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Original Research

Associations between patient factors and medication adherence: A Jordanian experience

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ABSTRACT[*]

Objective: To explore the effect of patient characteristics and health beliefs on their medication adherence.

Methods: Patients (n=167) with chronic conditions (mean age 58.9; SD=13.54, 53% males) were recruited from March 2009- to March 2010 using a cross sectional study design. Data collected included patients' demographics, medical conditions, medications therapeutic regimen, frequency of physician visits and health beliefs. Patient self-reported adherence to medications was assessed by the researcher using a validated and published scale. Treatment related problems (TRPs) were evaluated for each patient by competent clinical pharmacists. Associations between patient characteristics/health beliefs with adherence were explored.

Results: About half of the patients (46.1%) were non-adherent. A significant association was found between lower adherence and higher number of disease states ($p<0.001$), higher number of medications ($p=0.001$), and higher number of identified TRPs ($p = 0.003$). Patient adherence was positively affected by older age, higher educational level, and higher number of physician visits per month, while it was negatively affected by reporting difficulties with getting prescription refills on time.

Conclusion: This study identified different factors that may negatively affect adherence, including higher number of medications and disease states, higher number of identified TRPs and inability to getting prescription refills on time. Hence, more care needs to be provided to patients with complex therapeutic regimens in order to enhance adherence.

Keywords: Medication Adherence; Epidemiologic Factors; Health Knowledge, Attitudes, Practice; Jordan

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INTRODUCTION

In the last few decades, there has been growing universal awareness of drug related problems among patients with chronic conditions.[1] Recent research around the globe, from the USA, to Australia, Europe and Jordan, has found medication adherence to be a detrimental factor in achieving optimal health outcomes.[2] In Jordan, majority of the population in the community remain non-adherent.[3]

Better adherence has been strongly associated with improved survival and lower risk of hospitalization[3], but factors affecting adherence and the nature of association between adherence and these factors remain unclear.[4] Identifying patients at highest risk of poor adherence and subsequent poor health-outcomes continues to challenge the healthcare community in Jordan as elsewhere.

Patient adherence is not only influenced by the healthcare system, but also by different social and cultural factors.[5] Ethnic differences in attitudes to medicines and medicines-taking have been documented, and investigating these differences is important for developing resources to assist health care providers in providing tailored patient care.[6] Investigating these factors in Jordan, a country with low income and unique health care system can unveil important commonalities and dissimilarities. Jordanian health care system lacks the general prescriber/family doctor structure, with up to 40% of patients self-medicate themselves, and up to 50% purchase their medications at community pharmacies without receiving pharmacist counselling.[7-9]

The aim of this analysis was to explore the relationship of different patient characteristics and health beliefs with their adherence in a sample population in Jordan for patients with chronic conditions.

METHODS

Study design and clinical setting

This study was conducted from March 2009 to March 2010, in Amman, Jordan using a cross sectional study design. Ethics approval for this study was obtained from the Jordanian Ministry of Health and the Applied Science University Ethics Committee. Only patients with one or more of the following inclusion criteria were recruited into the study: taking 5 or more medications, taking more than 12 doses of medication per day, recently discharged from a hospital (in the last 4 weeks), had significant changes made to their medication

regimen in the last 3 months (pre-set criteria included: ceasing and/or starting new medication/s for chronic condition/s). Children (below the age of 16) were excluded from the study.

In the course run by a researcher (IB), students attended 3 hour per week tutorials for 10 weeks. All students (n=167) of the 5th (final) year at Pharmacy Program enrolled in the clinical pharmacy and therapeutics course in the Applied Science University were asked to participate. Each student learnt patient interviewing skills during the course to qualify them for conducting a home medication review (HMR) for a real patient enrolled in the study.[3]

Recruitment process

Patients were recruited by the pharmacy students through community pharmacies following the consent of the pharmacist in charge. Majority of the students recruited patients from the community pharmacy at which they were interns. Hence, with each student recruiting one patient, each patient was recruited from a different pharmacy. During the recruitment phase, the students identified and invited into the study patients coming into the pharmacy with one or more inclusion criteria. Patients who agreed to participate provided informed written consent. All students provided the researchers with complete contact details of recruited patients for verification purposes.

Data Collection

A patient interview was initially conducted by the students at the pharmacies to collect demographic data followed by an interview at the patients' homes to complete a pre-printed template designed by the researchers consisting of questions aimed at collating necessary data to complete the HMR process for the patient (further demographic details, medical conditions, medications therapeutic regimen, frequency of physician visits, health beliefs and patient self-reported adherence to medications). Similar to other clinical interviews, the home interview was designed to take an hour in total[10], to enable the students to ask questions regarding all medications found in the patient's drug cabinet and to complete the template. Contact details of physicians were made available by the patients, and the former were contacted by the students/researchers when needed. Once completion of the templates was approved by a researcher, treatment related problems (TRPs) for each patient were assessed by the researchers (reported elsewhere).[3]

Adherence to medications

Self-reported medication adherence was assessed utilizing a validated scale developed by Morisky *et al*.[11] translated into Arabic by accredited translators and then was tested for face validity. Patients were considered to have a problem with their knowledge if they failed to answer correctly any of the questions related to their medications' name, doses, indications or timing.

The Brief Medication Questionnaire (BMQ)

The BMQ was adapted as opposed to "design" for this study, as a part of the template for self-completion by the patients. The BMQ questionnaire is a validated published tool used for the screening of patient adherence and barriers to it.[12] The tool was found effective when applied in clinical research studies similar to this study.[13] The questionnaire (Online appendix 1) includes four different dimensions.

The first is the 'physical/mental assessment' dimension which included two sections, the physical health segment and the mental health segment.

The second section is the 'Belief' dimension investigating patient belief about drug effects and bothersome features by exploring patient perception of how well their medical condition was going; how did they feel about the medications they were taking; and patients' existing concerns and worries about their medications.

The third section was the 'recall' dimension, investigating patients' adherence to their treatment in the past three months, where patients were questioned whether they were careless about taking their medications, forgot to take their medications, stopped taking their medications because they felt better or felt worse.

The fourth section was the 'medication problems' dimension, investigating patients' difficulties with opening or closing their drug bottles; reading the print on their bottle; remembering to take all of their pills and/or injections on time, getting their refills on time; taking so many medications on the same time; and giving themselves injections (for patients with diabetes mainly).

Before data collection, the questionnaire was translated into Arabic. To ensure face validity, the questionnaire was evaluated by three academics (IB, NB, EQ) who have previous experience in conducting clinical studies and have a wide range of clinical professional experience. The questionnaire was then completed by patients (n=10) to test for clarity of questions. Views and comments of respondents were considered by the researchers and then incorporated where appropriate into the final version of the questionnaire

Data analysis

Upon evaluation of the completed patient templates, the following variables were tabulated into the SPSS version 17 (SPSS, Inc., Chicago, IL, USA). Patient demographic data (demographics), number of diseases, number of medications, number of TRPs, and patient answers to each of the questions in the physical/mental assessment dimension, belief dimension, recall dimension and medication problems dimension.

All categorical data were expressed as proportions (%), and continuous data as mean (SD). Descriptive analysis was conducted using mean and SD for continuous data and percentage for categorical variables. Chi squared test was used to evaluate

Table 1. Study participants (n=167) demographic data.

Variable	Female (n=78)	Male (n=89)	Total (n=167)	p-value*
Age, (mean [SD])	59.8 [13.6]	57.9 [13.3]	58.9 [13.54]	0.424
Number of family members, (mean [SD])	5.83 [9.3]	4.39 [2.4]	5.05 [6.6]	0.170
Marital Status, n (%)				<0.001
Married	47 (60.3%)	87 (97.8%)	134 (80.2%)	
Unmarried	9 (11.5%)	2 (2.2%)	11 (6.6%)	
Widowed	22 (28.2%)	0 (0.0%)	22 (13.2%)	
Patients with insurance, n (%)	n=77 31 (40.3%)	n=65 32 (49.2%)	n=142 63 (44.4%)	0.462
Family Income in JD, n (%)	n=77	n=65	n=142	0.508
<150	1 (1.3%)	2 (3.1%)	3 (2.1%)	
150-350	10 (13.0%)	4 (6.2%)	14 (9.9%)	
350-500	13 (16.9%)	11 (16.9%)	24 (16.9%)	
>500[a]	53 (68.8%)	48 (73.8%)	101 (71.1%)	
Education, n (%)	n= 45	n= 43	n= 88	0.003
Pre-tertiary level	8 (17.8%)	20 (46.5%)	28 (31.8 %)	
Non-university post-secondary level	5 (11.1%)	5 (11.6%)	10 (11.4 %)	
University level	25 (55.6%)	16 (37.2%)	41 (46.6 %)	
Postgraduate level	7 (15.6%)	2 (4.7%)	9 (10.2 %)	

*Difference between males and females; [a]500 JOD (Jordan Dinar) is equivalent to about 621.87 EUR.

differences between groups for categorical variables. Significance level was set at p<0.05.

Patient self- reported adherence was measured by the outcomes of the 8-item Morisky Medication Adherence Scale (MMAS-8), which was treated as a total score (continuous data).

Initial screening of the data was carried out using univariate correlation analyses. A p value of less than 0.05 was considered statistically significant and all tests were two tailed. Any variable that had a p-value of less than or equal 0.05 was a candidate for multiple linear regression, after checking for the absence of multicollinearity, to determine potential predictors of the dependent variable, adherence.

RESULTS

A total of 167 participants were enrolled in the study (only 3 patients declined from study participation). Mean age of the participants was 58.9; SD=13.54 and 53.3% (n=89) were males. As for the marital status, 80.2% (n=134) of the participants were married, with significantly more males reported married than females (p<0.001) (Table 1). The average number of family members was similar for both genders (5.05; SD=6.6). For patients who reported their income (n=142), the majority of respondents (71.1%, n=101) reported an average income of more than 500 JOD (621.87 EUR). Less than half of the participants (44.4%, n=63) had medical insurance. More males stopped at pre-tertiary education compared to females, and more females had university and postgraduate education level (p=0.003) (Table 1).

The mean number of disease conditions per patient was 4.1 SD=1.74, the mean number of medications taken by each patient was 8.06 SD=2.70, and the mean number of TRPs per patient was assessed to be 7.4 SD=2.8 (range of 1–16) (reported elsewhere).[3]

Results from the MMAS-8 questionnaire showed that a high proportion of both females (46.7%, n=78) and males (53.3%, n=89) were non-adherent, with no significant difference between both genders (p=0.322, chi square test).

Significant association between better adherence and lower number of disease states (r=-0.368, p<0.001), lower number of medications (r=-0.293, p=0.001), and lower number of identified TRPs (r=-0.332, p=0.003) was found.

Results of multiple linear regression showed that the final resultant model from the analysis reporting on the dependent variable, adherence (R^2=0.454, p=0.001) indicated significant association with older age, higher educational level, and higher number of physician visits per month. Patients with diabetes mellitus showed significantly lower adherence levels, while patients with cancer showed significantly higher adherence levels. Difficulty in getting medication refills on time also showed significant association with lower adherence (Table 2).

Physical/mental assessment dimension

Participants' self-evaluation of their medical condition/s revealed that many patients felt it was "good" (34.7%) or at least "not bad" (40.7%). More than half of the patients (58.1%) reported that their medical condition restricted them from performing their normal daily activity to some extent.

Table 2. Summary of the regression models for the dependent variable; adherence (Self-reported medication adherence assessed utilizing Morisky scale) with significantly associated patient characteristics and predictors for all participants (n=167).

Independent variables	Beta	t	p-value
Age	0.476	3.443	0.002
Education level	0.562	3.599	0.001
Diabetes Mellitus	-0.576	-3.670	0.001
Cancer	0.330	2.390	0.023
No. of physician visits per month	0.318	2.366	0.024
Difficulty in getting medication refills on time	-0.334	2.925	0.005

Table 3. Proportion of study participants (n=167) choosing each of the answers in Physical / Mental Health dimension of the Brief Medication Questionnaire:

Part A: Physical dimension, n (%)						
How do you feel about your health condition now?	Very bad 0 (0.0%)	Bad 31 (18.6%)	Not bad 68 (40.7%)	Good 58 (34.7%)	Very good 10 (6.0%)	
Does your health condition restrict you from performing your normal daily activities?	Yes 29 (17.4%)		A little bit 68 (40.7%)		No 70 (41.9%)	
To what degree does your physical health prevent you from doing your daily activities?	Absolute prevention 21 (12.6%)	Large prevention 25 (15.0%)	Medium prevention 34 (20.3%)	Little prevention 53 (31.7%)	No prevention 34 (20.4%)	
Does your health condition restrict you from going up the stairs?	Yes 35 (21.0%)		Little 53 (31.7%)		No 79 (47.3%)	
Does Your health condition restrict you from doing a certain activity you love?	Yes 49 (29.3%)		Little 67 (40.1%)		No 51 (30.6%)	
Part B: Mental dimension (%)						
Does your mental health condition cause you to lower the physical activities you wanted to achieve?	Yes 44 (26.3%)		Little 0 (0.0%)		No 123 (73.7%)	
Does your mental health condition prevent you from doing things you wished to achieve in your daily life?	Yes 98 (58.7%)		Little 0 (0.0%)		No 69 (41.3%)	
In the last 4 weeks, how much time did you feel calm?	Not at all 12 (7.1%)	Few times 46 (27.6%)	Some Times 59 (35.5%)	Many times 30 (17.8%)	Most of the time 14 (8.4%)	All the time 6 (3.6%)
In the last 4 weeks, how much time did you feel energetic?	12 (7.1%)	63 (37.8%)	32 (19.3%)	28 (16.7%)	26 (15.5%)	6 (3.6%)
In the last 4 weeks, how much time you feel exhausted?	16 (9.6%)	22 (13.2%)	48 (28.7%)	27 (16.1%)	32 (19.2%)	22 (13.2%)

Questioning the degree to which physical health prevented patients from doing their daily activities showed that 47.9% suffered absolute, large or medium prevention. Majority (52.7%) reported that their illnesses prevented them to some degree from going up the stairs. About 29.3% believed that their physical condition prevented them completely from doing a certain activity that they loved (Table 3, part A).

The Mental dimension revealed that many patients (26.3%) believed that their mental health made them lower to some extent the physical activities they wanted to perform. This was reported significantly more by females (45.2%) than by males (19.2%) (p=0.01). More than half of the patients (58.7%) reported that their mental health prevented them from doing any of what they wished to achieve in their daily lives.

Regarding patients reporting how they felt about their condition in the past 4 weeks, less patients reported feeling calm all the time/most of the time when compared to feeling energetic or exhausted (Table 3, Part B).

Educational level showed significant association with patient answers to the questions: “To what degree does your physical health prevent you from doing your daily activities?”, and ‘Does your mental health condition prevent you from doing things you wished to achieve in your daily life?’. Patients with higher educational level reported lower influence of their medical illnesses (r=-0.353; p=0.001) and mental condition (r=-0.353, p=0.01) on their daily activities.

Belief Dimension

When the participants were asked about their beliefs regarding their treatment and medical conditions, many (38.9%) reported that their illness was eradicated following initiation of their medical treatment, while 13.2% believed that their condition worsened following treatment. Regardless of the above, 64.5% of patients believed that their medications were important for their health and effective for preventing future health complications. Few (14.9%) believed that their medications were necessary only to relieve their short term symptoms. Some patients (18.1%) believed that their medications will terminate their ‘chronic condition’, a misconception considering the nature of their chronic conditions (Table 4).

Significant association between better adherence and patients positive beliefs regarding the effectiveness of treatment (p<0.001) was also found (belief that their illness was eradicated following

Table 4. Proportion of study participants (n=167) choosing each of the answers in Belief Dimension part of the Brief Medication Questionnaire.

Belief Dimension, n (%)					
How do you think your medical condition is going?	Eradicated 65 (38.9%)	Same 80 (47.9%)	Worsening 22 (13.2%)		
How do you feel about the medications you take?	Important for my health 71 (42.4%)	Necessary only for short term symptoms 25 (14.9%)	Will terminate my chronic conditions 30 (18.1%)	Effective in preventing future health complications 37 (22.1%)	Worthless 4 (2.5%)
Do you have any concerns or worries about your medications?	Harm my stomach 43 (25.8%)	Harm my kidneys 7 (4.2%)	Side effects 33 (19.7%)	Drug interactions 53 (31.8%)	I can never stop it 31 (18.5%)

Table 5. Proportion of study participants (n=167) choosing each of the answers in Recall Dimension part of the Brief Medication Questionnaire.

Recall Dimension, n (%)					
Have you been careless about taking your medications	Never	Rarely	Sometimes	Usually	All the time
	0.0 (0.0%)	24 (14.3%)	102 (61.2%)	23 (13.7%)	18 (10.8%)
Did you forget to take your medications?	105 (62.8%)	14 (8.4%)	16 (9.5%)	4 (2.5%)	28 (16.8%)
Have you ever stopped taking any of your medications because you felt better?	106 (63.5%)	10 (5.9%)	11 (6.6%)	8 (4.9%)	32 (19.1%)
Have you ever stopped taking any of your medications because you felt worse?	118 (70.8%)	15 (8.9%)	14 (8.3%)	5 (3.0 %)	15 (9.0%)

initiating of treatment and acknowledgement that medications will prevent future health complications).

Majority of patients reported concerns about their medications, mostly regarding medications causing drug interactions, harming their stomach, or being unable to ever stop them after starting (Table 4).

Recall dimension

This section defines adherence through patient perspectives. About quarter (24.5%) of the patients reported being usually/all the time careless about their medications. However, majority (63.5% and 70.8%) reported that they never stopped their medication due to feeling better or worse. Stopping medications due to feeling better or worse showed interesting differences (Table 5). Feeling 'better' led to more patients stopping their medications on an 'always/usually' basis (24.0%) when compared to feeling worse (12.0%). Common type of medications reported by the patients leading to frequent side-effects and poor adherence included aspirin (cyclooxygenase inhibitor) (14%), calcium channel blockers (10%), beta blocker (12.5%), diuretics (15.9%), biguanides (metformin) (11.0%), hypoglycemics (20%) and valproic acid (carboxyilic acid derivatives) (5%) and a combination of other drugs (11.6)

Medication Problems Dimension

Opening and closing the medication bottles was a problem to 15.0% of the patients, as they found it a somewhat/very hard maneuver to perform. Reading the prints on the medication bottles was a problem to more patients (47.8%) who found it somewhat/very hard to perform (Table 6).

Most patients (31.1%) found taking their pills/injections on time somewhat/very hard. Getting medication refills on time was an issue to 25.2% of patients who found it somewhat/ very hard to do so. For those who found it hard to get their medication refills on time, barriers included non-availability of the medications in the pharmacy (15.0%), having to travel to the pharmacy (22.0%), and simply forgetfulness (63.0%).

Regarding the complexity of the therapeutic regimen (taking many medications at the same time), about half of the patients (49.1%) believed that their therapeutic regimen was very/somewhat complex. Out of the respondents who used injectable (75.5%, with 56.9% due to diabetes, 11.4% due to renal insufficiency, 7.2% due to other conditions), many reported that giving themselves the injections was very hard (59.3%).

No significant association between higher income or having insurance was found with getting medication refills on time (r=0.028, p=0.755; r=0.024, p=0.859 respectively).

Significant correlation between lower adherence and each of the following was found: higher regimen complexity (r=-0.267, p=0.011); difficulty in remembering to take all of the pills/injections on time (r=-0.209, p= 0.050); difficulty in getting refills on time (r=-0.260, p=0.016) and difficulty with opening/closing the drug container (r=-0.250, p=0.022).

DISCUSSION

The World Health Organization identified the issue of adherence to medications as a growing concern adding to the burden of disease.[14] To our knowledge, this is the first exploratory study conducted in Jordan that investigated the effect of patient health beliefs on medication adherence for outpatients with chronic conditions. Most of the previous studies about patient health beliefs and their impact on medication adherence have been conducted in the USA, Australia, and Europe.[14] Investigating these issues in Jordan broadens the vision for more diverse social and cultural backgrounds. A lot of culture stands behind health beliefs and treatment decisions.[5] Socioeconomic

Table 6. Proportion of study participants (n=167) choosing each of the answers in Medication Problems Dimension part of the Brief Medication Questionnaire.

Medication Problems Dimension, n (%)	**Very hard**	**Somewhat hard**	**Not hard**
Open or close the medicines bottle	7 (4.2%)	18 (10.8%)	141 (84.4%)
Read the print on the bottle	25 (14.9%)	55 (32.9%)	87 (52.1%)
Remember to take all the pills/ injections on time	5 (3.0%)	47 (28.1%)	114 (68.3%)
Get your refills on time	7 (4.2%)	35 (21.0%)	126 (75.4%)
Complexity of drug-regimen (Take so many medicines on the same time)	21 (12.6%)	61 (36.5%)	86 (51.5%)
Give yourself injections (75.5% of patients reported previous or current use of injections for different reasons)	99 (59.3%)	22 (13.2%)	46 (27.5%)

and cultural differences have been proposed to influence patient adherence as much as the healthcare systems do.[5]

Many of the associations between patient health beliefs and self-reported adherence identified in this study support findings from previous studies conducted in different countries. This study supports the finding that older age and more frequent physician visits have been associated with better adherence.[15,16] Similarly, complex medication regimens (polypharmacy) are associated with poor adherence.[17] Among all chronic conditions, diabetes mellitus was associated with significantly lower adherence while patients suffering from cancer showed significantly better adherence, similar to findings from previous studies.[15,18] This could be due to the short-term hidden effect of missing a dose for the former and patients' perceived significance of the treatment for the latter. Higher educational level also showed significant association with adherence as was reported elsewhere.[15,19] Hence, despite significant differences in the health system, socioeconomic background and cultural context, factors affecting adherence remain similar across the countries.

Although Jordan is a country with low income per capita, getting medication refills on time was not related to economic reasons, as no significant association was found with higher income or having insurance. Educated Jordanians were found more capable to cope with their disease states, as they reported less effect of their physical/mental conditions on their daily activities. Patients having better feelings about their medical condition/s promoted better adherence, possibly highlighting the significance of reassurance, a role in which the community pharmacist can contribute significantly in.

Patient's negative beliefs can lead to poor adherence. About two-third of the patients in this study believed that their condition did not change or even was worsened following treatment. However, patients seemed to acknowledge that this can be due to the progress of their disease rather than drug failure, because nearly all of them believed that their medications were important for their health. Results showed that less medications was associated with better health beliefs about drug effectiveness. This finding can promote the use of combination dosage forms.

Majority of patients reported concerns about their medications causing drug side effects and harming their stomach or kidneys. Anecdotal comments showed that drug side effects led to more patients stopping their medication/s. This comes in agreement with previous studies conducted in Palestine[20] and Nigeria[21], reporting that more drug adverse effects decreased patient adherence. Henceforth, patients with greater number of medications and more complex therapeutic regimens need more attention from the health care professionals in order to prevent the adverse effects of polypharmacy and hence improve adherence.

A connection was revealed between patient's inability to get his/her medication refill on time and poor adherence. Strategies that would increase patient's chances of getting their refills on time could involve phoning-in to a neighboring pharmacy for delivery of repeat medications, mail ordering and internet prescription refilling.[15]

Limitations of study include the involvement of multiple interviewers which may have introduced some confounder and variability. Yet, data collection was completed by following strictly a questionnaire developed by the researcher. Analyses included comparisons of adherence across different chronic illnesses, while there may be illness-specific factors impacting adherence. Some of the questions in the BMQ questionnaire could be expressed in a clearer way to provide more accurate results. For example, the question that asks the patients about 'how their medical condition is going'; the answers presented cannot be exhaustive and could lead patients to select an option that is not necessarily reflective of their actual view." Hence, we recommend an extensive review to the content of the BMQ. As each student recruited one patient, there is a chance that students may have selected the most interesting patients, which can have implications for the generalizability of the results. This issue was avoided as much as possible by informing the students of the importance of random patient selection. Follow-up studies are needed to explore specific trends revealed by this exploratory study.

CONCLUSIONS

This study sheds the light on the importance of pharmacists and prescribers (e.g. physicians) evaluating patient's pre-existing health beliefs regarding their illness and treatment[22], in order to improve patient's evaluation of the designated prescription, adherence and hence beneficial outcomes.[23] Results from this study unveiled findings that add to the literature on patient health beliefs and adherence. Certain patient characteristics and health beliefs were significantly associated with self- reported medication adherence. Older age, higher educational level, and higher number of physician visits per month led to better adherence. Higher number of medical conditions, higher number of medications, and more TRPs led to lower adherence. Reported patient difficulties in obtaining medication refills showed significant association with lower adherence. Patients with diabetes showed lower adherence levels, while cancer patients showed higher adherence levels. Taking these findings in consideration when planning individualised patient care plans and services can improve drug adherence.

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CONFLICT OF INTEREST

None.

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