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ORIGINAL RESEARCH

Medication adherence in a nurse practitioner managed clinic for indigent patients

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Abstract

Purpose: Little is published in the literature about medication adherence rates among patients who are medically indigent and patients receiving primary care from nurse practitioners (NPs). This project examined adherence rates and barriers to adherence among patients at an NP-managed health clinic (NPMC).
Data sources: The setting for this research was an NPMC for uninsured and low-income patients. A cross-sectional convenience sample of patients completed surveys eliciting demographic information, self-report of medication adherence, health literacy, and barriers to adherence.
Conclusions: Analysis of subjects demonstrated a vulnerable population, yet the mean adherence rate was surprisingly high (77%), compared to the rate usually cited in published literature. The best predictive model differentiating patients with high adherence from those with low adherence combined the total number of reported barriers, health literacy, and employment status. The barriers most frequently cited by subjects were difficulty paying for medications, and difficulty reading and understanding written prescription labels, which was particularly prevalent among Spanish-speaking patients.
Implications for practice: Clinic efforts to improve patient access to affordable medications may have contributed to subjects' high rates of adherence. These efforts included helping patients with filling out prescription assistance program paperwork, prescribing generic medications, providing samples, and providing effective patient education.

Although taking medication is simple, patients often experience difficulty adhering to prescribed regimens. Healthcare providers face this problem daily in clinical practice. Increasing chronic disease rates have prompted increased prescribing (Lin et al., 2012; World Health Organization [WHO], 2003, 2013), steadily escalating the corresponding global impact of this problem, which increases costs, morbidity, and mortality for individuals and societies. Reasons for nonadherence vary greatly and understanding them is the first step to finding effective solutions. Because increasing costs and demands on the healthcare system have made nurse practitioners (NPs) a crucial source of primary care, particularly for low-income populations (Liu, Finkelstein, & Poghosyan, 2014), this study sought to discover the rate of medication adherence at an NP-managed clinic (NPMC) serving indigent patients, and to identify self-reported barriers to medication adherence.

The problem of patient nonadherence

Neiheisel, Wheeler, and Roberts (2014) define medication adherence as "the degree to which a patient's medication behaviors are congruent with the recommendations and instructions of his/her healthcare provider regarding timing, dose, and frequency" (p. 50)—in contrast with the outdated term compliance, which connotes a paternalistic, unidirectional, provider-centered relationship (Vrijens et al., 2012). Medication persistence describes the degree to which a patient continues taking medication as advised throughout treatment (Neiheisel et al., 2014; Vrijens et al., 2012). Primary adherence

refers to initially filling a prescribed medication, while partial adherence describes initially acquiring the medication but not following the prescribed regimen (Neiheisel et al., 2014). Adherence is a complex concept and many inconsistencies in research findings may reflect differences in the meaning ascribed to adherence (Ascertaining Barriers to Compliance Project [ABC], 2012; Gwadry-Sridhar et al., 2009; Medic et al., 2013).

Published adherence rates vary from approximately 50% (Brown & Bussell, 2011; Haynes, Ackloo, Sahota, McDonald, & Yao, 2008; WHO, 2003) to 75%–80% (Neiheisel et al., 2014). The most robust research has been done in patients with cancer (Neiheisel et al., 2014) and patients infected with HIV/AIDS, likely because of the consequence of disease progression from nonadherence (Malow et al., 2013). Current findings are largely consistent with the frequently cited adherence rate of 50% reported by WHO (2003) and are confirmed by the most recent Cochrane review (Haynes et al., 2008). For example, a study of Taiwanese patients with type 2 diabetes indicated 55.8% adherence to oral antihyperglycemic medications (Chen, Tseng, & Cheng, 2013), and Kales et al. (2013) reported 55% adherence among older adults taking antidepressant medications. Reported rates of primary adherence are also low, with Derose et al. (2013) reporting that only 26% of the control group and 42% of the intervention treatment group filled a new statin prescription.

There are notable gaps in the literature regarding medication adherence rates for low-income and uninsured patients, a socially disadvantaged population that is frequently served by NPMCs (Fiandt, Doeschot, Lanning, & Latzke, 2010). There is also a gap in the literature describing adherence among patients receiving primary care from NPs. Only one study was found that compared medication adherence rates of patients with NPs as primary care providers (PCPs) to other providers. The study was performed in Thailand and compared patients cared for by NPs to those with NP/MD partners as their PCP. No significant difference was found between the two groups (Mekwiwatanawong, Hanucharurnkul, Piaseu, & Nityasuddhi, 2013). Although adherence is complex and difficult to measure, its impact on costs and health outcomes has been well established.

In 2013, the annual cost of nonadherence in the United States was estimated at over $200 billion (IMS Institute for Healthcare Informatics, 2013). In addition to financial costs, the social cost is high. Medication nonadherence may exacerbate disease processes, resulting in suffering, as well as preventable expenses to individuals and communities (Institute of Medicine [IOM], 2012; WHO, 2003). A joint publication by the Centers for Disease Control and Prevention and National Center for Chronic Disease Prevention and Health Promotion (2012) reports that improved adherence to antihypertensive treatment could prevent almost 90,000 deaths annually in the United States. Human and social costs have become so great that public coalitions and worldwide consortia have been formed to address the problem (ABC, 2012; Bosworth & National Consumers League, 2013).

Measuring medication adherence

Adherence measurements are categorized as either direct or indirect (Neiheisel et al., 2014). Direct measures include observing ingestion and measurement of medication, biological markers, or metabolites in the blood; however, these methods are expensive and impractical for use in outpatient clinical practice. Indirect methods include self-report, pill counts, refill rates, and clinical outcomes. Each method has strengths and weaknesses, along with underlying assumptions that must be true in order to obtain an accurate measurement (Neiheisel et al., 2014; Williams, Amico, Bova, & Womack, 2013). Best practice advocates concurrent use of several methods to compensate for the shortcomings of individual measurement strategies (Velligan et al., 2006; Williams et al., 2013); however, this is impractical in routine clinical practice because it decreases productivity and increases costs (Dunbar-Jacob, Sereika, Houze, Luyster, & Callan, 2012).

The study described in this article relied on self-report to assess both patient adherence and factors influencing nonadherence. Disadvantages of self-report methods include reliance on the patient's recall of events and potential biases of social desirability and self-presentation that may consciously or unconsciously influence patient responses (Dunbar-Jacob et al., 2012). Despite concerns about the accuracy of self-report, its validity has been found to equal or exceed that of count-based measures, and it has been positively correlated with physiological outcomes (Dunbar-Jacob et al., 2012; Shi et al., 2010; Williams et al., 2013).

Factors influencing patient adherence

A variety of influences are reported to affect medication adherence (IOM, 2012; Kales et al., 2013; Wister, Malloy-Weir, Rootman, & Desjardins, 2010). These are further defined as preventable or nonpreventable, and intentional or nonintentional (Neiheisel et al., 2014; Vrijens et al., 2012). Nonpreventable influences include cognitive impairment, medication side effects, and psychological disorders (Malow et al., 2013; Sreenath, Reddy, Tacchi, & Scott, 2010), while preventable influences include disbelief in the efficacy of medication, lack of insight or understanding, and out-of-pocket costs (Osterberg & Blaschke, 2005). Complex medication regimens, frequent

dosing schedules, and multiple or chronic medical conditions may also decrease medication adherence (Medic et al., 2013; O'Connor et al., 2013; Rolnick, Pawloski, Hedblom, Asche, & Bruzek, 2013). Patients may intentionally disregard a prescribed medication for financial reasons or as a result of personal beliefs, or they may be unintentionally forced to discontinue treatment because of side effects or adverse medication events (Wheeler et al., 2014).

Barriers to adherence such as socioeconomic status and health literacy have a disparate impact on socially disadvantaged populations (IOM, 2012; Kales et al., 2013; Wister et al., 2010). Cost is a common barrier for low-income patients (Wei, Lloyd, & Shrank, 2013; Zhang, Baik, & Lave, 2013). The impact of low health literacy increases with the complexity of modern health care, requiring an advanced ability to understand specialized information and reasoning skills needed to carry out suggested treatments (Wister et al., 2010). Past research has shown higher rates of adherence among Caucasians compared with other ethnicities (Kales et al., 2013); however, when socioeconomic and other demographic measures are held constant, health literacy is a more significant variable than ethnicity (Bauer et al., 2013; Kalichman, Pellowski, & Chen, 2013; Kripalani, Gatti, & Jacobson, 2010; Osborn et al., 2011).

Conceptual framework

In medication adherence research, patient behaviors are often dichotomized in terms of adherence or nonadherence. Complexity theory better explains adherence in everyday life, where unpredictable behaviors and patterns interact with multifaceted layers of systems. Rather than framing adherence behavior in terms of success or failure, adherence can be considered as a continuum of greater or lesser degrees, reflecting the tension and paradox of human behavior (Plsek & Greenhalgh, 2001; Sanger & Giddings, 2012). Complexity theory accounts for the myriad influences on medication adherence, such as economic factors, personal relationships, educational level, healthcare delivery, and health policies (Berben, Dobbels, Engberg, Hill, & Geest, 2012; Brown & Bussell, 2011; Haynes et al., 2008). Adhering to medication involves a process of adaption to situations through self-reorganization, whereby order develops sometimes spontaneously, and sometimes over time (Plsek & Greenhalgh, 2001). Coevolution describes the adaptation of related systems through interaction with one another (Cooper & Geyer, 2008; Plsek & Greenhalgh, 2001). Complexity theory acknowledges these unique influences and incorporates the flexibility to overcome challenges and increase treatment effectiveness through adaptation and innovation.

Method

Sample

The study population included a convenience sample of participants receiving care at an NPMC serving indigent patients. Inclusion criteria required participants to be age 19 or older and have the ability to read and speak either English or Spanish. Pregnant women and children were excluded because they were referred elsewhere for care. A sample size of 92 was required to achieve adequate power according to a G*Power estimate for multiple regression (power = 0.80, probability = .05, eight predictors) for a medium size effect (0.15). A total of 123 questionnaires were collected during a 3-week period, representing a return rate of 86% for all patients who were approached.

Instruments

Patient adherence and barriers to adherence were measured using a self-report method because it was cost-effective, practical for use in the clinic setting, and facilitated qualitative assessment of reasons for nonadherence. A three-page questionnaire assessed demographics, health literacy, medical conditions, number and frequency of medications, medication adherence, and perceived barriers to adherence. The meaningful and user-friendly instruments used in this research were created to assess medication adherence among HIV/AIDS patients, and included the visual analog scale (VAS) shown in Figure 1 (Giordano, Guzman, Clark, Charlebois, & Bangsberg, 2004) and the Adult AIDS Clinical Trials Group (AACTG) Adherence Instrument (Chesney et al., 2000). These tools were designed for and validated with low-income participants (median income of $30,000 or less).

The VAS correlated significantly with results obtained through unannounced pill counts (Giordano et al., 2004), and was inversely correlated with log HIV load, likely indicating an inverse relationship between disease state and medication adherence. The AACTG Adherence Instrument (Chesney et al., 2000) assessed self-perceived barriers to adherence. The frequency responses (rarely, sometimes, and often) were clarified by associating a numeric measure with each term, and additional barriers were added: trouble paying for medicine and trouble getting to the pharmacy. Questions about perceived

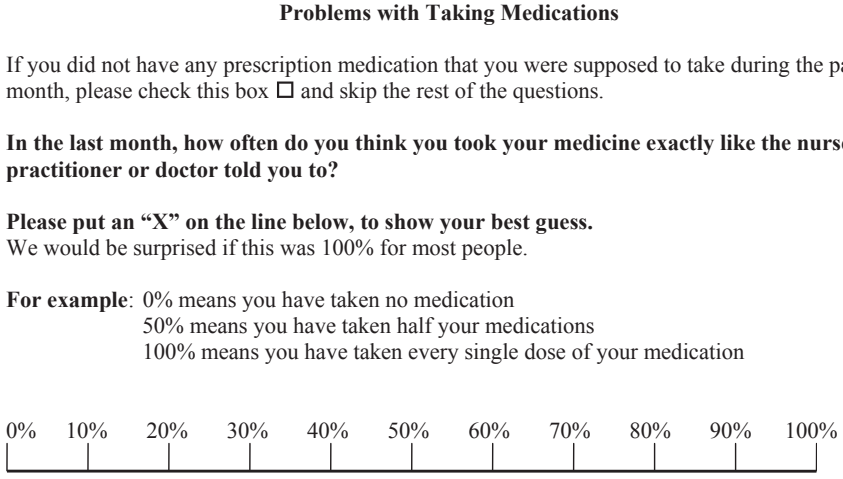

Figure 1 Visual analog scale.

medication efficacy and basic health literacy were also added. In addition, the single literacy-screening question was refined from the original version (Morris, MacLean, Chew, & Littenberg, 2006). A certified interpreter translated the questionnaire from English into Spanish, and it was then reverse translated by a second interpreter to ensure accurate translation. The questionnaires were approved by the Institutional Review Board (IRB) for protection of human subjects and piloted with six volunteers before final IRB approval.

Data collection

Clinic patients registering for an office visit were invited to fill out the 10-minute survey. Eligible volunteers received a clipboard with the informed consent and questionnaire in their preferred language. Consent did not require a signature, which was of particular concern because some NPMC patients may have been illegal residents and reluctant to participate in fear of deportation (Guarnero & Rentfro, 2011). To avoid coercion, the survey advised participants that incomplete forms could be deposited in the collection box, eliminating the need to directly refuse a perceived authority figure.

Data analysis

IBM SPSS Statistics for Windows version 20 was used to statistically analyze the data. Frequencies were tabulated for categorical variables, and means and standard deviations (SD) were calculated for continuous variables. Appropriate bivariate statistical tests examined relationships among the variables.

Results

Participant characteristics

Demographics. Although 123 responses were submitted, four incomplete questionnaires were excluded from analysis. The majority of participants were 40–59 years old (62%, $n = 75$). Nearly a third of participants did not indicate gender (31%), probably because of the visual format of the questionnaire. Participants identified their ethnicities as African American or Black, 29.3% ($n = 36$); Hispanic, 48% ($n = 59$); White or Non-Hispanic, 22% ($n = 27$); and other, 0.8% ($n = 1$). Most questionnaires (67.5%; $n = 83$) were completed in English, and 67.8% ($n = 40$) of respondents identifying themselves as Hispanic completed the questionnaire in Spanish. About one third (29.2%; $n = 35$) of participants reported grade school as the highest level of completed education, and are included in the 53.3% ($n = 64$) who reported completing some high school or less. High school or general educational development graduates composed 19.2% of the sample ($n = 23$), with 27.5% ($n = 33$) reporting completion of some college. Half of participants (49.6%; $n = 61$) were unemployed and 81.4% ($n = 96$) reported incomes of less than $20,000 annually. The mean household size was 2.38 (SD 1.41).

Health status. The mean number of medical problems reported by participants was 1.96 (SD 1.33), with a range of 0–6. Many reported more than one medical condition, with hypertension the most commonly reported medical problem (50.4%; $n = 62$), followed by diabetes (37%; $n = 46$), other problems (35%; $n = 43$), hyperlipidemia (27.6%; $n = 34$), and depression (26.8%; $n = 33$).

Prescription medications. The sample was divided into two groups: 78.9% taking medications within the last month ($n = 97$, "Meds" group), and 17.1% reporting no use of prescription medication in the last month ($n = 21$, "No Meds" group). Five participants (4% of the total sample) were excluded from analysis because they neither completed the VAS nor denied taking medications. Groups were compared to identify significant differences. The differences between the Meds and No Meds groups were not surprising, with older participants more likely than younger participants to report taking medications ($\chi^2 = 7.86$, $p = .02$). Participants in the Meds group were more likely than those in the No Meds group to report diabetes ($\chi^2 = 11.1$, $p = .001$), hypertension ($\chi^2 = 8.1$, $p = .004$), and hyperlipidemia ($\chi^2 = 6.73$, $p = .009$), and also reported significantly more medical diagnoses (mean of 2.06) compared with the No Meds group (mean 0.95; t-test −6.8, $p = .000$). In the Meds group, the mean number of medications taken daily was 3 (SD 2.26), while the most predominant dosing frequencies were once or twice daily.

Adherence to medication

The adherence rate results were highly skewed, with most participants reporting 90%–100% adherence (mean 77%, median 90%, mode 100%). Because of this, the assumptions for normal distribution were not valid, and the variable could not be analyzed as a continuous one with parametric statistics. The variable was changed to categorical, but responses could not be divided into low, moderate, and high adherers because this resulted in low and medium groups that were too small for statistical comparison. As a result, adherence was transformed into a dichotomous variable with responses categorized as high (85%–100%) or low (≤84%) adherers, with the minimally optimal adherence rate of 85% based on the likelihood of improved clinical outcomes resulting from prescribed medication. Dividing the adherence rate at 80%–85% has been supported by previous research and addressed by Gwadry-Sridhar et al. (2009). The binomial logistical regression model that best predicted adherence was constructed using bivariate analysis, and assumptions of variable independence were confirmed through collinear analysis.

Only the question about the last time a medication was missed correlated significantly with adherence (χ^2 12.45, $p = .002$), which lent support to the soundness of data. A significant inverse correlation was observed between adherence and the number of barriers indicated by participants (t-test 2.27, $p = .03$). Barriers significantly related to low adherence included trouble paying for medication ($\chi^2 = 4.05$, $p = .04$), being away from home ($\chi^2 = 4.09$, $p = .04$), and forgetting to take medication ($\chi^2 = 4.86$, $p = .03$). The modified barrier scale had good internal consistency (Cronbach's alpha coefficient = 0.87) and no items with low values. Adherence rate was not correlated with type or number of medical diagnoses, number or frequency of daily medications, health literacy (needing help to understand medication labels), or any demographic variable.

Binary logistic regression determined the best predictive model to differentiate high from low adherers (Table 1). The final model contained three independent variables: total number of barriers, health literacy, and employment status. This model was statistically significant ($n = 91$, $\chi^2 = 11.49$, $p = .043$), indicating that these factors distinguished participants who reported low adherence from those who reported high medication adherence. The odds ratio of 0.35 indicated that participants who reported sometimes needing help understanding prescription labels were three times more likely to be in the low adherence group than those who reported needing no help. Without solicitation, 20% of Spanish-speaking participants reported having trouble understanding prescription bottles when labeled in English rather than in Spanish.

Table 1 Logistic regression predicting low (1%–84%) or high (85%–100%) adherence to medication

	B	SE	Wald	df	*p*	Odds ratio	95% CI
Barriers: total number	−0.09	0.06	2.18	1	.14	0.91	[0.80, 1.03]
Need help understanding label							
None of the time	Reference	-	5.42	2	.067	1.00	-
Need help 25%–75% of time	−1.06	0.58	3.33	1	.070	0.35	[0.11, 1.08]
All of the time	0.21	0.55	0.15	1	.690	1.24	[0.42, 3.61]
Work status							
Not working	Reference	-	3.41	2	.18	1.00	-
Work full time	0.95	0.60	2.52	1	.11	2.59	[0.80, 8.38]
Work part time or other	0.77	0.55	1.97	1	.16	2.15	[0.74, 6.28]
Constant	0.50	0.54	0.86	1	.36	1.65	-

Note. CI, confidence interval.

Discussion

The sample in this study represented an ethnically diverse, predominantly Hispanic middle-aged, low-income population with a variety of factors influencing adherence levels. Speaking Spanish, having low income (<$20,000 per household for 80% of sample), and being uninsured are consistent with reported characteristics of vulnerable populations (Lewis, Larson, McClurg, Boswell, & Fisher, 2012). The majority of participants did not complete high school, with almost a third of these not even completing grade school. Although different than formal education, health literacy does presuppose some general knowledge and is influenced by education level (Wister et al., 2010). These patients had the compounded disadvantages of both low educational level and low health literacy, with 35% always needing help to understand medication labels, further reinforcing this population's vulnerability. Framed within the paradigm of complexity theory, vulnerable characteristics form an interactive web that influences an individual's ability to adhere to a medication regimen, and low levels of health literacy and education appear to have a profound impact.

The most common medical problems, hypertension (50%) and diabetes (43%), were observed at higher incidences than previously reported in this clinic population (K. Fiandt, personal communication, April 30, 2013). Given the prevalence of chronic disease, the average of three prescribed medications per patient was not surprising. Even one chronic disease increases the complexity of a person's health care and influences family, work, and the social environment.

The high rate of adherence, with many participants reporting 100% adherence, was unexpected considering the vulnerable characteristics of participants, along with the prevalence of chronic diseases. This result was significantly higher than the typically reported rate of 50%–75% (Brown & Bussell, 2011; Chen et al., 2013; Haynes et al., 2008; Kales et al., 2013; Neiheisel et al., 2014; WHO, 2003); however, there are several possible explanations. First, the clinic had taken action to facilitate access to affordable medications. Constantly mindful of patients' limited financial resources, NPs frequently prescribed generic medications, provided samples, or referred patients to drug company prescription assistance programs (PAPs). The clinic nurse spends about half of her full-time position assisting patients to complete PAP applications. When coupled with the most frequently indicated barrier (62.5%) "trouble paying for medications," the high rate of adherence to medication could be a consequence of the increased patient access to medication. Having the nurse spend half her time assisting patients with filling out PAP increases the cost to the clinic in terms of time and expense, but supports the clinic's primary mission of providing quality care to indigent patients. Considered within the framework of complexity theory, clinic processes designed to remove financial barriers represent an ideal example of how changing system components can positively influence patient behavior, counteract risks and barriers, and increase adherence. The clinic process of assisting patients with PAP paperwork is an example of coevolution: by increasing access to medications, patients adapt and self-reorganize, with the consequent behavior of increased medication adherence.

Another possible explanation for the high adherence rate may be greater attention to patient education, which is a hallmark of nursing practice. NPs may have devoted more time to educating patients about the need for medication and the potential side effects than is customary among physicians and other types of care providers. Common attributes of NP practice include nonjudgmental provider–patient interactions and careful monitoring of patient understanding, ability, and willingness to take medications as prescribed. Additional research is needed to fully document the effects of NP care on adherence.

Finally, the high self-reported rate may not reflect actual medication adherence, as participants may have inflated their rates for a number of reasons. Participants deposited the questionnaires in a box to increase anonymity, but may have worried that their answers would be divulged to clinic staff. The sample was 48% Hispanic, and disproportional effects of acquiescent response sets (yea-saying) and giving socially desirable responses have been demonstrated in survey research of Hispanic populations (Marin & Marin, 1991). However, the relationship among ethnicities and rate of adherence was not significant.

A statistically significant inverse correlation was observed between the number of reported barriers and medication adherence. As expected, patients reporting fewer barriers were more adherent. In addition to "trouble paying for medications," barriers having significant inverse correlations with patient adherence were "away from home" and "simply forgot." These barriers substantiate the potentially disproportionate downstream impact of seemingly small, everyday occurrences. Consequently, coaching patients may be important in overcoming these challenges. The ability to elicit patient problems and help them create effective solutions within the context of their lives is an essential element of NP clinical practice.

Limitations

Although self-reported adherence measures have been previously validated (Williams et al., 2013), objective

measures such as blood pressure or HgbA1C levels would lend greater credibility to findings. The power was adequate for the statistical analysis completed; however, a larger population might have facilitated a more in-depth analysis. The low variance in reported medication adherence, with half the respondents reporting 90% adherence or greater, produced a markedly skewed distribution that required changing adherence from a continuous to a categorical variable. Division of the responses into high and low adherers may have impacted findings by preventing more sensitive and precise statistical analyses. Historical bias introduced by the 3-week data collection period could also have affected the results. Finally, this study was conducted at a single clinic location and is therefore not generalizable. It should be replicated across multiple sites and at different times to confirm whether these findings are typical of NPMC's serving similar populations and clinics actively assisting patients in obtaining more affordable medications.

Implications for NP practice

The barriers and risk factors reported by clinic patients suggest substantial opportunity for NPs to impact medication adherence through relatively small practice changes. W. Clement Stone said "Big doors swing on little hinges" (2012), and small interventions like educating patients about preventable barriers such as forgetfulness and being away from home can result in self-reorganization, overcoming challenges, and improving treatment outcomes. Patients who forget their medication might be encouraged to set an alarm, use a compartmental weekly pill container, or tie the behavior to a daily activity such as brushing teeth. Patients who miss doses when away from home might be advised to keep an extra dose of medications in an accessible location. For patients who prefer Spanish, a checkbox in the patient's electronic health record requesting Spanish language instructions could provide a cost-effective, culturally sensitive solution. Complexity theory explains how relatively small interventions can lead to high impact results, and NPs are perfectly situated to use these interventions as a fulcrum for behavioral change.

The NPMC had already implemented processes to increase patient access to affordable medications in response to the known barrier of cost. These strategies included using generic medications, PAPs, and pharmaceutical samples. These actions represent an example of how clinical practice changes can promote greater medication adherence. The role of the NP is to facilitate patient assessment of medication adherence, identify barriers to successful treatment, and develop creative solutions. By assuming a collaborative rather than paternalistic role, NPs can encourage patients to participate more actively in self-care and recognize discordance between health goals and current behaviors, thus promoting self-reorganization and adoption of behaviors leading to medication adherence.

Conclusion

The surprisingly high median adherence rate of 90%, despite the financial challenges for this clinic population, could reflect the efforts of the NPMC to increase access to affordable medications. This validates the application of complexity theory to the problem of medication adherence and suggests that a small change in NP practice can disproportionately impact patient behavior. The method used in this study could be easily replicated to evaluate potential interventions or to assess adherence rates and barriers in other populations. Establishing baseline medication adherence rates and identifying barriers to successful treatment represent the first steps toward effective intervention.

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