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Motivational Interviewing in Diabetes Education and Adherence Assessment (MIiDEA)

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Abstract

Background: People living with diabetes are often taking multiple medications for glycemic control. There is an inverse relationship between the complexity of the medication regimen and adherence. Motivational interviewing has been shown to improve medication adherence in chronic disease state management.

Objectives: Evaluate the use of motivational interviewing and the impact on medication adherence and hemoglobin A1C (A1C) levels.

Methods: This single-center, quality improvement study included adult participants enrolled in a Diabetes Self-Management, Education, and Training program. All patients completed a Morisky Medication Adherence Scale and had A1C and other clinical biomarkers recorded at baseline and each additional encounter. Proportion of days covered (PDC) was calculated for the six months prior to and after study enrollment.

Results: The greatest percent reduction in body mass index (-0.5%) and blood pressure (-3.5% average) occurred in subjects attending group classes, while the greatest percentage reduction for A1C occurred in subjects attending individual sessions only (-7.1%). PDC increased in subjects attending group sessions (47.2%, p=.008) and decreased in subjects attending individual sessions only (-32.6%, p=.035).

Conclusion: Motivational interviewing, applied in a group setting and in a repeated format, is more impactful on improving medication adherence than individual education or single application alone.

1 Introduction

Approximately 24% of people in the U.S. take three or more medications daily. (Centers for Disease Control and Prevention [CDC], 2018) This number is generally higher for patients suffering from chronic disease states such as diabetes. (U.S. Department of Health & Human Services [HHS], 2010) An inverse relationship exists between the adherence rates and the number of times per day a patient has to take medications. (Donnan et al., 2002; Saini, 2009) While there is no exact configured average for the number of medications patients with diabetes take, regimens often consist of more than one medication, and several of the available medications need to be administered multiple times a day. According to the National Diabetes Statistics Report, in 2020there were approximately 34.1 million adults in the U.S. with diabetes. (CDC, 2020)Survey data collected from 2007 to 2010 found that 88% of persons age ≥ 20 years with diagnosed diabetes were taking insulin and/or oral medications. (CDC, 2012)

Medication adherence is the frequency and consistency of a person taking their medications compared with how the medications are prescribed to be taken. Medication adherence is defined as taking medications correctly at least 80% of the time. (New England Healthcare Institute [NEHI], 2009) Taking medications properly has been found to be a very important marker for control of chronic disease states and improved medication adherence has been associated with improved hemoglobin A1C(A1C) levels.(Rozenfeld et al., 2008; Krapek et al., 2004; Lawrence et al, 2006) It is estimated that about 50% of adults do not take their medications exactly as prescribed. (Brown & Bussell, 2011) Not taking medications properly, known as medication non-adherence, is estimated to cost the healthcare system about $290 billion yearly and is associated with an increased risk of hospitalization. (NEHI, 2009) In a study assessing the effect of non-adherence on hospital admissions, patients with diabetes who took their medications as directed less than 80% of the time were found to be 2.5 times more likely to be admitted to the hospital. (Lau & Nau, 2004)

Reasons for non-adherence can vary greatly, but most fall under six major categories: (Osterberg & Blaschke, 2005; Vermeire et al., 2001)

1. Knowledge: Unsure of what to do, underestimate importance, unclear about effects
2. Attitudes: Embarrassment about or denial of disease, cultural beliefs, desire to save money
3. State of health: Feel fine without taking it, feel bad or have side effects when taking it, poor memory, co-morbid disease states
4. Support: No person or system to remind or assist them, responsibility for many other life aspects, no healthcare team
5. Literacy: Unable to read or interpret instructions, not sure when to use a particular medication or what each medication is for
6. Access: Unable to afford medications, unable to get to pharmacy to pick up medicines or office to get prescriptions

Several strategies have been tested and determined to assist patients in improving medication adherence. Motivational interviewing, a way of talking with patients to encourage and inspire them to commit to change, has been studied and demonstrated improved medication adherence in chronic disease state management. (DiIorio et al., 2003; Safren et al., 2001; Schmaling et al., 2000; Rosen et al., 2002; Odedegbe et al., 2008).

Motivational interviewing has also been used as a technique to improve A1C levels in teenagers with diabetes. (Channon et al., 2007) In addition, educating patients on the purpose of their medications and how each one works to help manage their disease has been shown to improve adherence in patients with a complex drug regimen as a result of their increased medication knowledge. (Schrader et al., 1996) This is especially important for patients with diabetes because they are predisposed to multiple chronic conditions, resulting in a state of "polypharmacy", or the use of many medications by a patient. (Austin, 2006) Polypharmacy can be of concern becausemany patients who have complex drug regimens subsequently demonstrate lower adherence rates. (Donnan et al., 2002; Saini et al., 2009) Other strategies such as using electronic reminders, medication therapy services, pill boxes and reminder calls have also been associated with improved adherence and diabetes control outcomes. (Morello et al., 2011; Petersen et al., 2007; Ostrop & Gill, 2000; Vervloet et al., 2012; Branham et al., 2013; Strand et al., 2007)

The purpose of this single-center, quality improvement study was to evaluate the use of motivational interviewing and the impact on medication adherence and A1C levels for patients enrolled in a Diabetes Self-Management, Education, and Training (DSMET) program.

2 Methods

The pharmacist-led DSMET program at the University of Toledo serves adult patients with diabetes in an urban area and is nationally accredited by the American Association of Diabetes Educators (AADE). For most patients, the program consists of a one-hour, face-to-face initial individual assessment with the educator, followed by a series of four monthly group education sessions lasting two hours each. After the patient has successfully completed the group education classes, there is a one-hour individual follow-up appointment with the diabetes educator. Patients are enrolled in the program on a continuing basis. A patient generally completes one entire course of the program, from initial visit to follow-up, in approximately six months, providing the patient with a total of 10 hours of contact time with the diabetes education team.

Patients enrolled in the DSMET program scheduled to attend an individual education session over a 12-month period were recruited for inclusion in the study. Study participants completed the eight-point Morisky Medication Adherence Scale (MMAS) during the initial assessment with the diabetes educator and at each subsequent group session to measure patient self-reported adherence. (Morisky et al., 2008) A score greater than or equal to eight was considered high risk of non-adherence; a score between six and eight points indicated a medium risk; and a score less than six indicated a low risk of non-adherence. Regardless of the patient's self-reported adherence score, the educator used motivational interviewing techniques to determine barriers to medication adherence, develop methods to remove those barriers, and to encourage subjects to create and reach individualized goals for improvement. Educators were trained in motivational interviewing through completion of the Comprehensive Motivational Interviewing Training (comMIt) Program offered by Physician's Institute and completion of the AADE webinar "Motivational Interviewing: An Approach to Behavioral Change". Educators also used Medication Therapy Management Services (MTMS) as needed, which included reviewing all medications and their uses with patients, making recommendations for change to physicians if necessary, and providing patients with a personalized medication record.

Baseline clinical biomarker results (within the past three months of the initial encounter) were collected from the electronic medical record including A1C, blood pressure (BP), and body mass index (BMI) for participants who provided consent to be in the study. Follow-up results of the same clinical biomarkers were recorded at each subsequent group education session, or within three months for A1C. Sex and age at the time of study enrollment were also recorded. Proportion of days covered (PDC) was calculated for the six months prior to and after study enrollment to determine adherence. (Fairman & Motheral, 2000)PDC is used to estimate medication adherence by looking at the proportion of days in which a person has access to the medication, over a given period of interest. The standard PDC that was used in the DSMET program to categorize patient adherence was 80% or above. (NEHI, 2009)

The primary outcome of this study was to detect a difference in medication adherence using the number of patients at baseline PDC goal (≥80%) compared to whether or not they had at least a 10% improvement in PDC or remained at goal.

Differences in MMAS and clinical biomarkers between participants attending individual sessions only and those who attended at least one group class were explored as secondary outcomes. An independent-samples t-test was run to determine if there were differences in baseline biomarkers between groups. An exact McNemar's test was run to determine if there was a difference in the proportion of patients at PDC goal at baseline and at six months after study enrollment. Paired-samples t-tests were run to detect differences in means from baseline to the end of the study period.A *p*value less than 0.05 was determined a priori to be statistically significant. All statistical analyses were performed using SPSS Statistics for Windows, Version 23 (IBM Corp; Armonk, NY).The study was approved by the University of Toledo, Social, Behavioral & Educational Institutional Review Board.

3 Results

Data are presented as mean ± standard deviation, unless otherwise stated. There were a total of 39 participants enrolled in the study (individual only, n=26, individual + group classes, n=13). There were no significant differences at baseline between the two groups in terms of demographics or baseline clinical biomarkers except for PDC. (Table 1) The PDC was higher for participants attending an individual session only (92% ± 17%) than those who progressed to also attend group sessions (53% ± 27%), a statistically significant difference of 40% (95% CI, 16 to 64, t(14)=4%, *p*=.003).

Table 1. Baseline Characteristics

	Individual Only (n=26)	Individual + Group (n=13)	*p* value
Gender (male/female) n (%)	7 (26.9)/19 (73.1)	6 (46.2)/7 (53.8)	.241
Age (years)	54.5 ± 13	55.1 ± 13.3	.744
A1C (%)[a]	9.8 ± 2.1 (n=24)	8.5 ± 1.6	.062
SBP (mmHg)[a]	132 ± 14 (n=24)	129 ± 13	.556
DBP (mmHg)[a]	78 ± 10 (n=24)	77 ± 8	.684
BMI (kg/m^2)	34.3 ± 8.3	38 ± 11.6	.262
PDC (%)[a]	92 ± 17 (n=11)	53 ± 27 (n=5)	**.003**
MMAS[a]	3 ± 1.4 (n=2)	2.4 ± 2 (n=8)	.702
No. prescription medications[a]	10 ± 3 (n=2)	13 ± 9 (n=8)	.670

[a]data not available for all participants

SD=standard deviation; A1C=hemoglobin A1C; SBP=systolic blood pressure; DBP=diastolic blood pressure; BMI=body mass index; PDC=proportion of days covered; MMAS=Morisky Medication Adherence Scale

Medication adherence was assessed using PDC and MMAS. Data on PDC was collected for 16 participants that took part in this study. (Table 2) Ten subjects (62.5%) had an individual PDC at goal of ≥80% for the six months prior to study enrollment. At the end of the study, seven subjects had a PDC of ≥80% for the six months following their study enrollment date and two participants had a PDC increase or more than 10% from baseline (total n=9, 56.3%). The proportion of patients at PDC goal decreased from a pre-intervention value of 0.625 to 0.563 post-intervention (*p*=1). Subjects attending only one individual session had a 32.6% decrease in PDC (n=5, *p*=.035) while those attending group classes had a 47.2% increase in PDC (n=11, *p*=0.008).The differences detected in both groups were statistically significant.There were no statistically significant differences for either of the study groups when assessing MMAS.

Table 2. Medication Adherence Measurement Results

	Baseline	Follow-up	% Change	*p* value
PDC (%)				
Individual only (n=11)	92 ± 17	62 ± 41	32.6% decrease	**.035**
Individual + Group (n=5)	53 ± 27	78 ± 22	47.2% increase	**.008**
MMAS				
Individual only (n=2)	3 ± 1.4	1.5 ± 2.1	50% decrease	.205
Individual + Group (n=8)	2.4 ± 2	2.8 ± 3	16.6% increase	.662

SD=standard deviation; PDC=proportion of days covered; MMAS=Morisky Medication Adherence Scale

The results for changes to clinical biomarkers over time in each study group are presented in Table 3. In general, participation in diabetes education regardless of session type resulted in a decrease in clinical biomarker levels from baseline, except for SBP in those who attended individual sessions only. The greatest percentage reduction in BMI and both systolic and diastolic BP occurred in subjects attending group classes, while the greatest percentage reduction for A1C occurred in subjects attending individual sessions only. There were no statistically significant differences detected (p>.05) for this analysis.

Table 3. Clinical Biomarkers

	Baseline	Follow-up	% Change	*p* value
A1C(%)				
Individual only (n=24)	9.8 ± 2.1	9.1 ± 2	7.1% decrease	.090
Individual + Group (n=13)	8.5 ± 1.6	8 ± 2	5.9% decrease	.443
BMI(kg/m^2)				
Individual only (n=26)	34.3 ± 8.3	34.2 ± 8.2	0.3% decrease	.247
Individual + Group (n=13)	38 ± 11.6	37.8 ± 11.5	0.5% decrease	.379
SBP(mmHg)				
Individual only (n=24)	132 ± 14	133 ± 17	0.8% increase	.770
Individual + Group (n=13)	129 ± 13	125 ± 10	3.1% decrease	.289
DBP(mmHg)				
Individual only (n=24)	78 ± 10	76 ± 10	2.6% decrease	.113
Individual + Group (n=13)	77 ± 8	74 ± 8	3.9% decrease	.307

SD=standard deviation; MMAS=Morisky Medication Adherence Scale; A1C=hemoglobin A1C; BMI=body mass index; SBP=systolic blood pressure; DBP=diastolic blood pressure

4 Discussion

The purpose of this study was to determine if the use of motivational interviewing techniques applied in a DSMET program had an impact on medication adherence. Overall, PDC decreased by

32.6% for patients attending an individual session only while there was a 47.2% increase in PDC measured for those patients who progressed to attend group classes. These findings suggest that estimated medication adherence improved over time for patients attending group classes. Further research needs to be performed to determine if the frequency of exposure to motivational interviewing techniques has a positive impact on clinical biomarkers.

This study of the impact of incorporating motivational interviewing techniques in diabetes education sessions on medication adherence has multiple strengths. Broad inclusion criteria with no exclusions produced a study population which was representative of the target population in the area, potentially allowing results to be more generalizable. Use of the pre-/post-intervention design in this study helped to determine the significance of the use of the motivational interviewing techniques in this diabetes education program. Participants who progressed to complete group classes were followed over a longer period of time than those who only participated in an individual appointment.

One of the biggest limitations to consider is patient loss to follow-up. Several patients agreed to enroll in the project, expressed interest in attending group education classes, and then never attended a group session or did not attend all of the group sessions. The group classes were held once a month in the mornings but a weekly evening option was also available in an attempt to increase patient attendance. Overall, the evening classes were not well attended but did allow one participant enrolled in the study to attend six out of eight total hours of class.

The investigators also encountered difficulty in obtaining refill histories from pharmacies in order to calculate PDC for medication adherence. Pharmacists were either reluctant to provide the information when requested or stated that they were too busy to take the time to look up the data. Patients also provided incomplete information on the locations where they fill their prescriptions even though they were specifically asked to list every pharmacy where they fill their chronic medications on the intake form. It was also determined that calculating PDC for all medications individually was too cumbersome of a process for the investigators and the pharmacies. This study only focused on PDC for diabetes medications, medications proven to prevent complications (i.e. statins, ACE-inhibitors/ARB's, aspirin), and mental health medications (i.e. depression). Future studies could consider assessing PDC for all prescribed chronic medications.

5 Conclusion

The greatest percentage reduction in BMI and both systolic and diastolic BP occurred in subjects attending group classes, while the greatest percentage reduction for A1C occurred in subjects attending individual sessions only.PDC increased in those subjects who attended group sessions and decreasedfor subjects attending individual sessions only. This may indicate that motivational interviewing, applied in addition to the group atmosphere and in a repeated format, is more impactful on improving medication adherence than individual education or single application alone.

Conflict of Interest Statement:

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References

Austin, R.P. (2006). Polypharmacy as a Risk Factor in the Treatment of Type 2 Diabetes. *Diabetes spectrum,* 19 (1): 13–16.

Branham, A. R., Katz, A. J., Moose, J. S., Ferreri, S. P., Farley, J. F., & Marciniak, M. W. (2013). Retrospective Analysis of Estimated Cost Avoidance Following Pharmacist-Provided Medication Therapy Management Services. *Journal of Pharmacy Practice*, 26(4), 420–427.

Brown, M. T., & Bussell, J. K. (2011). Medication adherence: WHO cares?. Mayo Clinic proceedings, 86(4), 304–314.

Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2020. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2020.

Channon, S. J., Huws-Thomas, M. V., Rollnick, S., Hood, K., Cannings-John, R. L., Rogers, C., & Gregory, J. W. (2007). A multicenter randomized controlled trial of motivational interviewing in teenagers with diabetes. *Diabetes care*, 30(6), 1390–1395.

DiIorio, C., Resnicow, K., McDonnell, M., Soet, J., McCarty, F., & Yeager, K. (2003). Using motivational interviewing to promote adherence to antiretroviral medications: a pilot study. The *Journal of the Association of Nurses in AIDS Care*, 14(2), 52–62.

Donnan, P. T., MacDonald, T. M., & Morris, A. D. (2002). Adherence to prescribed oral hypoglycaemic medication in a population of patients with Type 2 diabetes: a retrospective cohort study. *Diabetic medicine: a journal of the British Diabetic Association*, 19(4), 279–284.

Fairman, K.A. & Motheral, B. (2000). Evaluating medication adherence: which measure is rightyou're your program? *Journal of managed care pharmacy,* 6(6), 499-506.

Krapek, K., King, K., Warren, S. S., George, K. G., Caputo, D. A., Mihelich, K., Holst, E. M., Nichol, M. B., Shi, S. G., Livengood, K. B., Walden, S., & Lubowski, T. J. (2004). Medication adherence and associated hemoglobin A1C in type 2 diabetes. *The Annals of pharmacotherapy*, 38(9), 1357–1362.

Lau, D. T., & Nau, D. P. (2004). Oral antihyperglycemic medication nonadherence and subsequent hospitalization among individuals with type 2 diabetes. *Diabetes care*, 27(9), 2149–2153.

Lawrence, D. B., Ragucci, K. R., Long, L. B., Parris, B. S., & Helfer, L. A. (2006). Relationship of oral antihyperglycemic (sulfonylurea or metformin) medication adherence and hemoglobin A1C goal attainment for HMO patients enrolled in a diabetes disease management program. *Journal of managed care pharmacy*, 12(6), 466–471.

Morello, C. M., Chynoweth, M., Kim, H., Singh, R. F., & Hirsch, J. D. (2011). Strategies to Improve Medication Adherence Reported by Diabetes Patients and Caregivers: Results of a Taking Control of Your Diabetes Survey. *The Annals of pharmacotherapy*, 45(2), 145–153.

Morisky, D. E., Ang, A., Krousel-Wood, M., & Ward, H. J. (2008). Predictive validity of a medication adherence measure in an outpatient setting. *Journal of clinical hypertension* (Greenwich, Conn.), 10(5), 348–354.

National Center for Health Statistics. (2012) *National health and nutrition examination survey*. Centers for Disease Control and Prevention. http://www.cdc.gov/nchs/nhanes.htm.

National Center for Health Statistics. (2018) *Therapeutic Drug Use*. Centers for Disease Control and Prevention. https://www.cdc.gov/nchs/fastats/drug-use-therapeutic.htm

New England Healthcare Institute. *Thinking outside the pillbox: a system-wide approach to improving patient medication adherence for chronic disease*. Cambridge, MA: New England Healthcare Institute; 2009.

Ogedegbe, G., Chaplin, W., Schoenthaler, A., Statman, D., Berger, D., Richardson, T., Phillips, E., Spencer, J., & Allegrante, J. P. (2008). A practice-based trial of motivational interviewing and adherence in hypertensive African Americans. *American journal of hypertension*, 21(10), 1137–1143.

Osterberg, L., & Blaschke, T. (2005). Adherence to medication. *The New England journal of medicine*, 353(5), 487–497.

Ostrop, N. J., & Gill, M. J. (2000). Antiretroviral medication adherence and persistence with respect to adherence tool usage. *AIDS patient care and STDs*, 14(7), 351–358.

Petersen, M. L., Wang, Y., van der Laan, M. J., Guzman, D., Riley, E., & Bangsberg, D. R. (2007). Pillbox organizers are associated with improved adherence to HIV antiretroviral therapy and viral suppression: a marginal structural model analysis. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*, 45(7), 908–915.

Rosen, M., Ryan, C., & Rigsby, M. (2002). Motivational Enhancement and MEMS Review to Improve Medication Adherence. *Behaviour Change*, 19(4), 183-190.

Rozenfeld, Y., Hunt, J. S., Plauschinat, C., & Wong, K. S. (2008). Oral antidiabetic medication adherence and glycemic control in managed care. *The American journal of managedcare*, 14(2), 71–75.

Safren, S. A., Otto, M. W., Worth, J. L., Salomon, E., Johnson, W., Mayer, K., & Boswell, S. (2001). Two strategies to increase adherence to HIV antiretroviral medication: life-steps and medication monitoring. *Behaviour research and therapy*, 39(10), 1151–1162.

Saini, S. D., Schoenfeld, P., Kaulback, K., & Dubinsky, M. C. (2009). Effect of medication dosing frequency on adherence in chronic diseases. *The American journal of managed care*, 15(6), e22–e33.

Schmaling, K. B., Afari, N., & Blume, A. W. (2000). Assessment of psychological factors associated with adherence to medication regimens among adult patients with asthma. *The Journal of asthma : official journal of the Association for the Care of Asthma*, 37(4), 335–343.

Schrader, S. L., Dressing, B., Blue, R., Jensen, G., Miller, D., & Zawada, E. T. (1996). The Medication Reduction Project: combating polypharmacy in South Dakota elders through community-based interventions. *South Dakota journal of medicine*, 49(12), 441–448.

Strand L.M., Cipolle R.J., & Frakes M.J. (2007). Medication adherence: improved results with comprehensive medication therapy management services. Medication Management Systems, Inc.

U.S. Department of Health & Human Services. Multiple chronic conditions—A strategic framework: optimum health and quality of life for individuals with multiple chronic conditions. U.S. Department of Health & Human Services, Initiative on Multiple Chronic Conditions; 2010.

Vermeire, E., Hearnshaw, H., Van Royen, P., & Denekens, J. (2001). Patient adherence to treatment: three decades of research. A comprehensive review. *Journal of clinical pharmacy and therapeutics*, 26(5), 331–342.

Vervloet, M., Linn, A. J., van Weert, J. C., de Bakker, D. H., Bouvy, M. L., & van Dijk, L. (2012). The effectiveness of interventions using electronic reminders to improve adherence to chronic medication: a systematic review of the literature. *Journal of the American Medical Informatics Association*, 19(5), 696–704.