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Factors predicting self-reported medication low adherence in a large sample of adults in the US general population: a cross-sectional study

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ABSTRACT

Objectives The study objective was to determine the level and correlates of self-reported medication low adherence in the US general population.

Setting A 30 min cross-sectional online survey was conducted with a national sample of adults.

Participants 9202 adults (aged 18+) who had filled at least three or more prescriptions at a community pharmacy in the past 12 months.

Primary and secondary outcome measures Self-reported medication adherence was measured with the 8-item Morisky Medication Adherence Scale.

Results Low adherence was reported by 42.0%, 29.4% had medium adherence and 28.6% had high adherence. Low adherence was significantly associated with: lower age, being of Hispanic origin or African-American, having difficulty with healthcare, medication or transportation costs, needing the support of others to access primary care, health limiting activity, using multiple providers, infrequent visits to primary care providers and visiting an emergency department >3 times in last 12 months.

Conclusions A very high level of low medication adherence is seen in the general population, particularly for ethnic minorities, those who use multiple healthcare providers and those who experience barriers to access for regular primary care. As clinical, patient education and counselling, and healthcare policy initiatives are directed to tracking the problem of low medication adherence, these should be priority populations for research and interventions.

INTRODUCTION

Medication non-adherence is recognised as one of the most important and costly worldwide healthcare problems in the 21st century.[1] The comprehensive 2003 WHO report on adherence to long-term therapies highlighted that: 'Increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments'.[2 3] In the USA, an estimated $100–290 billion in preventable costs can be realised by improving the estimated 30%–50% adult non-adherence rate to chronic medications.[4] The Congressional Budget Office estimates that a 1% increase in the number of prescriptions filled by beneficiaries would result in a reduction of a fifth of 1% of total Medicare spending on services.[5] The literature on the prevalence of non-adherence is challenging in that estimates vary widely by countries, the methodologies employed (eg, database abstraction from claims databases vs self-report through surveys) and the criteria used to define low adherence. There is a paucity of information on the overall prevalence and correlates of medication non-adherence as reported by patients themselves (across ethnic and socioeconomic groups), across conditions in the general US population.

Adherence is determined by multiple inter-related factors. These include attributes of the patient, the patient's environment (including social supports, characteristics and functioning of the healthcare system and the availability and accessibility of healthcare resources) and characteristics of the disease in question and its treatment.[2] Estimates of the level of medication non-adherence and its correlates in the population can vary dramatically by the way non-adherence or low-adherence is defined and the data sources were used. Primary non-adherence (not picking up a prescription) can range from 7% to 17%[6–8] and has been associated with a variety of patient characteristics (adjusted ORs up to 1.76) including: smoking tobacco, having five or more ambulatory healthcare contacts, ethnicity other than non-Hispanic white, having multiple comorbidities and a shorter time in health plan enrolment.[6] Once patients have picked up an initial prescription, analyses of pharmacy refill data for chronic medications can indicate the level

of adherence by tracking whether patients refill their prescriptions according to the designated schedule. In our previous studies of community pharmacy databases, using the medication possession ratio and proportion of days covered, we have found rates of *satisfactory adherence* (80% or more medication availability) for adults in community pharmacy dispensing databases of only 14%–16% for asthma, with women and older patients having greater satisfactory adherence,[9] and in an older sample, only 30%–37% for eye-drop medications for glaucoma, which is a blinding disease.[10] Determining the possible drivers and correlates of low adherence in such databases is challenging given the limited breadth of data available. A more patient-centric way to understand the predictors of low medication adherence is through comparisons of self-reported medication behaviour in association with patients' self-described social, clinical and environmental factors. As patients tend to self-report higher rates of adherence, any associations between social factors and low adherence then are likely to be conservative. This approach provides healthcare providers with evidence-based factors that should be considered as they evaluate the potential for any one patient to have a lower likelihood of adherence to the regimen recommended.

In order to gauge the level of self-reported medication adherence in the general population, this study surveyed a sample of over 9000 healthcare consumers. The study was designed to determine the degree of association between a range of potential correlates and self-reported medication low adherence, including age, ethnicity, income level, insurance availability, healthcare utilisation and barriers to healthcare access.

METHODS

The population-based cross-sectional quantitative study used a 30 min online survey instrument (English language only) that was approved as exempt following applicable guidelines involving the ethical treatment of human participants by the University of Utah's Institutional Review Board (IRB) before initiating data collection.

Participants

The sample comprised 10 006 adults (aged 18 years or older) recruited from an established nationally representative panel of individuals in the USA, who opted-in to be contacted for research purposes (Universal Survey Center, d/b/a SHC Universal New York, New York, USA). Panellists accessed the survey electronically through an invitation email and received a minimal honorarium for participation. Respondents were prescreened to meet the inclusion criteria: being an adult aged 18 years or older who had filled at least three or more prescriptions at a pharmacy in the past 12 months (no information on specific disease states the prescriptions were for, or the actual medications, was gathered). Patients with VA, CHAMPUS or TRICARE insurance or who received care through Kaiser, Kaiser Permanente, the Permanente or the Permanente Medical Group were excluded, given the unique nature of patient management in these systems. Between 27 August 2015 and 21 September 2015, the survey was opened to 15 572 eligible patients. However, the survey was purposely capped, and the survey was closed at 10 006 respondents (64.3% of those eligible). The data set was screened to remove those respondents giving non-sensical data (ie, not providing variation in answers, completing the survey in unrealistically short time and giving manifestly inconsistent responses), resulting in a final total of 9202 surveys for analysis (92.0% of the 10 006).

Measures

Medication adherence

The NIH Adherence Network expert panel (2011) recommended the use of validated measures to assess adherence.[11] Accordingly, self-reported medication adherence was measured using the eight-item Morisky Medication Adherence Scale (MMAS).[12] This has been validated against other adherence sources such as pharmacy dispensing database fill data[13] and is accredited/endorsed by the American Medical Association and American Pharmaceutical Association. It has been widely used in adherence research for multiple disease states and medications across numerous countries.[14–17] In this study, the MMAS-8 was used to assess for self-reported low adherence in general and was not grounded in any specific conditions or medications. MMAS-8 scores can range from 0 to 8 with low adherence defined as a score <6, medium adherence as scores of 6 or 7 and high adherence with a score of 8.

Demographic characteristics

The survey collected individual demographic characteristics including income level and insurance status, perceived level of health, healthcare access and utilisation, and perceived barriers to access including the presence or absence of health insurance. Individual age, gender and ethnicity were collected. Respondent income was categorised by thresholds established by the 2014 US Census Bureau and categorised as poverty, low income or not poverty or low income.[18 19]

Health status

Respondents rated their perceived general health on a five-point scale from '1': poor, '2': fair, '3': good, '4': very good and '5': excellent. The degree to which the respondent's health limited their activities was assessed as: '0': No, Not at All, '1': A Little or '2': A Lot. Respondents had limited activity due to health if they responded with a 2 for either question, and 'Not at All' if they indicated 0 for both questions. All others were classified as health limiting their activities 'A Little'. Health status was further evaluated by counting the number of health conditions respondents were diagnosed with within the past 12 months, including cancer, cardiovascular diseases, endocrine disorders, major mental health conditions,

respiratory disorders, allergies or a self-described condition. The resultant comorbidity score ranged from 0 to 16.

Barriers to access

Respondents indicated the degree of difficulty they had in meeting healthcare costs related to primary care and the costs of prescription medications. They also indicated the degree to which transportation issues made it difficult to access primary care services they needed as well as the degree to which they needed the support of others at home to get the services they needed. These four items used a 1–10 scale where '1' means 'Not at all Difficult' and '10' means 'Extremely Difficult'. Scores above 7 were used to categorise respondents as 'having difficulty' in each domain.

Healthcare utilisation

Respondents indicated how often they visited a primary healthcare provider for services (defined as care for general health issues and prevention, such as illness, physical examinations, vaccinations and health screenings) in the past 12 months. They also indicted how many different providers they saw in that period. Reliance on emergency or urgent care was determined by asking what type of healthcare location they received most of their primary care services. They were also asked how often they had visited the emergency room (ER) in the past 12 months to address a personal health issue (not at all, once or twice or three or more times).

The survey also included an experimental task evaluating perceptions of operational factors and services offered by community pharmacies (unrelated to adherence) to be reported elsewhere.

Statistical analysis

Risk factors were tested for their association with low medication adherence defined by a score of <6 on the MMAS-8 adherence scale, using binary logistic regression models in SAS (V.9.3). Initial univariate tests were conducted, and those variables significantly associated with low adherence ($p<0.05$) were then included in a multivariate model. Given the large sample size and the number of univariate tests being conducted, to avoid spurious associations, this conservative approach was used rather than using a looser inclusion criterion ($p<0.20$). No issues with multicollinearity between predictor variables were thus observed.

RESULTS

Respondent characteristics

A total of 9202 respondents' surveys were analysed as completed (see table 1.) Respondents were primarily Caucasian, with those of Hispanic origin, or African-American ethnicity represented by 11.8% and 10.7%, respectively. In terms of age, 18.3% were aged ≥65 years with the majority of respondents being aged 46–64 years. The youngest age group aged 18–25 years was the smallest (6.0%), presumably more healthy, which is consistent with the study screening for prior prescription filling at a pharmacy. With regard to income, 14.6% were living below the poverty level and 24.2% had low income. Respondents were well represented from the four regions of the USA, with a somewhat higher proportion in the South (38.5%) than in the Northeast (19.1%), Midwest (24.7%) or the West (17.6%). Most answered they lived in a small city/town (31.3%) or suburb of a large city (34.8%).

Low medication adherence and its correlates

Using the standard cutoffs for the Morisky scale, 3862 (42%) respondents had 'low' self-reported adherence (<6 on the scale), 2706 (29.4%) had 'medium' adherence (6 or 7 on the scale) and 2635 (28.6) had 'high' adherence (score of 8).

Table 2 shows the degree of association between each of the demographic and predictor variables with low adherence in the univariate analyses. Univariate predictors of low adherence ranked by highest to lowest strength of association included age, adherence lowest in the youngest age group and improving with each age category, frequent visits to the emergency department (OR: 2.52 (3 or more)) or care mostly delivered through a hospital or urgent care facility (OR: 1.62), difficulty with transportation for healthcare needs (OR: 2.01), health status (OR: 1.93 (poor), 1.69 (fair), 1.36 (good) and 1.12 (very good)), needs support of others (OR: 1.92), difficulty with healthcare and medication costs (OR: 1.76), Hispanic and African-American ethnicity (OR: 1.63; 1.41), poverty or low income (OR 1.61; 1.38), visit to primary care doctor every 2 years (adjusted OR: 1.51), utilisation of more than two providers or more than two locations (OR: 1.48, 1.43) and women (OR: 1.17).

Table 2 also shows the results from the multivariate model. This model was a well-fitting model with a C-statistic of 0.7.[20] Low adherence was most strongly associated with being of younger age; Hispanic origin (AOR=1.24) or African-American (AOR: 1.42), difficulty with healthcare, medication, or transportation costs (AORs: 1.24, 1.24, 1.32, respectively), health limiting activity (AOR: 1.33), using more than two providers (AOR: 1.27), visiting a primary care provider every few years (AOR 2.06) and visiting an emergency department >3 times in last 12 months (AOR: 1.34).

DISCUSSION

The level of self-reported low medication adherence in this large sample of healthcare consumers from the general population, using a well-recognised standardised instrument, of 42% is alarmingly high, and is probably an underestimate. It is somewhat lower than the 52.7% seen with the same measure in an inner city sample, which was associated with younger age.[21] Similarly, lower age was the strongest predictor of low adherence in our study, followed by socioeconomic status as it relates specifically to the ability to afford healthcare costs, frequent

Table 1 Demographic characteristics of 9202 adults surveyed from the general population

	Total		Male		Female	
	n=9202		n=4226 (45.9%)		n=4976 (54.1%)	
Characteristic	No.	(%)	No.	(%)	No.	(%)
Age						
18–25	553	(6.0)	277	(6.6)	276	(5.6)
26–45	2843	(30.9)	1294	(30.62)	1549	(31.1)
46–64	4118	(44.8)	1825	(43.2)	2293	(44.8)
65+	1688	(18.3)	830	(19.6)	858	(17.2)
Hispanic Origin						
Hispanic origin	1088	(11.8)	569	(13.5)	519	(10.4)
Non-Hispanic origin	8114	(88.2)	3657	(86.5)	4457	(89.6)
African-American	985	(10.7)	453	(10.7)	532	(10.7)
Non-African-American	8217	(89.3)	3773	(89.3)	4444	(89.3)
Insurance status						
Insured	8701	(94.6)	4008	(94.8)	4693	(94.3)
Non-Insured	501	(5.4)	218	(5.2)	283	(5.7)
Poverty level						
Poverty	1346	(14.6)	447	(10.6)	899	(18.1)
Low income	2229	(24.2)	916	(21.7)	1313	(26.4)
Above low income	5627	(61.1)	2863	(67.7)	2764	(55.5)
Community residence						
Rural	1748	(19.0)	690	(16.3)	1058	(21.3)
Small city or town	2879	(31.3)	1311	(31.0)	1568	(31.5)
Suburb of a large city	3203	(34.8)	1525	(36.1)	1678	(33.7)
Large city	1372	(14.9)	700	(16.6)	672	(13.5)
Region						
Northeast	1759	(19.1)	838	(19.8)	921	(18.5)
Midwest	2273	(24.7)	1025	(24.3)	1248	(25.1)
South	3546	(38.5)	1560	(36.9)	1986	(39.9)
West	1624	(17.6)	803	(19.0)	821	(16.5)

use of ER or urgent care centres for healthcare and use of more providers—all associated with lower adherence rates. High adherence rates were associated with having a frequent ongoing relationship with a primary care provider.

A limitation of the study is its cross-sectional nature. A prospective longitudinal study of a large general population sample would allow for a determination of associated adverse health outcomes from low adherence over time. Some limitations of the study may suggest the low adherence estimates obtained may be an underestimate: a potential source of bias is that those who are less adherent may be less likely to participate in online surveys. The study is focused on adherence in general, rather than specific conditions or medications. Since it is possible for a person to indicate adherence to one medication while being non-adherent to another, and reporting themselves as overall adherent, this could also suggest the present already very high estimates on low adherence may underestimate the true level of low adherence. The survey was administered in English language only; a Spanish language version may elicit more reporting of low adherence for the Hispanic respondents. One additional limitation of the study was the restriction on survey length, which limited the ability to explore adherence by specific disorders, and a deeper exploration of the patient's health status. Furthermore, this is a comprehensive evaluation of the US population, and its application to other countries warrants further study.

One of the larger studies of low adherence in the USA is the Cohort Study of Medication Adherence among Older Adults (CoSMO), an investigation of antihypertensive medication adherence among 2194 adults aged 65 years and older recruited from a managed care organisation in Louisiana.[22] In this study, 14.1% of respondents self-reported reported low medication adherence using the

Table 2 Univariate and multivariate associations between multiple predictor variables and self-reported low medication adherence as measured by the eight-item MMAS* in 9202 adults surveyed from the general population

		Univariate results		Multivariate results	
Risk factors	***n* (% total)**	**OR (95% CI)**	**p Value**	**Adjusted OR (95% CI)**	**p Value**
Age					
65+	1688 (24.2)	0.158 (0.128 to 0.194)	<0.0001	0.174 (0.138 to 0.221)	<0.0001
46–64	4118 (44.8)	0.330 (0.274 to 0.397)	<0.0001	0.313 (0.245 to 0.386)	<0.0001
26–45	2843 (30.9)	0.658 (0.544 to 0.795)	<0.0001	0.632 (0.513 to 0.780)	<0.0001
18–25 (ref)	553 (6.0)				
Ethnicity					
Hispanic	1088 (11.8)	1.630 (1.438 to 1.854)	<0.0001	1.237 (1.060 to 1.444)	<0.0068
Non-Hispanic (ref)	8114 (88.2)				
Black/African-American	928 (10.7)	1.413 (1.232 to 1.619)	<0.0001	1.423 (1.227 to 1.651)	<0.0001
White (ref)	7771 (89.3)				
Gender					
Female	4976 (54.1)	1.174 (1.080 to 1.276)	0.0002	1.136 (1.033 to 1.249)	0.0088
Male (ref)	4226 (45.9)				
Income and insurance					
Low income	2229 (24.2)	1.378 (1.248 to 1.522)	0.1164	–	–
Poverty	1346 (14.6)	1.612 (1.431 to 1.817)	<0.0001	–	–
Neither poverty or low income (ref)	5627 (61.2)				
No health insurance	501 (5.4)	1.502 (1.254 to 1.799)	<0.0001	–	–
Health insurance (ref)	8701 (94.6)				
Barriers to access					
Has difficulty with healthcare costs	3963 (43.1)	1.760 (1.618 to 1.914)	<0.0001	1.239 (1.104 to 1.391)	0.0003
No difficulty (ref)	5239 (56.9)				
Has difficulty with medication cost	4289 (46.6)	1.761 (1.620 to 1.915)	<0.0001	1.240 (1.103 to 1.394)	0.0003
No difficulty (ref)	4913 (53.4)				
Has difficulty with transportation to medical care	3835 (41.7)	2.073 (1.904 to 2.256)	<0.0001	1.321 (1.176 to 1.483)	<0.0001
No difficulty (ref)	5367 (58.3)				
Needs support of others	4338 (47.1)	1.916 (1.762 to 2.084)	<0.0001	–	–
Does not need support (ref)	4864 (52.9)				
Health status					
Poor health	489 (5.3)	1.929 (1.449 to 2.568)	<0.0001	–	–
Fair health	2167 (23.6)	1.688 (1.328 to 2.146)	<0.0001	1.594 (1.199 to 2.119)	0.0069
Good health	3930 (42.7)	1.359 (1.076 to 1.716)	0.7323	–	–
Very good health	2279 (24.8)	1.123 (0.883 to 1.428)	<0.0001	–	–
Excellent health (ref)	337 (3.7)				
Health limiting activity a little bit	2718 (29.5)	1.447 (1.314 to 1.592)	<0.0001	1.333 (1.185 to 1.498)	0.0003
Health limiting activity a lot	1836 (20.0)	1.421 (1.274 to 1.585)	0.0016	–	–
Health not limiting (ref)	4648 (50.5)				
Number of comorbidities	$\bar{x}$=2.7, SD=2.1	1.058 (1.037 to 1.080)	<0.0001	–	–
Healthcare utilisation					
utilised more than 2 providers	4254 (46.2)	1.483 (1.364 to 1.611)	<0.0001	1.270 (1.141 to 1.413)	<0.0001
≤2 providers (ref)	4948 (53.8)				

Continued

Table 2 Continued

Risk factors	n (% total)	Univariate results		Multivariate results	
		OR (95% CI)	p Value	Adjusted OR (95% CI)	p Value
Utilised more than 2 locations for primary healthcare services	2317 (25.2)	1.434 (1.319 to 1.558)	<0.0001	–	–
≤2 locations (ref)	6885 (74.8)				
Visits Primary Care Physician (PCP) C every few years	217 (2.4)	1.514 (1.121 to 2.044)	<0.0001	2.057 (1.445 to 2.927)	<0.0001
Visits PCP once a year	1670 (18.4)	0.770 (0.656 to 0.904)	0.0318	–	–
Visits PCP every 6 months	2770 (30.5)	0.558 (0.480 to 0.648)	<0.0001	0.917 (0.769 to 1.094)	<0.0001
Visits PCP every 2–5 months	3481 (38.4)	0.719 (0.623 to 0.831)	<0.0001	0.928 (0.788 to 1.092)	<0.0001
Every month (ref)	937 (10.3)				
Receive most care in hospital/ urgent care	579 (6.4)	1.615 (1.364 to 1.912)	<0.0001	–	–
Other locations (ref)	8528 (93.6)				
Visited ED 1–2 times in last 12 months	2509 (27.3)	1.497 (1.363 to 1.644)	0.3380	–	–
Visited ED three or more times in last 12 months	541 (5.9)	2.519 (2.104 to 3.016)	<0.0001	1.339 (1.073 to 1.672)	0.0107
No visits (ref)	6152 (66.9)				
Geography					
Live in large city	1372 (14.9)	1.048 (0.908 to 1.209)	0.2946	–	–
Live in suburb of a large city	3203 (34.8)	0.900 (0.800 to 1.014)	0.0020	–	–
Live in small city or town	2879 (31.3)	1.061 (0.941 to 1.196)	0.0915	–	–
Rural (ref)	1748 (19.0)				
Live in Midwest	2273 (24.7)	1.035 (0.912 to 1.174)	0.7050	–	–
Live in South	3546 (38.5)	1.075 (0.957 to 1.208)	0.4545	–	–
Live in West	1624 (17.7)	1.090 (0.950 to 1.249)	0.3661	–	–
Northeast (ref)	1759 (19.1)				

ED, emergency department;
* MMAS, Morisky Medication Adherence Scale. Use of the MMAS is protected by US copyright laws. Permission for use is required. A licence agreement is available from Donald E Morisky, ScD,ScM, MSPH, Professor, 294 Lindura Court, Las Vegas, NV 89138-4632; dmorisky@gmail.com.

MMAS eight-item version.[12] Factors associated with low adherence included being younger (less than 75 years of age), being African-American, having a higher body mass index.[22] In a subsequent study of this cohort, a decline in adherence was predictive by the presence of depressive symptoms, being female, being married and the level of stressful life events experienced.[23] Our rate of 42% is threefold higher than the CoSMO study; however, shorter enrolment time in healthcare plans is associated with higher levels of non-adherence.[6] Our higher rate may also be accounted for by the wider range of patients (ie, not restricted to those with a singly condition) and the wider age distributions compared with the CoSMO sample. As noted in the CoSMO study, even among an older sample, younger age was associated with low adherence.[22] We found that younger age was the strongest independent factor associated with of low adherence in the present study, consistent with our previous studies showing higher adherence with increasing age.[9 10] Age may also be related to more commonly having a continuous relationship with a provider, something that is not always seen with younger healthy individuals.

Low adherence was observed uniformly across the country, without differentiation to geographic region, size of community and respondents' health status and level of comorbidities. However, beyond age, certain demographic characteristics stand out as being significantly independently associated with low adherence, notably being of Hispanic origin or African-American. This is after adjusting for income and other access and healthcare utilisation factors. A recent study of income data for the US population from 1999 to 2004 showed that higher income was associated with greater longevity over time, and differences in life expectancy were correlated with rates of smoking, obesity and positively correlated with exercise rates.[24] Furthermore, medical causes such as heart disease and cancer mortality are known to be higher in in individuals with lower socioeconomic status when compared with vehicle crashes, suicide and homicide. Could a lack of a consistent relationship with a

provider, the inability to afford health costs or ease of being able to access healthcare and poor medication adherence lead to greater mortality from heart disease and cancer? Further exploration is warranted to determine the drivers of low adherence in these populations, so perhaps to be able to improve health outcomes in lower socioeconomic areas.

Although respondents' health status per se was not independently associated with low adherence in our multivariate model, importantly the level of healthcare utilisation was. Low adherence was significantly and independently associated a high level of ER use. In this study, it is not possible to tease out temporal causality, and it may be that these factors may be a consequence of low adherence, but also possible predictors, as the use of multiple providers may foster the possibility of miscommunications in health education and counselling, particularly with regard to medication use. Development of a centralised electronic medical record, independent of healthcare systems, that allows all providers a link to the same information source could assist in improving the quality of healthcare delivery by reducing harms, improving communication between providers, thereby improving medication adherence.

In the present multivariate model, low adherence is a phenomenon observed uniformly across the country, with no statistically significant differentiation with regard to geographic region, size of community and respondents' health status and level of comorbidities. However, beyond age, certain demographic characteristics stand out as being significantly independently associated with low adherence, notably being of Hispanic origin or African-American. This is after adjusting for income and other access and healthcare utilisation factors. Further research is warranted to determine the drivers of low adherence in these populations. Again, it may be that the quality and delivery processes for health education and counselling with regard to mediations may be deficit for ethnic minority patients.

CONCLUSIONS

This study demonstrated a very high level of self-reported low medication adherence in the general population, reinforcing the WHO report of non-adherence as a significant public health problem. It is particularly evident that after adjusting for income and insurance status, medication adherence remains a significant issue for ethnic minorities, those who use multiple healthcare providers and those who experience barriers to healthcare access in terms of the ability to pay for healthcare and medications, and transportation issues. Patient education, counselling and healthcare policy initiatives directed to addressing low medication adherence should be priorities for research and interventions. One such step could be to focus healthcare resources towards how to engage patients in a meaningful, continuous, and quality patient–provider relationship, that is, medication adherence-centric.

Contributors Drs. MF and MarkM had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: MF, MMD, DEM and MarkM. Acquisition, analysis or interpretation of data: all authors. Drafting of the manuscript: MF. Critical revision of the manuscript for important intellectual content: all authors. Statistical analysis: MargAM, CT. Obtaining funding: MF, MMD and MarkM. Study supervision: MF and MarkM. All authors approved the manuscript.

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Competing interests None declared.

Patient consent Respondents completed an online consent form reviewed by the University of Utah's IRB.

Ethics approval The study protocol and survey instrument were reviewed and considered as exempt based on applicable guidelines involving the ethical treatment of human subjects by the University of Utah Institutional Review Board before the initiation of data collection. The University of Utah Institutional Review Board is fully accredited by the Human Research Protection Programs, Inc.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No extra data available. Please contact corresponding author for access to study data.

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