Patient Education and Medication Adherence

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Abstract

**Purpose/Aims:** The purpose of this project was to evaluate how patient education can improve medication adherence.

**Background and Significance:** An exhaustive literature search was conducted with critical appraisal and evidence synthesis to evaluate the effectiveness of patient education on medication adherence. The search concluded that adherence is crucial to chronic disease processes. However, there was no one intervention that emerged as being superior for improving medication adherence. Working with patients individually to address needs through a variety of methods appeared to be the best way to improve medication non-adherence.

**Methods:** A project to improve medication adherence in an outpatient mental health clinic incorporated electronic medical record (EMR) technology with patient education materials. The project evaluated provider satisfaction with the EMR handout system and evaluated providers’ perceptions of improved medication adherence. Providers (n=9) were followed for eight weeks once system was live. Appraisal was conducted on the providers and pre-test, mid project test, and an eight-week post-test were administered. The instrument used was the Technology Acceptance Model-2 (TAM-2).

**Outcomes:** Friedman Test was conducted. Results obtained showed no significant difference between the three tests ($\chi^2 (2) = 2.889, p>0.05$). The pretest had a standard deviation of 14.24. The posttest standard deviation was 23.75.

**Conclusion:** Providers educate patients about a variety of topics such as chronic conditions and wellness. It is beneficial to focus on education more broadly, instead of only medication adherence.

**Keywords:** patient education, medication adherence, physician perceptions
For Ryan, Emma, & Max. I couldn’t have completed this or the past four years possible without your enduring love, support, and belief in me. I never could have imagined that I would be here now and it is all thanks to you. Your love has made me who I am and who I will forever be. I aspire to be the best wife and mom thanks to you. This is all for you.
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Chapter 1: Introduction

Background and Significance

Adherence vs. Compliance

The terms “adherence” and “compliance” are sometimes used interchangeably in medicine. Yet the words have different connotations. Merriam-Webster (2016) defines adherence as “the act of doing what is required by a rule, belief” (para 1). Compliance is defined as “the act or process of doing what you have been asked or ordered to do” (Merriam-Webster, para 1, 2016). The term “adherence” can be seen as preferable because it implies that a relationship or alliance has been established whereas compliance purports that the patient is following an order given to him by the doctor (Osterberg & Blaschke, 2005). The term compliance is identified as being a passive term whereas adherence implies that the patient is in accord with recommendations (Brown & Bussell, 2011). Another important distinction to make between adherence and compliance is that adherence allows the provider to build a partnership with the patient (Gould & Mitty, 2010). No longer is the provider dictating to the patient how and when he is to do things, but instead, through the use of adherence, the perspective is that care is a collaborative effort for the patient to eventually achieve “self-mastery” (Gould & Mitty, 2010, p. 2010).

Barriers to Adherence

Barriers to a collaborative effort and improved patient outcomes can be difficult to overcome. The WHO (2003) cites the following as barriers to adherence: disease state, treatment regimen, healthcare system/provider-patient relationship, socioeconomic factors, and personal patient qualities. One meta-analysis explored the patient-provider relationship specifically and found that physicians tend to not get adequate training on how to effectively communicate with
patients which in turn negatively impacts adherence (Haskard-Zolnierek & DiMatteo, 2009). There was a 19% greater risk of poor adherence related to a lack of effective communication skills from the healthcare provider (Haskard-Zolnierek & DiMatteo, 2009).

By categorizing the barriers to adherence presented by WHO (2003) into three main categories, it allows for better focus on the problem. Three main categories are: patient-related factors, physician-related factors, and health system/team building-related factors (Brown & Bussell, 2011). Patient-related factors include the patient’s ability to be motivated to receive care, previous perceptions and experiences with therapies, “lack of understanding of their disease, lack of involvement in the treatment decision—making process, and suboptimal medical literacy,” (p. 306). Physician-related factors include the prescribing of intricate drug regimens without adequately explaining or educating the patient about things such as adverse reactions. Health system/team building related factors look at “fragmented health care systems” (p. 307) where coordination of care and access to care are nearly impossible; this also includes the barrier to adherence in relation to lack of time. Clinicians are expected to see a vast number of patients in very short periods of time. Time constraints during patient assessments impede clinicians from appropriately having engaging conversation or dialoguing with patients about the importance of medication adherence or ways to ensure long-term adherence to ensure treatment goals and objectives can be met (Brown & Bussell, 2011). This barrier is familiar to any practitioner and can impede the ability to properly provide appropriate PE.

**PE and Adherence**

“Patient education begins in the doctor’s office but should not end there,” (Young et al., 2006, p. 1176). Collaborative patient education can make patients feel as though they are empowered participants of their care. Physicians do not spend enough time discussing what
patients want to know about with regards to antidepressant therapy (Young et al., 2006). When patients are not properly informed about medications such as antidepressants with information such as how long they should wait before seeing results and that using the medication over at least 4-12 weeks may improve efficacy, the ability to encourage adherence diminishes significantly (Young et al., 2006)

A systematic review was conducted to evaluate effective teaching strategies for delivering PE. The data shows that PE can be disseminated in a variety of ways (computers, audio, video, and verbal), however it is patient specific and specific to the situation (Friedman et al., 2011). In order for PE to be the most success, PE should be delivered in a variety of different modalities and should always be culturally sensitive and specific (Friedman et al., 2011)

An educational program was developed which involved PE in a group and asked patients to adopt a reminder activity daily. This activity would prompt the patient to take their medication daily. Results found that over 90% of the cases found the reminder activity helpful and, in turn, helped cut back on non-adherence rates (Kardas, 2013)

Bipolar disorder is a psychiatric disorder that requires a great deal of PE due to the impact that non-adherence can have on patients. By implementing a psychoeducational group along with psychiatric medication to treat bipolar disorder over a 2-year period allowed patients to have a “significant improvement in all areas of quality of life, number of relapses, and hospitalizations due to…medication compliance” (Javadpour, Hedayati, Dehbozorgi, & Azizi, 2012, p. 208). Another study found that a nurse led educational programs were beneficial in improving patient adherence in patients with bipolar disorder (Eker and Harkin, 2012).

A systematic review performed a review of 75 systematic reviews to evaluate the effectiveness of interventions directed at clients and medication efficacy. The review was aimed
at showing what ways promoted efficacy and safety most successfully. The review found that providing education unaided may be ineffective in providing long-term adherence for patients, however it showed to be effective in improving knowledge for patients; by improving knowledge for patient, this showed that clients made more informed medication choices long-term (Ryan et al., 2014).

A systematic review conducted a review of 182 systematic reviews and randomized controlled trials (RCT) to evaluate effects of a variety of interventions on medication adherence and clinical outcomes. Results varied greatly and the studies that were deemed to be of the highest quality were also complex in nature in their interventions. These studies had a variety of interventions to attempt to improve medication adherence. Few studies showed how medication adherence can consistently be enhanced. Also, only five RCTs were able to improve both adherence and clinical outcomes (Nieuwlaat et al., 2014).

**Technology and Medication Adherence**

As the medical community moves towards using health information technology (HIT), it is important to evaluate its effectiveness. Fang, Peifer, Chen, and Rizzo (2011) found that HIT improved physicians' awareness for the need to provide quality health care. Through the use of HIT, clinicians are mindful of their patients' care more readily than before. A systematic review of 119 articles found that HIT implementation led to improved medication adherence, improved staff productivity, improved patient-provider collaborations, and cost savings (Police, Rachel & Foster, 2011). Although there are numerous benefits to the implementation of HIT, there still appears to be barriers to the transition of fully operational EMRs; there also appears to be less emphasis in the literature on this topic as well (Police et al., 2011).

Through the use of adherence rather than compliance, a collaborative partnership is
created between the clinician and the patient to achieve the common goal of having the patient achieving self-mastery. PE is beneficial in improving adherence in patients and can be used by clinicians to build a tenacious relationship between clinician and patient. Although barriers to adherence are present, it is important to not lose sight of the importance of the end goal, and work through the barriers for the improved outcome of the patient which is to have the patient achieve self-mastery. HIT has shown to help improve physician cognizance to improve patients’ need for improved care and this includes improving medication adherence.

Internal Evidence

In a suburban, private, outpatient mental health clinic in the East Valley, which has one physician, one physician assistant, three nurse practitioners, three medical assistants, and one licensed professional counselor, patient adherence is evaluated on a daily basis by practitioners. Practitioners assess for adherence through subjective measurement (asking patients and family members about adherence) and objective measurement (requesting pharmacy records). Practitioners face daily problems of not being able to provide PE effectively to more adequately address adherence.

Problem Statement

Currently the clinic has no set protocol on how much time is spent on PE with regard to medication education or diagnosis education between practitioner and patients. The providers feel that if there was a way this could be prompted and documented through the use of their electronic medical record system (EMR), not only would it help facilitate the implementation of a regular protocol, but they feel their patient population would be more receptive to it as well (L. Amezcua-Patino, personal communication, September 29, 2014). The providers would also feel more adequately prepared to provide PE when seeing patients if they had a system within the
EMR which was simple and user-friendly. This inquiry has led to the clinically relevant PICOT question: In an outpatient, private mental health clinic, how does provider satisfaction and the use of educational handouts with patients as opposed to not using educational handouts and not feeling prepared affect provider perception of patient adherence to prescribed medications within 8 weeks?

**Search Strategy and Process**

Exhaustive search of the clinical literature and inquiry involved various search methods to narrow down the most appropriate evidence to support the use of patient education to improve medication adherence. Databases searched were ERIC ProQuest, PubMed, CINAHL, and Cochrane Library. Keywords searched included: *patient education, adherence, medication adherence, and psychiatry*. The “AND” Boolean operator was used throughout all searches to help as an inclusive searching strategy. Initially, *patient education* and *adherence* yielded the most results on all databases: ERIC ProQuest 151 results, PubMed 3803 results, CINAHL 1706 results, and Cochrane Library 16 results. By changing the search terms to *patient education* and *medication adherence* on all databases, results became more limited allowing for more clarity on subject matter. Final yields when using *patient education* and *medication adherence* were ERIC ProQuest 44 results, PubMed 1087 results, CINAHL 354 results, and Cochrane Library 7 results. When the search term *psychiatry* was added to the databases ERIC Proquest, PubMed, and CINAHL for searching, the results were limited too strictly, excluding too many studies. Cochrane Library results were zero when searching with the term *psychiatry* was included. PubMed’s results were quite high (1087 results) so a rapid appraisal of these studies was conducted to determine which studies were most appropriate for topic at hand.
Exclusion criteria used during searches included studies published before 2005, studies written in languages other than English, and doctoral dissertations. Only items published in scholarly journals were selected during the search processes as well in ERIC Proquest, PubMed, and CINAHL. Cochrane Library was limited to reviews only. Final yields after the exclusion criteria were the following: ERIC Proquest 26 results, PubMed 353 results, CINAHL 284 results, and Cochrane Library 7 results. Through careful deliberation by evaluating the strength of the evidence and the quality of the studies, ten studies were chosen, reviewed, and evaluated for appraisal. Currently, there are ten studies which were used for synthesis and evaluation (Appendix A) despite starting with over twenty studies that were deemed valuable.

Additional searches were conducted to include physicians’ perceptions and attitudes towards HIT and the effect on medication adherence. Databases searched were ERIC ProQuest and CINAHL. Keywords searched included: physician’s perceptions and medication adherence. The “AND” Boolean operator was used throughout all searches to help as an inclusive searching strategy. Same aforementioned exclusion criteria were used. ERIC ProQuest final yield was 17 results. CINAHL final yield was 12.

**Critical Appraisal and Synthesis**

Overall, the studies chosen and critically appraised were of high quality. This includes five systematic reviews with two meta-analyses of level I evidence and confidence, four randomized controlled trials (RCTs) (level II), and one randomized experiment (level III). The levels of evidence and confidence were determined using Melnyk & Fineout-Overholt’s (2011) Rating System for the Hierarchy of Evidence for Intervention/Treatment. There were several recurring themes seen throughout the studies that were evaluated (Appendix B).
Synthesis allowed for a merging of these themes to allow for homogeneity among the study variables. Ten out of twelve studies looked at strategies to improve medication adherence and seven out of twelve studies talked about psychoeducational programs and how these programs can impact medication adherence. Another common theme that seemed to be prevalent was physician communication methods. This subject was present in seven out of twelve of the synthesized studies. Other commonalities seen within the studies were conceptual frameworks. Nine out of twelve studies used the transtheoretical model. The second most commonly used conceptual framework among these studies was health belief model, used in two out of twelve studies. The biopsychosocial model was used in the remaining study.

Data analysis and analytic methods varied greatly amongst the studies (Appendix A). Statistical analysis was found to be appropriate to the type of studies conducted. No bias was noted to be present in the analysis of the studies. Some weaknesses were found within the studies such as low participation (including low acquisition of study participants) or small number of articles reviewed.

**Conclusions from Synthesis Discussion**

The literature synthesis and review imply that medication adherence is critical to helping patients with chronic illness. The literature also suggests that through the use of HIT clinicians can become more aware of the need to improve medication adherence. The appropriate interventions for improving medication adherence are not appropriately narrowed down or adequately researched. The literature synthesis concludes that there are a plethora of interventions suggesting improving medication adherence. However, no intervention is able to conclusively and statistically improve non-adherence. The findings are very positive in stating that there are many strategies that need to be encouraged for daily practice with patients in an
attempt to correct the problem of medication non-adherence as this problem should not be ignored. Working with patients individually to address their personal needs through multiple modalities appears to be the best way to improve medication non-adherence. Also taking into account physicians’ use of HIT and proper implementation of HIT may lead to improved medication adherence. Implementing multi-faceted approaches into practice is a recurrent theme among the synthesized articles and necessary for providing evidence-based care.

**Purpose Statement**

The purpose of the proposed project was to evaluate provider satisfaction, comfort, and the effectiveness of education materials on medication adherence. The goal of this project was to evaluate how provider satisfaction with the EMR education handout system improved medication adherence. Long-term objectives of this project will look at how implementation of the EMR education handout system will develop processes in the outpatient psychiatric clinic and improve patient medication adherence.

**Study Questions**

The study questions for this project are the following: Will the use of an EMR education handout system improve provider awareness of medication non-adherence? Does provider satisfaction with an EMR education handout system improve provider perception of medication adherence? How does the overall acceptance of the EMR education handout system (technology) affect provider perception of medication adherence?
Chapter 2: Applied Clinical Project: Methods & Results

Introduction

This chapter will review the evidence-based practice model and conceptual framework used to guide the project. It will also discuss the approaches employed for recruitment and protecting human subject participants. Methods for the project as a whole are also described in detail including setting, organizational culture, procedures, outcome measures, data collection, analysis, and project results.

Evidence Based Practice (EBP) Model and Conceptual Framework

The ability to implement the synthesized information via a project requires a foundation with which to do so. The Stetler Model (Appendix C) was chosen as the EBP Model which will guide the proposed project. The Stetler Model is appropriate because its emphasis is on the “individual practitioner focus” (Stetler, 2001, p. 278). The model also clearly defines evidence as external versus internal (Stetler, 2001) which is essential in this project. The Stetler Model is comprised of five phases. They are preparation, validation, comparative evaluation/decision making, translation/application, and evaluation (Stetler, 2001). The Stetler Model provides a comprehensive strategy of critical evaluation for the proposed project.

The conceptual framework that will guide the proposed project will be Pender’s Health Promotion Model (Appendix D). This model was developed by Nola Pender in the 1980’s and explores the motivation behind what drives people to participate in health promoting behaviors (Pender, 1982). The model also looks at ways to promote and enrich health and quality of life. Enriching health and promoting health is an underlying theme of this project. The Stetler Model, creating the implementation design, and the Health Promotion Model, creating the intervention
design, together will serve as the foundation for the evidence-based project and provide guidance for implementation and intervention strategies.

**Project Methods**

**Ethics: Protection of Human Subjects and Recruitment**

For the proposed project, all appropriate institutional review board (IRB) protocols were adhered to and submitted for approval. Exemption was granted on August 21, 2015 pursuant to Federal Regulation 45CFR46 (2) with IRBID STUDY00002967(Appendix E). All of the appropriate Collaborative Institutional Training Initiative (CITI) training had taken place by the Principal Investigator (PI) and Co-Principal investigator (Co-PI). Data storage was appropriately stored on Arizona State University (ASU) Secure Cloud Storage. The data was stored until May 2016 and removed and destroyed after data analysis was complete.

The proposed project had no foreseeable risks to the participants. Recruitment of the participants took place through the use of a flyer (Appendix F). The study also was discussed in a staff meeting. For tracking purposes, the pre and posttests were tracked in the following manner: favorite color, day of birth, and first initial of father’s name. This allowed for full confidentiality of the participants. The consent of the participants took place prior to any study procedures. Each participant had as much time as needed to decide if they would like to participate in the project. Participation in this project was voluntary for all participants.

**Setting & Participants**

The setting for the proposed project was a suburban, private, outpatient mental health clinic in the East Valley of Arizona. The clinic consists of one physician, one physician assistant, three nurse practitioners, three medical assistants, and one licensed professional counselor. The providers see anywhere from eight to 25 patients per day and work 4 to 5 days per week. The
medical assistants work with patients daily educating them about their medications, and treatment, diagnoses. They each may speak with an average of 10 to 20 patients per day.

**Organizational Culture**

The clinic is considered a small company, being comprised of twenty-two employees. The clinic is organized as a democratic hierarchy. The CEO is the owner of the company. All major decisions for the company must be approved through him. However, he has a director of business development and a clinic supervisor who help manage the daily operations of the clinic. Between the three of these entities, the clinic is able to diplomatically make decisions about things such as operations, employees, and growth. The organization also values the input of its employees to make changes internally. When employees find an issue within a system, they are encouraged to bring it to management to see what sort of change internally can be made.

**Procedure**

The intervention for this project involves activating a patient education feature in the clinic’s existing EMR system. In doing this, an educational session was held for the clinic’s providers and medical assistants regarding the importance of medication adherence. The session discussed the purpose of the project and how to use the activated feature in the EMR. During the educational session, a pre-test was administered. After 4 weeks, a mid-project survey was administered. The posttest survey was administered after 8 weeks.

**Outcome Measures**

The data collection tool used is called the Technology Acceptance Model-2 (TAM-2) (Appendix G). The tool consists of 26 quantitative questions which evaluate user acceptance. TAM-2 was developed by Venkatesh and Davis (2000) from TAM-2 includes “additional theoretical constructs spanning social influence processes...and cognitive instrumental processes”
Direct approval was obtained to use TAM-2 from the instrument’s original authors (Appendix H). The survey also includes two qualitative questions to assess medication adherence. This survey includes minimal demographic information. However, due to the project not being dependent on demographics of the clinicians and participants, minimal demographic information will be collected for this project.

TAM-2 shows strong psychometric properties. All Cronbach alpha coefficient surpassed 0.80, ranging from 0.88-0.93. The principal components analysis with Oblimin Rotation showed high reliability.

**Data Collection and Analysis Plan**

Data collection for this project took place over 8 weeks. A pre-test was administered to commence the project, followed by a 4 week follow up test. An 8-week posttest was administered to close out the project.

The level of data collected for the project is Ordinal as it is a Likert-Scale. This project was looking at inferential statistics as the focus is on “how one variable is related to other variables” (Plichta & Kelvin, 2013, p. 6). The data collected was analyzed using paired Friedman Analysis of Variance (ANOVA) Test. This test is appropriate to the data being collected as it is a “non-parametric test equivalent of a one-way repeated-measures ANOVA” (Cronk, 2014, p. 113). The Friedman test is used with two or more measurements from related participant as in the case of this project of a pre, mid, and post-test.

**Proposed Budget**

The proposed cost for this project is $5.00 for handouts of the pre/post tests and $40.00-$100.00 to provide lunch to the participants at the educational meeting. No compensation was provided to participants. Salary of the participants is being compensated by the clinic.
Project Results

The pre-tests, mid project surveys, and post-tests were coded with unique identifiers as chosen by the participants. The method for coding was: favorite color, day of birth, and first initial of father’s name. Participants (N=9) were reminded throughout the project to not put their names or other identifying features on the surveys. Most of the participants (66.7%) were providers while the remaining (33.3%) were medical assistants (see Figure 1). The majority of the participants were female (88.9%). Nine pre-tests, mid project surveys, and post tests were administered and all returned completed. A total of 27 surveys were synthesized using SPSS to determine the impact of educational handouts on provider satisfaction and provider perception of patient adherence to prescribed medications.

The TAM-2 tool was scored on a Likert scale from 1-7 (see Appendix G); 1 being strongly disagree and 7 being strongly agree. TAM-2 looked at nine domains when evaluating provider perceptions of the intervention. There were also two qualitative questions that were analyzed looking at provider perception of improved medication adherence. Out of the nine domains, only three out of the nine showed improvement of the average of scores from pre to post test. These domains were Intention to Use, Perceived Ease of Use, and Voluntariness. (see Table 1). The Qualitative questions were scored using 1 for yes and 2 for no. The average scores for the qualitative questions also showed positive results from pre to post test (see Table 2).

The pretest had a standard deviation of 14.24. The mid project survey standard deviation was 19.26. The posttest standard deviation was 23.75. A Friedman Test was conducted to compare all three tests performed. Data analysis plan had critical value at p.0.05. No significant difference was found between the three tests ($\chi^2 (2) =2.889$, p>0.05). The education handout system did not significantly affect the providers’ perception of medication adherence. Provider
satisfaction was also not found to be a significant result through the use of the education handout system.

**Discussion of Results**

The results of this project were not found to be statistically significant through the use of a Friedman ANOVA test. The sample size used in this project ($N=9$) may have contributed to the reason the results were not statistically significant. The project focused on the improvement of medication adherence and medication education. Providers frequently educate patients about many other things such as their chronic conditions, wellness, and provide improvement strategies. Since these education approaches were not part of the project, they were not deemed part of the TAM-2 results. It may have been beneficial to focus on education more broadly, instead of only on medication adherence. Medication adherence literature is consistent with the results of this project, which indicate that the most adequate interventions for improving medication adherence are not yet sufficiently researched.

The project had steady improvements in specific domains (see Table 1). These areas include Intention to Use, Perceived Ease of Use, and Voluntariness. These areas were not statistically significant improvements; however, the mean improvement of scores appears to be tendencies in the right direction. Clinical significance can be found in the domains in which mean improvement was found overtime from the pretest to the post test. These mean improvements are relevant to the project in various ways. Participants had intentions to use the system prior to starting, during, and even after finishing the project. The participants perceived that the system was overall an easy system to use prior to using it, while using it, and after the project had concluded. The participants also deemed the system to be voluntary; this being that participants felt inclined to participate in the project voluntarily and did not feel superiors in their
work place or peers pressured them to use the system. These mean improvements are clinically significant because they show trends of improvement: intention to use the system was evident, the level of difficulty of the system was not a barrier to the system’s use, and participants’ feeling pressured by peers to use the system was not a barrier to the project.

The mean scores for Job Relevance stayed relatively the same throughout the project as well. This, too, is clinically significant because it indicates that prior to and after the project the use of education handouts was and continues to be a relevant part of the participants’ daily function.

Average scores of the two qualitative questions (see Table 2) also showed positive results from pre to post tests. This indicates clinical significance through mean improvement of scores over time. These improvements state that participants felt the system allowed their patients to be educated about their medications and helped them become more compliant with treatment.

**Conclusion**

Through the use of the Stetler Model to identify the links between the intervention and outcomes and Pender’s Health Promotion Model guiding intervention design, this project was able to aptly take place. Organizational and ethical considerations were taken into account prior to any procedures taking place. For data collection, the Technology Acceptance Model-2 (TAM-2) was used to evaluate all participants who agreed to take part in the project. The project spanned over 8 weeks where three tests were collected. Data analysis involved the use of Friedman ANOVA Test which showed that there was no significant difference between the three set of tests collected. This is very typical of medication adherence projects. However, three different domains did show to have improvement in mean scores over time.
Chapter 3: Organizational/Health Policy Impact & Sustainability

Introduction

This chapter discusses the impact of the project in its entirety. It also looks at financial implications including a cost/benefit analysis. The chapter evaluates the impact of current policy which impacts the project’s ability to be sustainable long-term. It will also look at this project’s future application to future research and study.

Impact of Project

The project results show various outcomes which are impactful to the practice site, the providers and the system as a whole. First, the results show that emphasis was placed on education during the first half of the project. However, as the project went on, it appears there was a lack of emphasis that was placed on using the system. This can be seen in the drop of average scores (see Table 1). Another interesting point can also be said about the scores themselves. The highest mean scores on the pre-tests (Perceived Usefulness Subjective Norm) had the biggest drop to the posttest mean score. This would translate to mean that the participants went from perceiving the system to being extremely useful and part of their normal routine to not useful and not routine. In evaluating the mean scores that declined, it was important to evaluate them with the owner of the practice and decide how important it is to sit down with the providers and staff to see what needs to be done to make them more satisfied with the EMR handout system. If the providers are not happy with the system, it is evident they are unlikely to use it. It is also unlikely that patients will obtain the necessary education tools to improve adherence. It would be important to implement this system for the future due to its ease of use for the providers. However, it would be necessary to take into account this project and work with the providers on how to improve its use.
The impacts the project had, despite its lack of statistical significance were enormous. The participants are cognizant to the true power they have in being able to provide education by simply clicking a button. One provider that was not computer savvy, even would frequently ask “Are we sure the computer will know how to get the hand out to the patient?” The ever-changing world of healthcare technology is at our disposal. This was a small example of the many uses of health information technology.

**Financial Implications of Project**

The cost for this project was $5.00 for handouts of the pre/post tests and $40.00-$100.00 to provide lunch to the participants at the educational meeting. No compensation was provided to participants. Salary of the participants was compensated by the clinic for their time spent participating on the project. (see Table 3). The benefit of this project surpasses the cost of the project. The benefit, unfortunately cannot be measured monetarily as the benefit will be measured long-term in individual patient and provider successes. This will be seen in patients returning for follow-up visits more knowledgeable about their prescribed medications and being more adherent to treatment. It will also be seen in providers being more satisfied with their day to day experiences with patients, more satisfied with their place of employment, and seeing more patient success stories. These benefits and successes have no price.

**Current Policy, Project Future, and Sustainability Plan for Project**

The Affordable Care Act (ACA) and other healthcare policies will continue to impact healthcare on many levels. The potential impact of ACA on this project will be on the use of HIT. As of 2012, The Health Resources and Services Administration (HRSA) has provided numerous grants as part of ACA to help fund the enactment and implementation of HIT throughout community health centers across the United States (U.S. Department of Health &
Human Services. Health Resources and Services Administration (HRSA, 2012). The ongoing use and implementation of HIT will allow for the healthcare system to become more efficient and resourceful in the coming years.

This project’s main barrier included time. The participants all have very short appointment times with their patients. It was difficult for them to implement the system at first, but once they were able to make it routine, it became habit. Another challenge faced were the number of participants. Unfortunately the size of the clinic did not lend itself to have clinically significant results with a sample size of 9. However, it did allow for good group dialogue and being able to talk to participants one on one after the project ended to discuss more openly their concerns or suggestions for bettering the system.

The future of this project includes full implementation into the clinic’s daily protocols. The providers have agreed to continue using the system and have asked for more handouts to be added to the system that include broader topics such as wellness, chronic illness, therapy modalities, and diagnosis education. In order to sustain the project, it will be necessary for the administrative staff to reinforce the use of the system going forward and remind providers why education is important. It will also be important to encourage providers to ask for new handouts to be added to the system if necessary to encourage reciprocity and ongoing dialogue about the system.

**Implications for Future Research**

As previously mentioned, literature is consistent with the results of this project. The most adequate interventions for improving medication adherence are not yet sufficiently researched. Provider’s use of HIT has shown to improve patient provider collaboration and improve medication adherence (Police, Rachel & Foster, 2011). It is difficult to pinpoint what problems
occurred. If the sample size were bigger, it is possible that statistical significance may have been obtained. However, due to the clinic size, that was not possible. In the future, it would be considered to use a larger population.

The next step for this project will be to meet with all the participants and discuss the project findings. It will also be to discuss what issues need to be corrected or changed with the system to encourage its ongoing use. These changes may include to add handouts to incorporate topics other than pharmacology such as chronic disease processes, therapy modalities, and sleep. The project may be replicated for future projects. This should be encouraged as ongoing patient education is vital to the advancement of improved patient quality of life.

Conclusion and Summary

The impact of this project will go far beyond the eight weeks that the project spanned. This is obvious in the ongoing protocols that have been implemented for patient education at the clinic and the renewed awareness and enthusiasm for patient education through the use of HIT. Overall, it was empowering to educate providers about the great need patients have to be educated during their visits and to implement this protocol at the site.

Adherence is an ongoing problem that all providers will struggle with on a daily basis. Any patient encounter will require a provider to ask about adherence and approach the patient in an individualized and personalized way to ensure adherence is achieved. Through the use of HIT, patients can be reached in a way that can be personal, effortless and expeditious for the provider and providers feel it can improve medication adherence as validated by this project. In closing, “Patient education begins in the doctor’s office but should not end there,” (Young et al., 2006, p. 1176). It is our duty to all patients to not allow time to be a constraint when it comes to education. We as healthcare providers must come up with ways to take the time during
appointments and have that communication; send the handout, send the video, make the referral. These are the things that will make the difference in the patients’ lives and it is our duty to make this happen. We have the research and evidence and not using it would be imprudent and illogical. We have a responsibility to our patients to provide the best care possible, and with that comes education their healthcare.
References


Table 1

*TAM-2 Domains and Mean Scores*

<table>
<thead>
<tr>
<th>Domain</th>
<th>Pre-Test</th>
<th>Mid-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention to Use (Questions 1-2)*</td>
<td>5.6</td>
<td>5.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Perceived Usefulness (Questions 3-6)</td>
<td>6.2</td>
<td>5.7</td>
<td>5.4</td>
</tr>
<tr>
<td>Perceived Ease of Use (Questions 7-10)*</td>
<td>4.7</td>
<td>4.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Subjective Norm (Questions 11-12)</td>
<td>6.7</td>
<td>5.4</td>
<td>4.8</td>
</tr>
<tr>
<td>Voluntariness (Questions 13-15)*</td>
<td>5.2</td>
<td>5.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Image (Questions 16-18)</td>
<td>3.6</td>
<td>2.7</td>
<td>3.2</td>
</tr>
<tr>
<td>Job Relevance (Questions 19-20)*</td>
<td>5.6</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Output Quality (Questions 21-22)</td>
<td>5.9</td>
<td>4.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Result Demonstrability (Questions 21-26)</td>
<td>5.2</td>
<td>4.8</td>
<td>5.1</td>
</tr>
</tbody>
</table>

*Note.* * Indicates that average scores increased or stayed the same throughout the course of the project.
Table 2

*TAM-2 Qualitative Questions & Mean Scores*

<table>
<thead>
<tr>
<th>Questions</th>
<th>Pre-Test</th>
<th>Mid-Test</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think the system has allowed you to educate your patients more readily about their diagnoses and medications? (Question 27)*</td>
<td>1</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Do you think the system has allowed your patients to become more compliant with their medications and treatment? (Question 28)*</td>
<td>1</td>
<td>1.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*Note. * Indicates that average scores remained positive throughout the course of the project
Figure 1. Participants of Project

Project Participant Distribution

N=9
## Appendix A

### Table

<table>
<thead>
<tr>
<th>Citation</th>
<th>Conceptual Framework</th>
<th>Design/Method</th>
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<th>Major Variables &amp; Definitions</th>
<th>Measurement</th>
<th>Data Analysis</th>
<th>Findings</th>
<th>Decision for use in Practice/Application to Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown, M. &amp; (2011). Medication adherence: WHO cares? Country: USA Bias: MEDLINE articles used only</td>
<td>TTM</td>
<td>Design: SR Level 1, Purpose: To discuss the general aspects of MA using CVD as an example and provide clinicians with resources to improve MA. n= approx. 127 not specified what kind, also states “more studies” were retrieved but never states how many or from where</td>
<td></td>
<td>IV1: Factors for NA IV2: Strategies to improve MA DV: MA</td>
<td>Systematic evaluation of MEDLINE database literature search based on inclusion criteria</td>
<td>Manual sorting of retrieved articles</td>
<td>Chronically ill patients have trouble adhering to medications -3 identified factors for NA: physician-related factors, pt related factors, health system related factors. -In addressing NA, all three previously identified factors must be taken into consideration to be successful.</td>
<td>Strengths: High number of articles reviewed (127+). Synthesis of information is valuable and practical Weakness: No statistical test for analysis used or discussed. Vagueness about number of studies</td>
</tr>
</tbody>
</table>

HBM- Health-Belief Model, MA- Medication Adherence, PE- Patient Education, RCT- Randomized Controlled Trial, SR- Systematic Review, TTM- Transtheoretical Model
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Friedman, A. J., (2011). Effective teaching strategies and methods of delivery for patient education: A systematic review and practice guideline recommendations Country: Canada Bias: None Noted</td>
<td>HBM</td>
<td>Design: SR with and without meta-analysis Level I Purpose: To determine effective teaching strategies and methods of the delivery for PE through a systematic review of literature</td>
<td>n= 23 systematic reviews</td>
<td>IV1: Effective Teaching Strategies IV2: Methods of Delivery DV: PE</td>
<td>Relevant database search for SRs with or without meta-analyses</td>
<td>AMSTAR Tool AMSTAR Scores: 5 articles: 10/11 3 articles: 9/11 5 articles: 8/11 7 articles: 7/11 3 articles 4-6/11</td>
<td>-There are multiple effective teaching strategies and modalities for PE such as using computers, audio/videotapes, written materials, and verbal instruction. -The method of delivery of PE also is important: PE should be pt specific, involve multiple teaching strategies, culturally sensitive, and structured.</td>
<td>Strengths: Relatively good quality SR due to use of AMSTAR and high AMSTAR scores Weakness: Reliability could not be confirmed Conclusion: PE requires pt appropriate teaching strategies along with pt appropriate delivery in order to be effective and specific. Feasibility: RDD for use in practice due to ability to personalize care to pts and high quality of AMSTAR scores make SR applicable &amp; translatable to practice</td>
</tr>
</tbody>
</table>

AR- Attrition rate, AD- Antidepressant, CVD – Cardiovascular Disease, CO – Clinical outcomes, DV– Dependent Variable, F–Final number of participants, HBM- Health Belief Model, IV– Independent Variable, LOCF- last observation carried over, MA – Medication adherence, MEA– Mean age, MPR -Medication possession ratio, n – studies, N– sample size (people), NA- non-adherence, NC– Control Sample Group, NI – Control Intervention Group, n– sample size (studies), PA– Patient adherence, PE– Patient education, PT– Patient, QOL- Quality of life, RCT- Randomized Control trial, RDD- Recommended, SD – Standard Deviation, SP– Standardized patient, SR- systematic review, TTM – Trans-theoretical Model, TX– Treatment, USA– United States of America, Y/O– Years old
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</tr>
</thead>
<tbody>
<tr>
<td>Eker, F. (2012) Effectiveness of six-week psychoeducation program on adherence of patients with bipolar affective disorder</td>
<td>HBM</td>
<td>Design: RCT Level II Purpose: Examine effectiveness of a 6-week psychoeducation program on MA in patients with Bipolar Disorder</td>
<td>N=71 F=63 NC=35, F=33 MEA=36.64±10.63, N=36, F=30 MEA=34.57±11.03.</td>
<td>IV: 6 week Psychoeducation program DV: MA</td>
<td>6 week, 6 session psychoeducation program. Each session 90-120 min, each group=10-12 pts</td>
<td>Chi-Test, independent sample t Test, paired t test &amp; LOCF</td>
<td>Prior to intervention, 40% of pts in intervention group were adherent to meds; after intervention, 86.7% were found to be adherent. Control group tx adherence was 38.9% before intervention and 24.2% post intervention. Pretest x²= 0.009, p&lt;0.05 Posttest of completers: x²=24.649, p&lt;0.01 Posttest of LOCF: x²= 17.525, p&lt;0.01</td>
<td>Strength: Large sample group, no AR Weakness: Intervention done was informative to pts not aimed at long-term behavioral modification and difficult to measure objective MA (did not have serum levels to monitor medications) but instead only used subjective reports from pts. Conclusion: MA was improved through the use of 6 week/6 session psychoeducation program and was statistically significant. Feasibility: Not RDD as may be high cost associated with implementing this type of program in exact format; however this data supports psychoeducation improves MA subjectively therefore replicating program that may be cost-effective and sustainable for a practice or clinic may be worth looking into</td>
</tr>
</tbody>
</table>

AR- Attrition rate, AD- Antidepressant, CVD – Cardiovascular Disease, CO – Clinical outcomes, DV– Dependent Variable, F– Final number of participants, HBM- Health Belief Model, IV– Independent Variable, LOCF- last observation carried over, MA – Medication adherence, MEA– Mean age, MPR- Medication possession ratio, n – studies, N- sample size (people), NA- non-adherence, NC– Control Sample Group, NI – Control Intervention Group, n- sample size (studies), PA– Patient adherence, PE– Patient education, PT- Patient, QOL- Quality of life, RCT- Randomized Control trial, RDD- Recommended, SD – Standard Deviation, SP- Standardized patient, SR- systematic review, TTM – Trans-theoretical Model, TX– Treatment, USA– United States of America, Y/O– Years old
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</tr>
</thead>
</table>
**Level I**  
**Purpose:** Evaluate the relationship between physician communication and PA to treatment | n= 106 correlational studies, 21 experimental studies | IV: Physician communication  
DV: PA to Tx | Strength of association analysis (r)  
Fisher’s Exact Test  
Fail-Safe n | PA correlated with communication skill of physician:  
k=106  
-Weighted r (95% CI): 0.15 (0.14, 0.16)  
-Unweighted r (95% CI): 0.19 (0.16, 0.21)  
-Effect size d=0.39  
-Fail-Safe n= 28,563 (tolerance level =540) | Strengths: High number of studies and scrutinizing data analysis  
Weakness: Very broad time frame of publication (49 years) which may weaken data  
Conclusion: All but 2 of the 106 studies evaluated found adherence and physician communication to be strongly correlated and significant with random effects tests and fixed tests. The risk of NA is 19% greater for pts who’s physician has poor communication.  
Feasibility: RDD to evaluate the effectiveness of provider communication style in connection with PA and MA |
<table>
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<th>Findings</th>
<th>Decision for use in Practice / Application to Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Javadpour, A. (2012) The impact of a simple individual psycho-education program on quality of life, rate of relapse and medication adherence in bipolar disorder patients. Country: Iran Bias: Funding from a grant from Shiraz University of Medical Science and conducted at the university.</td>
<td>TTM</td>
<td>Design: RCT Level II</td>
<td>Purpose: Evaluate the impact of individual psycho-education program on QOL, rate of relapse and MA in bipolar patients</td>
<td>Inclusion Criteria: 18-60 y/o, at least 2 or 3 episodes of relapse in last 5 years of Bipolar Disorder, patients in euthymic state (HAM-D &lt;8 and Bech Rafaelsen Mania Rate Scale, 9)</td>
<td>IV1: Pharmacotherapy IV2: Psycho-education &amp; pharmacotherapy</td>
<td>DV: MA</td>
<td>T-test, Chi-square test, and repeated measures</td>
<td>Intervention Group: Medication Adherence scores: 6 months: 7.93 12 months: 7.80 18 months: 7.91 P= 0.008 Quality of Life Domains: Physical Health: 63.81 Mental Health: 66.65 Social Health: 74.07 Environment: 65.05 P=0.000 Median number of hospital admissions: Intervention Group= 2.9 Control Group= 3.5 P= 0.176</td>
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<tr>
<td>Citation</td>
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</tr>
<tr>
<td>Ryan, R. (2014)</td>
<td>TTM</td>
<td>Design:</td>
<td>n= 75 RCT</td>
<td>IV: All intervention evaluated affecting MA</td>
<td>Standardized selection of studies and extraction of data</td>
<td>AMSTAR Tool</td>
<td>Cochrane review found that there is an array of different methods to help improve MA. However there is not one specific way that was found to help improve MA significantly more than another. Some interventions prevalent in the literature include simplifying dosing regimens, collaboration with pharmacists, providing reminder cues, financial or material incentives, education programs in combination with enhanced follow-up and additional support.</td>
<td>Strengths: Large number of studies reviewed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SR based on Cochrane Review Criteria Level I</td>
<td>N= 46962 participants</td>
<td>DV: MA</td>
<td></td>
<td></td>
<td></td>
<td>Weakness: No risk of bias analysis</td>
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<tr>
<td></td>
<td></td>
<td>Purpose:</td>
<td></td>
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<td></td>
<td></td>
<td>Conclusion: Many methods are researched to help improve MA. Statistically, one intervention has not been found to help more than another.</td>
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<tr>
<td></td>
<td></td>
<td>To evaluate the effects of interventions that promote MA</td>
<td>Inclusion Criteria: Systematic reviews from Cochrane Database of Systematic Reviews &amp; the Database of Abstracts of Reviews of Effects. Inclusion dates were from start dates to March 2012. Reviews were also sorted by intervention and included by any intervention affecting adherence to self-administration of medication.</td>
<td></td>
<td></td>
<td></td>
<td>Feasibility: Possible. Some of the interventions may be feasible to implement, however to have the knowledge of what may help improve MA for pts and what may not is vital for everyday practice in terms of MA.</td>
<td></td>
</tr>
</tbody>
</table>
### Nieuwlaat, R. (2014)

**Interventions for enhancing medication adherence.**

**Country:** Canada  
**Bias:** None noted

<table>
<thead>
<tr>
<th>Citation</th>
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</tr>
</thead>
</table>
| Nieuwlaat, R. (2014) | TTM | **Design:** SR based on Cochrane Review Criteria Level I  
**Purpose:** Evaluate the effectiveness of interventions aimed at improving both MA and CO | n= 182 RCTS | IV: All interventions evaluated to affect MA and clinical outcomes  
DV: MA | Standardized selection of studies and extraction of data | Qualitative Analysis  
Risk of Bias evaluation using Cohen's kappa (k)  
Risk of bias for Random sequence: low in 105 RCTs and unclear in 77 RCTs.  
Concealment of allocation, risk of bias: high in 2 RCTs, low in 58 RCTs, and unclear in 122 | Interventions to improve MA were deemed to be complex or complicated. These included increased family/peer support, education from a healthcare professional such as pharmacist or physician, or daily support for treatment. Large improvements were not notable and only five RCTs were able to improve CO and MA. | Strengths: Thorough research methods and database searches  
Weakness: Data analysis method did not include AMSTAR, Conclusion: Adherence requires complex strategies that do not show to have long term benefit and further research is necessary to look at strategies to improve MA & CO together.  
Feasibility: Not RDD. This review suggests that financially too many resources are being used up on MA without enough evidence to support this, mainly due to the complexity of the strategies researched. |

**AR**- Attrition rate, **AD**- Antidepressant, **CVD** – Cardiovascular Disease, **CO** – Clinical outcomes, **DV**– Dependent Variable, **F**– Final number of participants, **HBM**- Health Belief Model, **IV**- Independent Variable, **LOCF**- last observation carried over, **MA** – Medication adherence, **MEA**- Mean age, **MPR**-Medication possession ratio, **n** – studies, **N**– sample size (people), **NA**- non-adherence, **NC**– Control Sample Group, **NI** – Control Intervention Group, **n**– sample size (studies), **PA**– Patient adherence, **PE**- Patient education, **PT**- Patient, **QOL**- Quality of life, **RCT**- Randomized Control trial, **RDD**- Recommended, **SD** – Standard Deviation, **SP**- Standardized patient, **SR**- systematic review, **TTM** – Trans-theoretical Model, **TX**– Treatment, **USA**– United States of America, **Y/O**– Years old
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</tr>
</thead>
<tbody>
<tr>
<td>Kardas, P. (2013)</td>
<td>TTM</td>
<td>Design: Open-label, prospective, RCT Level II</td>
<td>N=198, F=196; NC=91, F=F=89; MEA=59.7 ± 9.5; N=107, F=107; MEA=59.5 ± 8.8</td>
<td>IV: Educational counseling &amp; Routine reminder activity (Behavioral intervention)</td>
<td>Educational counseling provided to control group every 8 weeks upon follow-up after starting Statin medication and asked to adopt a routine evening activity.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Purpose: To improve adherence through the use of a combination of education and behavioral interventions</td>
<td>IV: Educational counseling &amp; Routine reminder activity (Behavioral intervention)</td>
<td>DV: MA</td>
<td>Educational counseling provided to control group every 8 weeks upon follow-up after starting Statin medication and asked to adopt a routine evening activity.</td>
<td>Chi Square Test</td>
<td>Average MPR intervention group: (+/- SD) = 95.4 +/- 53.7%</td>
<td>Average MPR control group: (+/- SD) = 81.7% +/- 31% (P&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inclusion Criteria: Adult cardiac patients with untreated hypercholesterolemia between ages 40-80 y/o</td>
<td>Inclusion Criteria: Adult cardiac patients with untreated hypercholesterolemia between ages 40-80 y/o</td>
<td>Inclusion Criteria: Adult cardiac patients with untreated hypercholesterolemia between ages 40-80 y/o</td>
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<tr>
<td></td>
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<td>Exclusion Criteria: Mental illness, dependence on other people’s assistance in medical care (use of wheelchair or bed bound), substance abuse, homelessness, unstable angina,</td>
<td>Exclusion Criteria: Mental illness, dependence on other people’s assistance in medical care (use of wheelchair or bed bound), substance abuse, homelessness, unstable angina,</td>
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<tr>
<td></td>
<td></td>
<td>MPR Validity: Yes, due to being a standard measuring tool</td>
<td>MPR Validity: Yes, due to being a standard measuring tool</td>
<td>MPR Validity: Yes, due to being a standard measuring tool</td>
<td>MPR Validity: Yes, due to being a standard measuring tool</td>
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<tr>
<td></td>
<td></td>
<td>Average MPR intervention group: (+/- SD) = 95.4 +/- 53.7%</td>
<td>Average MPR control group: (+/- SD) = 81.7% +/- 31% (P&lt;0.05)</td>
<td>Average MPR intervention group: (+/- SD) = 95.4 +/- 53.7%</td>
<td>Average MPR control group: (+/- SD) = 81.7% +/- 31% (P&lt;0.05)</td>
<td>Average MPR intervention group: (+/- SD) = 95.4 +/- 53.7%</td>
<td>Average MPR control group: (+/- SD) = 81.7% +/- 31% (P&lt;0.05)</td>
<td>Average MPR intervention group: (+/- SD) = 95.4 +/- 53.7%</td>
</tr>
</tbody>
</table>

Strengths: Provides affordable interventions which are translatable to practice

Weakness: Statistical weakness; could have provided more analytical data to support findings.

Conclusion: Use of education counseling and a reminder activity improve MA.

Feasibility: RDD as it appears to be cost effective and shows an effective and creative way to engage pts into being adherent to medication regimens.
<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Young H. (2006). Types of information physicians provide when prescribing antidepressants</td>
<td>TTM</td>
<td>Controlled Observational Study</td>
<td>N: 101 physicians (131 interactions recorded) with SPs MEA= 46.3 years, 69% males, 31% female</td>
<td>IV: Type of information provided by physicians</td>
<td>Standardized patients were interviewed by physicians blindly. These sessions were recorded to evaluate the delivery method of patient education and type of information given during patient education</td>
<td>Generalized Estimating Equations</td>
<td>On average, physicians talked about 5.7 (SD=1.6) topics with regards to ADs. Main topic discussed was purpose (96%), name (90.7%), side effects (85.3%), timing (76.0%), and technical information (68.2%).</td>
<td>Strengths: Focuses on antidepressants and how physicians are educating patients about them</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level III</td>
<td></td>
<td>IV: Delivery method of physicians during assessments</td>
<td></td>
<td>Poisson Distribution</td>
<td></td>
<td>Conclusion: Pts leave their doctor’s office without important information about medication.</td>
</tr>
<tr>
<td>Purpose: To assess information provided by physicians while prescribing ADs</td>
<td></td>
<td></td>
<td></td>
<td>DV: Factors that influence provision of information disseminated by physicians.</td>
<td></td>
<td></td>
<td>Reliability: Not noted or discussed</td>
<td></td>
</tr>
<tr>
<td>Inclusion Criteria: Physician specialties: general internists &amp; family practice</td>
<td></td>
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<td></td>
<td></td>
<td>Feasibility: Information gleaned from study is invaluable to apply to practice and develop new educational strategies when discussing medications with a pt</td>
</tr>
</tbody>
</table>
Zygmunt, A. (2002). Interventions to improve medication adherence in schizophrenia. Country: USA. Bias: None noted

<table>
<thead>
<tr>
<th>Citation</th>
<th>Conceptual Framework</th>
<th>Design/Method</th>
<th>Sample/Setting</th>
<th>Major Variables &amp; Definitions</th>
<th>Measurement</th>
<th>Data Analysis</th>
<th>Findings</th>
<th>Decision for use in Practice / Application to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zygmunt, A. (2002).</td>
<td>TTM</td>
<td>Design: Meta-analysis Level I</td>
<td>Purpose: To improve knowledge about MA and evaluate interventions that may improve MA</td>
<td>n= 39 studies</td>
<td>IV: Psychosocial interventions DV:MA</td>
<td>Standardized selection of studies and extraction of data</td>
<td>Qualitative Analysis</td>
<td>A wide variety of MA interventions were evaluated in this review. No single intervention was overwhelmingly or statistically successful in improving MA.</td>
</tr>
</tbody>
</table>

**Practice**

**Strengths:** Reviews different modalities to address MA

**Weakness:** Statistical analysis is lacking and not discussed

**Conclusion:** There are many interventions studied that look at MA. However it is important to evaluate its success in the specific pt population for overall effectiveness and appropriateness prior to implementation. Further research is needed to suggest one intervention over another.

**Feasibility:** Pts are all individual and different. Using the strategies mentioned in this analysis may be useful in practice as adherence in pts with schizophrenia is a challenge and having new strategies to approach difficult pts is highly RDD.
### Fang (2011)

**Health information technology and physicians’ perceptions of healthcare quality**

**Country:** USA

**Bias:** None noted

<table>
<thead>
<tr>
<th>Citation</th>
<th>Conceptual Framework</th>
<th>Design/Method</th>
<th>Sample/Setting</th>
<th>Major Variables &amp; Definitions</th>
<th>Measurement</th>
<th>Data Analysis</th>
<th>Findings</th>
<th>Decision for use in Practice</th>
</tr>
</thead>
</table>
|          | TTM                  | **Design:** RCT  
Level III | **Purpose:** To evaluate the relationship between physicians perceptions and high quality health care | **N=** 11963 physicians in 2000-2001  
**N=** 6306 in 2004-2005 | **IV:** Use of health information technology  
**DV:** Physicians perceptions | **Standardized selection of studies and extraction of data**  
**Validity:** Due to being systematic and coding methods allowing for valid data collection. | **Bivariate analysis, t test and X2 test** | **Health information technology is considered an important way to progress the effectiveness of healthcare. Health information technology improved physicians ability to provide improved care.** | **Strengths:**  
High population/sample size  
**Weakness:**  
Only physicians, not other types of clinicians (NPs, PAs)  
**Conclusion:**  
Opened up the ability of other studies that should be looked at relating to health information technology and physician perception  
**Feasibility:**  
Information is feasible and valuable but should be looked at more closely due to information being so new when studied and further studies being needed on this topic. |

AR- Attrition rate, AD- Antidepressant, CVD – Cardiovascular Disease, CO – Clinical outcomes, DV- Dependent Variable, F- Final number of participants, HBM- Health Belief Model, IV – Independent Variable, LOCF- last observation carried over, MA – Medication adherence, MEA- Mean age, MPR- Medication possession ratio, n – studies, N- sample size (people), NA- non-adherance, NC– Control Sample Group, NI – Control Intervention Group, n- sample size (studies), PA- Patient adherence, PE- Patient education, PT- Patient, QOL- Quality of life, RCT- Randomized Control trial, RDD- Recommended, SD – Standard Deviation, SP- Standardized patient, SR- systematic review, TTM – Trans-theoretical Model, TX- Treatment, USA – United States of America, Y/O- Years old
**Table:**

<table>
<thead>
<tr>
<th>Police (2011)</th>
<th>TTM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design:</strong></td>
<td>Systematic Review</td>
</tr>
<tr>
<td><strong>Level I</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Purpose:</strong></td>
<td>To further understand benefits and barriers of health information technology in physician organizations</td>
</tr>
<tr>
<td><strong>Inclusion Criteria:</strong></td>
<td>English language, articles with abstracts, published between 2004-2009 on human research related to the adoption and usage of health information technology.</td>
</tr>
<tr>
<td><strong>Exclusion Criteria:</strong></td>
<td>Not US Articles, based in hospital...total of 23 exclusionary criteria reported</td>
</tr>
<tr>
<td><strong>IV:</strong></td>
<td>Barriers and benefits</td>
</tr>
<tr>
<td><strong>DV:</strong></td>
<td>Current utilization</td>
</tr>
<tr>
<td><strong>Standardized selection of studies and extraction of data</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Validity:</strong></td>
<td>Yes due to being systematic and coding methods allowing for valid data collection.</td>
</tr>
<tr>
<td><strong>Reliability:</strong></td>
<td>Yes. Using appropriate research design for SR</td>
</tr>
<tr>
<td><strong>Qualitative Analysis</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Health information technology has high prospective to impact organizations including the ability to improve things such as medication adherence, reduce cost, and improve the patient-provider relationship.</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Strengths:**
- Research articles are comprehensively searched and very thorough search strategies. Clearly explains each article used.

**Weakness:**
- Limited time frame of articles used

**Conclusion:**
- Evidence shows that through the use of health information technology clinical improvements may occur including medication adherence.

**Feasibility:**
- There is a great deal of data available supporting the adoption of health information technology due to its improvements in on day to day clinical operation. Further research is needed to focus on implementation.

---

**Note:**
- AR - Attrition rate, AD - Antidepressant, CVD - Cardiovascular Disease, CO - Clinical outcomes, DV - Dependent Variable, F - Final number of participants, HBM - Health Belief Model, IV - Independent Variable, LOCF - last observation carried over, MA - Medication adherence, MEA - Mean age, MPR - Medication possession ratio, n - studies, N - sample size (people), NA - non-adherence, NC - Control Sample Group, NI - Control Intervention Group, n - sample size (studies), PA - Patient adherence, PE - Patient education, PT - Patient, QOL - Quality of life, RCT - Randomized Control trial, RDD - Recommended, SD - Standard Deviation, SP - Standardized patient, SR - systematic review, TTM - Trans-theoretical Model, TX - Treatment, USA - United States of America, Y/O - Years old
## Appendix B

### Synthesis Table

<table>
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<td>Routine Reminder Activity</td>
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</tr>
</tbody>
</table>

HBM- Health-Belief Model, MA- Medication Adherence, PE- Patient Education, RCT- Randomized Controlled Trial, SR- Systematic Review, TTM- Transtheoretical Model
Appendix C

Stetler Model

Figure 3A. Stetler Model, Part I: Steps of research utilization to facilitate EBP.

Appendix D

Pender’s Health Promotion Model

Appendix E

IRB Exception

EXEMPTION GRANTED

Ann Guthery
CONVH - BNP
602-496-0794
Ann.Guthery@asu.edu

Dear Ann Guthery:

On 8/21/15 the ASU IRB reviewed the following protocol:

<table>
<thead>
<tr>
<th>Type of Review</th>
<th>Title</th>
<th>Use of educational handouts for psychiatric medication adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigator</td>
<td>Ann Guthery</td>
<td>STUDY000002954</td>
</tr>
<tr>
<td>Funding</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Grant Title</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Grant ID</td>
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Documents Reviewed:

- TAM2 Measurement Scales and Reliabilities.pdf, Category: Measures Survey questions/Interview questions/Interview guide/Group questions/
  Sample Education Material 1, Category: Other to reflect anything not captured above.
- Sample Education Material 2, Category: Other to reflect anything not captured above.
- BShulman Site Approval Letter Summer 2015.pdf, Category: Other to reflect anything not captured above.
- BShulman Info Form Consent Summer 2015.pdf, Category: Consent Form.
- BShulman Permission to use TAM-2, David Summer 2015.pdf, Category: Other to reflect anything not captured above.
- Sample Education Material 1, Category: Other to reflect anything not captured above.
- Schulte_HRP-54a-TEMPLATE_PROTOCOL_SocialBehavioralV02-10.

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45 CFR 46 (2) Tests, surveys, interviews, or observation on 8/21/2015.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-101).

Sincerely,

IRB Administrator
cc: Barbara Schulte
Ann Guthery
Barbara Schulte
Appendix F

Recruitment Flyer

Provider Participants Needed!!

This DNP Applied Project will look at provider satisfaction and the effectiveness of education materials on medication adherence.

If you are interested in participating, we are looking for:

- Any provider who has direct patient contact
  - This includes MD, NP, PA, LPN, MA
- Speaks and Reads English

Project Involvement Includes:

- 3 scheduled sessions including an Educational Session on how to use New EMR Education Handout System
- Using New EMR Education Handout System with patients on a daily basis

For More Information, please contact:
Barbara Schulte, RN, BSN  email: Barbara.Schulte@asu.edu
Ann Guthery, PhD, PMHNP-BC  email: Ann.Guthery@asu.edu

ARIZONA STATE UNIVERSITY
### Appendix G

Technology Acceptance Model-2 (TAM-2)

<table>
<thead>
<tr>
<th>Observation Period:</th>
<th>ID#:</th>
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</thead>
<tbody>
<tr>
<td>PLEASE CIRCLE TITLE: MD  NP  PA  LPC  MA</td>
<td></td>
</tr>
<tr>
<td>Favorite Color:</td>
<td>Day of Birth:</td>
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</tbody>
</table>

#### TAM2 Measurement Scales and Reliabilities

Please answer the following questions rating them 1 through 7:


<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assuming I have access to the system, I intend to use it.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>2. Given that I have access to the system, I predict that I would use it.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>3. Using the system improves my performance in my job.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>4. Using the system in my job increases my productivity.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>5. Using the system enhances my effectiveness in my job.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>6. I find the system to be useful in my job.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>7. My interaction with the system is clear and understandable.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>8. Interacting with the system does not require a lot of my mental effort.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>9. I find the system to be easy to use.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>10. I find it easy to get the system to do what I want it to do.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>11. People who influence my behavior think that I should use the system.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>12. People who are important to me think that I should use the system.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>13. My use of the system is voluntary.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>14. My supervisor does not require me to use the system.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>15. Although it might be helpful, using the system is certainly not</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>compulsory in my job.</td>
<td></td>
</tr>
<tr>
<td>16. People in my organization who use the system have more prestige than</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>those who do not.</td>
<td></td>
</tr>
<tr>
<td>17. People in my organization who use the system have a high profile.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>18. Having the system is a status symbol in my organization.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>19. In my job, usage of the system is important.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>20. In my job, usage of the system is relevant.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>21. The quality of the output I get from the system is high.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>22. I have no problem with the quality of the system’s output.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>23. I have no difficulty telling others about the results of using the system.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>24. I believe I could communicate to others the consequences of using the system.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>25. The results of using the system are apparent to me.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>26. I would have difficulty explaining why using the system may or may not be beneficial.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>27. Do you think the system has allowed you to educate your patients more readily about their diagnoses and medications?</td>
<td></td>
</tr>
<tr>
<td>28. Do you think the system has allowed your patients to become more compliant with their medications and treatment?</td>
<td></td>
</tr>
</tbody>
</table>

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**STUDY00002967**  
Date of Approval: Aug. 21, 2015
Appendix H

Authorization to use TAM-2

---

Viswanath Venkatesh <vvenkatesh@vvenkatesh.us>  
To: Barbara Schulte <bschulte@asu.edu>  
Wed, Jun 24, 2015 at 8:01 PM

Thanks for your interest. I am sorry for the delayed response which is due to a hectic travel schedule.

You have my permission.

You will find papers that are useful at: http://vvenkatesh.com/Downloads/Papers/fulltext/downloadpapers.htm

You may also find my book (that can be purchased for a significant student discount and faculty member discount) to be of use: http://vvenkatesh.com/book

Sincerely,
Viswanath Venkatesh
Distinguished Professor and George and Royce Billingsley Chair in Information Systems
Walton College of Business
University of Arkansas
Fayetteville, AR 72701
Phone: 479-575-3660; Fax: 479-575-3689
Email: vvenkatesh@vvenkatesh.us
Website: http://vvenkatesh.com
IS Research rankings Website: http://vvenkatesh.com/ranking
Doctor of Nursing Practice Project
3 messages

Barbara Schulte <bschult2@asu.edu>
To: fdavis@walton.uark.edu
Scc: Barbara Schulte <bschult2@asu.edu>

Mon, Jun 22, 2015 at 6:13 PM

Hello Dr. Davis,

My name is Barbara Schulte and I am a Doctor of Nursing Practice (DNP) Candidate from Arizona State University in the Family Psych Mental Health NP Program. I am writing you today to ask for some assistance. I have come across 2 of your papers written by you and your colleagues (“User Acceptance of Information Technology; Toward a Unified View” (2003) “A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies” (2000) ). I am writing you today for permission to use the tools you used and constructed in these papers. The papers describe and illustrate the items used to measure UTAUT and the TAM2 Measurement Scales respectively. I need to use a tool that has already been constructed and tested for validity for my project. The instruments your teams used appear to fit with my project quite well, and truly this is the purpose of my email. I also wanted to ask if you have a copy of the tools so that I may see how you administered it to your participants.

My project entails implementing patient educational handouts into an Electronic Medical Record (EMR) system at an outpatient psychiatric clinic. I would be assessing the practitioners’ perceptions of the implementation and the effect it had on medication adherence. The assessments would take place prior to the project, mid way through, and afterwards.

I hope this email finds you well. If there are any questions I may answer for you, please don’t hesitate to let me know. If there is someone else you feel I should reach out to instead that may be better suited to help me with this, please let me know. I really appreciate your help with this and any other guidance you may suggest. My project would really benefit from your assistance with this. Thanks very much. Have a wonderful rest of your evening.

...Barbara A. Schulte, RN, BSN

Fred Davis <FDavis@walton.uark.edu>
To: Barbara Schulte <bschult2@asu.edu>

Tue, Jun 23, 2015 at 9:46 AM

Hello

You have my permission to use the TAM measurement scales for your research. I do not have the original questionnaire instruments, but you should be able to construct them using a word processor following the wording provided in the articles.

Best wishes,

Fred Davis

[Quoted text hidden]

Barbara Schulte <bschult2@asu.edu>
To: Fred Davis <FDavis@walton.uark.edu>
Scc: Ann Guthery <Ann.Guthery@asu.edu>

Tue, Jun 23, 2015 at 10:17 AM

Thank you very much for your quick reply with this. I really appreciate your permission to use the TAM measurement scale. This will help facilitate my project immensely. Have a great rest of your summer.