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Case Report

Improving Medication Adherence among Patients with Coronary Heart Disease

Xinxin Tang and Maureen Courtney*

College of Nursing and Health Innovation, University of Texas Arlington, USA

***Corresponding author:** Maureen Courtney, Associate Professor, College of Nursing and Health Innovation, University of Texas Arlington, USA. Tel: +18172724861; Fax: +18172725006; Email: maureen@uta.edu

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Abstract

Purpose: The purpose of this study was to evaluate the effectiveness of an initial medication adherence interview followed by a personalized telephone-based counseling intervention to improve medication adherence among adult patients with Coronary Heart Disease (CHD).

Methodology: A pilot study was conducted utilizing a quasi-experimental, pre and post intervention design. Study participants completed an eight-item Modified Medication Adherence Scale (MMAS-8) questionnaire to measure and compare self-reported medication adherence before and after the intervention, which consisted of an interview and six weekly follow-up counseling sessions. The Statistical Package for the Social Science (SPSS) version 25 software was used to conduct a correlation analysis and a Wilcoxon signed-rank test to explore whether the mean scores achieved on the MMAS-8 scale had significantly changed after the intervention.

Results: A total of 50 patients was initially assessed, and 22 participants with low medication adherence were recruited and completed the intervention. Among the 22 participants, Spearman's correlation found no significant relationship between demographics and pretest and posttest scores. The correlation between the number of telephone counseling sessions and the postintervention MMAS-8 score was not statistically significant. There was no correlation between the spoken language (English or Spanish) and the preintervention or postintervention MMAS-8 score. A Wilcoxon signed-rank test indicated an average 3.12 point increase in pre-intervention scores from M=3.37 to post-intervention scores M=6.59 ($p<.0001$). In addition, 95% of participants (21) reported that participating in the telephone sessions positively affected their compliance with taking medications.

Conclusions: This study examined the effectiveness of a patient-centered strategy inclusive of an individualized interview and follow-up telephone counseling to increase medication adherence. The findings suggested that this form of intervention had a positive and measureable impact on medication compliance among patients with CHD and carries implications, particularly for those who had limited physical access to healthcare facilities.

Keywords: Cardiovascular disease; Medication adherence; Phone-based counseling intervention

Introduction

Medication adherence in the treatment of various diseases is an issue that impacts patients of all races, ages, and social demographics in the United States [1]. Among patients with chronic diseases, approximately half do not take medications as prescribed [2]. Adherence is an important factor in increasing the effectiveness of pharmacological therapies, which impacts improving health in a population more than any other medical treatment [2]. Between one- and two-thirds of medication-related hospitalizations in the United States are caused by poor medication adherence, leading to increased morbidity and mortality and high medical costs, approximately $100-$300 billion annually [3-5]. This includes direct treatment costs and indirect costs such as lost work productivity and the cost of caregiver assistance [5,6]. Thus, medication adherence is crucial to reduce mortality and hospitalizations, improve health outcomes, and reduce costs [4].

Medication nonadherence in patients with cardiovascular disease is especially critical because heart disease is the leading cause of death in the United States, causing one of every four deaths [7]. Effective medications exist to prevent CVD morbidity and mortality (aspirin, bets blockers, and statins for patients with CHD) [8]. In fact, in the past 20 years, half of the 50% reduction in mortality from CHD has been achieved by cardiovascular medications alone [6]. However, achieving cardiovascular benefits is often unsuccessful because of the high rates of nonadherence in real-world settings, leading to poor clinical outcomes, including rehospitalization, subsequent myocardial infarction, and increased mortality [6,9].

Compared with African-Americans and nonHispanic whites, Hispanics have the lowest mortality rate from heart disease [10]. However, unlike the rest of Texas and nationwide, where Hispanics are less likely than nonHispanic whites to die of heart disease, Hispanics living in south Texas have mortality rates similar to those for nonHispanic whites [11]. A study by Gellad WF, et al. [12] determined that rates and reasons for medication nonadherence vary by race/ethnicity among seniors. The study found that Hispanics are more likely than blacks and whites to report cost-related nonadherence. Other studies have also found that a higher rate of medication nonadherence exists among Hispanics [13,14]. Spanish-speaking patients are more likely to receive insufficient care and have poorer health outcomes due to language barriers and household income [14]. Therefore, the current project was conducted to enhance medication adherence among patients with CHD in an area with a large Hispanic population.

Although many interventions intended to improve medication adherence among patients with chronic conditions have been studied, researchers have not determined any standard interventions because the barriers to medication adherence vary widely among different populations and areas. Some factors contributing to medication nonadherence are related to socio-economic status, therapy, patients, providers, and healthcare systems. Thus, interventions should address specific issues to positively impact medication adherence [15].

Communication and interaction with patients can help clinicians clarify patients' barriers and their commitment to medication adherence [16]. The engagement of clinicians in assessing and counseling is an effective approach to provide tailored intervention to help patients overcome these barriers [16]. Identifying the factors contributing to medication nonadherence in specific settings and using cost-effective, patient-centered, and convenient approaches targeted to the population are essential. No previous study, to best of our knowledge, has reported examining the combination of these two interventions in patients with CHD.

Literature Review

Many potential interventions designed to improve medication adherence have been studied. Hu, et al. [15] reviewed 20 studies evaluating various interventions to increase medication adherence in African-American and Hispanic populations (8 of the 20 studies), including education, counseling, motivational interviewing, peer support, home visits, handouts, telephone calls, and reminder devices from community health workers, pharmacists, trained nurses, and peer counselors in a variety of settings. Patient self-reporting was the most commonly used method of measuring adherence among these studies. Although the studies varied widely in the type of intervention, their results supported the conclusion that the most effective approach was to target the specific population and provide a few combined interventions of education and counseling with more details to improve medication adherence. A systematic review by Teeter and Kavookjian [17] examined nine studies conducted between 1991 and 2012 related to telephone-based Motivational Interviewing (MINT) for medication adherence in patients with chronic conditions. Six of these studies demonstrated statistically significant improvement in adherence between the telephone intervention and control groups.

A Randomized Control Trial (RCT) reported by Palacio, et al. [18] determined the efficacy of the telephone-delivered interview (MINT) in 452 minority individuals with CHD after percutaneous coronary intervention. The study had two interventions: a phone-delivered MINT and an educational video to improve adherence to antiplatelet medications. The result showed the MINT group had greater medication adherence ($p<.01$) than usual care with significantly higher MMAS-4 scores ($p<.01$).

The two prior studies provided evidence to support the effectiveness of an initial interview to determine barriers and subsequent telephone-based education and counseling session to improve medication adherence. These studies also support an approach that is patient-centered, cost-effective, and convenient. The cost and health outcome benefits obtained by improving medication adherence in patients with CHD have been shown by many additional studies [4,19-22]. Thus, although myriad barriers impact adherence to therapy in patients with CHD, implementing a face-to-face interview to assess those barriers followed by telephone-based counseling to provide individualized education and support appears to be a convenient and inexpensive approach to help patients improve medication adherence [17].

Framework

The conceptual framework generated by Gellad, et al. [23] integrates three interrelated factors-patient, provider, and health system-to describe how patient compliance is influenced to promote evidence-based therapy. A schematic diagram of their framework is shown in Figure 1. Because it reveals the important effects on medication adherence, this conceptual framework provides guidance to clinicians for evaluating patient self-identified barriers to medication adherence and for developing effective interventions tailored to each individual to enhance medication adherence and health outcomes. The current study applied this conceptual framework as a guide to determine potential barriers to medication adherence and create interventions for overcoming those barriers in patients with stable CHD.

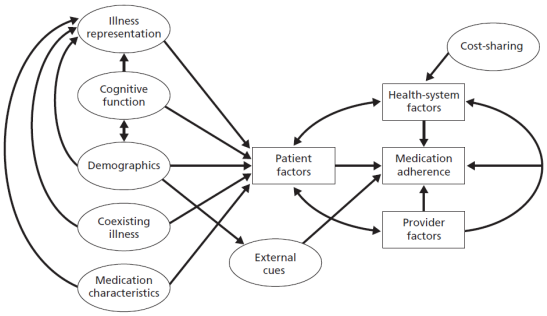

Figure 1: General conceptual framework of medication adherence and the interactions among patient factors [23].

Project Purpose

The purpose of this project is to determine whether combining an initial face-to-face medication adherence interview with adult CHD patients to assess barriers with subsequent individualized telephone-based counseling improves medication adherence in patients who had low adherence to current evidence-based medication regimens.

Institutional Review Board Approval

The project was reviewed and approved by the University of Texas at Arlington and the Research Committee of the Doctors Hospital at Renaissance (DHR), the Medical Executive Committee of the DHR, and the Board of Governors of the DHR.

Methodology

Project Design

This study used quasi-experimental pre- and post intervention design to determine the effectiveness of individualized interview to determine barriers and telephone counseling to improve medication adherence in patients with CHD. The MMAS-8 (Table 1) was used to assess medication adherence before and after intervention. The assessment was offered in English or Spanish and queried demographic variables (gender, age, and education level) [24].

	No=1	Yes=0
1) Do you sometimes forget to take your pills?		
2) People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine?		
3) Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?		
4) When you travel or leave home, do you sometimes forget to bring along your medicine?		
5) Did you take all your medicine yesterday?		
6) When you feel like your symptoms are under control, do you sometimes stop taking your medicine?		
7) Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
8) How often do you have difficulty remembering to take all your medicine?	Never/Rarely……..4 Once in a while…...…3 Sometimes……...…..2 Usually……...1 All the time……...…..0	
Total Score		

Table 1: Eight-Item Morisky Medication Adherence Scale (MMAS-8) [25].

Population and Specific Sampling Plan

This study was conducted in a cardiology outpatient clinic of the DHR between May 2016 and August 2016 in the Rio Grande Valley, Texas, where approximately 84.6% of the population is Hispanic [24]. Convenience sampling was used to identify project participants. After the initial screening using the MMAS-8 in 50 patients with CHD for low medication adherence, 22 patients who had low adherence were recruited as volunteers, and permissions were obtained before the interview. The participants' confidentiality was ensured.

The interventions were conducted with adult CHD patients with low medication adherence. The inclusion criteria were (1) established CHD patients over 18 years old who had had a percutaneous coronary interventions and/or coronary artery bypass graft surgery; (2) patients who had been prescribed evidence-based medications (aspirin, beta-blocker, statin, and/or angiotensin-converting enzyme inhibitor); and (3) patients who had low medication adherence as assessed by scoring <6 on the MMAS-8. The exclusion criteria were patients who (1) did not manage their own medications, (2) were residents of nursing homes, (3) did not use a cell phone, (4) did not communicate verbally, or (5) had MMAS-8 scores >6.

Measurements

An initial medication adherence interview was conducted to determine barriers to medication adherence and empower patients to engage in positive health behaviors and make behavior changes. The interview tool was modified from that used in the "Multi-site RCT for BP Control in Hypertensive African Americans" funded by the National Heart, Lung and Blood Institute in 2005. Follow-up telephone counseling sessions were used to reinforce medication adherence. The primary outcome was medication adherence as measured by self-reported adherence using the MMAS-8, an eight-item questionnaire available in both English and Spanish (Table 1). Data were collected at baseline and after completing a one-time interview and weekly telephone counseling sessions for six weeks.

The MMAS-8 score was used to assess a change in medication adherence in patients with CHD before and after intervention. The final scores for each participant were based on the five-point Likert scale. The code response for item number five on the MMAS-8 was altered to a positive direction, and item eight was divided by four for the summated score. The summated adherence score ranged from zero to eight. Low adherence was defined as a score less than six, medium adherence from six to less than eight, and high adherence was a score equal to eight [25].

Many studies have shown that the MMAS-8 is a reliable and valid measure for detecting patients at risk of nonadherence, is correlated with pharmacy refill adherence, and is simple and practical to use in outpatient settings [25-28]. Thus, it is a valid and easy-to-use screening tool in a clinical setting to identify patients who are poorly adherent and at risk for poor outcomes of CHD.

Demographic data were obtained using a data collection form (Appendix A). The Nurse Practitioner (NP) recorded data for 22 participants during the initial medical adherence interview and for each telephone counseling session. The data collection form was designed by the investigator to track individual barriers to medication adherence and to easily record, code, and enter data into a computer.

Procedures

Fifty participants with CHD who were currently under treatment with evidence-based medications were initially assessed using the MMAS-8. Twenty-four patients were identified as having low adherence to medication (MMAS-8 score<6). Two patients refused to participate in the intervention. Therefore, 22 participants with low medication adherence were recruited for an initial medication adherence interview and six weeks of weekly telephone counseling (Figure 2). An NP conducted the interview and telephone counseling sessions for participants who preferred English. If patients' preferred language was Spanish, a bilingual Medical Assistant (MA) conducted the interview and telephone counseling together with the NP.

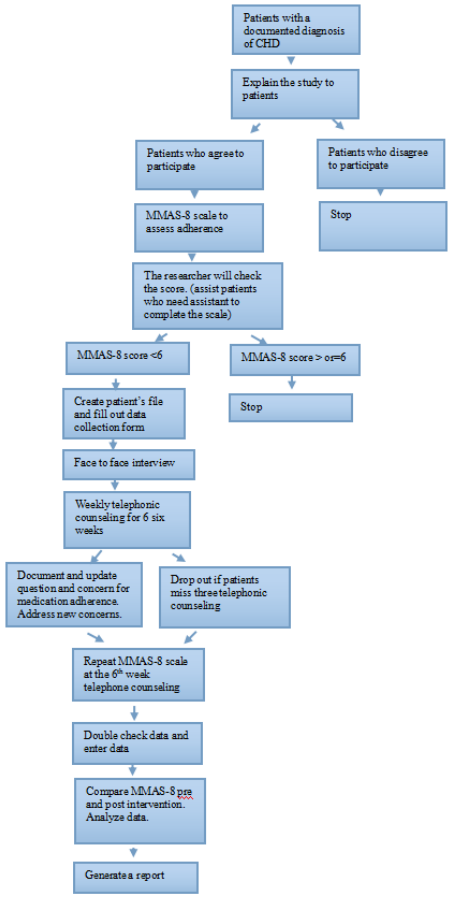

Figure 2: Data collection flow chart.

A 25-min medication adherence interview (modified from that in "Multi-site RCT for BP Control in Hypertensive African Americans" funded by the National Heart, Lung and Blood Institute in 2005) [29] was conducted in the cardiology clinic when patients came for their regular appointments. This interview was used to strengthen participant motivation toward a positive change. During the interview, the NP initiated the conversation by using open-ended questions (Appendix B). The NP identified barriers to adherence, reviewed all medications with participants, informed them of side effects, gave directions for proper use, provided education about the importance of taking medications by using the teach-back method, addressed fears and concerns, set up a cell phone reminder app, provided a pillbox, and filled out a medication wallet card that provided the prescription instructions written clearly. The patient's family or caregiver was encouraged to be involved, when appropriate. The aforementioned data collection form was used to obtain these data (Appendix A).

Other patient-centered interview techniques were adopted during conversations, such as the NP being an active listener, providing emotional support, using plain language, and eliciting patient input in treatment decisions. In addition, interviewer bias was avoided by the use of a standardized interview and words to encourage and motivate patients (for examples, see Appendix B).

After the initial interview, weekly telephone counseling sessions were conducted for six weeks. Each telephone counseling session lasted 10-15 min, 15 min for patients with less than a high school education and 10 min for patients with higher levels. Telephone counseling for 10 of the 22 participants was conducted in English, and for 12 participants in Spanish. During the telephone counseling, emphasis was placed on reminding and reinforcing patients to take their medications by using a script (Appendix C) to explore adherence, problems experienced, questions, and use of wallet card and pill box. The NP ended the conversation by reminding each participant about the next telephone counseling session and recommending they write down their questions to discuss during the next phone call. During the sixth week of telephone counseling, the participants were reassessed for medication adherence by conducting the MMAS-8 questionnaire over the phone. Participants who missed three telephone counseling sessions were considered drop outs.

Statistical Analysis

Descriptive statistics were used to analyze demographic variables (age, gender, and educational level) and the barriers to adherence. Bivariate correlation was used to calculate whether patient demographics were related to the level of medication adherence, and bivariate Spearman's correlation coefficients (95% confidence intervals) were used to evaluate the number of telephone counseling sessions and post intervention scores as well as the correlation between the spoken language (English or Spanish) and the preintervention or post intervention MMAS-8 score. Values of $p<.05$ were considered statistically significant. Using Statistical Package for the Social Science, version 25 (SPSS) software, a nonparametric Wilcoxon signed-rank test with matched pairs was used to determine whether there was a difference in the MMAS-8 scores before and after the intervention by analyzing the degree of medication adherence assessed as ordinal levels of high, medium, and low to avoid any variance or normality issues that may have been associated with the original values due to the small sample size [30].

Results

Demographic Characteristics

A total of 50 patients with CHD were assessed using the MMAS-8 at baseline (Table 2). Their demographic characteristics are shown in Table 3. No correlation was found between age, gender, or educational level and medication adherence. The distributions of gender and language were equal among the 50 participants (50% female; 50% English), and their average age was 62 years old (Table 4).

ID	Age	Gender	Language	Education	MMAS-8 score	
					Before	After
1	72	M	English	Less than high school	4.5	8
2	58	F	Spanish	High school	3.75	5
3	56	M	Spanish	Less than high school	4.75	8
4	54	F	English	High school	5.5	8
5	44	M	English	High school	2.5	8
6	59	M	English	High school	1	8
7	72	F	Spanish	Less than high school	5.5	8
8	53	F	Spanish	High school	4	8
9	69	M	Spanish	Less than high school	5	8

ID	Age	Gender	Language	Education	MMAS-8 score	
					Before	After
10	47	F	English	College	4.75	6.75
11	72	F	English	High school	5.75	8
12	33	M	English	Less than high school	1	8
13	46	F	English	College	5.75	6.75
14	63	F	English	High school	5.75	7
15	51	M	English	High school	5.5	8
16	55	F	Spanish	Less than high school	5.75	8
17	62	F	Spanish	Less than high school	4.5	8
18	90	F	Spanish	Less than high school	3.75	7
19	61	F	Spanish	Less than high school	3.75	6.25
20	55	M	Spanish	College	4.75	7
21	75	M	Spanish	Less than high school	3.75	8
22	72	M	Spanish	Less than high school	5.75	8
Note: The study's demographic information and MMAS-8 scores before and after Intervention.						

Table 2: Demographic Information and MMAS-8 Scores Before and After Intervention.

Characteristic	n		%	
Gender				
Male	25		50	
Female	25		50	
Language				
Spanish	25		50	
English	25		50	
Education				
Less than high school	24		48	
High school	16		32	
College	7		14	
Bachelor's degree or greater	3		6	
	Mean	**SD**	**Minimum**	**Maximum**
Age	61.92	1.61	33	90
Baseline MMAS-8 score	6.05	0.26	1	8

Table 3: Participant Characteristics in the Total Population Sampled (N=50).

Age versus MMAS-8 baseline score				
			Age	MMAS-8 score
Spearman's rho	Age	Correlation coefficient	1.000	0.156
		Significance (two-tailed)	-	0.281
	MMAS-8	Correlation coefficient	0.156	1.00
		Significance (two-tailed)	0.281	-
Gender versus MMAS-8 baseline score				
			Gender	MMAS-8 score
Spearman's rho	Gender	Correlation coefficient	1.000	0.077
		Significance (two-tailed)	-	0.593
	MMAS-8	Correlation coefficient	0.077	1.000
		Significance (two-tailed)	0.593	-
Education versus MMAS-8 baseline score				
			Education	MMAS-8 score
Spearman's rho	Education	Correlation coefficient	1.000	0.066
		Significance (two-tailed)	-	0.648
	MMAS-8	Correlation coefficient	0.066	1.000
		Significance (two-tailed)	0.648	-
Note: There was no correlation between age and medication adherence (r=.156, N=50, p=.281), gender and medication adherence (r=.077, N=50, p=.593), or education level and medication adherence (r=.066, N=50, p=.648).				

Table 4: Correlations between Medication Adherence as Assessed by the MMAS-8 Baseline Score and Age, Gender, or Education in the Total Population Sampled (N= 0).

As shown in Table 5, the distributions of gender and language were similar among the 22 participants who scored less than six on the MMAS-8, indicating low medication adherence. However, the distribution of education level in this cohort was unbalanced, with a larger proportion of participants (48%) having less than a high school education (32% had high school diplomas, 14% had college degrees, and 6% had bachelor's degrees).

Measure	**n**	**%**
Gender		
Male	10	45
Female	12	55
Language		
Spanish	12	55
English	10	45
Education		
Less than high school	11	50
High school	8	36.4

College	3		13.6	
Bachelor's or more advanced degree	0		0	
	Mean	**SD**	**Minimum**	**Maximum**
Age	60.0	12.69	33	90
MMAS-8 score				
Before intervention	4.41	1.42	1	5.75
After intervention	7.53	0.79	5	8
Reasons for nonadherence				
Forgetfulness	20			
Complexity of medication regimen	2			
Concern or risk of side effects	3			
Lack of support from family members	1			
Illness severity perception	1			
Belief system	0			
Lack of explanation from physicians	1			
High out-of-pocket cost	2			
Tired of taking medications	1			
Note: People with lower education are more likely to have low medication adherence. MMAS-8 score improved after the intervention. Most of reasons for nonadherence are forgetfulness.				

Table 5: Characteristics of Patients with Low Medication Adherence (n=22).

Baseline MMAS-8 Adherence Scores

Mean baseline MMAS-8 adherence scores before intervention as well as reasons for medication nonadherence are shown in Table 5. Among the 22 participants, the lowest score was 1 and highest score was 5.75. The baseline mean score was 4.41. Most participants reported "Forgetfulness" as the reason for medication nonadherence.

Effects of the Intervention

All 22 participants completed both the initial medication adherence interview and at least four of the six weekly telephone counseling sessions. Eight participants missed one telephone counseling session and one participant missed two sessions, but no participant missed more than two.

A non-significant correlation of the number of telephone counseling sessions and postintervention scores was found (Table 6). No correlation was found between the spoken language (English or Spanish) and the preintervention or postintervention MMAS-8 score (Table 7). Pre- and postintervention data related to medication adherence (Tables 8 and 9) were examined using the nonparametric Wilcoxon signed-rank test to analyze the efficacy of the intervention. The results indicated that postintervention MMAS-8 scores were significantly higher than preintervention scores, with a 71% increase (Table 10). In addition, 21 (95%) participants reported that the interview and telephone counseling sessions as well as their using a pillbox and the medication wallet card positively affected their medication compliance and increased their knowledge about the importance of taking medications. One participant was not sure if the intervention helped with compliance because he remembered to take his medication only when the NP called him.

			MMAS-8 score	Telephone sessions
Spearman's rho	MMAS-8 score	Correlation Coefficient	1	0.366
		Significance (two-tailed)	–	0.094
	Telephone session	Correlation coefficient	0.366	1
		Significance (two-tailed)	0.094	–
Note: The correlation between the number of telephone counseling sessions and the postintervention MMAS-8 score was evaluated using Spearman's correlation coefficient. The correlation was not statistically significant at the 95% confidence interval.				

Table 6: Correlation Between Post intervention MMAS-8 Scores and Number of Telephone Counseling Sessions in CHD Patients with Low Medication Adherence (n = 22).

Language versus MMAS-8 preintervention score				
			Language	**Preintervention MMAS-8 score**
Spearman's rho	Language	Correlation coefficient	1.000	-.065
		Significance (two-tailed)	–	.772
	PreinterventionMMAS-8	Correlation coefficient	-.065	1.00
		Significance (two-tailed)	.772	–
Language versus MMAS-8 post intervention score				
			Language	**Preintervention MMAS-8 score**
Spearman's rho	Language	Correlation coefficient	1.000	-.052
		Significance (two-tailed)	–	.817
	PreinterventionMMAS-8	Correlation coefficient	-.052	1.00
		Significance (two-tailed)	.817	–
Note: There was no correlation between language and preintervention medication adherence (r = -.065, N = 50, p = .772), and language and post intervention medication adherence (r = -.052, N = 50, p = .817).				

Table 7: Correlations between Medication Adherence as Assessed by the MMAS-8 Pre and Post Intervention Score and Language Among Participants (N = 22).

MMAS-8 score	Preintervention (n)	Post intervention (n)
1-2	2	0
2.25-3	1	0
3.25-4	5	0
4.25-5	6	1
5.25-6	8	0
6.25-7	0	6
7.25-8	0	15
Note: MMAS-8 score improved after the intervention. Most people's MMSA-8 score after the intervention are between 7.25-8 compared to zero people with this score before the intervention.		

Table 8: MMAS-8 Scores Pre- and Post-intervention among Participants with CHD and Low Medication Adherence (n = 22).

	Preintervention				Post intervention			
	Minimum	**Maximum**	**M**	**SD**	**Minimum**	**Maximum**	**M**	**SD**
Age								
30-40 (n=1)	1.00	1.00	1.00	0.00	8.00	8.00	8.00	0.00
41-50 (n=3)	2.50	5.75	4.33	1.67	6.75	8.00	7.17	0.72
51-60 (n=8)	1.00	5.75	4.38	1.54	5.00	8.00	7.50	1.07
61-70 (n=4)	3.75	5.75	4.75	0.84	6.25	8.00	7.31	0.85
≥71 (n=6)	3.75	5.75	4.83	0.96	7.00	8.00	7.83	0.41
Gender								
Male (n=10)	1.00	5.75	3.85	1.76	7.00	8.00	7.90	0.32
Female (n=12)	3.75	5.75	4.88	0.88	5.00	8.00	7.23	0.96
Language								
English (n=10)	1.00	5.75	4.20	1.95	6.75	8.00	7.65	0.57
Spanish (n=12)	3.75	5.75	4.58	0.79	5.00	8.00	7.44	0.97
Education								
>High school (n=11)	1.00	5.75	4.36	1.35	6.25	8.00	7.75	0.58
High school (n=8)	1.00	5.75	4.22	1.76	5.00	8.00	7.50	1.07
College (n=3)	4.75	5.75	5.08	0.58	6.75	7.00	6.83	0.14
Note: MMAS-8 scores improved from 1-5.75 to 5-8 after the intervention. The people with higher education have higher score compared to other, but no significant differences compared to other group after the intervention.								

Table 9: Pre- and Post-intervention MMAS-8 Scores among Participants with CHD and Low Medication Adherence as Assessed by Age, Gender, Preferred Language, and Education Level (n=22).

Score Scale			
1	1-2		
2	2.25-3		
3	3.25-4		
4	4.25-5		
5	5.25-6		
6	6.25-7		
7	7.25-8		
Ranks			
Post-test – Pre-test	**N**	**Mean Rank**	**Sum of Ranks**
Negative Ranks	0[a]	0.00	0.00
Positive Ranks	22[b]	11.50	253.00
Ties	0[c]		

Total	22
[a]Post-test < Pre-test; [b]Post-test > Pre-test; [c]Post-test = Pre-test	
Test Statistics[b]	
	Post-test – Pre-test
Z	-4.141[a]
Asymptotic Significance (two-tailed)	0.000
[a]Based on negative ranks; [b]Wilcoxon Signed Ranks Test	

Table 10: Statistical Analysis of Pre- and Post-intervention MMAS-8 Scores among Participants with CHD and Low Medication Adherence.

Discussion

Poor medication adherence among patients with CHD negatively affects health outcomes and cost. Adherence to evidence-based medication therapy among patients with CHD determines treatment success and reduces medical cost [31]. Identifying patients with low medication adherence and providing appropriate

interventions to improve adherence lead to this success. Previous studies have provided evidence to support the effectiveness of interview and telephone-based education and counseling for improving medication adherence in other patient populations, especially for patients who lack access to healthcare facilities [32]. Hispanics may have greater difficulty with medication adherence as they are less likely to receive timely and appropriate health care because of low average income, language barriers, and educational attainment [33].

Using the MMAS-8 as an assessment tool, this study found that combining an initial face-to-face interview designed to determine an individual's barriers to medication adherence with six weekly telephone-based individualized counseling sessions significantly improved medication adherence in adult patients with CHD who had shown low adherence to their evidence-based medication regimen. Although the sample size for this project was small, the success observed for increasing medication adherence among participants with CHD was comparable to that observed in studies of other populations with larger sample sizes that used interview and telephone counseling to improve medication adherence [18,34-36]. No previous study has reported examining the combination of these two interventions in patients with CHD; thus, the present study confirmed and extended these findings to this patient population.

The current study found that forgetfulness was the most common reason patients reported for lack of medication adherence. This finding is consistent with the Harris interactive 10,000 patient survey conducted in 2002 [37]. Most participants said that the pillbox was a useful reminder. Three participants reported that the medical wallet card was helpful for showing to their providers to avoid duplicate orders or medication interactions. The participant reporting that he remembered taking medications only when the NP called him would likely benefit from daily text reminders or having a pillbox with an alarm. One participant's wife reminded him to take his medications and accompanied him during each telephone session, suggesting that behavioral changes are more successful when family members are supportive [38].

During the interview, the provider reviewed each medication with the patients to increase their knowledge about their medications and why it was important to take them. Face-to-face communication through the interview was beneficial for education, allowing patients to ask questions and express their barriers to adherence. Weekly telephone counseling sessions were chosen for reinforcing participants' compliance due to their flexibility and convenience. Because this study found that forgetfulness was the most common reason for medication nonadherence, in addition to providing various medication adherence aids, behavior-based methods and counseling focused on increasing adherence motivation were also beneficial.

No single solution to the nonadherence problem fits all patients [39]. By discussing barriers with the patients through patient-centered intervention, the provider offered personalized support targeted to each patient's individual emotional, cognitive, and practical needs [40]. According to Hugtenburg, et al. [39], patient medication nonadherence can be intentional or unintentional. In the present study, the most common reason for nonadherence was forgetfulness, which is unintentional. The intervention used in the present study thus improved unintentional nonadherence. The results of this study suggest that counseling focused on promoting behavioral change and adherence motivation is a beneficial intervention. This type of intervention is easily implemented and can be considered for facilitating evidence-based practice interventions in clinical settings to improve medication adherence.

Limitations

Convenience sampling used in this study may have biased the results in unknown ways. A future randomized study to evaluate the intervention is recommended. Self-reported evaluation (used in the MMAS-8) can be unreliable for obtaining data due to question misinterpretation or reliance on recall. However, trained individuals were available to help patients understand the questions and minimize misinterpretations. Response bias in self-reported data, in which participants provide answers that cast them in a more favorable light, may lead to underestimating medication nonadherence. Using pharmacy prescription refill data to assess medication adherence would likely provide more accurate information. A third limitation is that the present study assessed only short-term results; thus, more research is needed to evaluate the effectiveness of the intervention in the long term. Finally, the present study did not consider either the impact of insurance or the effects of the initial medication adherence interview in the absence of follow-up telephone counseling sessions. Future studies will be needed to examine the effects of single interventions. However, the study intervention was designed as a reasonable approach to CHD patients based on what is currently known about medication adherence.

Implications

Supporting office staff to understand and implement a quality improvement intervention is essential. MA staff reported being satisfied with the results and agreed that the intervention successfully helped patients take their medications. A cardiologist reported that he had experienced poor patient medication compliance and indicated that a trained MA could conduct the medication adherence intervention. All expected to continue the intervention recognizing that teamwork should make implementing the intervention easier. For example, the average wait time for a patient office visit is approximately one hour. During that time, a receptionist could administer the MMAS-8, and then a MA could conduct the medication adherence interview.

In addition to improving patients' clinical conditions, promoting consistent intervention can potentially benefit the clinic. Although the interview conducted in the current study was approximately 25 minutes, this could easily be extended to 30 minutes. Providers can receive reimbursement from private insurance with the Current Procedural Terminology (CPT) code

98960 (education and training for patient self-management by a qualified, nonphysician healthcare professional using a standardized curriculum, face-to-face with the patient, each 30 minutes; individual patient) [41]. The average reimbursement for CPT code 98960 is approximately $38. For patients with Medicare, The CPT has not been a separately billable service since January 1, 2007; however, it can be bundled into another service reported on the same day or reported to secondary insurance, if the patient has secondary insurance [41].

Improving the quality of care with decreasing expenditures is required in the current healthcare system. Although this study did not assess cost, previous studies have shown that using telephone counseling to improve medication adherence is a convenient, practical, and cost-effective method for providers to approach their patients with CHD to improve health outcomes [16,17]. Assessing patient medication adherence and providing interventions to improve adherence are not commonly implemented in outpatient settings. Heidenrich [42] called medication adherence the "next frontier in quality improvement." Adherence to medications is the key to successfully managing CHD. The present study showed that the effectiveness of the provider involves behavioral intervention for improving medication adherence, which can improve the quality of care in outpatient settings. Advanced practice registered nurses cannot only use evidence-based practice but also help direct this positive transformation [43,44].

Conclusion

Identifying patients with low medication adherence and providing appropriate interventions to improve adherence led to treatment success and reduced medical cost. The interview and telephone-based education and counseling were effective to improve medication adherence in a vulnerable population who lacked access to healthcare facilities, hadlow average income, language barriers, and educational attainment. The present study used the MMAS-8 to examine the effectiveness of patient-centered strategies in individualized interview and follow-up telephone counseling sessions conducted by bilingual healthcare professionals to increase medication adherence. These interventions significantly improved patient medication compliance. Such intervention is a relatively inexpensive, practical, and easily implemented approach for improving the quality of care in outpatient settings leading to improved health outcomes in patients with CHD.

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Name
Age (1) 30-40, (2) 40-50, (3) 50-60, (4) 60-70, (5)>70
Gender (1) F, (2) M
Preferred language (1) English, (2) Spanish
Education level (1) less than high school graduate, (2) high school graduate, (3) some college or associate degree, (4) bachelor's degree or higher
Phone numbers (more than one)
The best time to call:
MMAS-8 scale score at baseline: (1) <6, (2) 6-8, (3) =8.
MMAS-8 scale score at completing interventions: (1) <6, (2) 6-8, (3) =8.

Reasons for non-adherence for medications
(1) Forgetfulness to take medication,
(2) Complexity of medication regimen,
(3) Concern or risk of side effects,
(4) Lack of support from family members or friends,
(5) Perception of one's illness severity,
(6) Belief system that is inconsistent with contemporary medicine,
(7) Lack of explanation from physicians,
(8) High out-of-pocket cost ".
(9) Other:

Any new concerns for medication adherence
1,
2,
3,
4,
5,
6,

Date of interview
Date of Telephonic counseling
1,
2,
3,
4,
5,
6,

Does the intervention help you take medications?

Appendix A: Data Collection Form.

Script for the Initial Medication Adherence Interview

Bold, italic font indicates spoken script.

If it is ok with you, I would like to talk with you about taking your medication.

I would like to begin our conversation today by asking a few questions about how you are doing with taking your medication. Let's review all your medications together. I see that you are taking (name of medications). Tell me how taking your medication is going?

The NP continues the conversation using open-ended questions. The following are examples:

Has it been difficult to take medications?

Do you think you need to take the medications?

Have you tried to make any changes in taking your medications?

The NP identifies barriers to adherence, reviews all medications with participants, informs them of side effects, gives directions for proper use, and provides information about the importance of taking medications.

If the patient has missed some medication say: **Could you tell me the reason you missed your medication?**

If the patient has missed the medication because of forgetfulness say: **What are your thoughts about using a reminder to help you remember to take your medications?**

The NP sets up a cell phone reminder app, provides a pillbox, and fills out a medication wallet card that provides the prescription instructions written clearly. The patient's family or caregiver is encouraged to be involved, when appropriate.

During the interview, the NP is an active listener. Because listening involves more than hearing the words the patient is saying, attention is also paid to the information the patient is conveying nonverbally, such as eye contact, facial expressions, and body language.

The NP determines the patient's motivations, the given reasons for wanting to make a change, and empowers the patient to follow through with these ideas to improve his or her health.

Do you have any ideas how to deal with this problem? What have you tried in the past to deal with this problem? If it is okay with you, I would like to tell you about some solutions that have worked for other people. If appropriate say: **I have had similar experiences but I would like to hear your opinion first.**

During the interview, the NP uses plain language and reflective listening and paraphrasing. Some examples follow.

So many people avoid seeking help. It says a lot about you that you are willing to take this step.

I'm really glad you brought that up.

I think what you are doing is really difficult.

I'm really proud to be working with you on this.

I appreciate that you are willing to talk about this.

I've enjoyed talking with you today.

The NP ends the conversation by scheduling the next follow-up telephone counseling session.

Note. This medication adherence interview script was modified from that used in the "Multi-site RCT for BP Control in Hypertensive African Americans" funded by the National Heart, Lung and Blood Institute, 2005, and obtained from Salvo & Cannon-Breland, 2015.

Appendix B: Script for the Initial Medication Adherence Interview.

Script For Telephone Counseling

Bold, italic font indicates spoken script.

Good afternoon. This is the NP from the cardiology clinic. We discussed helping you take your medications last time. Do you have 15 minutes to talk with me about taking your medication?

Tell me how taking your medication is going?

Can you describe your medicine routine during the past week? Would you say that your adherence to medications has increased, decreased, or remained the same? (Adherence means taking your medication as prescribed every day and every dose).

If the patient missed the medication say: **Could you tell me the reason you missed your medication?**

If adherence has declined say: **Tell me about any problems that you are having with taking your medicine since our last discussion?**

If patient has taken ALL his/her medications, go to Part A.

If patient has MISSED medications, go to Part B.

Part A

If the patient has taken ALL of his/her medications exactly as ordered with no missing medication in the past week, say:

(A1) **It is great that you have taken your medication exactly as ordered. You have not missed a single dose in the past week and you have taken each medication exactly as prescribed. It seems like you have made efforts to take this medication as it was prescribed. Tell me about your methods/routines that helped you to do this?**

Use reflective listening and paraphrasing. Reinforce efforts.

(A2) Ask: **What are your concerns about taking your medication?**

Ask: **Can you tell me about barriers you faced in the past and how you were able to overcome them?**

Use reflective listening and paraphrasing. Address problems and solve any barriers that do come up.

Say: **Describe some of the benefits that you now experience from taking your medicine exactly as ordered.**

Part B

If the patient has missed a dose of his/her medication or taken it incorrectly within the last 2 weeks, say:

(B1) **You said that you missed ___# doses of _____medication because (reason).** If permission is granted, continue to (B2).

(B2) **To help me better understand how you feel about taking medication, I'd like to ask you a couple questions. Is that okay with you? What are some problems you are having with taking the medication, for example, side effects or forgetfulness? Can you tell me about some specific examples of when and why this happened?**

(B3) **What are some possible reasons for your skipped/missed doses**? **Tell me more about your daily (medication) routine.** Allow patient to choose from his or her own solutions or those of other people the method he or she will try. Ask why they chose those particular methods and how they will adapt them to their individual lifestyle.

Use reflective listening and paraphrasing.

Incorporate the values card into the patient's health behavior. Highlight the changing behavior and relate them to the values cited.

(Because most patients reported their primary barrier to adherence was forgetfulness, the NP suggested taking all medications at the same time of the day, if possible, so that taking medication turns into a habit. The NP also recommended matching their medication regimen to their daily living activities and encouraged them to use an adherence log (e.g., medication wallet card) and a pillbox. The NP also advised on how to cope with medication costs, such as finding a pharmacy that offered the cheapest price. The NP ended the conversation by reminding each participant when the next telephone counseling session was scheduled for and recommended they write down their questions for that next discussion.)

Conclude the call with a short summary of what the patient has agreed to do and your suggestions for the medication. Have the

patient participate in the summary for a deeper understanding/reflection on their part. Ask: **Would you like to start by summarizing what we spoke about today?** OR say: **It would help me to understand this situation better if you explain to me how you understand it.**

Use reflective listening and paraphrasing and contract with the patient specific things he/she agreed to do.

Note: This telephone counseling script was modified from that in "Multi-site RCT for BP Control in Hypertensive African Americans" funded by the National Heart, Lung and Blood Institute, 2005.

Appendix C: Script For Telephone Counseling.