospital

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Background: Hypertension remains the leading risk factor for mortality due to cardiovascular diseases worldwide. In the Philippines, this is the second most common cause of morbidity, with a rate of 602.4/100,000. Contributory to this burden is low adherence to lifestyle modifications in the general population and among healthcare workers (HCWs). This is observed despite HCWs' knowledge and access to health services. Key to addressing this problem is patient education regarding healthy lifestyle, which has proven benefits on blood pressure control. Supportive methods, such as text messages and phone calls, can improve adherence. However, there is a gap in local data regarding tele-education, content, and healthcare workers.
Objectives: The study aimed to determine adherence to a healthy lifestyle among hypertensive healthcare workers, specifically 1) adherence score to diet, physical activity, smoking cessation, and alcohol intake after 8 weeks of tele- education; 2) change in adherence from baseline to week 8; 3) change in adherence of those who underwent standard versus intensified tele-education.
Method: A randomized, controlled intervention study with 40 participants was conducted. Baseline adherence was recorded at the beginning, standard and intensified tele-education at week 4, and final adherence measurement at week 8.
Results: Baseline data revealed low total adherence to healthy lifestyle, with the lowest scores for diet (0%) and physical activity (20%). Highest change after week 4 of tele-education was seen in the intervention group diet (50%) and physical activity (70%). Total adherence increased in control (10%) and intervention (45%) groups. However, only the intervention group showed statistical significance (p-value < 0.001). Conclusions. Thus, intensified tele-education given one month after standard face-to-face education is an effective way of increasing adherence of hypertensive HCWs to a healthy lifestyle.

Key words: Hypertension, telemedicine, patient education

Introduction

Non-communicable diseases (NCDs) such as cardiovascular diseases account for an estimated 41 million death worldwide, and hypertension remains its leading risk factor.[1] The burden of this illness is highlighted by the fact that only 1 in 5 people with hypertension have this problem under control.[1] In the Philippines, hypertension ranks as the second leading cause of morbidity, with reported cases of 637,078, at a rate of 602.4/100,000 population.[2] In the 2021 Report of East Avenue Medical Center, Department of Family and Community Medicine, an average of 27 hospital workers consulted at the Employee's Clinic monthly for hypertension. However, despite comprehensive guidelines covering medical and non-pharmacological recommendations, the goal of reducing premature deaths secondary to NCDs remains to be achieved nationally[2] and worldwide.[1] Lifestyle modifications have long been recommended for their proven cardiovascular risk-lowering effects and low cost.[1] The latest Philippine clinical practice management pathway for hypertension recommends enhanced patient education regarding modification of risk factors by the patient's second visit.[3] However, data on monitoring and evaluating patient adherence to a healthy lifestyle are limited. Most studies report low adherence to a healthy lifestyle among hypertensives.[4,5,6] Age, marital status, educational background, monthly income, other illnesses, and self-efficacy were predictors of adherence to lifestyle interventions.[7,9] Despite considerable knowledge

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and access to health services, healthcare workers do not report healthier lifestyles compared to the general population.[7,8] Their poor adherence was across all components of a healthy lifestyle: 50% in the diet, 21% in physical activity, and 8.4% in smoking.[11,12]

Low adherence to lifestyle modifications is an important worldwide issue because medication alone is insufficient to control blood pressure.[10] A local study shows that pre-hypertensives, and stage 1 hypertensives who receive lifestyle education programs, experienced a significant decrease in blood pressure.[13] Education on adherence to lifestyle modifications ranges from standard generalized hypertension information (adapted prom prevailing clinical practice guidelines), and supportive interventions with comprehensive information.[4] The most common mode of education is a single one-on-one session, with an average time of 30 minutes.[15]

The main reference for patient education is the WHO HEART (World Health Organization, technical package for cardiovascular disease management in primary health care – healthy lifestyle counselling).[16] A healthy lifestyle includes diet, physical activity, smoking cessation, and limited alcohol intake. The general elements of a healthy adult diet are a variety of foods (vegetables and fruits), restricted salt intake, and fat consumption.[16] The physical activity covers activities of daily life and includes exercise.[16] Smoking cessation recommendations are because tobacco products are harmful and can damage every part of the body, causing 10% of all cardiovascular deaths.[16] Alcohol intake must be limited since it is a known risk factor for cardiovascular diseases.[16]

Despite clinical guidelines, local literature is limited regarding adherence to lifestyle interventions for hypertension. Data on healthcare worker adherence both internationally and locally are also limited, along with studies regarding methods of patient education. This study aimed to fill that gap and provide evidence for tele-education as an avenue for patient education and counselling on healthy lifestyles for hypertension. This study's rationale was to provide data regarding tele-education as an alternative to physical patient education regarding a healthy lifestyle. Making patient education more accessible and convenient may lead to better adherence. Data gathered can also help design programs on employee wellness in the community. These may also lead to interventions that will alleviate the disease burden of hypertension and its complications in the country. Better adherence to a healthy lifestyle will contribute to achieving the goal of quality life and avoiding premature deaths secondary to cardiovascular diseases. This study determined the effects of tele-education on adherence to a healthy lifestyle among hypertensive health care workers in a tertiary government hospital.

Methods

Study Design

The study design is a randomized and controlled intervention trial, and participants were recruited as they came. All hypertensive patients seen in the Employees' Clinic of East Avenue Medical Center who fulfilled the inclusion criteria and were available during data collection were invited. The definition of hypertension used in the study was blood pressure readings higher than 140/90 mmHg recorded by a health professional on at least three separate occasions (more than 15 minutes apart).[17] Assignment to intervention and control group was done using systematic random sampling of weekly recruited participant census using the software Microsoft Excel. Baseline adherence (Annex A) and initial patient education on a healthy lifestyle for hypertension were done in person in the study area with a target duration of 5 to 20 minutes. Standard (control, Annex B) and intensified (intervention, Annex C) patient education was conducted via tele-education after 4 weeks. Follow-up and post-intervention assessment of adherence to a healthy lifestyle was conducted at week 8. The Adherence Questionnaire (Annex A) measured adherence to a healthy lifestyle. Descriptive statistics were used to analyze the sociodemographic factors, presented in frequency and percentages. Adherence to healthy lifestyle interventions per category of diet, physical activities, smoking, and alcohol intake was analyzed as the rate of "yes" answers and presented as frequency and percentage. Effects of tele-education on adherence to healthy lifestyle interventions were analyzed using change in adherence from baseline to end of the intervention, using a chi-square test with a confidence interval set at 95% and p-value at ≤ 0.05 for significance.

Setting

The research was conducted in the Employee's Clinic of East Avenue Medical Center. This facility is the tertiary hospital's designated occupational safety and health clinic and caters to its 1081 employees. The recruitment started on June 8, 2022 and ended on August 31, 2022. Data collection was completed on October 26, 2022, with a follow-up period from October 27 to 31, 2022. Recruitment was done as they came, with random selection for control and intervention groups.

Study Participants

All healthcare workers with hypertension for at least 6 months during the commencement of the study and who were willing to undergo tele-education were included. However, those unable to communicate, were critically-ill, with urgent or emergent needs (BP > 160/100 mmHg with signs of end-organ damage), had mental health issues, or were participants in other research studies at the time of recruitment were excluded. Participants were withdrawn if they became ineligible according to the exclusion criteria above and failed to comply with the scheduled tele-education at week 4 and evaluation on week 8. Participants were informed that they could withdraw anytime. Before data collection began, written informed consent was obtained from each participant with the assurance of confidentiality, an explanation of the objectives of the study, the process and their role, and provisions in the event of adverse events.

Randomization

Randomization was done weekly using Microsoft Excel. Those randomly assigned odd numbers were included in the control group,

while those with even numbers were in the intervention group. Randomization was concealed using sequentially numbered opaque folders. Different persons recruited participants and assigned them to the control and intervention groups.

Intervention

Resident physicians were trained regarding the conduct of this study, from recruitment, use of the Healthy Lifestyle Adherence Questionnaire, in- person and tele-education administration of Standard and Intensified Materials for Healthy Lifestyle and the ethical aspect in approaching the participants and the objectives of the study. Once consent from recruited participants was secured, a baseline in-person consult was conducted. The Healthy Lifestyle Adherence Questionnaire was administered in a Google Form document to survey the demographic profile and measure baseline adherence score. This was followed by patient counselling using the Standard Education Material for Healthy Lifestyle interventions. The target session time was 5 to 20 minutes. In the fourth week, participants were contacted based on their preference; direct telephone or mobile phone or online audio call through Facebook Messenger or Viber applications. A brief introduction of who was calling and the purpose of the tele-education was given. The intervention group received tele-education using the Intensified Tele-education Material for Healthy Lifestyle (Annex C). The control group received the Standard Education Material for Healthy Lifestyle. The intensified tele-education material covers more comprehensive details of lifestyle changes such as specific dietary proportions, physical activity targets, harmful effects of tobacco, and behavioural changes with alcohol intake. The education material was adapted from the DOH PhilPEN Risk Assessment[2] and WHO HEARTS protocol.[16] According to the baseline questionnaire results, the physician-educator focused the intensified tele-education on the healthy lifestyle categories which the participants answered "no." The advice was delivered in English as stated in the material. The control group received the same standard education material given at baseline; the physician-educator did not focus the tele-education on specific healthy lifestyle categories based on the "no" answer in the Adherence Questionnaire; this was to establish an attention control group. The consultation duration was recorded when tele-education started and ended. The target duration was 5 to 20 minutes. In the 8th week, all participants were contacted based on their previous preferences. Post-intervention adherence scores to healthy lifestyle recommendations were measured using the Adherence Questionnaire, which was based on the recommendations by the local guideline for hypertension management published in 2020. Initial follow-up was made after 1 week of the initial diagnosis of hypertension, then monthly for evaluation of blood pressure control and adherence to pharmacologic and non-pharmacologic treatment.[3] The study was single-blinded. Participants were blinded as to the intervention they received. An attention control group was designed, which was monitored on the same schedule as the intervention group. The physician-educators knew the tele-education material (standard or intensified) before their administration.

Follow-Up and Outcomes

Follow-up was done at week 8 to assess the primary outcome of adherence to a healthy lifestyle. This was through telephone or internet audio calls. Outcome was measured using the Healthy Lifestyle Adherence Questionnaire (Annex A) Parts II and III. The tool consisted of 13 structured English questions regarding the participant's lifestyle, which were adopted from the DOH2 PhilPEN NCD High-Risk Assessment Facility Form. The analysis was stratified based on categorical adherence or non-adherence to diet, physical activity, smoking cessation, and alcohol intake. In Part III of the questionnaire, the participants' total adherence scores were calculated by adding the number of variables (diet, physical activity, smoking cessation, and alcohol intake) they were categorized as adherent.

Participants who dropped out for any reason or became ineligible according to the aforementioned inclusion and exclusion criteria would be followed up for accountability and monitored according to prevailing clinical guidelines for hypertension. However, for this study, there was no reported drop-out.

Statistical Analysis

The study's null hypothesis is that there is no significant difference in the adherence to a healthy lifestyle among hypertensive workers who received intensified versus standard patient tele-education at 8 weeks. The alternative hypothesis is that there is a significant difference in the adherence to a healthy lifestyle among hypertensive workers who received intensified versus standard patient tele-education at 8 weeks. The sample size was determined using the OpenEpi calculator. Single population proportion formula was used by considering the proportion of healthcare worker adherence to recommended healthy lifestyle[11,12] of 50%, 95% CI, and 5% margin of error. The total sample size is 32 using the Kelsey criteria. To increase power, the final sample size was determined with a non- response rate of 25%, $32 + 8 = 40$ participants. The data were stored in a USB and kept in the Department of Family and Community Medicine storage for resident physicians in training. Access was only given to the principal investigator and statistician. Storage will be for 10 years, after which file shredding will be done. Statistical Analysis was done using SPSS (Statistical Package for Social Sciences) version 21. The analytical method for sociodemographic data was descriptive statistics using frequency and percentages. Adherence to healthy lifestyle interventions per category of diet, physical activities, smoking, and alcohol intake was analyzed as the "yes" answers rate and presented as frequency and percentage. Effects of tele-education on adherence to healthy lifestyle interventions were analysed using change in adherence scores from baseline to end of the intervention, using a chi-square test with a confidence interval set at 95% and p-value at ≤ 0.05 for significance. The median consultation time with range was used to compare baseline, week 4, and week 8 sessions.

Ethical Considerations

The general principles of ethical safeguards applied in this study were as follows: social and clinical value as mentioned in the

significance of the study (Part I. Background), scientific validity (Technical Review Board approval), fair subject selection (Part III. Methodology, Selection), favorable risk-benefit ratio, independent review (Institutional Ethics Review Board), informed consent and respect for autonomy (patient free choice, Part III Methodology, Study Design), and respect for potential and enrolled participants (assurance of privacy and confidentiality, information on withdrawal from the study should participants decide, monitoring of welfare).

Results

Participants were recruited in the study area (Employee's Clinic) from June to August 2022. The intervention of standard and intensified patient tele-education was done at week 4. Post-intervention measurement of adherence to a healthy lifestyle and follow-up was done at week 8. The total number of recruited participants was 40, based on the calculated sample size using Kelsey criteria with 25% non-response rate consideration. All 40 participants were eligible based on inclusion and exclusion criteria. They were randomly assigned to the control (standard patient tele- education) and intervention (intensified patient tele-education) groups, with 20 participants per group. There were no dropouts. They all received patient tele- education for a healthy lifestyle at week 4 and completed follow-up at week 8. All were included in data analysis, with primary outcome measurement of adherence to healthy lifestyle interventions.

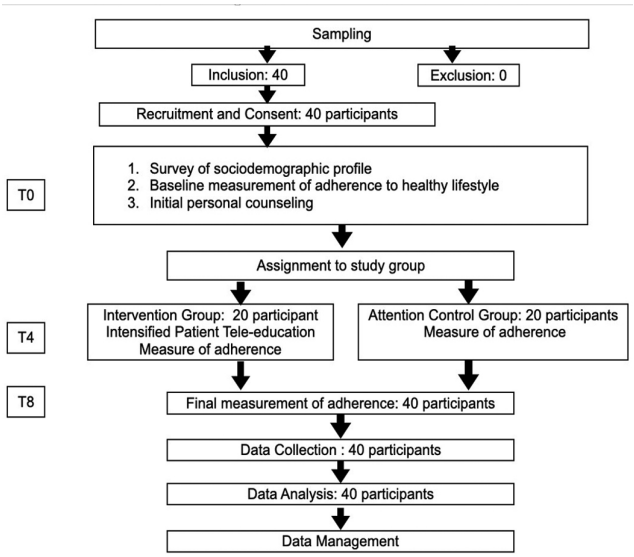

Figure 1. Flow diagram of participant recruitment to completion of the study.

Table 1. Socio-demographic characteristics of participants.

Variable	Category	Frequency (N=40)	Percentage (100%)	Mean ± SD
Age	29 and below	1	2.5	44.82 ± 10.21
	30 to 39	11	27.5	
	40 to 49	15	37.5	
	50 to 59	9	22.5	
	60 and above	4	10.0	
Sex	Male	22	55	
	Female	18	45	
Religious Affiliation	Roman Catholic	26	65	
	Islam	0	0	
	Iglesia ni Cristo	6	15	
	Evangelicals	8	20	
	Others	0	0	
Marital Status	Single	8	20.0	
	Married	29	72.5	
	Common-Law/Live-In	1	2.5	
	Widowed	2	5.0	
	Separated	0	0	
Occupation	Medical	12	30.0	
	Nursing	15	37.5	
	Allied Health	7	17.5	
	Administrative	6	15	
Monthly Income	Poor and Low	7	17.5	39,175 ± 17,240.00
	Lower Middle	17	42.5	
	Middle and Upper Middle	16	40.0	

The demographic profile of all 40 study participants is shown in Table 1 The participants have a mean age of 44; predominantly male (55%); Roman Catholic (65%); married (72%); the majority were nurses or nurse aides (37.5%), followed by doctors (30%); and the average monthly income was Php39,000. All participants were known Hypertensives without complications for at least 1 year.

Shown in Table 2 is the baseline adherence to a healthy lifestyle, distributed between the control and intervention groups. Non-adherence was observed in 100% of the control and intervention groups to a healthy diet, 80% in the control group, and 84% in the intervention group to healthy physical activity; 5% in both groups for smoking cessation, and 40% in the control group and 25% in the intervention group to limited alcohol intake. All participants in both groups got adherence scores of 0-3. None got a score of 4; thus, all 40 participants were non-adherent to a healthy lifestyle at the beginning of the study. At week 8, adherence to a healthy diet increased to 30% from 0% in the control group and 50% from 0% in the intervention group, healthy physical activity increased to 65% from 20% in the control group and 70% from 15% in the intervention group, smoking cessation increased to 100% from 95% for both groups, and limited alcohol intake increased to 90% from 60% in the control group and 95% from 75% in the intervention group. Total adherence to a healthy lifestyle increased to 10% in the control group and 45% in the intervention group.

The effect of patient tele-education is shown in Table 3 and was measured using Chi-square Test (Fisher's Exact Test), with statistical significance set at p- value<0.05. In the control group, an increase of 10% in adherent participants was noted 8 weeks after standard patient tele-education on a healthy lifestyle. The calculated p-value is 0.487, greater than the set p-value for significance. In the intervention group, an increase of 45% in adherent participants was noted 8 weeks post-intensified patient tele-education on a healthy lifestyle. The calculated p-value is 0.001, smaller than the set p-value for significance.

Table 2. Adherence score of hypertensive healthcare workers after 8 weeks of receiving tele-education for healthy lifestyle interventions on diet, physical activity, smoking, and alcohol intake.

Group			Control				Intervention			
			Before		After 8 Weeks		Before		After 8 Weeks	
Variable	Score	Category	Frequency (n = 20)	Percentage (100%)	Frequency (n = 20)	Percentage (50%)	Frequency (n = 21)	Percentage (100%)	Frequency (n = 20)	Percentage (50%)
Diet	0	Non-adherent	20	100	14	70	20	100	10	50
	1	Adherent	0	0	6	30	0	0	10	50
Physical Activity	0	Non-adherent	16	80	13	65	17	84	6	30
	1	Adherent	4	20	7	35	3	15	14	70
Smoking Cessation	0	Non-adherent	1	5	0	0	1	5	0	0
	1	Adherent	19	95	20	100	19	95	20	100
Limited Alcohol Intake	0	Non-adherent	8	40	2	10	5	25	1	5
	1	Adherent	12	60	18	90	15	75	19	95
Total Adherence Score	0-3	Non-adherent	20	100	18	90	20	100	11	55
	4	Adherent	0	0.0	2	10	0	0.0	9	45

Table 3. Change in the adherence score from baseline to 8 weeks among hypertensive healthcare workers who underwent standard (control) and intensified (intervention) patient tele-education for a healthy lifestyle (n=40).

	Adherence to Healthy Lifestyle (%)			
Week	Standard (n = 20)	*p-value	Intensified (n = 20)	*p-value
Week 1	0%	0.487	0%	0.001
Week 8	10%		45%	

*Exact Sig. (2-sided) of Fisher's Exact Test

Table 4. Change in total adherence score among hypertensive healthcare workers who underwent standard (control) and intensified (intervention) patient tele-education for a healthy lifestyle (n=40).

Time	Control (n =20) Percentage (%)	Intervention (n =20) Percentage (%)	Difference	*p-value
Change in adherence	10	45	35	0.031

*Exact Sig. (2-sided) of Fisher's Exact Test

Table 5. Duration of interview and tele-education at baseline (T0), intervention (T4), and follow-up (T8).

Variable	Median	Range
(T0) Baseline Interview	14 minutes	7 to 40 minutes
(T4) Standard Tele-education	14 minutes 30 seconds	9 to 38 minutes
(T4) Intensified Tele-education	16 minutes 30 seconds	8 to 30 minutes
(T8) Follow-up	8 minutes	8 to 22 minutes

Change in total adherence to a healthy lifestyle among hypertensive healthcare workers who underwent intensified tele-education versus those who underwent standard patient tele-education is shown in Table 4 and was measured using Fisher's Exact Test, with significance set at p-value < 0.05. A difference of 35% was noted in the number of adherent participants after standard versus intensified patient tele-education. The calculated p-value is 0.31, smaller than the set p-value for significance.

A median duration of 14 minutes was observed for the in-person baseline interview and initial standard patient education of all 40 participants, the range was 7 to 40 minutes. At week 4, the median duration was 14 minutes 30 seconds for the control group (standard tele-education) and 16 minutes 30 seconds for the intervention group (intensified tele-education). Follow-up interviews via tele consult had a median duration of 8 minutes for both control and intervention groups (Table 5).

Discussion

This study investigated the effects of patient tele-education on adherence to a healthy lifestyle of hypertensive healthcare workers. The participants have a mean age of 44 years old; predominantly male (55%); Roman Catholic (65%); married (72%); the majority were nurses or nurse aides (37.5%), followed by doctors (30%); and the average monthly income was 39,000. Baseline data revealed low total adherence to a healthy lifestyle among hypertensive healthcare workers, with the lowest scores for diet and physical activity. Highest change in adherence scores after week 4 of tele-education was seen in the diet and physical activity of the intervention group. Total adherence to a healthy lifestyle increased both in the control and intervention groups. However, only the increase in the intervention group showed statistical significance. Intensified patient tele-education was more effective than standard tele-education in increasing adherence to a healthy lifestyle among hypertensive healthcare workers.

The results of this study show that despite considerable knowledge and access to health services, hypertensive healthcare workers have low adherence to a healthy lifestyle at baseline. To address this problem, intensified patient tele-education was proven effective in increasing adherence scores. This is in line with the Clinical Practice Management Pathway for Hypertension recommendations by the Philippine Academy of Family Physicians to enhance patient education for lifestyle modification on follow-up consultations.[18] This study also provides evidence for healthcare providers to use tele-education as an effective tool for administering lifestyle counselling. Tele-education may be considered an alternative to face-to-face sessions, contributing to a family medicine practice that is more responsive to the needs of the hypertensive healthcare worker. Participants could choose which avenues to use for tele-education and follow-up in the convenience of their home or workplace. The implication of this is a more effective health service, as evidenced by a 100% follow-up rate by the participants. Long-term implications of receiving lifestyle education are better blood pressure control[13,25] and delay of cardiovascular complications.[13,19,21] Policymakers can consider strengthening preventive health programs and providing health technology to improve service delivery (such as mobile applications or free access to the internet). They may also consider policies that will allow for better adherence to a healthy lifestyle, such as areas for physical activities, supporting a healthy diet, and controlling smoking and alcohol consumption. Health leaders and societies may include lifestyle adherence targets in the success of hypertension management and NCD programs. Reducing risk factors through a healthy lifestyle will lessen premature deaths due to NCDs. Reduced disease burden due to hypertension will lead to allocating resources to other health needs.

The baseline finding on overall adherence in this study was similar to that of the study conducted by Fang and colleagues, where the overall adherence rate to lifestyle modification among hypertensives in 50 USA states was only 1.7%.[5] This was also similar in studies done in Turkey[6] and Ethiopia[23], which reported low adherence rates to lifestyle modifications

among hypertensive patients. Ayodapo and colleagues reported a significant difference in post-intervention adherence to lifestyle modifications for diet, physical activity, and alcohol consumption.[15] There was no significant change observed in the smoking habits of their control and intervention groups[15], which is like this study (95% to 100% adherence, Table 2). This study shows that total adherence to a healthy lifestyle improved after tele-education, like the findings of Tam and colleagues[14] and Omboni and colleagues.[24] They observed that supportive methods such as phone calls and message reminders after face-to- face educational interventions enhanced adherence to lifestyle modifications among hypertensive patients.[14,24] In particular, adherence was enhanced in dietary and physical activity components after monthly supportive counselling for lifestyle modification.[14]

The study focused on adherence to healthy lifestyle recommendations for hypertensive patients. However, clinical parameters such as blood pressure and body mass index were not measured. The study relied on the veracity of all participants in answering the questionnaire at baseline and after eight weeks.

Interpretation of the results must be in the context of adherence to lifestyle modifications. Long-term effects related to decreasing cardiovascular risks are beyond the scope of this study but can be recommended for future research.

Conclusion

This study showed a significant difference in the adherence scores of hypertensive healthcare workers who received standard versus intensified tele- education for a healthy lifestyle after eight weeks. Tele-education is most effective in increasing adherence to diet and physical activity recommendations. Intensified tele- education significantly increased the adherence score from baseline to week 8. While no significant change was seen in the control group, intensified tele-education given one month after standard face-to-face education is an effective way of increasing adherence to a healthy lifestyle among hypertensive healthcare workers.

Recommendations for the application of the study results are 1) use in the East Avenue Medical Center programs for Employee's Clinic, 2) occupational health clinics, 3) family medicine clinics, and 4) community clinics. The results can be used in the design of health programs for hypertension control and monitoring. Data can be used as the basis for implementing tele-education programs and the tools as assessment forms. Further research based on this study are as follows: 1) evaluation of clinical outcomes, such as blood pressure and body mass index, 2) comparison of counselling techniques targeted for behavioral change; and 3) comparison of technologies used for a healthy lifestyle, such as mobile applications. A follow-up study may also be done at six months and one year, as these are the recommended follow-up schedule for controlled hypertension.[22] Participants can be evaluated for long-term adherence to a healthy lifestyle and clinical outcomes.

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