

**RELATIONSHIP BETWEEN PATIENTS' MEDICATION NON-ADHERENCE AND
QUALITY OF HEALTH CARE OUTCOME**^{1,2*}Chike H. Ezeoke PhD, ¹Amy Gangal, ¹Mathew Brooks, ³Titus Ibekwe MD, ¹Bruce Lazar PhD¹Faculty of Human Services and School of Public Service Leadership, Capella University Minnesota, USA.²Faculty of Pharmaceutical Science, University of Jos Nigeria.³Faculty of clinical Sciences, University of Abuja Nigeria.***Corresponding Author: Chike H. Ezeoke PhD**

Faculty of Human Services and School of Public Service Leadership, Capella University Minnesota, USA.

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ABSTRACT

Background: Adherence to medication is not only important to hypertension but also to other chronic disease conditions that require long-term therapy for effective clinical outcomes and improvement of individual health status. **Aims/Objectives:** This work is therefore aimed at establishing the relationship between patients' medication beliefs mediated by non-adherence and quality of health care outcomes. **Methodology:** A correlational quantitative study on respondents conducted across the United States of America via online (monkey-survey) self-administered questionnaire. **Result:** One hundred and thirty-four (134) respondents age between 30-65 years, had their results assessed and subjected to multiple regression to test the relationship between Drug Adherence and outcome ($P \leq 0.05$). **Conclusion:** Adherence and non-adherence significantly affected the relationship between patient medication beliefs and quality of health care outcome.

KEYWORDS: Medication; Non-Adherence; Health; Outcome.**INTRODUCTION**

It is complex to understand illness experience from the perspective of the patient, particularly those suffering from chronic illness. Available statistics indicate that the emphasis on management of chronic illness is very important for effective clinical outcomes.^[1,2] Most of those who seek medical care are treated with some form of medication regimen, especially in chronic disease conditions like hypertension, asthma, diabetes, and COPD.^[3-5]

Prescription medications are one of the most important tools for disease treatment and clinical interventions; as a result, adherence to medication remains a critically important process for achieving treatment objectives.^[6,7] The observed clinical benefits of prescription medications and their role in the mitigation of diseases have also increased the reliance on them for improving clinical disease conditions and individual health status.^[8] Because of this increased reliance on medications, expenditure on prescription medications have become one of the fastest growing aspects of medical costs in the United States.^[9]

Despite this noted importance of prescription medication to disease treatment and management, "estimates indicate

that about 20-50% of patients are non-adherent".^[3] Among hypertensive patients, evidence also suggests that between 50-80% of patients are still non-adherent to treatment and their medications.^[8] Similar patterns of non-adherence were also observed among ambulatory patients, in which studies show that about half of those who filled their prescriptions discontinued after about 6 months.^[10,11]

Adherence levels have also been noted to vary with disease types, for example, in a quantitative study among diabetic patients, adherence to insulin ranged from 36% - 93% over a 6 to 24-month period^[12], with about 46.6% of patients reporting insulin underuse.^[13] Among hypertensive patients, a similar quantitative study showed an adherence range of 43% - 88%, with about 31.1% of the patients admitting to underuse of anti-hypertensive medications.^[14] These statistical findings support that even with various intervention efforts; non-adherence to medication is still pervasive across various types of chronic diseases.^[12]

Economically, non-adherence to medication has major economic implications, as approximately 225 million dangerous situations are created worldwide each year because of problems related to non-adherence to medications.^[15] Researchers estimated that about

380,000 nursing home admissions representing approximately 23% of all nursing home admissions in the United States each year have a direct relationship to non-adherence to medication.^[16] Non-adherence accounts for approximately 3.5 million hospital admissions in the United States alone, and among the older adult population, roughly 40% of all admissions have a link to medication problems, with an estimated cost of nearly \$2,150 per admission.^[15] Because of these identified and other associated problems, the annual cost related to non-adherence is estimated to be in the range of \$100 billion in the United States alone.^[16]

Results from a quantitative study conducted by the National Council on Patient Information and Education (NCPIE)^[17] showed that about three out of every four American consumer admitted not taking their medications as directed. The study results noted that about 24% of those surveyed indicated they had taken less than recommended doses, while about 29% of those surveyed indicated they stopped taking their medication before it ran out.^[18] (NCPIE, 2007). The study results also indicated that about 31% of those surveyed had not filled their prescriptions, while approximately 49% had forgotten to take their medication. All prescribed medications were either taken incorrectly or not at all approximately 60% of the time.^[15,18]

Some of the risks associated with non-adherence include an increased risk of hospitalization, re-hospitalization, and premature death by 5.4 times in hypertension, 2.8 times in dyslipidemia, and 1.5 times in heart disease.^[18] This supports the notion that suboptimal treatment of diseases conditions may lead to increased office visits, increased hospitalization, increased ER visits, and use of more health care services.^[19] Economically, non-adherence also leads to increase in consumption of medical resources, establishing a direct positive relationship between non-adherence and increase in health care costs.^[9]

Reduced adherence can also increase disease burden, and in the case of infections, this may lead to resistance to medications such as antibiotics.^[20] Adherence to medication is not only important to hypertension but also to other chronic disease conditions that require long-term therapy for effective clinical outcomes and improvement of individual health status.^[21] In patients with HIV, high levels of adherence is associated with reduction in viral load, increased quality of life, and the ability to function normally.^[22] In a quantitative study Cremer et al^[23] examined adherence to tuberculosis medications and linked poor adherence to tuberculosis medication with higher incidence of tuberculosis among HIV positive patients.

In a similar quantitative study Starace et al.^[5] examined adherence to highly active antiretroviral therapy (HAART) medications and linked increased adherence to medication to a reduced possibility of co-infection in

HIV infected patients. Conversely, diminished adherence can lead to increase in viral load, and the development of drug resistant viral strains leading to treatment failure in HIV positive patients.^[24] In relation to HIV and other disease conditions, adherence to medications is not only critical to achieving optimal treatment goals, but also important for controlling disease incidence.^[25]

Adherence also plays a significant role in the management of other chronic diseases. For example, in the management of diabetes, it helps to reduce A1C, a factor considered as an important indicator of the disease progression.^[26] In relation to asthma, statisticians from WHO (2003) noted that even as a critical factor in the management of asthma, adherence rates ranged from 30-70%. Estimates also showed that among dialysis patients, adherence rates to long-term therapy ranged between 2% to 86%.^[27] These facts indicate that adherence is not only a pervasive problem that cuts across all disease situations, but also important for improvement in clinical disease outcomes.

In summarizing the importance of adherence, Bainbridge and Ruscin^[28] noted that adherence to medication is not only "very important for achieving treatment objectives, but it is also important to quality of life and it also impacts health care costs". It is therefore important to understand the effect of patient beliefs about their diseases and the treatment in chronic disease conditions because it provides an opportunity for improving adherence to medication.^[29] The attempt to highlight the psychosocial, management, and quality improvement aspects of the relationship between medication beliefs and quality of health care outcomes resulted in the choice of the following theoretical models as the framework that guided this study. This work is therefore aimed at establishing the relationship between patient medication beliefs mediated by non-adherence and quality of health care outcomes.

MATERIALS AND METHODS

Method: This is a correlational quantitative study of 134 respondents conducted across the United States of America via online (monkey-survey) self-administered questionnaire. A correlational design and self-administered questionnaire were chosen because of their ease of use and applicability in various settings^[30] and given that this method is suitable for research design to examine the relationship between variables.^[31] Hypotheses were tested and statistical tests were used to analyze the relationship between variables. Objective/deductive reasoning was used to analyze the results to determine the extent of the correlational relationship between medication beliefs and quality of health care outcome. These research strategies are fundamentally quantitative and the researcher's philosophy is based on logical positivism, this paradigm is the basis of this research.

Power and analysis: For the sample size, a power analysis was performed to calculate the appropriate sample size for a two-tailed correlational hypothesis. There were no exclusions based on demographic characteristics such as race, gender, educational level, socio economic status, comorbidity, and marital status; however, demographic data was collected for use during data analysis. Because the data collection method was Internet based, eligibility criteria were used to identify potential participants who did not qualify. For this study, a power analysis was conducted to determine the appropriate number of participants necessary to achieve a 95% confidence level for a 50% return rate and confidence interval error of 5% for those who fully participated in the study. The power analysis calculation indicated that a sample size of between 110-120 participants was adequate for a two-tailed hypothesis, with a power of 0.999 and alpha of (α) 0.05. The target sample size for this study was therefore 120 participants, although the number of participants could be higher than the target.

Research Instrument: The research instrument was a Likert scale based pretested questionnaire with a 5-item factor that assesses an individual's concern and necessity beliefs about medications. To obtain information about medication non-adherence and quality of health care outcome, the following instruments and measures were used (a) Belief about Medication Questionnaire (BMQ) and (b) SF-36v2 Health Survey. The survey consisted of 66 questions, of which 56 questions were generated from the BMQ and the SF-36v2 Health Survey instruments. The rest consists of demographic questions collected for

the purpose of data analysis. Prior to the use of these instruments, permission was sought and obtained from the developers/owners of BMQ and Quality Metrics Inc, the owners of the SF-36v2 Health Survey Instrument.

Recruitment: The research package for the study was prepared after obtaining authorization from Capella University IRB. The package included detailed information about the research, its purpose, reasons for participation, risks, benefits, voluntary nature, right to withdraw, confidentiality strategies, and the researcher's contact information. The research package was organized sequentially, including the title, school, researcher, mentor, contact information, eligibility criteria, informed consent, and main research questions.

RESULTS

In order to analyze the data collected from the participants using their answers to the questions derived from the BMQ and SF-36v2 Health Survey instruments, statistical tests are used. Determining the strength of the association between medication beliefs and the caliber of the health care outcome was the main goal of the data analysis. Table 1 displays the specifics of the data analysis. Due to the research sample's diversity in terms of demographics, participant demographic information was gathered for use in data analysis^[31] (Zugelj et al., 2010). The Statistical Package for the Social Sciences (SPSS) v 21.0 for Windows program was used to analyze the quantitative data for this study. Research Hypothesis 1 was used to analyze the data and look at the relationship between medication beliefs and outcome.

Table 1.

(Research Question). What is the level of relationship between medication beliefs, adherence, non-adherence and quality of health care outcome	BMQ-Specific SF-36v2 Health Survey Adherence +1 to -1	1. Common Sense Model of Self Regulation 2. Expectancy Theory 3. Donabedian Model	H _{4A} / H _{4O}	Nominal	Independent, dependent and intermediate variables	Multiple linear regression, Partial correlation ($r = 12.3$), Multivariate analysis
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Table 1: Descriptive Characteristics of Participants.

Demographic Characteristics		Frequency	%
Gender	Male	71	53.0
	Female	63	47.0
	Total	134	100.0
Age	Between 31-40 years	5	3.7
	Between 41-50 years	27	20.1
	Between 51- 60 years	64	47.8
	Between 61-65 years	38	28.4
	Total	134	100.0
Marital Status	Single	29	21.6
	Married	81	60.4
	Divorced	21	15.7
	Total	131	97.8

Missing	System	3	2.2
Total		134	100.0
Race	Caucasian	116	86.6
	African American	11	8.2
	Asian	3	2.2
	Hispanic	3	2.2
	Other	1	0.7
	Total	134	100.0
Highest Level of Education	High School	47	35.1
	College	87	64.9
	Total	134	100.0

The participant's responses were also used to determine their levels of adherence and non-adherence. Table 4 indicates the frequency and percentages of the adherence and non-adherence variables as was calculated. The variable for adherence level was coded as -1 for non-adherence and +1 for adherence, and the variable for adherence level was calculated as the difference between the concern, and the necessity beliefs.

A positive result indicates adherence while a negative result indicates non-adherence.

Of the responses, 119 or 88.8% of the participants skipped an average of one question in the BMQ-Concern. The calculation of the adherence level variable indicates that more participants were classified as non-adherent compared to those classified as adherent. The adherence level variable was used as the intermediate variable in the multiple linear regression analysis conducted to address the research question in table 3.

Table 3: Frequency and Percentages of Adherence and Non-adherence Variables.

	Frequency	%
Non-Adherence	119	88.8
Adherence	15	11.2
Total	134	100.0

Table 4: Descriptive Statistics of Quality of Health Care Outcome Scales.

SF36v2 Subscales	N	Minimum	Maximum	Mean	Std. Deviation
Physical Functioning	134	1	30	24.65	5.76
Role-Physical	133	4	20	15.60	4.75
Bodily Pain	133	1	11	4.56	2.28
General Health	131	4	18	12.99	1.93
Vitality	131	4	20	12.15	2.11
Role-Emotional	133	3	15	12.33	3.39
Social Functioning	133	1	10	6.26	1.38
Mental Health	131	5	25	17.24	2.67

DISCUSSION

This study was conducted among various age groups ranging between 30 to 65 years (table 1),^[33] and noted that there is no concrete information about the age group most affected by non-adherence. This is in accordance with study conducted by Although this study was conducted among various age groups ranging between 30

The response of the participants to the SF-36v2 Health Survey was used to calculate each of the eight subscales of the instrument. The subscales were classified as a measure of either the Physical Health Component or Mental Health Component of each participant. According to the classification, four subscales that measure the physical health component include (a) Physical Functioning, (b) Role-Physical, (c) Bodily Pain, and (d) General Health.

The four subscales that measure the mental health component include (a) Vitality, (b) Role-Emotional, (c) Social Functioning and (d) Mental Health measure. Table 4 presents the descriptive statistics for the eight subscales. To calculate the quality of health care outcome variable, the score of each participant in each of the four scales that measure either Physical Health or Mental Health were summed up. Physical Health Component has a mean of 57.37 ($SD = 9.34$), while the Mental Health Component has a mean of 47.55 ($SD = 7.57$).

to 65 years, Krousel-Wood et al.³³ It was noted that there is no concrete information about the age group most affected by non-adherence. The age distribution of the participants indicated that those between 51 to 65 years were greater in number ($n = 102$), while those between 30 to 50 years were smaller in number ($n = 32$) (table 1,2). This may suggest that more individuals in the age

bracket of 51 to 65 years suffer from hypertension and other forms of chronic disease compared to those in the younger age bracket. It could also mean that more individuals in the age bracket 51 to 65 years age bracket participated in the study more than those in any other age group(table3).

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The result suggests that non-adherence as an intermediate variable significantly affects the relationship between medication beliefs and quality of health care outcome(table4). Summarily from the result of the analysis, a significant relationship exists between patient medication beliefs and quality of health care outcomes. This relationship; however, "does not imply a cause and effect" rather, it suggests only a possible association.^[32] It provides a detailed interpretation of the data analysis as well as explores the implications of the research findings for practice and future studies. This study is important because even though there is an established relationship between patient specific barriers and adherence, there is still limited information about the relationship between patient specific barriers and quality of health care outcome^[35] (Swihart et al., 2023). For the purpose of this study, medication belief was identified as the patient specific barrier of interest, and determining its relationship to quality of health care outcome may generate useful information for developing target interventions.

The results of of the quality of the health outcome scale is presented in table4. The relationship between medication beliefs and quality of health care outcome mediated by non-adherence showed a significant relationship between BMQ-Specific and Physical Health as well as between BMQ-Specific and Mental Health with non-adherence as a mediating variable. The results suggest a significant relationship exists between patient medication beliefs mediated by non-adherence and the quality of health care outcomes. This confirms that both adherence/non-adherence play a significant role in achieving treatment outcomes and in case of hypertension, improved adherence to medication can help reduce the annual number of premature deaths from hypertension.^[34] (Cutler & Everett, 2010).

A multivariate analysis of the relationship between medication beliefs and quality of health care outcomes while controlling for both the adherence variable and demographic characteristics are presented in 5. These

variables were used as the control variables to eliminate their effect in defining the relationship between the BMQ-Specific and quality of health care outcomes. Controlling for all the demographic characteristics ensured that whatever relationship was determined through the correlation analysis is based on the relationship between BMQ specific and quality of health care outcome alone and not because of the effect of any of the demographic characteristics.

Study's Limitations

The generalizability of the research findings to the population of interest was impacted by the use of a cross-sectional study and purposive sampling, which may have skewed the number of participants in favor of a particular age group and ethnicity. Most adherence related studies identify patient, provider, and the health care system related factors as the most important factors that affect adherence, health care outcome, and the overall cost of care. Patient-provider relationship is identified as a major role player in most adherence related issues, while the health care system has to do with the policies and the creation of the enabling environment for achieving improved health care outcomes. Intervention strategies such as the expansion of the MTM consumer/provider service coverage not only have the potential to harmonize the interaction between these three major factors for a better clinical outcome, but also to increase the potential for a long-term reduction in overall cost of health care.

Recommendations for Further Research

Researchers conducting adherence related studies argue that the presence of multiple chronic disease conditions could affect medication adherence, due to a possible concomitant multiplicity of medications. Future researchers could try to determine the role of comorbidity on patient medication beliefs using any demographic characteristics such as age, gender, or specific ethnic group. Because the incidence of hypertension is higher in African Americans groups, future studies might determine the extent of the relationship between medication beliefs and quality of health care outcomes among African Americans alone.

CONCLUSIONS

Adherence and non-adherence significantly affected the relationship between patient medication beliefs and quality of health care outcome.

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