Improving Adherence in Adults with Hypertension using Personalized Pictogram Pill Cards

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IMPROVING ADHERENCE IN ADULTS WITH HYPERTENSION USING
PERSONALIZED PICTOGRAM PILL CARDS

by
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Paper submitted in partial fulfillment of the requirements for the degree of

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Signature DNP Project Chair

Signature DNP Project Committee Member

Signature Program Director

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Date
Date
Date
Date
Acknowledgments

I would like to begin by thanking God for the wisdom, knowledge, and strength he gave me to impart on, and complete this great journey. This experience has truly straightened my faith and I know now that I can handle whatever comes my way. I would also like to thank everyone for their support for me and my family as we traveled down this road to success. Next, I would like to thank Park DuValle Community Health Center and Donald E. Morisky for their support in conducting this project.

To my family, I say thank you for believing in me. To my husband, Miller Knuckles, I say thank you for sacrificing your desires, so that I may carry out my dream, and for being my breath and heartbeat when I felt like giving up. To my children, Brian, Christian, and Tristian, I say thank you for being my hope and my motivation for excellence. I am extremely proud to be your mother and want to lead you to greatness and leave behind a tradition of success. To my parents, Stanley and Rose Cooper, I say this is for all your hard work and sacrifices you've made in support of my destiny. To my younger siblings, Stanton, Stanlia, Tokonjay, Iyadeh, Leela, and Stanleymae, I say thank you for believing in me and encouraging me every step of the way.

Much thanks to my committee chair Dr. Mary DeLetter for her countless hours of reflecting, reading, encouraging, and most of all her patience throughout the entire process. Thanks for reminding me to “stay the course.” To my committee member, Dr. Sara Robertson, I say thanks for your encouragement and guidance throughout this process. You all were more than generous with sharing your expertise and precious time.
Dedication

I dedicate my work to my family and friends. A special feeling of gratitude to my loving grandparents, Wilton and Amelia Sankawulo whose words of encouragement and push for tenacity ring in my ears. Though you both have passed on, you have never left my side and are very special. I will always appreciate what you’ve done for me. Although you are no longer with us in the physical—you remain my greatest cheerleaders.
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Improving Adherence in Adults with Hypertension Using Personalized Pictogram Pill Cards

Janneve P. Sankawulo-Knuckles

The University of Louisville, School of Nursing
Abstract

Non-adherence with prescribed hypertension (HTN) treatment significantly increases the risk for cardiovascular disease and stroke, leading to increased morbidity, mortality, and burden to the health care system. HTN affects one in three American adults and costs the health care system approximately $48.6 billion annually in direct (providers/health professionals fees, hospital services, prescription medications) and indirect (premature mortality) medical expenses (CDC, 2018; 2016). This quality improvement (QI) project implemented a personalized pictogram pill card intervention for adults with HTN at an urban, federally-qualified health care clinic in west Louisville. Pictogram pill cards were provided to hypertensive adults with medium and low adherence score on the Morisky, Green, and Levine (MGL) Medication Adherence Scale (1986). Medication count at Day 1 was compared to Day 30 count to determine the percentage of adherence. In a sample of 10 patients, nine showed improved medication adherence following the pill card intervention. Mean adherence score was 99.16 ± 2.37. This evidence-based intervention using pictograms in medication instructions was a valuable tool to improve adherence to antihypertensive medications in patients with HTN.

Keywords: Hypertension; medication adherence, non-adherence, pictograms, pill card
Improving Adherence in Adults with Hypertension Using Personalized Pictogram Pill Cards

Hypertension (HTN) is one of the most critical risk factors for the development of cardiovascular disease (CVD) and stroke (Centers for Disease Control and Prevention [CDC], 2018; HealthyPeople.gov, 2019). HTN affects approximately one in three American adults, or about 75 million people in the US (CDC, 2018). Although there are adequate medical therapies for HTN management, only about 48.3% of persons with HTN have their blood pressure (BP) controlled (Chang, Ritchey, Ayala, Durthaler, & Loustalot, 2018; Fryar, Ostchega, Hales, Zhang, & Kruszon-Moran, 2017).

One factor contributing to this low percentage of blood pressure control is patient non-adherence to prescribed regimens. Non-adherence is defined as the degree to which people’s behaviors agree with medication regimens from health care providers (Leporini, De Sarro, & Russo, 2014). Non-adherence rates range from 20-50% and include not filling prescriptions and not taking medications as prescribed (American College of Preventative Medicine, 2011; Fryar et al., 2017; & US Department of Health and Human Services [DHHS], 2016). As a result, there are approximately 1,000 HTN-related deaths daily in the U.S. (CDC, 2014).

Many factors influence patients’ adherence to prescribed regimens, including complexity and side effects of regimen, quality of life, health care system issues, behavioral, demographic, lack of knowledge regarding HTN, and treatment and clinical variables. The risk of CVD and stroke from HTN has surpassed diabetes mellitus (DM), obesity, and smoking, accounting for 49% of CVD and 62% of stroke (American Heart Association, 2013). Between the years 2015 and 2016, the prevalence of HTN among American adults was 29.0% and increased with age: age group 18–39, 7.5%; 40–59, 33.2%; and 60 and over, 63.1% (Fryar et al., 2017). Projections show that by 2030, approximately 41.4% of American adults will have HTN,
an increase of 12.4% (Fryar et al., 2017). Uncontrolled HTN is associated with increased morbidity and mortality and increased use of health care resources (Yoon et al., 2015). According to the CDC, annual direct (providers/health professionals fees, hospital services, prescription medications) and indirect (premature mortality) medical expenses for persons with HTN are approximately $48.6 billion (CDC, 2016). Promoting medication adherence is a major clinical hurdle that is necessary to decrease CVD and stroke morbidity and mortality (Hamilton, 2003; Wogen & French, 2004).

Clinical Questions

The following clinical question guides this project: How will the implementation of an educational pictogram pill card intervention improve antihypertensive medication adherence in adult patients with a diagnosis of HTN when compared to usual medication education?

Summary of the Literature

Literature shows pictogram use in medication instruction as favorable for improving adherence. Yet, there is a lack of pictogram use in practice. Pictograms add benefits to medication instruction and should be considered as a means of improving adherence. Several studies have been conducted to illustrate the effectiveness of pictogram use in medication instruction.

In a 2006 study by Mansoor and Dowse’s pictograms used in the medication education of Native South African patients taking co-trimoxazole tablets significantly aided comprehension and adherence. A comprehension rate of 92% was determined in experimental group B (those receiving a simple patient information leaflet incorporating pictograms) as compared to 78% in experimental group A (those receiving a complex patient information leaflet) and 70.0% in the
control group (those receiving no patient information leaflet). The difference between the
experimental group B and the other two groups was statistically significant (p < 0.05).

A similar study by Braich, Almeida, Hollands, and Coleman (2011) assessed the
effectiveness of pictograms on adherence to postoperative cataract eye drops in low literacy
patients. They found that experimental group 2, taught with both pictograms in the clinic and for
utilization at home, showed higher amounts of medication consumption (p < 0.001). Taking
pictograms home was the most effective way to educate causing an increase in the adherence rate
to regimens by 28 days or more.

In 2003 Mansoor and Dowse compared the comprehension of labels and patient
information sheets containing text-only with those containing text and pictograms. Sixty
participants were assigned to either the control group (looking at material containing only text)
or the experimental group (looking at material containing text and pictograms) and asked to read
a nystatin suspension label and answer six questions. Comprehension of the label was rated
according to the number of questions answered correctly. All but two participants in the
experimental group achieved 100% understanding of the label incorporating pictograms.
However, less than half (40%) of the control group understood the label. This difference was
significant (p = 0.001) (Mansoor & Dowse, 2003).

Dowse and Ehlers (2005) saw similar results in a more extensive study (N=87) that
assessed comprehension and adherence using text-only (control) or text-plus-pictogram
(experimental) labels for prescribed antibiotics in a mostly female (93%), low-literacy
population. Participants were allocated to two groups: a control group that received text-only
labels and an experimental group that received text and pictogram labels. Participants we
examined 3-5 days after initiation of therapy to evaluate adherence. Recall and understanding of
the medicine instructions were assessed using a series of questions and a cumulative score of understanding was calculated based on questions answered correctly. Adherence was determined by self-reporting and by “pill count”. A rating out of 10 was converted into a percentage. Dowse and Ehlers (2005) found that in 54% of the experimental groups, an adherence of greater than 90% was achieved, compared with only 2% in the control group. Average understanding of the medicine instructions in the control and experimental groups were 70% and 95%, and average adherence was 72% and 90%.

Advani et al. (2013) investigated the use of pictograms and written medication instructions over six weeks in patients filling or refilling prescriptions at a chosen pharmacy. Two sets of handouts with patient information were designed, one with pictogram-based patient information and the other with textual substance. A patient-administered survey assessed four criteria of the handout received: user-friendliness, long-term comprehension, the likelihood of the participants referencing the handout in the future, and the effectiveness of the pill card. Based on a five-point Likert scale, the survey assessed the perception of four measurable variables to best gauge the effect on patient attention, understanding, memory, and adherence. Advani et al. (2013) evaluated patient perceptions of the actual impact of pictogram-based handouts on attention, understanding, remembering, and adherence. They found that the addition of pictograms increased the likelihood of the patient referencing the handout for understanding.

Wilby et al. (2011) concluded that the use of pictograms on medication vials as a means of improving patients' understanding of HIV medication information had a positive influence on understanding and adherence compared to text alone. Eighty-two adults were randomized to either a control group (n=42) receiving standard counseling or an experimental group (n=40) receiving pictogram-enhanced medication information for 18 months. Pictogram stickers was
placed on the medication vial representing the targeted information for that medication and verbal explanation provided of the meaning of the pictogram as it related to that drug. Each vial contained the standard label, usually dispensed by the ambulatory pharmacy. Patients in the intervention group were shown drugs with pictogram stickers, and those in the control group were shown drugs without pictogram stickers. For each medication, pharmacists asked the patient, "What can you tell me about this medication?" and documenting their response. Patients who reported the targeted information were scored as giving the correct answer, and those who did not were scored as providing an incorrect response. The intervention group correctly identified the majority (88%) of the targeted pieces of information at follow-up, compared to only 2% in the control group. Concluding that pictograms improve the recall of targeted medication information among patients receiving antiretroviral therapy for HIV management.

Kripalani et al. (2007) evaluated the development and implementation of a pill card using pictograms (pill images and icons) that depicts a patient’s daily medication regimen. They found a large percentage (83%) of participants used the pill card when they initially received it and also three months later. Majority of the pill card users (92%) rated this adherence tool as very easy on understandability. Most of the participants (94%) found the pill card helpful in remembering important medication information, such as the name, purpose, and time of administration. Nearly all patients considered the pill card to be a useful and readily understood tool to assist with medication management.

A similar pictorial aid intervention (PictureRx) as in the study by Kripalani et al. (2007) was pilot-tested by Monroe et al. (2018) to evaluate its effect on medication adherence in both patients with HIV and other common chronic conditions. Forty-six adult patients with HIV and DM or HTN from an underserved clinic were enrolled in this study. Patients were randomly
selected to receive either a photographic representation of their medication’s instructions (n=23) or standard (n=23) discharge medications instructions. The intervention group received pictogram representations of the appearance, indication, and daily dosing schedule for each of their medications. The PictureRx card was provided to the patient, along with their regular discharge medication list. Among all 46 participants, there was a trend towards higher adherence to medications for HIV compared with drugs for HTN/DM (baseline median medication possession ratio (p = 0.07) for antiretroviral therapy and comorbid condition was 0.92 and 0.79, respectively).

Pictograms use in medication instruction has shown positive results on increasing understanding, and hence, promoting adherence to prescribed medication regimens (Sorfleet, Vaillancourt, Groves, & Dawson, 2009). A current limitation of its implementation may be tied to the lack of screening for adherence in practice, signaling the need for stronger evidence.

Conceptual Framework

Concepts from the Health Belief Model (HBM) have been applied to this project (Rosenstock, 1974). HTN management requires both immediate behavioral change and long-term behavior maintenance. HBM explains and predicts health behaviors by focusing on the attitudes and beliefs of individuals (Rosenstock, 1974). The model has six key concepts: perceived susceptibility (patient's risk and awareness of disease), perceived severity (concept that a disease can cause morbidity or mortality), perceived benefits (benefit of taking medications), perceived barriers (obstacles in taking medication like cost, side effects, frequency), cues for action (factors that can push an individual to take action) and self-efficacy (Rosenstock, 1990). Several risk factors, including age, gender, socioeconomic, and treatment regimens, may influence these cognitive constructs and, thus, indirectly result in the health-related behaviors of
patients (Glanz, Rimer, & Viswanath, 2008). The six constructs of the model were useful when framing this project intervention to improve medication adherence among HTN patients.

**Setting and Organizational Assessment**

The setting for the project was an urban, federally-qualified health care clinic that provides medical care to both insured and uninsured individuals with chronic diseases. The agency has a licensed primary care adult clinic that provided medical services to 20,402 insured and uninsured patients in 2017. Of these, 6,010 (29%) had HTN without comorbidities. Half of these were diagnosed with uncontrolled HTN (Health Resources and Services Administration, 2017; PDCHC Clinical Measures, 2018).

**Purpose**

The purpose of this quality improvement (QI) project was to implement a sustainable personalized pictogram pill card intervention for adult outpatients with primary HTN. A long-term aim for this project was for pictograms to become a standard part of agency primary care practice.

**Intervention**

For this QI project, a personalized pictograms pill card was given to 10 patients with HTN diagnoses who had medium and low adherence scores on the MGL Medication Adherence Scale. The personalized pictograms pill card conveyed essential information patients should understand about their medication regimens such as the name, dose, purpose or use, and frequency and times of administration. Pill cards were created in English at the 6th – 8th-grade reading level (AHRQ, 2018). Permission to use the web-based tool to create the pill cards for this QI project was obtained (David I. Lewin, Health Communication Specialist/Manager of Copyrights & Permissions, personal communication, January 19, 2019).
Ethics and Human Subjects Protection

Approval for this QI project was obtained from the University of Louisville Institutional Review Board. A letter of support for the project was obtained from the agency Director of Nursing (DON). Patients’ personal and health information was protected under the Health Insurance Portability and Accountability Act (HIPPA) policies. All confidential or protected patient health information was stored on an encrypted and password-protected laptop. Hard copies were kept in a secured lock file cabinet in the DON locked office.

Participants

Participants were clinic patients with a single diagnosis of primary HTN who had medium and low adherence scores on the MGL Medication Adherence Scale. All individuals were 18 years of age and older, had a provider’s diagnosis of HTN without co-morbidity, spoke English, were on at least one anti-hypertensive medication, self-managed their anti-hypertensive medication(s), had a working landline or cell phone, and used the clinic pharmacy for prescription(s).

Data Collection

Patients were assigned a project number to maintain confidentiality, and agency HIPAA procedures were followed. Completed MGL scales and all identifiable and non-identifiable project data were stored in a locked file cabinet in the DON locked office. All completed final analyses were maintained on an encrypted and password-protected project laptop. After completion of the project, any printed documents were shredded.
Measures

The MGL Medication Adherence Scale is a validated screening tool designed to assess medication non-adherence in adults (Morisky, Green, & Levine, 1986). The MGL Medication Adherence Scale can identify adherence behavior in many chronic disease populations with scores correlating well with objective adherence measures and clinical outcomes (Morisky et al., 1986; Wang, Lee, Toh, Tang, & Ko, 2012). Acceptable reliability with a Cronbach's alpha of >0.70 has been reported (Beyhaghi, Reeve, Rodgers, & Stearns, 2016) with this scale. The MGL Adherence Scale has several advantages: it is short, easy to score, and very adaptable for various groups of medication. Items on the scale address barriers to medication taking and permit the reinforcement of positive adherence behaviors. The total score is based on patient responses to four "yes" or "no" questions. High adherence is measured by not answering "yes" to any of the four questions, medium adherence is measured by answering ‘yes" to one or two of the four questions, and low adherence is measured by answering ‘yes" to three or four of the four questions. The scale allows for the correct screening for those in which time should be spent on improving medication adherence. Permission to use the scale for this QI project was obtained (Donald E. Morisky, personal communication, November 3, 2018).

Procedure

Patients with primary HTN were initially assessed with the MGL Medication Adherence Scale. Those identified as having medium or low adherence were included in the project. Immediately following the provider visit, the project leader administered the MGL Medication Adherence Scale to a patient and scored it. If criteria were met for medium or low adherence, a personalized medication pill card was created of current antihypertensive medication(s). The project leader used scripted education material to educate a patient on HTN, non-adherence and
the use of the personalized pictogram medication pill card. A patient was informed of follow up phone calls for pill count on day one and 30.

**Results**

Data were collected and analyzed using the most recent edition of Microsoft Excel. Demographic data included age, gender, and race/ethnicity. The primary outcome measure for medication adherence was pill count. The reported pill count was compared to the patients’ expected pill count to calculate the adherence percentage. Adherence was calculated using the equation recommended by Vik, Maxwell, and Hogan (2003):

\[
\text{% of adherence} = \frac{\text{# of Pills taken}}{\text{# of pills that should have been taken}} \times 100
\]

Sixteen patients with primary HTN were initially identified for the project; ten participated in this project. Six patients did not participate because they initially perceived the pill card development would take too long. Participants were both male (n=6) and female (n=4) and had a mean age of 44.5 ± 13.90. The majority (nine) were African American; one patient was Hispanic.

The mean pre-MGL score was 2.64 ± 2.58 (Table 1). All participants were identified as having low or medium risk for non-adherence based on the MGL Scale assessment (Table 2). Seventy percent of patients indicated that they sometimes forget to take their antihypertensive medication; eighty percent of patients indicated that they were careless at times with taking their medication(s); thirty percent of the patient indicated that when they felt better, they stopped taking their medication(s); ten percent indicated that when they felt worse when they took their medication(s), they stop taking it. Medium adherence was the most common result of the MGL Scale assessment.
On day 30 a post MGL scale was conducted to compare mean scores. Post MGL score mean was 0.1 ± 0.32 (Table 1). All but one participant had high adherence on the post MGL Scale (Table 2).

All participant rated the pill card as easy to use and a helpful reminder tool for adherence. One of the participants who completed the intervention provided feedback that “including pre/post B/P readings” would have been beneficial to the program. The participant who had medium adherence after completion of the intervention reported her work schedule interfered with her ability to take her medication on the two days, she forgot to take it.

Table 1:

**Pre- and Post-Intervention Mean MGL Scores**

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2.64 ± 2.58</td>
<td>0.1 ± 0.32</td>
</tr>
</tbody>
</table>

Table 2:

**Pre- and Post-Intervention MGL Medication Adherence Scale Findings**

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Adherence</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Medium Adherence</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

**Discussion**

**Summary Review and Key Findings**

The purpose of this project was to implement a pill card intervention to be used for adults diagnosed with HTN who received care in one primary care setting. The overarching goal of the project was to develop a standard process of care in the primary care practice setting that improved medication adherence among hypertensive patients. The project implementation
process involved adherence screening, educating patients on HTN and non-adherence, and initiation of the personalized pill card intervention.

**Clinical Implication**

The pill card intervention improved medication adherence in nine out of the 10 HTN patients who initially reported low to medium adherence. Data from this project revealed a similar pattern to that reported in the literature (Kripalani et al., 2007, Monroe et al., 2018). Findings of this project in that 90% of patients showed improved medication adherence after participating in the pill card intervention. Mean adherence score was 99.33 ± 2.12. Screening and education methods specifically designed for patients at risk for medication adherence becomes essential in addressing this need.

**Feasibility**

Agency providers and staff were motivated and willing to participate in the project to improve the medication adherence of identified clinic patients. The time required to administer the MGL scale, deliver the pill cards and short teaching lessons, and collect pill counts was quite feasible in this clinic setting. The pill cards were well accepted by the patients in the project. Overall, the project was simple to implement and provided easily obtainable outcomes to demonstrate pill count accuracy. Patient education with pill cards fit well in the flow of patient visits. The development of the cards required little cost, and because the majority of agency patients have prescriptions filled on-site, pill picture accuracy was assured.

**Sustainability and Recommendations**

This project provided valuable information regarding the development and implementation of a pill card intervention in the primary care setting. Pre-intervention assessment with the MGL scale revealed that many patients have problems with medication
adherence. These findings also supported the need for healthcare provider interventions that appropriately identify and address risk factors for poor medication adherence. The pill card intervention developed and implemented through this project is recommended to continue as a standard of practice in the primary care setting. The DON of the project clinic is considering permanent implementation of pill cards. One of the clinic doctors has already started screening her patients with the MGL Medication Adherence Scale. Equipping healthcare providers and staff to assess and treat medication non-adherence is an appropriate method of improving patient medication adherence and thus promoting improved health outcomes.

Limitations

The most notable limitation was the low number of patients in the project. The inclusion criteria of only using patients with HTN diagnosis and not including all patient medications limited participation but was necessary to pilot this intervention. Only patients with primary HTN were included due to concern that patients with multiple prescriptions would misunderstand the use of their pill cards and discard other prescribed medications for which there was no pill card.

Conclusion

Poor adherence to antihypertensive medication is a significant risk factor for CVD and stroke (CDC, 2018). HTN requires both immediate behavioral change and long-term behavior maintenance to manage the disease and prevent complications. Primary care settings are appropriate sites to implement proactive strategies such as the screening, education, and adherence tools used in this project. Educating patients with pill cards as the standard of practice could improve HTN control, decrease the complications, and reduce overall healthcare costs. Although this QI project yielded small-scale results due to the small sample size of the project
and short intervention period, the feasibility of the pictogram pill card-based education in the outpatient setting and the value of this education for patients were demonstrated.
References


