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"Evaluation of Medication Adherence through the use of Home Assisted Telemanagement"

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This is to certify that the doctoral study by

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Abstract

Evaluation of Medication Adherence Through the Use of Home-Assisted

Telemanagement

by

Kingsley Ngameduru Ogbuhoruzo

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Medication nonadherence can have serious consequences for patient outcomes. Home-automated telemanagement systems have supported increased levels of adherence among patients. This project explored whether the use of a home telemanagement program (HTM) would improve medication adherence in clinic patients diagnosed with hypertension (HTN). The health belief model, social learning theory, the self-regulation model and the theory of reasoned action guided this project. Providers in a primary care clinic completed the 4-question Morisky, Green, and Levine adherence scale with 50 HTN patients previously enrolled in a HTM. Survey results revealed that after 2 years in the program, patients were still forgetting to take their medications (56%), stopped taking their medications when they felt better (54%), stopped taking their medications when they felt worse (66%), or were careless at times about taking medications (38%). Data collection did not take place prior to beginning the HTM program; therefore, pre- and post-data for medication adherence behaviors were not compared. Project data support the importance of medication adherence and the consequences of nonadherence for all patients taking HTN medications. Monitoring of these patients is recommended to continue exploring if participation in HTM programs can support positive social change by improving health outcomes for HTN patients.

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Dedication

This project is dedicated to the course and purpose of accomplishment of doctoral study in the mist of family and other challenges faced. It is dedicated to the course of achieving advanced nursing knowledge. This project is devoted wholly and earnestly to God with great humility for his grace.

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Section 1: Nature of the Project

Introduction

Approximately 75 million individuals in the United States are presented with the clinical condition of hypertension (HTN) (Centers for Disease Control [CDC], 2017). Out of the estimated number of HTN patients, 46% of individuals revealed uncontrolled blood pressure (BP) (CDC, 2017). Considering the complications of HTN the reported rate of mortality is 9.5 per 100,000 every year (CDC, 2017). Additionally, uncontrolled HTN is underpinned with the increased risk of myocardial infarction, stroke, heart disease, renal disease and mortality (CDC, 2017). Several researchers have noted that the incidence of uncontrolled HTN in the United States has resulted from regional differences and other factors (Joffres et al. 2013; Yoon et al. 2014; Sampson et al. 2014). Medication adherence is a critical part of disease management. The World Health Organization (WHO) reported that by 2020 50%-60% of patients will be non-adherent to medications, and experience increased mortality and morbidity (Lam & Fresco, 2015).

The integration of home-assisted tele management (HTM) provides significant assistance in managing blood pressure of patients at home, alongside promoting effective partnership between care providers and family members of the patients (Lee & Park, 2016). The care facilitated through the use of the technology encompasses a patient-centered approach, which in turn, is associated with improved satisfaction of the patients and provision of care by innovative means (Zullig, Melnyk, Goldstein, Shaw, & Bosworth, 2013). The use of HTM helps in the attainment of better prognosis related to cardiovascular mortality as compared to monitoring performed in a clinic (Kitsiou, Pare, & Jaana, 2015). The use of such technology during care

provision assists care providers in the effective management of hypertension in the form of updated patient data (Lee & Park, 2016).

Problem Statement

The nursing practice problem for this project was medication adherence. Medication nonadherence is a factor that contributes to increased mortality rate, especially in patients with cardiovascular diseases, such as hypertension Medication nonadherence can also cause unnecessary healthcare expenditures and increased hospital readmissions (Yoon et al. 2014; Lam & Fresco, 2015; Solomon et al. 2015). In an effort to increase medication adherence with patients diagnosed with HTN, the primary care clinic instituted a HTM program. The clinic was seeking to evaluate medication adherence comparing those patients using HTM and those patients not enrolled in HTM.

Purpose Statement

The purpose of this project was to evaluate the improvement in medication adherence in hypertensive patients through the use of HTM. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN? HTM has been shown to improve medication adherence (Lam & Fresco, 2015). This project had the potential to contribute to social change by improving the lives of patients with HTN through HTM support, in addition; the project may contribute to decreased hospital admissions and improve quality of life for these patients and their families. This project followed the Walden University DNP Manual for Evaluating Quality Improvement Projects.

Nature of the Doctoral Project

This quality improvement evaluation project was conducted in a primary care clinic in an urban city in the southeast United States (US). The clinic instituted HTM two years ago in an

attempt to improve medication adherence with their hypertensive patients. No evaluation of the program had been completed. Providers in the clinic completed a medication adherence questionnaire (MGL)(Morisky, Green & Levine, 1986) for patients diagnosed with HTN over a three-month period. Participants included patients using HTM and those who are not. Descriptive statistics were used to describe the medication adherence profile of both groups.

The 4-point scale is the most widely used scale for medication adherence measurement. This scale was initially published in 1986. Since that time, it has been used to assess medication adherence for a wide range of diseases and in many languages (Morisky, Green, & Levine, 1986). Online databases from the Walden library were explored. Peer-reviewed literature over the past five years (2013-2018) was reviewed using key words such as medication adherence, medication non-adherence, medication compliance, medication noncompliance, telemedicine, home tele-monitoring, telemedicine and hypertension.

Significance

The physiological effects of HTN have been shown to contribute to the development of life-threatening conditions of stroke, coronary artery disease, and renal failure. (AHA, 2014; CDC, 2017). These complications from HTN have care costs as high as $51 billion dollars annually (Wang, Grosse, & Schooley, 2017; Mozzafarian, Benjamin & go, 2015). Almost one-half of the entire expenditure was related to prescribed medications. Enormous efforts have been invested in public health with the aim of reaching the goal designed by the Healthy People 2020 for the improvement of elevated BP (Martin et al. 2013). This project explored the use of home tele-monitoring as a means to improve patient adherence to medication regimes. The stakeholders for the project were health care provider and patients with HTN.

Summary

Section 1 introduced the problem of medication adherence in patients in a clinic setting. This project was an evaluation of the clinic's quality improvement initiative to implement HTM with HTN patients. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN? The MGL was administered to clinic patients with a diagnosis of hypertensive. Section 2 introduced the model supporting this project and the evidence related to HTM.

Section 2: Background and Context

Introduction

The purpose of this DNP project was to evaluate the quality improvement project related to HTM as a means to improve medication adherence in hypertensive patients by targeting a local mid-city clinic in an urban city United States. The practice question was: Will the use of HTM improve medication adherence in hypertensive clinic patients? Clinic providers administered the MGL questionnaire to patients with HTN during one clinic visit over a three-month period. Data was compared between patients receiving HTM and those who do not participate in HTM.

Concepts, Models, and Theories

The Medication Adherence Model (MAM) was developed by Johnson (2002) after a qualitative content analysis comparing factors associated with adherence and nonadherence to HTN medications. The model was built on the underlying principles of several well research models: Health Belief Model, Social learning Theory, the Self-Regulation Model and the Theory of Reasoned Action. Three core concepts framed the model: (a) purposeful action, (b) patterned behavior, and (c) feedback. The assumptions of this model include the following:

- Individuals want to maintain their health

- Individuals value health

- HTN is detrimental to one's health and well-being

- Effective treatment of HTN includes medication

- Prescribed medications for HTN are in the best interest of persons with HTN (Johnson, 2002).

Table 1 describes the three core concepts and their relationships to each other and to medication adherence, which is adapted from Johnson (2002).

Table 1: Medication Adherence Model

Purposeful Action	*Purposeful action* denotes a deliberate decision influenced by the perceived need and perceived effectiveness of the medication. This is an intentional decision associated with the cognitive process of decision making.
Patterned Behavior	The decision is made to take the medication, one develops a *patterned behavior* which is dependent on access, routine, and remembering.
Feedback	Both purposeful action and patterned behavior are being constantly evaluated via feedback through facts, prompts and events.
Adherence	Adherence will be maintained or modified based on continuous feedback.

Definitions of Terms

Compliance: Compliance is related to the degree to which a patient follows a medical advice (Vrijens et al. 2017).

Adherence: Adherence can be explained as the extent to which an individual follows the recommendations highlighted by a healthcare professional (Vrijens et al. 2017).

HTM: A telecommunication technology used for the distribution of any health care service among patients (Lam & Fresco, 2015).

Relevance to Nursing Practice

Medication Nonadherence

The main difference between compliance and adherence is that the adherence requires consent of the patient with the recommendations received. Adherence also expresses an active collaboration between health professional and patient in making decisions that affect healthcare

outcomes. On the contrary, the term compliance implies a behavior of submission and obedience to an order, typical of a paternalistic relationship between health professionals and the patient (Nielsen, Shrestha, Neupane, & Kallestrup, 2017). This lack of patient participation in the definition could justify the disuse of the term compliance in favor of adherence, but in practice both terms continue to be used interchangeably. Adherence is defined as the total number of days of medication taking according to the prescriber's guidelines during the follow-up period. Persistence is defined as the number of days of continuous use of the medication during a specific period (Vrijens, Antoniou, Burnier, de la Sierra, & Volpe, 2017). It can be established for each individual a period of grace or allowed interval to obtain or recharge the prescribed medication (in this case, 10 days). If the patient exceeds this predetermined interval, it is considered not to be persistent. The adherence and persistence rates are calculated by dividing the number of days the patient has been adherent or persistent, respectively, by the number of days of the follow-up period (in this case, 360 days) (Hamdidouche et al. 2017).

Recently, the International Society of Pharmacoeconomics and Health Outcomes Research (ISPOR) has defined therapeutic adherence, as a degree to which a patient act in accordance with the dose by considering a prescribed dosage within a suggested period. However, the clinical results of a treatment are affected not only by how patients take their medication, but by how long they do it (Calderon-Larranaga et al. 2016). For this reason, the term persistence has been used in recent years to define the time during which the patient continues with the treatment, that is, the amount of time that elapses from the beginning to the interruption.

Medication Nonadherence in HTN

Nonadherence to medications is now considered as a major health issue at the public level. Patients tend to project nonadherence when provided with a new prescription of medicines, including the patients presented with HTN (28.4%), diabetes (31.4%), and hyperlipidemia (28.2%). In context to the high rate of medication nonadherence, the percentage of morbidity and mortality among the patients with chronic clinical conditions has increased. In addition to this, poor or nonadherence to medication provided for the management of heart disease increases the number of emergency visits in the cardiovascular department and making nurses care demand rise and more stress to nursing practice with increase in shortage of the providers as well as the health care cost (Tomaszewski et al. 2014).

Factors Leading to Nonadherence

There are several factors that can lead to an adherence problem, many of them closely related. Age, cultural and social environment of the patient, the level of education, as well as their personality, condition is responsible for affecting treatment outcome (Adler et al. 2017). Some patients do not comply with the treatment because of the belief that they have not been treated correctly or that the medication is not effective, or because they have difficulty understanding the medical explanations related to the treatment. Other times the cause is a simple forgetfulness or difficulties when getting medication (Bazargan et al. 2017). Finally, it is necessary to highlight the special relevance of this problem in two special populations including elderly and children, in which aspects such as safety or simplification of therapeutic regimens are key aspects.

Adverse effects are regarded as the interruption of treatment due to the appearance of adverse effects is one of the most common causes of non-adherence. These can be the cause of

the abandonment of the therapeutic guideline or they can also appear as a consequence of the lack of follow-up of the medical recommendations on the dosage guidelines (Mongkhon, Ashcroft, Scholfield, & Kongkaew, 2018). Characteristics of the active ingredient: pharmacodynamics, pharmacokinetics, and pharmaceutical form and characteristics. Frequently, the patient projects non-adherence to treatment if he does not observe a beneficial result derived from its short-term use. An important factor that leads to non-adherence is the complexity of the patient's therapeutic regimen, which also produces an increase in the probability of error in taking the medication. Therefore, the simplification of the treatment increases the adherence of the patient to the therapy and in this way the probability of positive results (Mongkhon, Ashcroft, Scholfield, & Kongkaew, 2018). Cost is related to the increase in the price of drugs, as well as the increase in the co-payment of publicly financed medicines, causes an increase in the cost of medicines for the patient. Therefore, may constitute a barrier to adherence with the therapeutic regimen.

Of all the factors mentioned above, some of them have been identified as key predictors of low adherence to medication. These are: lack of knowledge of the disease, the therapeutic regimen and the consequences of non-adherence on the part of the patient, lack of an adequate relationship between the patient and complexity (Calderon-Larranaga et al. 2016). Long duration of treatment, asymptomatic disease, inadequate follow-up or lack of an elaborate plan on the abandonment of medication; presence of adverse effects, cost of medication and / or copayment, not attending medical appointments, presence of psychological problems such as depression or anxiety, beliefs and perceptions of the patient about medication and presence of cognitive difficulties are other major factors (Calderon-Larranaga et al. 2016).

Nielsen et al. (2017) stated that poor adherence to long-term treatment severely compromises the effectiveness of treatments, especially in those who have a greater probability of leading a non-compliant behavior over time. Therefore, this study is based on the need to have sensitive and applicable instruments in different situations quickly and economically, which allow to adequately measure this behavior, and thus manage differentiated, precise and focused interventions, reducing premature morbidity and mortality in this group of people (Foot et al. 2016). In this sense, Morisky's medication adherence scale has been frequently used in research on adherence to antihypertensive treatment.

Clinical Consequences

Clinical consequences are derived from the increase in mortality or morbidity observed in non-compliant patients. The importance and time horizon in which these consequences will develop will depend fundamentally on the type of drug prescribed and the disease for which its use is intended (Nafradi, Galimberti, Nakamoto, & Schulz, 2016). There is a clear and direct association between the lack of compliance and obtaining worse results in health. The difference between effectiveness and effectiveness of the treatments is even more evident in the presence of HTM (Pandey et al. 2015). The achievement of acceptable levels of compliance helps to know the real benefits of drugs and avoids the appearance of uncertainty about their effectiveness.

Considering the importance of knowing the prevalence of problems of adherence to treatment and its determinants for the design of effective intervention strategies, it is expected that the prevalence of having problems of adherence to the treatment (at least presenting a problem of adherence) is significant (Burnier, 2017). Older people with higher education, who evaluate their illness as more serious and longer, perceive more benefit and control of the disease through treatment, understand their illness better, report more support from the family, and take

less years treating each other have fewer adherence problems to the medication. Patients with chronic diseases comply with 50% to 60% of the indicated pharmacological treatments. In the US, it is estimated that 125,000 deaths per year occur due to non-compliance and that between 33% and 69% of hospital admissions related to medication are due to non-compliance with treatments (Schoenthaler, Knafl, Fiscella, & Ogedegbe, 2017). It is also estimated that half of the 50% reduction observed in the last 20 years in mortality from ischemic heart disease is due to cardiovascular drugs. However, the achievements of these benefits are lost due to the high default rates in real situations.

The inability to identify and remedy non-compliance commonly results in pharmacological therapies with higher doses of medications. This brings increases in the cost of the treatments, in the risk of adverse events, in the wrong diagnoses and, in extreme cases, in unnecessary treatments, aggravation of the disease and mortality (Omboni & Ferrari, 2015 Hedegaard et al. 2015). The WHO report also stated that the magnitude of the breach and its consequences are so alarming that improving compliance with existing treatments would bring greater global benefits than the development of new medical treatments. It is very likely that the transfer of interventions to large-scale real situations will be unsuccessful, in particular due to the lack of personnel to supervise the administration of the intervention and the monitoring used in clinical trials (Lo, Chau, Woo, Thompson, & Choi, (2016)). Some simple strategies that result in a small effect at the individual level can result in a substantial benefit in public health. A retrospective analysis of more than 3,000,000 individuals found this type of results when a blister-type package with a calendar for a daily cardiovascular drug was used (Yap, Thirumoorthy, & Kwan, 2016).

Role of Healthcare Professionals and Patients' Behavior

The second problem is that interventions focus on the doctor. Healthcare professionals have limited or no control over the drug taking behaviors. Interventions that facilitate open communication are more likely to endure. It would seem that patients' perspectives are not taken into account, data on the relationship between patients and physicians are omitted and approaches that take shared decision-making are lacking (van Boven et al. 2016). Interventions strive to achieve an objective (based on research) that may not be consistent with the role that medications play in the context of the patient's daily life. Interventions are needed that increase patient participation, improve the skills and behaviors of taking the different drugs and improve self-assessment and corrections, both in patients and doctors, regarding the use of medications.

A personalized and multi-faceted strategy is more effective. This is of great importance, since more than 100 factors associated with non-compliance have been observed. Effective interventions address barriers those related to literacy on health, those of necessary behavioral changes and administrative barriers related to access, and fragmentation of the health system. Interventions for patients with low literacy in health include educational materials with images, easy to understand, explanations in layman's terms, audiovisual presentations, the generation of environments for patients and practitioners to pour their questions and doubts and training on communication forms to all responsible people involved in the health system (van Boven et al. 2016). The inclusion of a spouse or family member increases effectiveness. Requesting demonstrations and repetitions of the information to the patient or companion assures that this was heard and understood.

Patients need behavioral skills that allow them to adopt and integrate taking medications into their daily lives. Among the strategies to improve compliance are self-assessment (the use of

diaries, records, packaging with calendars, electronic reminders, alerts), positive reinforcement (incentives, rewards) and forming associations to share responsibility (contracts between doctor and patient, internet support groups) (Vrijens et al. 2017). Compliance with pharmacological treatment is a responsibility and an objective shared by all the members of the health group (patient, family, doctors, and members of the different institutions). This objective is agreed according to the priorities and the purposes of the selection of the medicines and according to the administration and the behaviors of the taking of the medicines. Communication and flow of information between patients, physicians and institutions is needed to improve compliance (Hamdidouche et al. 2017). Opportunities to bridge the gap in communication take place in every instance of the process.

Healthcare professionals can succeed with participation at the local level, beyond the changes to be made at higher and national levels. Both patients and doctors can benefit from the analysis of performance with respect to the objectives set. It should be borne in mind that the time of the evaluation may result in predictable maximum and minimum points. Compliance is greater in five days before and five days after a visit to the doctor, while it decreases after 30 days (Nafradi et al. 2016). Therefore, improving compliance in the treatment of chronic diseases depends on the moments chosen for the evaluation, the open and continuous communication and the sensitivity to predict these patterns of maximum and minimum. Ideally, intervention programs can predict who will present compliance problems and when. Algorithms have been developed for this purpose (Pandey et al. 2015). The pharmacist also plays an important role in ensuring that pharmacological therapy is appropriate and that there is communication about the changes in it between the main actors (patient and doctor).

Conn et al. (2015) measured pharmacological adherence, leaving aside other aspects such as diet, exercise, activity physical and general lifestyle changes that are part of the therapeutic regimen and allow evaluation of adherence in an integral way. When referring to adherence, it is common to use the term compliance of the patient. This care provider approach can reduce the role of patient to a more passive or subordinate role. In this perspective, patients are not given the opportunity to participate in the decision-making process with regard to the adoption of their own regime for therapeutic a lifestyle change. As the measurement of the adherence moves to an approach in which patients assume a more active and dynamic role to negotiate the adoption of an established therapeutic regimen, the patient takes into account their beliefs and sociocultural context. The dynamic model of adherence suggests that knowledge about how the patient makes decisions related to his medication and the interaction between the person-team of health, plays a vitally important role in understanding the new therapeutic regimen which the patient will adopt.

Schuiling-Veninga et al. (2017) recognized that the dynamic concept of adherence has an implicit role in active collaboration and voluntary participation of the patient in the adoption of a healthy lifestyle. These changes favor changes in diet, exercise, and intake of medication prescribed by health personnel. Under this view, the therapeutic regimen of each person is voluntary in nature and plays an active role in the beliefs and context in which the patient is immersed (Thom et al. 2015). It becomes necessary to choose a method to measure the adherence concept in a comprehensive approach especially in people with long-term therapeutic regimens.

Morisky Scale

Beginning in 1986, Dr. Morisky and colleagues developed a four-item medication adherence scale. The scale was modified in 1008 to include eight items with a Cronbach alpha of

.83. Currently, the eight-point scale is not available for individual use. However, the revised 4-point scale, the Morisky, Green & Levine Scale, or MGL, is available in the public domain and had been cited over 4500 times in peer-reviewed journals since its publication in 1986 (Morisky, et al., 1986).

The MGL consists of four questions and requires a yes or no response.

1. Do you ever forget to take your medicine?

2. Are you careless at times about taking your medication?

3. When you feel better, do you sometimes stop taking your medication?

4. Sometimes, if you feel worse when you take the medicine, do you stop taking it?

(Morisky, Green, & Levine, 1986).

Home Assisted Telemanagement (HTM)

HTM is the distribution of any health care service using telecommunications technologies. HTM can be defined as the use of information medical exchanged from one place to another through the use of technology from information and communications (ICT) to improve the patient's health status (Conroy, Zhan, Culpepper, Royal III, & Wallin, 2018). HTM is a promising methodology for providing services to patients presented with chronic conditions who are readily prone to encounter barriers related to accessing attention or a heavy burden of the disease.

HTM is effective specifically in heart failure and diabetic disease monitoring, as remote monitoring and telephone support for problems in which cardiovascular diseases have shown a reduction of hospitalization in emergency room visits, delays in hospitalization, admission to hospital, duration of hospital stays, and mortality from these causes. An improvement in the quality of life and a reduction of costs have also been reported among the patients presented with

the condition of uncontrolled HTN (Jeong & Finkelstein, 2015). Communication through HTM also can increase formal prevention for those who do not have access to cardiac rehabilitation. According to Jeong and Finkelstein (2016), investigations carried out through HTM indicated benefits to patients with heart disease, as they constitute the cause of hospitalization more frequent. On the other hand, less favorable results have been found in respiratory pathologies. Remote monitoring for respiratory problems has shown a better control of symptoms and one more early identification of deterioration. The receptivity and positive attitude of patients is promising, but the evidence about the clinical and structural effects are only preliminary. For chronic problems in older people the most effective interventions provided through HTM are automatic monitoring of vital signs, which reduces the use of health services and telephone follow-up by nursing staff who improves clinical indicators, alongside reducing the use of health services.

Finkelstein, Cisse, and Jeong (2015) stated that HTM is effectively integrated in the areas such as alcohol abuse, problems of overweight and mental disorders. For mental health problems psychotherapy by HTM is as significant as face-to-face approach. However, for the success of telepsychiatry it is necessary to take into account human aspects and of organization in addition to legal aspects and ethical aspects. Gross-Schulman, Sklaroff, Hertz, and Guterman (2017) addressed that the care remote services provided through HTM are profitable in reducing the use of hospitals, improve organization of care, evaluation of attention procedures, trust of patients and their satisfaction, and quality of life. Nevertheless, Briscoe and Quezada (2016) depicted that the available studies are scarce and heterogeneous, as the studies focuses on socio-political environments and organizations of limited comparability.

According to Fang, Maeder, and Bjering (2016), the integration and the level of resolution of the HTM resulted that initial care can be guided and elaborated by a health professional with diagnostic capacity who has all the powers to establish a protocol of cardiovascular rehabilitation using the tool of HTM for internal medicine, cardiology, endocrinology, nutrition, and diet. It should be noted that a fundamental part of the management of this type of pathology goes hand in hand with training and the incorporation of healthcare professionals who are in the care and control of the patient (Mariotte & Starr, 2018). This constitutes a valid strategy that generates a control of non-communicable chronic disease of patient, reducing the entrance to the services of emergencies due to acute cardiovascular disorders. Another part is related to the contribution to the welfare of the adult, improving their quality of life, and providing more useful service time to society.

Effectiveness of HTM

The system for HTM technology is developed by including a unit for patient, a server for supporting decision, and a web-based portal for healthcare professionals. The patient unit is connected to a laptop computer along with an electronic weight scale. A serial port is used for connecting the scale with the laptop. A software is used through the laptop and the interface displays a keyboard that can be used for operating only three keys (Briscoe & Quezada, 2016). The process of self-testing is required to be completed by the patients on weekly basis for the duration of six months. In addition to this, data collection is carried out by considering use of medications, symptoms, and adverse effects in a diary. The self-testing results are then automatically transferred to the server of the HTM which leads to the generation of computerized alert to inform the healthcare provider in case of clinical condition detection (Briscoe & Quezada, 2016).In the evaluation of the HTM project, Yanicelli et al. (2015) have identified a

number of benefits that show a positive health impact on the population of its area of influence, but some benefits have not been valued so far, such as savings in costs for the services provided to these patients and transfers of control by medicine specialized. The reduction of adult pathologies points to improve the objectives of reducing the mortality of public health plans for the millennium through an impact and benefit strategy towards this type of population, which at the same time is decisive and low cost for hospitals (Purcell, McInnes, & Halcomb, 2014). On the other hand, HTM also seeks to bring technological resources in favor of the patient's assessment of the border area in the country, alongside delivering tools for the development of medical activities that contribute to the control and good functioning of prevention programs for the promotion of hospital extensively.

The evaluation of the economic consequences of HTM is hindered by methodological problems, such as the difficulty of establishing a consensus on its definition and assessment, and the design of the study that assesses the economic impact, the identification, measurement and assessment of costs and results (Kim, Wineinger, & Steinhubl, 2016). In addition, it also entails the problem in the interpretation of this value in controlled studies. The deficiency in the fulfillment of the outlined health objectives has an impact in the vast majority of situations on an increase in costs. These are generated due to the increase in hospitalizations and visits to ambulatory and emergency centers, which increases or changes in prescription or performance of more invasive diagnostic tests. In the US, it has been estimated a cost of 100 billion dollars a year derived from the incorrect taking of medication. Of this cost, 25 trillion corresponded to hospital admissions and 70 trillion, to loss of productivity and premature death as a result of cardiovascular diseases (Schuiling-Veninga et al. 2017). Costs increase as a result of the high levels of mortality and morbidity. For example, in the case of HTN, in which HTM contributes

to the effectiveness of treatments and causes a direct effect on costs and rehospitalizations. These are the main costs associated with the disease, so that therapeutic compliance in HTN is the key to controlling their derived costs (Thom et al. 2015).

Observational studies have shown that reducing co-payments for high-efficacy chronic therapies can substantially improve compliance. In addition, when doctors indicate generic or lower-cost medications, compliance improves (Krousel-Wood et al. 2015). Others have proposed that the reduction of co-payments may not be sufficient, but that monetary rewards for good compliance seem to be a more effective mechanism for behavioral change. A significant impact has been demonstrated with monetary incentives to quit smoking and lose weight. Therefore, the use of HTM can improve the connectivity of patients, doctors, pharmacists and the health system. It is currently used to generate measurements on the quality of drug administration and monitoring (Lam & Fresco, 2015). When information about medications is shared electronically, those who indicate them have access to information that allows them to evaluate the regimen and identify noncompliance with treatment.

Local Background and Context

Hypertension is an increase in human blood pressure in the arteries, which is a major risk factor for heart disease and stroke. Locally, it is measured in two criteria, systolic (contracting heart muscle) and diastolic (relaxing the heart muscle). HTN is classified as one of the clinical conditions that underpin a pronounced risk of developing cardiovascular diseases. Considering the manifestation of the condition in the United States, it is responsible for contributing to high rate of morbidity and mortality in the population in the form of a primary cause and fourth leading reason of death (CDC, 2017). Tomaszewski et al. (2014) highlighted that nonadherence to medications is now considered as a major health issue at the public level. Furthermore,

patients tend to project nonadherence when provided with a new prescription of medicines, including the patients presented with HTN (28.4%), diabetes (31.4%), and hyperlipidemia (28.2%). In context to the high rate of medication nonadherence, the percentage of morbidity and mortality among the patients with chronic clinical conditions has increased. Poor or nonadherence to medication to manage heart disease increases the number of emergency visits in the cardiovascular department and making nurses care demand rise and more stress to nursing practice with increase in shortage of the providers as well as the health care cost.

The clinic is located in a large metropolitan area in the southeast U.S. The clinic provides primary care services to a primarily underserved population. The majority of the patients are African American and Latino and are insured through Medicare or Medicaid. The providers report that upon questioning patients about their adherence to the medication regime, many report that once they feel better, they stop taking their medications. Others appear to just forget about taking the medications. The clinic implemented the HTM program approximately two years ago to address the identified problem of patients reporting non-adherence to their medication regimen.   Up to this point no evaluation of the program has been completed. The clinic is supportive of evaluating the effectiveness of the HTM with medication adherence in patients with HTN.

Role of the DNP Student and Project Team

The project team consisted of clinic providers who completed the MGL for each patient diagnosed with HTN. The providers completed one MGL for each patient over a three-month period.   The de-identified forms (Appendix A) were shared with me.

Summary

The purpose of this project was to evaluate the improvement in medication adherence in hypertensive patients through the use of HTM. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN? Section 2 described the concepts of the MAM, definition of terms associated with the project, the evidence-based literature relevant to the project as well as my role and the role of the project team. Section 3 discussed the plans for evaluation of the quality improvement project as well as data analysis and synthesis.

Section 3: Collection and Analysis of Evidence

Introduction

The nursing practice problem highlighted in this DNP project was related to medication adherence, which is a factor commonly attributed to increased mortality among patients suffering from cardiovascular diseases such as hypertension (Yoon et al. 2014). The purpose of this project was to evaluate the improvement in medication adherence in hypertensive patients through the use of HTM. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN?

Nonadherence to medications is now considered as a major health issue at the public level. Due to the high rate of medication nonadherence, the percentage of morbidity and mortality among the patients with chronic clinical conditions has increased. In addition to this, poor or nonadherence to medication provided for the management of heart disease increases the number of emergency visits in the cardiovascular department and making nurses care demand increase, adds stress to nursing practice and increases the health care cost (Tomaszewski et al. 2014). The local problem is poor adherence to HTN medication, which in turn, leads to the development of life-threatening conditions, hospital readmissions, and decreased quality of life.

Medication nonadherence is an issue that requires consideration since it has the potential to affect not only the health outcomes but also the overall healthcare costs. By 2010, healthcare costs described as wasteful amounted to 30% of America's health care expenditure (Ebbert, 2012). Medical nonadherence contributes to the waste of medical resources. There is a need to devise mechanisms to deal with the problem before it causes more damage. Evaluation of the HTM program as a means of mitigating medication nonadherence may provide additional evidence into improving medication compliance.

Practice-focused Question

The purpose of this project was to evaluate the improvement in medication adherence in hypertensive patients through the use of HTM. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN?

Sources of Evidence

Patients with a diagnosis of HTN were requested to respond to the questions on the MGL (appendix A) by clinic providers during their office visit. The providers completed a MGL during one patient visit for each patient diagnosed with HTN during a three month period. These de-identified MGLs were shared with me by the clinic administrator.

This 4-point scale is the most widely used scale for medication adherence measurement. Permission to use the MGL scale is found in Appendix B. The MGL consists of four questions and requires a yes or no response (Morisky, Green, & Levine, 1986).

1. Do you ever forget to take your medicine?

2. Are you careless at times about taking your medication?

3. When you feel better, do you sometimes stop taking your medication?

4. Sometimes, if you feel worse when you take the medicine, do you stop taking it?

Analysis and Synthesis

The de-identified responses were entered in Microsoft Excel. Descriptive statistics were used to compare the responses from patients using HTM and patients not using HTM.

Summary

When medication nonadherence is addressed, treatment for chronic diseases such as HTN can be more effective. HTM is a cost- effective way to monitor medication adherence. Section 3 described the process of data collection, analysis and synthesis of project results. The purpose of

this project was to compare responses in the MGL between patients using HTM and those not using HTM. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN? Section 4 described the findings and dissemination of the evaluation of the quality improvement initiative.

Section 4: Findings and Recommendations

Introduction

Current evidence posits that the effectiveness of the treatment of HTN depends not only on the correct and timely diagnosis and the choice of the optimal strategy and tactics of treatment, but also on patient compliance with the prescribed therapy regimen (Krousel-Wood et al. 2015). Thus, it has been established that measuring blood pressure is not a reliable method for assessing compliance with recommendations in hypertensive clinic patients in everyday practice. Much more accurate information can be obtained with careful questioning of the patient. (Krousel-Wood et al. 2015). Section 4 described the results of data collected by the facility using the Morisky questionnaire. The sample size for this project was 80 clinic patients with a diagnosis of hypertension. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN?

Findings and Implications

Evidence for this project was the de-identified surveys completed by the clinic providers over the past three months. The de-identified surveys were shared with me and data was analyzed using Microsoft Excel. Eighty patients responded to the survey questions. Out of 80 participants selected in the survey 50 patents were reported to use HTM while 30 patents were not using HTM. Table 1 describes the total number of participant responses. Although 66% of patients do not stop taking their medications even if they feel worse, responses to the questions about forgetting the medications, stopping medications if they feel better, and forgetting to take medications had more yes responses than no responses.

Table 1

Total Responses to MGL Survey

Question	Yes Response	No Response
Do you ever forget to take your medicine?	47 (59%)	33 (41%)
Are you careless at times about taking your medication?	44(55%)	36(45%)
When you feel better, do you sometimes stop taking your medication?	37(46%)	43(54%)
Sometimes, if you feel worse when you take the medicine, do you stop taking it?	53(66%)	27(34%)

Table 2 depicts the responses to the 50 patients participating in the HTM program and the 30 patients not enrolled in the program. For the question do you ever forget to take your medicine 56% of the HTM patients responded yes but only 37% of the non-HTM participants responded yes. For the question are you careless at times about taking your medication both groups had more patients responding no than yes. For the question when you feel better, do you sometimes stop taking your medication 54% of the HTM patients responded yes but only 13% of the non-HTM patients responded yes. For the final question sometimes, if you feel worse when you take the medicine, do you stop taking it 66% of the HTM patients responded yes while 33% of the non-HTM patients responded yes.

The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN? The results of the surveys revealed that more than 50% of the HTM patients still are forgetting to take their medications, stop taking their medications when they feel better, stop taking their medications when they feel worse. However, over 50% in both

groups did not feel they were careless about taking their medications. Since there was no data from the HTN patients prior to beginning the HTM program, there was no comparison data.

Table 2

Responses Participants and Non-Participants in HTM

Question	HTM Patients Response Yes	HTM Patients Response No	Non HTM Patients Response Yes	Non HTM Patients Response No
Do you ever forget to take your medicine?	28 (56%)	22 (44%)	11 (37%)	19 (63%)
Are you careless at times about taking your medication?	19 (38%)	31 (62%)	5 (17%)	25 (83%)
When you feel better, do you sometimes stop taking your medication?	27 (54%)	23 (46%)	4 (13%)	26 (87%)
Sometimes, if you feel worse when you take the medicine, do you stop taking it?	33 (66%)	17 (34%)	10 (33%)	20 (67%)

Recommendations

Since over 50% of the participants are still forgetting to take their medications, stop taking their medications when they feel better, stop taking their medications when they feel worse, there should be more discussion with patients and providers related to medication adherence. Providers could ask patients to provide specific examples related to their responses. Also, an education guide with key points could be developed and provided to patients.

Strengths and Limitations of the Project

The project was a good start in understanding medical adherence in HTN patients. Although the project question did not include non-HTM patients, the data revealed that more discussion should occur about the importance of medication adherence and the consequences of non-adherence with all patients taking hypertensive medications.

Summary

Section 4 discussed the data results for the projects, and strengths and limitations of the project. The practice question was: Will the use of HTM improve medication adherence in clinic patients diagnosed with HTN? The results of the surveys revealed that more than 50% of the HTM patients still are forgetting to take their medications, stop taking their medications when they feel better, stop taking their medications when they feel worse. Since there was no data on the HTM patients prior to beginning the HTM program, there was no comparison data. However, since over 50% of these patients are still not adhering to medication regimes patients need further education and monitoring of medication adherence.

Section 5: Dissemination Plan

This quality improvement evaluation project was conducted in a primary care clinic in an urban city in the southeast U.S. The clinic instituted HTM two years ago in an attempt to improve medication adherence with their hypertensive patients. No evaluation of the program had been completed. Providers in the clinic completed the MGL questionnaire (Morisky, Green & Levine, 1986) with 50 patients participating in a HTM program. over a three-month period. Results of the self-reported responses revealed that over 50% of the enrollees were still forgetting to take their medications, stop taking their medications when they feel better, or stop taking their medications when they feel worse. These results were shared with clinic providers with the recommendation that further exploration of why patients are still having difficulty with medication adherence. Providers should explore additional options to improve medication adherence.

Analysis of Self

The concept of telemedicine is here to stay for a whole and, its wave of positivity is rapidly taking over the world. I believe that the more a wide variety of healthcare facilities implement HTM strategies, the better the chances of patients recovering quicker than expected. For older adults above 50 years living in ALFs, HTM might not bring forth the desired results, but still, these elderly population stands a chance to lose a lot if they are not reminded always to take prescribed medications.

As a competent healthcare practitioner, I think that even though HTM does not entirely solve the problem of failure to complete prescribed medication, there is still no disputing the fact that it significantly reduces the health implications associated with avoiding medication dosages. My contribution would be individual, reminding all of my patient to their daily drugs. When I am

on my shift, I will take it upon myself to make a fixed point of telling all patients to complete their respective medications, with or without supervision.

Finally, my opinion as a change agent would be leading as an example. Following the fact on file that change is one of the most inevitable aspects in all human interactions, some stakeholders might not be in a position to adjust to accommodate the new changes. For this reason, it is essential to lead by example by enlightening all stakeholders about the merits of embracing HTM in all healthcare organizations. In other words, HTM is the closest that the delivery of quality healthcare services has gotten in ages, as far as reminding patients to take medications goes.

Summary

The results of the surveys conducted in this project indicated that more than 50% of HTN patients still go on to forget medications or stop taking soon after recovery, despite living under HTM environments. Further analysis from World Health Organization (WHO) indicates that by 2020, close to 60% of HTN patients will stop adhering to their medications, which will, in turn, heighten the morbidity and mortality rate of the disease (Lam & France, 2015). Continued interaction with patients, families, and healthcare providers to explore reasons for medication nonadherence should be explored.

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Appendix A: Medication Adherence Questionnaire

SURVEY NUMBER_____

Directions: Please complete only one survey for all patients with a diagnosis of hypertension.

This patient is participating in a home assisted telemanagement

1. Do you ever forget to take your medicine?

   Yes_____No_____

2. Are you careless at times about taking your medication?

   Yes_____No_____

3. When you feel better, do you sometimes stop taking your medication?

   Yes_____No_____

4. Sometimes, if you feel worse when you take the medicine, do you stop taking it?

   Yes_____No_____

Appendix B: Permission to Use Survey

On Wed, Dec 26, 2018, 2:40 PM Kingsley Ngameduru
<kingsley.ngameduru@waldenu.edu wrote:
Dear Dr. Morisky:
My name is Kingsley Ngameduru. I am a nurse practitioner enrolled in a Doctor of Nursing
Practice program at Walden University. I am currently completing my DNP project *titled
Evaluation of Medication Adherence Through the Use of Home-Assisted Telemanagement*. The
purpose of this project is to evaluate the improvement in medication adherence in
hypertensive patients through the use of home assisted telemanagement. The practice
question is: Will the use of HAT improve medication adherence in clinic patients diagnosed with
HTN? I am seeking permission to use the 4 point Morisky Scale to assess patients who are
enrolled in the telemanagement program and those that are not.-If you need further
information please contact me at kingsley.ngameduru@waldenu.edu or my committee chair
Dr. Diane Whitehead @ diane.whitehead@mail.waldenu.edu

Thank you for your consideration.
Kingsley Ngameduru, ARNP
From: DONALD MORISKY <dmorisky@ucla.edu>
Sent: Saturday, December 29, 2018 3:17:54 PM
To: Kingsley Ngameduru
Cc: Diane K. Whitehead; ngamedu4@aol.com; healthequity@ph.ucla.edu
Subject: Re: Permission 4 Point Morisky Scale

This email came from an external source.

Thank you very much, Kingsley, regarding your interest in obtaining a license to use the
MMAS-8 diagnostic adherence instrument. Sorry for my delay in responding.

Individual licenses are no longer being provided; you must have your organization or
university purchase the license on your behalf. The cost of the lifetime license is 4000 Euros
plus travel expenses and lodging for a required hands-on training session lasting one day
for three staff personnel. If you cannot convince your university to purchase the license for
use of the copyrighted MMAS-8, you are not permitted to use the MMAS-8.

All users of the MMAS-8 must purchase an institutional license and receive face to face
training in the correct use of my diagnostic adherence assessment instrument. No
individual licenses will be permitted.

**Since the cost of the widget is probably more than you can afford, I suggest that you
use the Morisky, Green, and Levine (MGL) Adherence Scale which is in the public**

domain and does not require a license fee. The MGL is NOT the same as the MMAS-4, which is a copyrighted and trademarked diagnostic adherence assessment instrument and requires a license to use, just like the MMAS-8 and these tools are NOT in the public domain. With the MGL, you can make your own translation as this scale is not copyrighted or trademarked,

Please let me know if you are interested in using the MGL and I will send you the original publication with the 4-item scale. Thank you again for your interest in using my validated diagnostic adherence tool.

Please send me a note that you received this email.

Sincerely,

Dmorisky

Donald E. Morisky, Sc.D., M.S.P.H., Sc.M.
Research Professor and Former Chair
Lifetime Career Award, American Public Health Association
Department of Community Health Sciences
UCLA Fielding School of Public Health

Kingsley Ngameduru <kingsley.ngameduru@waldenu.edu>

Today, 6:13 AM

Dear Dr. Morisky,
Thanks, for your email in response to my request for permission to use MMAS-8 scale. I would like to request your MGL adherence scale instead. I appreciate all your help and support.
Thanks,
Kingsley Ngameduru