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RESEARCH

Beliefs about medication, medication adherence and seizure control among adult epilepsy patients in Kimberley, South Africa

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Background: Patients with epilepsy regularly present to the Kimberley Hospital Complex's emergency department and are managed and discharged but within a short period present again to casualty with seizures. This study aimed to explore whether beliefs about medication have any relationship with treatment adherence and seizure control among adult patients with epilepsy attending the hospital and clinics in Kimberley.
Methods: In this descriptive observational study, participants included patients presenting to casualty with seizures, and epileptic patients collecting their antiepileptic drugs. Participants completed a questionnaire that included the Morisky eight-item medication adherence scale and Belief about Medication Questionnaire.
Results: The majority of the 197 participants were male (61.9%), unemployed (84.3%), and reporting two or more seizures annually (67.0%). The age range was between 19 and 68 years (mean age 40 years). High adherence was reported by 107 (54.6%) participants. The relationship between adherence and seizure control was not statistically significant. There was a statistically significant correlation between medication concerns and harm, and adherence but no correlation between medication overuse and adherence.
Conclusion: Patients' beliefs about medications can influence their adherence; beliefs about medication did not influence the control of the patient's seizures. Patients' medication adherence did influence the seizure control in this sample.

Keywords: beliefs about medication, epilepsy, medication adherence, seizure control

Introduction

In 2005 the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE) came to an agreement on the definition of epilepsy. They stated that 'Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological, and social consequences of this condition.'"[1] In 2014 the ILAE revised the definition of epilepsy 'as a disease of the brain defined by any of the following conditions: (1) At least two unprovoked (or reflex) seizures occurring > 24 h apart; (2) one unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring ever the next 10 years; (3) diagnosis of an epilepsy syndrome'.[2]

Controlled epilepsy was defined as a patient who is seizure-free for at least 18 months.[3] There is little common standard for the definition of uncontrolled epilepsy.[4] In general seizures are considered uncontrolled if they are frequent and severe enough to seriously interfere with patients' quality of life.[4] One European journal define uncontrolled seizures conservatively as the occurrence of seizures at an average frequency of at least one per month for 18 months.[5] Other journals used a more restrictive definition that sets uncontrolled epilepsy as the presence of at least one seizure per year.[6,7] No literature defining uncontrolled epilepsy applicable to African conditions could be found. For the purpose of this study, the definition 'one or more seizures per 12 months' was adopted as uncontrolled epilepsy.

Researchers believe that measuring of adherence to treatment should be a routine part of management of epilepsy.[8] If modifiable factors that cause non-adherence are understood, it may be possible to intervene to improve adherence and reduce morbidity and mortality among patients. A recent study found more than a 3-fold increase in mortality due to non-adherence to antiepileptic drugs when compared to adherence groups. The study also found that patients believing that they are managing their medication schedule effectively do not always adhere to recommendations.[9]

Lack of understanding of doctors' instructions has been identified as a strong contributing factor to patients' non-adherence.[10] Adherence can be improved if doctors take more time to explain to the patients how to use the medication, and ensure that they understand the instructions. Understanding patients' beliefs regarding their illness may help in identifying why patients do not adhere to medication regimens. Further attention should also be given to patients who have poor seizure control since they may have negative beliefs regarding epilepsy and the treatment thereof.[8]

Kimberley Hospital Complex is a regional hospital and the main referral centre in the Northern Cape Province. Monthly, an average of 43 patients with seizures are briefly admitted to the short-stay ward while about 70 patients report to the clinics to collect their medication.

Patients presenting to the casualty department at the Kimberley Hospital Complex with uncontrolled seizures are mostly patients with epilepsy on various antiepileptic drugs who have discontinued treatment or are non-adherent. This is a serious problem faced by doctors working with epileptic patients as it is not always apparent whether patients are adherent to their medications or whether they are presenting with a break-through seizure. Little time is spent

exploring the patients' beliefs about their medications, which may lead to intentional or unintentional non-adherence. Better information on the patients' beliefs regarding their antiepileptic medication (which should include their understanding of the impact of the use of their medications) will help the medical practitioners in better educating patients, which may in turn help improve patient adherence in the long run.

Table 1: Demographic characteristics of participants presenting with epilepsy at the Kimberley Hospital Complex and clinics

Factor	*n*	%
Gender (*n* = 197)		
Male	122	61.9
Female	75	38.1
Age distribution in years (*n* = 197, EQ \o (X,˜) = 39.9)		
< 20	7	3.6
20–29	46	23.4
30–39	38	19.3
40–49	54	27.4
50–59	40	20.3
60–69	12	6.1
Language (*n* = 196)		
Afrikaans	95	48.5
Tswana	74	37.8
Xhosa	14	7.1
Sotho	6	3.1
English	4	2.0
Zulu	2	1.0
Other	1	0.5
Employment status (*n* = 197)		
Employed	29	14.7
Self-employed	2	1.0
Unemployed	166	84.3
Seizure history in the past year (*n* = 197)		
No seizures	37	18.8
One seizure	28	14.2
Two or more seizures	132	67.0

Aim

The aim of this study was to explore whether beliefs about medication have any relationship with treatment adherence and seizure control among adult patients with epilepsy attending the hospital and clinics in Kimberley.

Methods

Study design

This was an observational descriptive study.

Study population

The study population included all adult patients with known epilepsy who visited the Kimberley Hospital Complex casualty department and clinics from September 2012 to February 2013.

Inclusion and exclusion criteria

Patients from the ages of 18 years and above with known epilepsy, who had been on at least one antiepileptic medication for 6 months or more prior to their casualty/clinic visit and who consented, were asked to participate in the study. Patients on multiple chronic medications were also included.

Patients with first-time seizures or newly diagnosed epilepsy were excluded as well as patients who were mentally disabled or who had poorly controlled psychiatric disorders such as depression, anxiety and psychosis, as revealed by the history taking.

Sample size

Since the adherence measure is expressed categorically, the SAS/STAT® POWER Version 9.3 (Cary, IN, USA) procedure was used to estimate a desired sample size for the Z-test for binomial proportions, given the following assumptions:

- a null proportion of 0.5 (i.e. giving a null hypothesis that participants were as likely to adhere as not adhere);
- a two-sided test;
- a power set at 0.8;
- an alternative hypothesis of at least a 10% difference in adherence.

The required sample size was calculated as 194 participants, and rounded up to 200.

Measurement

Data were collected by means of a questionnaire, which was administered by the researcher, doctors and nurses to patients in the Kimberley Hospital Complex casualty department, short-stay

Table 2: Distribution of educational qualifications according to medication adherence (*n* = 196)

Qualification	Total per education status	Low adherence (*n* = 89)	High adherence (*n* = 107)
	n (%)	*n* (%)	*n* (%)
No schooling	25 (12.8)	13 (52.0)	12 (48.0)
Primary school	48 (24.5)	20 (41.7)	28 (58.3)
Some level of high school	81 (41.3)	31 (38.3)	50 (61.7)
High school completed	33 (16.8)	20 (60.6)	13 (39.4)
Tertiary (including diploma, some level of university, university completed and postgraduate)	9 (4.6)	5 (55.6)	4 (44.4)

Notes: No statistical significance was found between the level of education and medication adherence ($\chi^2 = 5.8$, df = 4, $p = 0.21$).

Table 3: Seizures by MMAS-8 adherence (*n* = 196)

Seizure control during the previous year	Total per seizure level *n* (%)	Low adherence (*n* = 89) *n* (%)	High adherence (*n* = 107) *n* (%)
None	37 (18.9)	16 (18.0)	21 (19.6)
One	28 (14.3)	8 (9.0)	20 (18.7)
Two or more	131 (66.8)	65 (73.0)	66 (61.7)

ward, and medical specialist clinics as well as local clinics. Patients in the short-stay ward or casualty department were asked to complete the questionnaires after recovering from their seizure: interviews were conducted 24 hours or more post-seizure to ensure patients were not postictal. Patients in the clinics completed the questionnaires when they came to collect their chronic medication.

The consent form and information letter were available in English, Afrikaans and Setswana, while the questionnaire was available in English only. Doctors and nurses were trained by the primary researcher in the aim of the study and on how to collect information from the patients; the questionnaire was not difficult to interpret with unambiguous questions. The integrity of the interviewer in giving the correct interpretation was relied upon.

The treating doctors and nurses collected the patients' demographic data and assisted the patients in completing the questionnaires. Information regarding seizure control during the previous year was obtained from participants or their relatives, and available hospital records were used to verify the information. Professional nurses, trained in primary health care and working in the emergency department and local clinics, translated the questions to non-English-speaking patients by reading out the questions to them in their local dialect (Afrikaans, Tswana, Xhosa, Sotho or Zulu). The patients' responses were translated to the doctors, in cases where the doctors helped complete the questionnaires.

Two published scales were used to measure adherence and beliefs: the Morisky 8-item Medication Adherence Scale (MMAS-8)[11–13] was used to measure adherence, while treatment beliefs were determined using the Beliefs about Medicine Questionnaire (BMQ).[12,14] The wording of some of the scale items was changed slightly to better fit the context of the patients with epilepsy from the Kimberley Hospital Complex, as well as some changes to the scoring, as detailed below.

Explanation of questionnaire interpretation

The MMAS-8 was shown to have acceptable reliability, with a Cronbach's alpha reliability of 0.83, and good predictive validity.[13] The scale consists of eight questions: the first seven questions require a 'Yes' or 'No' response, scoring one point per item for every 'Yes' response. The last question consists of a five-point rating scale where any one of the three most frequent non-adherence options will give a point. Adherence scores can thus range between 0 and 8, with a score of 0 to 2 indicating high adherence and a score of 3 or more suggesting low adherence, as per the recommendations of Gatti et al.[12] Adherence to treatment can be difficult to measure; other techniques include measuring plasma drug levels, thought to be too invasive for this study.

The BMQ[14] is a five-point Likert scale consisting of two sections, Specific and General, each with two subscales:

The BMQ Specific section (five items each):

- 'Necessity', which assesses beliefs about the need for prescription medications.
- 'Concerns', which addresses concerns regarding the danger of dependency, toxicity and disruptive effects of prescription medications.

The BMQ General section (four items each):

- 'Harm', which looks at beliefs that medications are harmful, addictive or poisonous, and should thus not be taken continuously.
- 'Overuse', which assesses beliefs that medicines are overused by doctors.

One Overuse item ('Natural remedies are safer than medicines') showed an almost equivalent item loading (0.47 vs. 0.45) on the Harm subscale in Horne et al.'s study,[14] and thus showed poor discriminant validity. The item was subsequently excluded from the Overuse subscale in this study resulting in a three-item subscale. Because of the differing number of items in each subscale, the subscale scores for the BMQ were not computed as total scores, but as average scores (within a range of 1 to 5, as defined by the Likert scale used).

The Cronbach alpha coefficients reported in the literature for the various subscales were adequate, with the exception that in certain samples General Harm tended to show a lower alpha coefficient.[12,14] Construct validity was, unfortunately, only assessed with principal components analysis, but seemed reasonably adequate.

Pilot study

An initial pilot study was carried out on seven patients in order to confirm the feasibility of this study. Only minor corrections were made and thus data obtained from the pilot study were included in the main study.

Ethics

Approval for the study was granted by the Ethics Committee of the Faculty of Health Sciences, University of the Free State. Permission to collect the data was given by the management of Kimberley Hospital Complex.

All participants consented and no identifying information was captured on the data form.

Results

In total 201 patients were recruited between September 2012 and February 2013 from Kimberley Hospital Complex's emergency department, short-stay ward and specialist clinics, of whom four did not meet the necessary inclusion criteria, resulting in a final sample of 197 participants. Three patients withdrew from the study after completion of the questionnaire was started.

The age range for the study population was between 19 and 68 years with a mean age of 39.9, and a median age of 41 years.

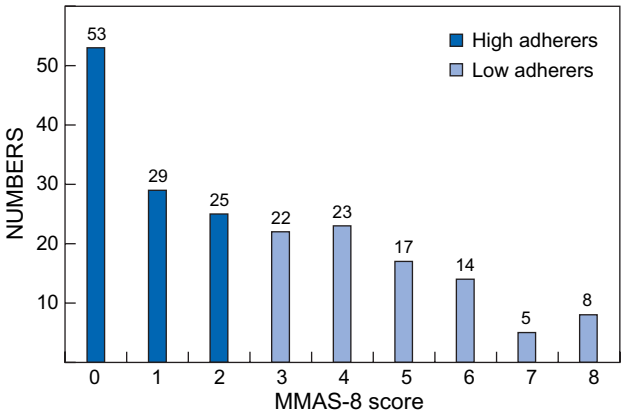

Figure 1: Distribution of participants according to their MMAS-8 medication adherence score (n = 196).

The majority of participants were male (61.9%), unemployed (84.3%), and suffering from two or more seizures per year (67.0%). Only 37 (18.8%) reported no seizures in the past year, which indicates that most of the study participants had uncontrolled epilepsy. The highest percentage of participants (48.5%) was Afrikaans speaking.Table 1 shows the Demographic characteristics of participants of the sample. Table 2 shows the distribution of educational qualifications according to medication adherence of the study sample and Table 3 reports on the seizures by MMAS-8 adherence for the study sample (n = 196).

Figure 1 shows that, according to the MMAS-8, 107 (54.6%) participants reported high adherence. It is not clear as to why the high adherence rate was measured in this study but it may be ascribed to a 'pleasing behaviour' of the patients.

Although it was interesting to note that the high adherers showed a smaller percentage of participants with two or more seizures (Table 3), the relationship between seizures and adherence was not statistically significant ($\chi^2 = 4.2$, df = 2, $p = 0.12$). The authors suspected that this might be due to either the coarser measurement produced by reducing the eight-point (essentially, nine-value) scale of the MMAS-8 to a two-category 'scale', or an incorrect cut-off used to distinguish between high and low adherers: the authors used that recommended by Gatti et al.[12] although a test (not shown) using that originally recommended by Morisky et al.[11] proved unsuccessful. Since using the MMAS-8 raw scores could possibly alleviate both problems, the further analyses reported use the actual score, not the high/low adherence dichotomy.

Table 5: Correlation of MMAS-8 and BMQ values

BMQ	MMAS-8
Specific	
Concerns[a]	0.35**
Necessity[b]	–0.14*
General	
Harm[a]	0.24**
Overuse[a]	0.03

Notes: [a]n = 196.
[b]n = 194.
*$p < 0.05$; **$p < 0.01$.

Table 4 shows the means MMAS-8 and BMQ scores for all participants, and then separately for those with none, one, and two or more seizures. The MMAS-8 scores could potentially range between 0 and 8, and the BMQ scores between 1 and 5 (being the average of a number of 5-point Likert scale items). The general trend is that those participants with one seizure show slightly lower means than those with none (the exception being Overuse), but these differences are not statistically significant, nor is the trend maintained, as those with two or more seizures again show generally higher mean values than those with one seizure.

Although it appears as if neither beliefs about medication nor an indication of adherence showed a definite relationship with the number of seizures, it was interesting to note that these two measurements themselves did show a relationship (Table 5). Table 5 shows the results of the correlation between the participants' medication adherence measure and belief variables. In interpreting these scores, it should be kept in mind that the MMAS-8 actually measures non-adherence (i.e. high scores on the MMAS-8 indicate low adherence, and vice versa). A significant positive correlation between participants' concerns and adherence was observed, indicating that an increase in patient concerns about their medications was related to a decrease in medication adherence. There was a weak negative correlation between participants' beliefs concerning the necessity of using their medication and adherence, indicating that a stronger belief in the necessity of the medication was related to an increased likelihood of actually using the medication. Lastly, there was a statistically significant positive correlation between harm and adherence, indicating that a stronger belief that medication might be harmful was related to an increased likelihood not to continue with the use of that medication. There was no correlation between beliefs about medication overuse and adherence, but it should be remembered that this subscale refers to the belief that doctors overuse (i.e. overprescribe) medication.

Table 4: Mean MMAS and BMQ values by seizure control

Variable	All participants	Number of seizures during the previous year								
		None			One seizure			Two or more seizures		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
MMAS-8	2.58	37	2.32	2.10	28	1.71	1.78	131	2.83	2.49
BMQ										
Specific Concerns	2.42	37	2.47	0.93	28	2.39	0.83	132	2.41	0.86
Specific Necessity	4.11	36	4.14	0.77	28	4.01	0.73	131	4.12	0.75
General Harm	1.99	37	2.08	0.81	28	1.78	0.65	132	2.01	0.80
General Overuse	2.73	37	2.64	0.90	28	2.82	1.02	132	2.73	1.10

Table 6: Logistic regression of medication adherence and beliefs as predictors of seizure control

Parameter		df	Estimate	Standard error	Wald chi-square	Pr > chi-square
Intercept	None	1	−1.09	1.09	1.00	0.318
Intercept	One	1	−0.30	1.08	0.08	0.781
MMAS-8		1	−0.16	0.07	4.37	0.037
BMQ Specific Concerns		1	0.19	0.21	0.83	0.364
BMQ Specific Necessity		1	−0.07	0.21	0.11	0.736
BMQ General Harm		1	0.00	0.24	0.00	0.984
BMQ General Overuse		1	−0.07	0.16	0.21	0.648

Note: df = degrees of freedom.

Given the relationship between the beliefs about medicine and the adherence to a medication regimen, the authors decided to examine whether the combination of adherence and beliefs might be able to predict seizure control. It was felt that the most appropriate way to test this, given the seizure frequency as an ordinal variable, was by means of logistic regression. The overall model was significant ($\chi^2 = 15.55$, df = 5, $p = 0.0083$). The scale estimates are shown in Table 6, which also lists the applicable variables. From this, it can be seen that the only significant predictor of seizure control was the MMAS-8 score, and that while they themselves are related to the MMAS-8, the BMQ subscales added nothing further to the prediction of seizure control.

Discussion

The majority of the participants in this study were male, which is quite different from a number of studies reported in the literature, where the majority were female,[12,15,16] although this could be attributed quite easily to very different sampling methods.

Whilst criteria in the literature for defining uncontrolled epilepsy vary,[17–19] in this study patients with at least one seizure per year were regarded as uncontrolled epileptics, and this accounted for the majority of the participants (160, 81.2%).

Although some studies have found factors like education to be associated with lower levels of adherence,[20] Lacro et al.[21] did not find education to be a significant predictor of medication adherence; and, in agreement with Lacro et al., this study found no statistical correlation between the level of education and the level of the adherence. It needs to be noted that the Lacro et al. study was not a systemic review and was done on patients with schizophrenia and not on epilepsy.

When looking at the patients' beliefs about medication, some interesting findings presented. First, it should be remembered that, given a Likert scale range from 1 to 5, the BMQ scale midpoints were 3. Although scale midpoints should not be misconstrued in terms of population norms, one might posit that scores above the scale midpoint tended towards a stronger expression of that belief. The scores for the Specific Concerns subscale were actually quite low (2.42). The sample, then, did not show particularly strong concerns about their medication. They also believed that their medication was necessary, as their sample mean on this subscale was 4.11, which was much higher than the scale midpoint, and also in line with sample means reported by the scale developers.[14] The General subscales, both with sample means below the scale midpoint, also indicated that, on average, the participants did not believe that their medication was harmful (EQ \o (X,¯) = 1.99), or that doctors overused medication (EQ \o (X,¯) = 2.73).

Despite the fact that Haut et al.[22] found that patients' beliefs and perception about stress were associated with increased seizure frequency, this study found no statistically significant relationship between the presence of seizures and the participants' beliefs about their medications.

More than half (107, 54.6%) self-reported high adherence, and no specific relationship could be found between controlled vs. uncontrolled epilepsy, and high and low adherence. The accuracy of adherence in self-reported studies is difficult to verify and is unfortunately inherent in the system of information gathering used in this study. This could be attributed to a social bias, in that the participants might have answered the MMAS-8 adherence measure in the way they believed the doctors would want them to answer, rather than actually reporting what they did in practice. Only a study that examined adherence much more closely, and preferably longitudinally, would be able to clarify that. It should also be noted that another factor which could cloud this relationship was the rather arbitrary distinction between low and high adherers that was used in this specific analysis, and was derived from the literature on the MMAS-8.[12,13] To illustrate this more clearly, while a participant with a score of 2 on the MMAS-8 would be classified as a high adherer, participants with scores both of 3 (only one point different from the 2) and 8 (six points difference) would be classified as low adherers. Further to this, the sample's median MMAS-8 score was 2 (107, 54.6% of the sample had MMAS-8 scores of 0, 1, or 2), which was indicative of a relatively high degree of adherence amongst more than half of the sample.

Given this, a logistic regression with presence of seizures (a categorical variable) as the criterion and the actual MMAS-8 and BMQ scores showed that seizure control can be influenced by the level of medication adherence: the better the patients adhere to the treatment, the less likely they are to have more seizures. This finding is consistent with the results from other studies where a negative correlation was found between seizure control and adherence.[8,15] However, none of the beliefs about medication showed any relationship with the presence of seizures.

One final aspect of interest was the relationship between beliefs about medication and adherence. Nakhutina et al.[15] reported that patients with increased concerns about the negative consequences of taking antiepileptic drugs were associated with lower adherence. This study showed relationships between three of the beliefs about medication and medication adherence, which is consistent with studies done in other parts of the world.[12,15,23] Specifically, beliefs that medication was harmful or concerns about medication were correlated to lower levels of adherence. Furthermore, a belief in the necessity of medication was correlated with higher adherence. This shows that our beliefs do influence our behaviour, and may suggest that attempts by medical practition-

ers to increase adherence may do well to focus on correcting mistaken beliefs about medication — not just for epileptics, as in this study, but in all likelihood any patient requiring medication.

Study limitations

The study may have been subject to reporting bias since the participants reported adherence using the self-reporting MMAS-8, which may have resulted in a bias estimation of adherence.

This study did not differentiate between participants presenting to the casualty department, and those visiting the clinics. This would have enabled the researchers to assess whether adherence to medication was the reason participants presented to the casualty department with uncontrolled seizures.

This study did not measure the number of anti-epileptic drugs taken and alcohol abuse, which could affect the patients' seizure threshold.

Seizure frequency should also have been measured as a continuous variable over a specific time frame, as this finer level of measurement would have permitted better analysis of the relationships between variables.

Nurses assisted patients when translation was required. These health care workers were trained in the aim of the study in order to minimise bias.

Recommendations

Based on the findings of this study the following recommendations are made:

(1) Measures should be developed to address the issues and concerns surrounding patients' beliefs about their medications. Negative beliefs can be associated with patients purposefully refusing to take their medications or unintentionally forgetting to take their medications as they deem their medication to be unimportant.[12]

(2) Education campaigns can be set up in the hospital to address the negative beliefs in the community, for example, a poster informing patients that antiepileptic drugs are not harmful if used as prescribed by their doctors. This may help to increase the medication adherence of the patients and may reduce the cost of managing patients, with fewer patients presenting to the emergency department with seizures.

(3) The study found that the participants' belief that their medication was harmful was significantly correlated to their adherence. By taking time to explain to the patients how to use their medication, what side effects to expect and how to handle these side effects, health practitioners can assist in reducing the likelihood of the patients abandoning the medications due to side effects or perceived harmful effects.

(4) This study has shown that medication adherence can affect seizure control. Medical practitioners should ensure that their patients adhere to their prescribed medication treatment, rather than changing their medications or adjusting their dose without confirming adherence.

(5) This study showed a relationship between adherence and seizure control, and between beliefs about medication and adherence, but not between beliefs about medication and seizure control. An interesting area of possible future research would be whether adherence mediates the influence of beliefs about medication on an outcome variable such as seizure frequency.

Conclusion

Patients with epilepsy are a common presentation to Kimberley Hospital Complex. Patients' beliefs can have a negative influence on their adherence to medications; if the patient is non-adherent he/she may present with more seizures, resulting in numerous visits to the emergency department. This will place an additional burden on ER staff and reduce the patients' quality of life.

This study found that the participants' beliefs had no significant effect on the control of their seizures, so regardless of whether the patient is a controlled epileptic with no seizures or uncontrolled with frequent seizures their beliefs about their medication will not predict how many seizures may occur. This study was, however, able to show a relationship between seizure control and medication adherence where medication adherence was found to be a good predictor of seizure control. This study also determined that patients' beliefs can affect medication adherence.

Due to misconceptions about antiepileptic medications there is a need for health education to reinforce and encourage positive beliefs and discourage negative beliefs in order to increase patients' medication adherence.

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