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Perceptions of Metabolic Syndrome Management Utilization in Relation to Patient Experience and Health-related Quality of Life

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Perceptions of metabolic syndrome management utilization in relation to patient experience and health-related quality of life

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ABSTRACT

Background: One factor for the poor health outcomes among adult people with metabolic syndrome (MetS) is poor utilization of disease management resources, which may be attributable to prior experience with pharmacists (PEwP) and perceptions of disease management resource utilization (PMU). Therefore, understanding patients' experience could be critical to improving their perceptions and promoting health outcomes.
Objectives: The study explored the influence of PEwP and PMU on the health-related quality of life (HRQoL) of people with MetS.
Methods: Data on perceptions of healthcare, medication, and pharmacy services utilization, PEwP, and HRQoL were collected using validated tools via an electronic survey. Chi-square and ordinal regression tests were used to predict the association between PMU, PEwP, and HRQoL. Also, mediation analysis through Haye's model 4 explored the direct and indirect relationship of PMU and PEwP on HRQoL.
Results: A total of 706 completed surveys were collected and used for analyses. On average, respondents reported three comorbidities. Of the respondents, 72.0% had good PEwP, while 32.6% had good PMU. Comparatively, 38.4% of those with good PEwP had good PMU, compared to 17.3% of those with poor PEwP. Also, 47.0% of those with good PMU had good HRQoL compared to 35.3% with poor PMU. The odds of having fair or good PMU were nearly triple (OR = 2.97, $p < 0.001$) among those with good PEwP compared to those with poor PEwP. Also, respondents with good PMU had 58% (OR = 1.58, $p = 0.008$) higher odds of having fair or good HRQoL. Analysis through bootstrap indicated a significant relationship (BootCI = −0.072, −0.022) between PEwP and HRQoL via respondents' PMU.
Conclusions: MetS individuals with good experience and PMU were more likely to have good HRQoL. Prior experience with pharmacists influenced PMU and indirectly impacted HRQoL. Therefore, pharmacists must consider patients' experience and management utilization perceptions to promote health outcome among people with MetS, while implementing interventions.

1. Introduction

Metabolic syndrome (MetS) remains a cluster of related metabolic abnormalities such as obesity, hypertension, insulin resistance, atherogenic dyslipidemia, atherosclerosis, osteoarthritis, etc.[1–4] The prevalence of MetS among adults in the United States (US), as reported by the National Health and Nutrition Examination Survey (NHANES), was 33% in 2012,[5] and 34.7% in 2016[6] and increased to 41.8% in 2018.[7]

Abbreviations: PwO, People with obesity; PMU, Perceptions of disease management resource utilization; PEwP, Prior experience with pharmacists; HRQoL, Health-related Quality of life; MetS, Metabolic syndrome; BMI, Body mass index; HPQ, Health Perception Questionnaire; BMQ, Belief About Medicine Questionnaire; SEAMS, Self-efficacy for Appropriate Medication Use Scale; NCSME&PR, National Consumer Survey on the Medication Experience and Pharmacist Role; CARE, Consultation and Relational Empathy; POM, Proportional odds models.

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Despite its already high prevalence, MetS is expected to increase further due to the global obesity epidemic.[8] For instance, 61.6% of people with obesity (PwO) in the US have MetS, suggesting a higher susceptibility among this group compared to the general population.[9]

The main aim of MetS clinical management is to mitigate the modifiable underlying risk factors through lifestyle and behavioral changes,[10] as well as pharmacological interventions and/or bariatric surgery.[11,12] Despite these interventions, pharmacological resources remain far from efficient and safe, as pharmacotherapy efficacy ranges from 3% to 9%,[13,14] despite a potential shift in this trend could occur with the recent emergence of Ozempic and other therapies aimed at managing obesity.[15–17] One of the challenges with MetS therapy is the non-treatment of existing chronic diseases,[1,18] attributed to the non-detection of MetS.[19] In addition, utilization of MetS management resources by the patients remains a more significant challenge,[20–25] impacting the achievement of optimal health outcomes. For instance, despite having more than half of the patients using healthcare and pharmacy services,[26,27] only one-third used the extended and health promotional services provided.[27] This insight highlights that even though healthcare systems and providers have the necessary resources for managing MetS, achieving optimal health status may be challenging if patients do not use MetS management services. Additionally, it is important to note that utilizing these resources does not happen by accident. Certain factors, such as patients' perceptions of medical and pharmaceutical resources, can influence their decision-making regarding healthcare, medications, and pharmacy service utilization, contributing to poor resource utilization among these patients.

While understanding patients' perceptions of MetS management utilization (PMU) is critical, it is equally paramount to investigate the factors that shape these perceptions and how they impact patients' health status. One such factor is patients' experience with pharmacists (PEwP). Patient experience is the sum of all interactions across the continuum of care,[28] influencing views on healthcare quality, clinical effectiveness, patient safety, and satisfaction.[29,30] Based on these definitions, PEwP could be defined as the conscious event, knowledge, and practical ways of explaining how one feels about pharmacists and their services (dispensing, medicine information provision, medication therapy management, and health promotion services). These experiences may influence patients' perceptions of utilizing MetS management resources for optimal health outcomes. Patients serve not only as the primary beneficiaries of therapeutic interventions but also as evaluators of the quality of healthcare services.[31] Therefore, if patients develop misconceptions about the services offered by pharmacists, it could reduce their motivation to effectively utilize resources for disease management. Therefore, evaluating patient experience as a recognized determinant of perceptions offers valuable insights into enhancing the health status of individuals with MetS.

Comprehending the perceptions and experiences among individuals with MetS is critical for improving MetS management practices. This revolves around the premise that patients with a better perception of healthcare services and experience with healthcare providers are likely to engage in good health-related behavior, which facilitates optimal healthcare system, medications, and pharmacy service utilization, and consequently enjoy an improved health-related quality of life (HRQoL). By elucidating these intricate interconnections, the outcomes of this study could offer deeper insights to pharmacists and other healthcare providers, emphasizing the significance of incorporating patients' experiences and perceptions into patient-centered care and strategies to positively influence their HRQoL.

The study objectives were (1) to explore respondents' perceptions of MetS management utilization (PMU) and investigate the influence of patients' experience with pharmacists (PEwP) on their PMU; (2) to assess the relationship between respondents' PMU and their HRQoL, as well as the influence of respondents' PEwP on their HRQoL. The third objective aimed to explore the mediating effect of respondents' PMU on the relationship between PEwP and HRQoL. Meanwhile, null hypotheses (H) were developed to guide the analyses and explore the study's objectives. Hypothesis 1 (H_1): no significant relationship exists between respondents' PMU and PEwP. Hypothesis 2 (H_2): no significant relationship exists between respondents' HRQoL and their PMU. The third hypothesis (H_3): no significant relationship exists between respondents' HRQoL and PEwP. Lastly, hypothesis 4 (H_4) postulates that a change in respondents' PMU does not mediate the association between their' HRQoL and PEwP.

2. Methods

2.1. Study design

The study employed a cross-sectional method from a population-based perspective based on the cognitive assessments of knowledge, beliefs, experience, and perceptions.[32,33]

2.2. Study area and population

The study area encompassed adult individuals residing in any of the Southern states of the US, including Washington, DC (Appendix 1), because of the region's high prevalence of obesity and MetS.[34–36] Meanwhile, the study population of interest were adult PwO with at least 30 Kg/m^2 body mass index (BMI),[12] and at least two of the related comorbidities, such as high blood pressure, myocardial infarction, hyperlipidemia, stroke, coronary heart disease, type-2 diabetes, insulin resistance, asthma, sleep apnea, cancer, infertility, or osteoarthritis.[1,2,37] Other inclusion criterion required eligible respondents to be at least 45 years old, considering that the median age of adults with MetS typically falls within the range of 44 to 47 years.[38,39]

2.3. Sample size and sampling

The study's sample size was calculated using G*Power software (version 3.1.9.7)[40,41] with parameters including a 0.15 effect size, a 0.05 significance level, and a 95% *Z*-score confidence interval. The sample size was 690 respondents, with an actual power of 0.95 and a critical F value of 3.01. The sample was selected using a purposive sampling technique by sending screening questions on weight in pounds, height in feet and inches, age in years, diagnosis of at least two comorbidities, and informed consent forms to a database of Qualtrics panels in the Southern states and Washington, DC. This technique was used as a non-random way to select targeted participants when the probability of selection is unequal or indeterminable or when participation is voluntary.[42] Meanwhile, Qualtrics panels provided a sample of respondents representing the US patient-care settings and comprehensive demographic coverage that reflects residence states, geographic areas (rural and urban), age, and gender.

2.4. Conceptual framework

A conceptual framework (Fig. 1) was constructed to investigate the perception of disease management resource utilization (PMU), assess the influence of patients' experience with pharmacists (PEwP) on both PMU

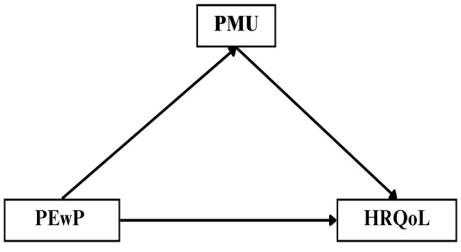

Fig. 1. Conceptual framework of the study.

and HRQoL, and assess the mediating effect of PMU on the relationship between PEwP and HRQoL. PMU was conceptualized as a combination of perceptions of healthcare, medications, and pharmacy service utilization. First, the perception of healthcare utilization was conceptualized as views on health status and healthcare system quality. This conceptualization was based on the belief that respondents who have the right attitude about their health status and believe that the healthcare system has adequate quality to provide adequate health care may have good perception of utilizing the healthcare system (Appendix 2). Second, medication utilization was conceptualized using perceived medication necessity and confidence in medication adherence. This conceptualization is grounded in the understanding that when patients perceive their medications as essential and have confidence in adhering to their medication regimen, they are more likely to hold positive perceptions of medication utilization (Appendix 2). The last PMU domain was the perception of pharmacy service utilization, which assumed that when patients have a good perception of pharmacists' education and training and are willing to accept pharmacy services, such patients may be considered to have good perceptions of utilizing pharmacy services (Appendix 2). These three perception domains were combined to form patients' PMU, one of the framework's constructs. While the framework provides a theoretical rationale to understand the relationship between the three constructs (PMU, PEwP, and HRQoL), PMU also serves as a mediator that explains the relationship between PEwP and HRQoL.

2.5. Data collection

The study's data were collected using a self-administered electronic questionnaire distributed by the Qualtrics XM platform from April 21st through June 23rd, 2023, after conducting pilot testing to identify possible issues that might arise during the full survey launch.[43] Also, certain measures were employed to improve the data quality. First, two attention check questions in the questionnaire helped identify and exclude unmotivated responses, such as not reading questions carefully, speeding through surveys, skipping questions, or providing random answers. Second, incomplete responses were identified and excluded to promote data completeness after the Qualtrics team had conducted some data verification procedures to promote data quality. The questionnaires were sent to over 4000 Qualtrics Panel respondents before receiving the 706 fully completed surveys needed from respondents who met the inclusion criteria.

2.6. Data collection tools

The questionnaire was comprised of different excerpts from validated questionnaire tools. For instance, respondents' views on their health status were assessed using the Health Perception Questionnaire's dimensions,[44] such as current health, health worries, and health outlook.[44,45] The perception of healthcare system quality was assessed using the six quality dimensions (effectiveness, efficiency, accessibility, acceptability, equitability, and safety) indicated by the Institute of Medicine and WHO.[46,47] Respondents' view on medication necessity was assessed using the Belief About Medicine Questionnaire,[48,49] with a principal component analysis of at least 0.7.[49,50] Confidence in medication adherence was assessed by the Self-efficacy for Appropriate Medication Use Scale.[51] Furthermore, respondents' perceptions of pharmacists' education and training and willingness to accept pharmacy services were assessed using components of the National Consumer Survey on the Medication Experience and Pharmacist Role questionnaire.[52] Prior experience with pharmacists (PEwP) was assessed using the Consultation and Relational Empathy measure,[53] a validated patient-reported experience measure.[54,55] Lastly, respondents' HRQoL was evaluated by using the EQ-5D-5L questionnaire, which assesses the five HRQoL dimensions such as mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.[56]

2.7. Study variables

2.7.1. Prior experience with pharmacists (PEwP)

Respondents' PEwP was computed using the CARE measure, which comprises ten questions on a 5-point Likert scale (poor, fair, good, very good, and excellent). Responses such as “good,” “very good,” and “excellent” were assigned a score of one, while “poor” and “fair” were recoded to have a score of zero. Then, the respondents' PEwP score was obtained by adding the scores for each questionnaire item to give a maximum score of 10. Meanwhile, the PEwP scores were divided into three ordinal categories: poor, fair, and good PEwP categories, using 33.3% and 66.6% percentile divisions to allow non-parametric analyses using ordinal variables.[57] Therefore, respondents with scores ranging from 0 to 2 were classified as having poor PEwP, while those with scores between 3 and 6 were classified as having fair PEwP. Lastly, those with PEwP scores of 7 and above were classified as having good PEwP.

2.7.2. Health-related Quality of life (HRQoL)

The Level Sum Score method was used to summarize the respondents' EQ-5D-5L severity profile to obtain HRQoL scores.[56] According to Devlin and colleagues, the Level Sum Score method adds up the levels on each EQ-5D-5L dimension, treating each level's conventional label (1, 2, 3, 4, or 5) as a number rather than a categorical description.[58] The best possible HRQoL score was 5, while the worst score was 25.[59] The higher the score, the worse the HRQoL.[59] Then, the HRQoL scores were divided into three ordinal categories, namely poor, fair, and good HRQoL categories, using the 33.3% and 66.6% percentile divisions, based on previous studies,[60–63] to ensure a balanced distribution of respondents and enhance statistical robustness. Therefore, respondents with HRQoL scores ranging from 5 to 9 were classified as those with good HRQoL, while those with scores between 10 and 13 were classified as having fair HRQoL. Lastly, respondents with HRQoL scores of 14 and above were classified as having poor HRQoL.

2.7.3. Perception of disease management resource utilization (PMU)

Concerning the PMU, respondents' responses with ‘definitely true/mostly true’ for HPQ, ‘good/great/excellent’ for health care system quality assessment, ‘strongly agree/agree’ for BMQ, ‘very confident’ for SEAMS, ‘definitely have education and training’ for pharmacists' education and training and ‘definitely willing to accept’ for willingness to accept pharmacy services measures, were scored 1. All other responses to each of the measures were scored 0. Then, each measure score was added to obtain the PMU scores with a maximum of 101. Then, the PMU scores were converted into an ordinal variable with three categories: poor, fair, and good PMU categories, based on 33.3% and 66.6% percentile divisions, to ensure that the categories have a similar number of observations, which improve the stability and robustness of subsequent non-parametric analyses.[64] Respondents with PMU scores ranging from 5 to 43 were classified as having poor PMU, while those between 44 and 62 were classified as having fair PMU. Lastly, respondents with PMU scores of 63 and higher were classified as having good PMU.

2.8. Statistical analysis

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS 28),[65] and Process Macros application,[66,67] while visualizations were done using the Microsoft Excel application.[68] All statistical analyses were carried out as two-tailed analyses at a 0.05 significant level and a 95% confidence level. Frequency and percentage were used to describe the categorical demographic characteristics, while mean and standard deviation (SD) values were used to describe the distribution of numerical demographic characteristics. Frequency and percentages were used to describe PEwP, PMU, and HRQoL categories. Chi-square tests were then conducted to explore the distribution of PEwP across PMU and HRQoL categories. Similarly, the chi-square test investigated the distribution of PMU categories across the HRQoL

categories.

Ordinal logistic regression analyses were conducted to build the proportional odds models (POM) between the variables to investigate any relationship between respondents' PMU, PEwP, and HRQoL. The choice of ordinal logistic regression was made because the dependent variable (HRQoL category types) was measured on an ordinal level, and there was no multi-collinearity between the two independent variables (PMU and PEwP category types).[69] Also, ordinal regression provides interpretable coefficients in terms of proportional odds of moving from one HRQoL category to the other and provides model fit indices that evaluate the appropriateness of the model between the variables.[70,71]

Hypothesis 1. (H_1) was tested using an ordinal logistic regression to predict POMs for the relationship between PEwP and PMU. The dependent and independent variables for testing the hypothesis were PMU and PEwP, respectively. Second, hypothesis 2 (H_2) was tested using ordinal logistic regression to predict the relationship between PMU and HRQol. The dependent variable for testing hypothesis 2 was HRQoL, while the independent variable was PMU. Furthermore, the relationship between PEwP and HRQoL was tested for hypothesis 3 (H_3) using ordinal logistic regression. This hypothesis's dependent and independent variables were HRQoL and PEwP, respectively. Meanwhile, all the estimates in the models were used to calculate the odds ratios (OR) of being in any of the PMU and HRQoL categories. Then, estimates of the probability of belonging to any of the PMU and HRQoL categories were developed and represented graphically using the following equation below.

$$P(Y) = \text{Exp}(\log[P(y)] / (1 + \text{Exp}(\log[P(y)]).$$

Hypothesis 4. (H_4) was tested by a serial mediation analysis using Haye's model 4 from the Process macros extension in SPSS to investigate how PMU influences the relationship between respondents' PEwP and HRQoL.[72] Mediation analysis explores complex pathways through which independent variables influence dependent variables through one or more mediators when the independent variable seems to have no relationship with the dependent variable.[72–74] The independent and dependent variables were the PEwP and HRQoL scores, respectively, while the PMU score was used as the mediator. The indirect influence was examined using 95% percentile bootstrap confidence intervals from 5000 resamples.[73] The bootstrap confidence intervals that did not contain zero provided statistical evidence of mediation.

2.8.1. Ethical considerations

Ethical approval was obtained from Chapman University's Institutional Review Board (IRB) with an approval number of IRB-23-248. Informed consent was obtained from the respondents. Also, privacy was ensured through information confidentiality, as data did not have an identifier. Approval to use proprietary questionnaires from the NCSME&PR, CARE, HPQ, BMQ, SEAMS, and EUROQoL managements were also granted.

3. Results

A total of 706 fully complete surveys were collected and used for analyses. The median age of the respondents was 58 years. Only 31.4% of the respondents were at least 65-year-old, while the majority (71.1%) were female (Table 1). Thirty percent of respondents had at least a bachelor's degree, compared to 24.2% with a high school degree or less. Although 47.2% were married, approximately 11.9% were single or widowed. A proportion of 17.6% earned $80,001 or higher as their household income, compared to 49.2% with $40,000 or lower. Only 8.5% were unemployed, whereas 31.2% and 38.1% were employed and retired, respectively. The median BMI value was 36.7 kg/m^2. Respondents had an average of three comorbidities, with 36.4% having two comorbidities, and <20% having at least five. The proportions of respondents with high blood pressure and high cholesterol were 79.0% and 68.7%, respectively. In addition, a proportion of 38.4% had high blood sugar, while only 4.7% and 7.6% reported infertility and insulin resistance, respectively. The median number of prescription drugs taken by respondents was 6.

Table 1
Demographic characteristics of the respondents.

Demographic characteristics		n (%)
Age group	45–64 years.	484 (68.6)
	65+ years.	222 (31.4)
Gender	Male	204 (28.9)
	Female	502 (71.1)
Education	High school or lower	171 (24.2)
	Some college-no degrees/associate degree	321 (45.5)
	Bachelor's or higher degree	214 (30.3)
Marital Status	Single (Never married)	85 (12.0)
	Single (separated/divorced)	204 (28.9)
	Married or partnered	333 (47.2)
	Widowed	84 (11.9)
Household Income	$40,000 or lower	347 (49.2)
	$40,001 - $80,000	235 (33.3)
	$80,001 or higher	124 (17.6)
Employment status	Stay-at-home caregiver	19 (2.7)
	Permanently Disabled	138 (19.5)
	Unemployed	60 (8.5)
	Employed	220 (31.2)
	Retired	269 (38.1)
Ethnicity	Non-white	158 (22.4)
	White/Caucasian	548 (77.6)
Health Insurance coverage	No	42 (5.9)
	Yes	664 (94.1)
Geographical area	City or urban area (≥ 20,000 population)	429 (60.8)
	Town or rural area (< 20,000 population)	277 (39.2)

A proportion of 72% had good PEwP with a median score of 10, while 12.5% and 15.6% had fair and poor PEwP, respectively (Table 2). Only 32.6% had good PMU, while 33.3% and 34.1% belonged to the poor and fair PMU categories, respectively. The median HRQoL score was 11. A proportion of 40.8% had good HRQoL, compared to 26.2% and 33.0% of respondents with poor and fair HRQoL, respectively.

3.1. Hypothesis H_1

3.1.1. No significant relationship exists between respondents' PMU and their PEwP

The chi-square test predicted a significant difference between PMU and PEwP ($X^2 = 42.52$, $p < 0.001$). A proportion of 38.4% with good PEwP had good PMU compared to 17.3% of those with poor PEwP. Similarly, 51.8% with poor PEwP had poor PMU (Table 3). The ordered logit function revealed that those with good PEwP had 2.97 times higher odds ($p < 0.001$) of being in a fair or good PMU category than those with poor PEwP (Table 4). The POM revealed that the probability of having good PMU among those with good PEwP was two times the probability

Table 2
Distribution of PEwP, PMU, and HRQoL categories.

	N (%)	Mean score (SD)	Median score
PEwP Categories			
Poor PEwP	110 (15.6)	0.9 (0.9)	1
Fair PEwP	88 (12.5)	4.7 (1.1)	5
Good PEwP	508 (72.0)	9.6 (0.9)	10
PMU categories			
Poor PMU	235 (33.3)	29.3 (9.6)	31
Fair PMU	241 (34.1)	52.7 (5.5)	53
Good PMU	230 (32.6)	72.4 (7.0)	72
HRQoL categories			
Poor HRQoL	185 (26.2)	16.4 (2.2)	16
Fair HRQoL	233 (33.0)	11.4 (1.1)	11
Good HRQoL	288 (40.8)	7.4 (1.3)	7

PEwP = Prior experience with pharmacist; PMU = Perceptions of disease management resource utilization; HRQoL = Health-related quality of life.

Table 3
Chi-square test between the variables.

Chi-square test between PEwP and PMU				
	Poor PMU n (%)	Fair PMU n (%)	Good PMU n (%)	X^2 (p *value*)
Poor PEwP	57 (51.8)	34 (30.9)	19 (17.3)	
Fair PEwP	42 (47.7)	30 (34.1)	16 (18.2)	42.52 (<0.001*)
Good PEwP	136 (26.8)	177 (34.8)	195 (38.4)	

Chi-square test between PMU and HRQoL				
	Poor HRQoL n (%)	Fair HRQoL n (%)	Good HRQoL n (%)	X^2 (p *value*)
Poor PMU	68 (28.9)	84 (35.7)	83 (35.3)	
Fair PMU	69 (28.6)	75 (31.1)	97 (40.2)	8.44 (0.08)
Good PMU	48 (20.9)	74 (32.2)	108 (47.0)	

Chi-square test between PEwP and HRQoL				
	Poor HRQoL n (%)	Fair HRQoL n (%)	Good HRQoL n (%)	X^2 (p *value*)
Poor PEwP	34 (30.9)	35 (31.8)	41 (37.3)	
Fair PEwP	24 (27.3)	35 (39.8)	29 (33.0)	4.87 (0.30)
Good PEwP	127 (25.0)	163 (32.1)	218 (42.9)	

* Significant at <0.05; PMU = Perceptions of disease management resource utilization; PEwP = Prior experience with pharmacists; X^2 = Chi-square test; HRQoL = Health-related quality of life.

for those with fair and poor PEwP (Fig. 2A). Similarly, the probability of having poor PMU among those with poor PEwP was 0.52, compared to 0.27 among those with good PEwP. Also, the model of fitting information revealed that PEwP accounted for a significant amount of variance in the outcome of likelihood ratio, $X^2 = 42.94$, $p < 0.001$, with a 0.92 deviance goodness-of-fit, indicating that PEwP predicted the respondents' PMU. Hence, the null hypothesis was rejected, and it was affirmed that respondents' PEwP significantly influenced their PMU.

3.2. Hypothesis H_2

3.2.1. No significant relationship exists between respondents' HRQoL and their PMU

Although no significant difference was established ($X^2 = 8.44$, $p = 0.08$) in the distribution of PMU categories across the HRQoL categories, 47.0% of those with good PMU had good HRQoL (Table 3). Respondents with good PMU had 58% (OR = 1.58, 95% CI = 0.12, 0.8) higher odds of having a fair or good HRQoL than those with poor PMU (Table 4). However, the probability of those with good PMU having good HRQoL was 0.47, compared to those with fair (0.39) and poor (0.36) PMU (Fig. 2B). The model of fitting information revealed that PMU accounted for a significant amount of variance in the outcome of likelihood ratio, $X^2 = 7.51$, $P = 0.023$, with a 0.59 deviance goodness of fit, indicating that PMU influenced HRQoL.

Table 4
Ordinal regression between PEwP, PMU, and HRQoL.

		Estimate	OR	*P value*	95% CI
Ordinal regression between PEwP and PMU					
Threshold	Poor or Fair/ Good PMU	0.07		0.69	−0.29, 0.43
	Poor/Fair or Good PMU	1.57		<0.001	1.19, 1.95
	Good PEwP	1.09	2.97	<0.001*	0.69, 1.48
PEwP categories	Fair PEwP	0.14	1.14	0.62	−0.40, 0.67
	Poor PEwP (*ref*)				
Ordinal regression between PMU and HRQoL					
Threshold	Poor or Fair/ Good HRQoL	−0.85		<0.001	−1.10, −0.60
	Poor/Fair or Good HRQoL	0.57		<0.001	0.32, 0.81
	Good PMU	0.46	1.58	0.008*	0.12, 0.80
PMU categories	Fair PMU	0.13	1.13	0.46	−0.21, 0.46
	Poor PMU (*ref*)				
Ordinal regression between PEwP and HRQoL					
Threshold	Poor or Fair/ Good HRQoL	−0.85		<0.001	−1.21, −0.50
	Poor/Fair or Good HRQoL	0.56		0.002	0.21, 0.91
	Good PEwP	0.26	1.30	0.17	−0.12, 0.64
PEwP categories	Fair PEwP	−0.02	0.98	0.93	−0.54, 0.49
	Poor PEwP (*ref*)				

* Significant at 0.05 level; PEwP = Prior experience with pharmacists; OR = Odds ratio; CI – Confidence interval. HRQoL = Health-related Quality of life; PMU = Perception of management utilization.

3.3. Hypothesis H_3

3.3.1. No significant relationship exists between respondents' HRQoL and PEwP

The chi-square test predicted no significant difference existed ($X^2 = 4.87$, $p = 0.30$) in the distribution of PEwP categories across the HRQoL categories (Table 4). The proportion of respondents with good PEwP who had good HRQoL was 42.9%, compared to 37.3% with poor PEwP. The regression revealed that those with good PEwP had 30% higher odds (OR = 1.30, 95% CI -0.12, 0.64) of being in a fair or good HRQoL category than those with poor PEwP (Table 4). Fig. 2C shows that the probability of having good HRQoL among those with good PEwP was 0.43 compared to those with fair or poor PEwP (0.36). Conversely, the probability of poor HRQoL among those with good PEwP (0.25) was lower than those with fair or poor PEwP (0.30). The model of fitting information revealed that PMU accounted for an amount of variance in the outcome of likelihood ratio, $X^2 = 3.19$, $p = 0.20$, with a 0.44 deviance goodness-of-fit, indicating no relationship between PEwP and HRQoL. Therefore, the null hypothesis was not rejected, confirming that respondents' PEwP did not significantly influence their HRQoL.

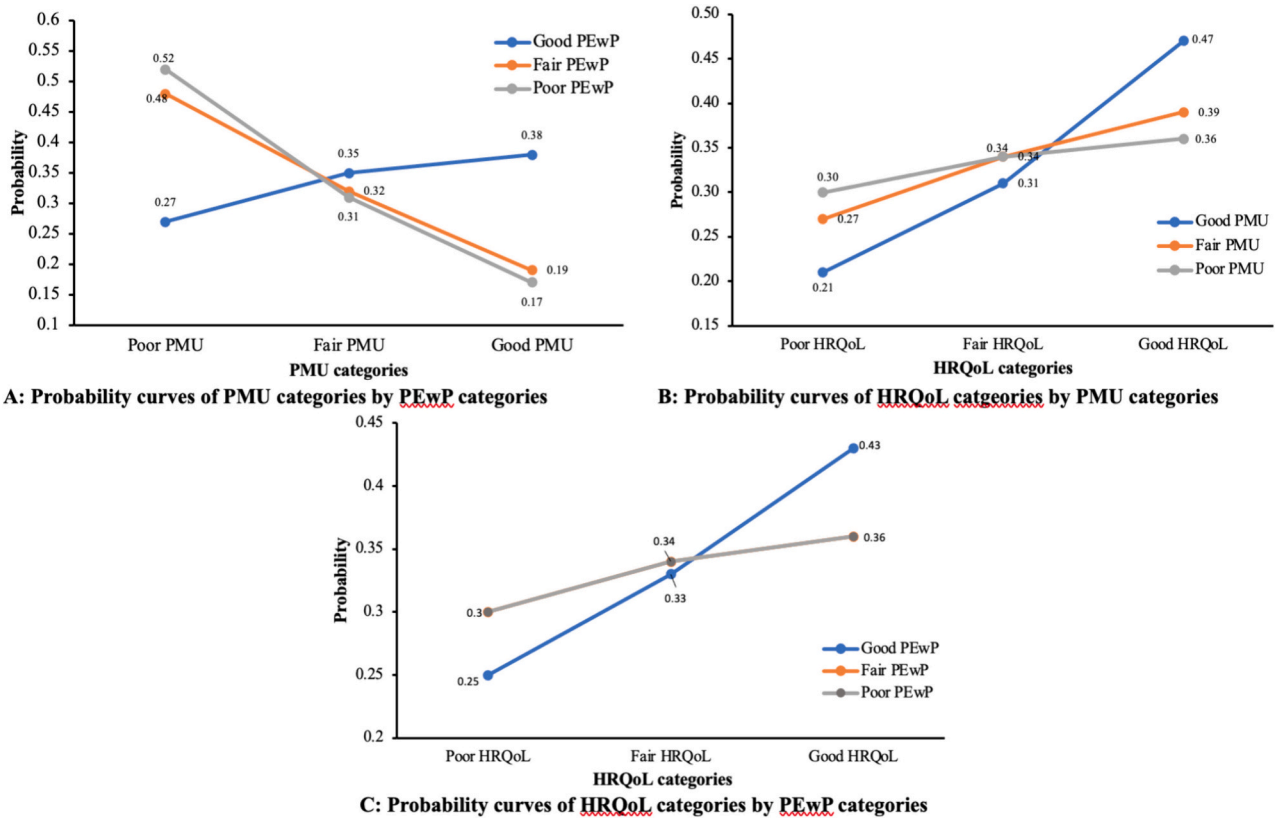

Fig. 2. Probabilities curves.

3.4. Hypothesis H_4

3.4.1. A change in PMU does not mediate the association between HRQoL and PEwP

Although the direct effect of the mediation analysis revealed no significant relationship between HRQoL and PEwP, the bootstrap analysis indicated an indirect and statistically significant relationship (95% CI = −0.07, −0.02) between PEwP and HRQoL, through the respondents' PMU (Table 5). This result suggested that PMU fully mediated the relationship between PEwP and HRQoL. Hence, the null hypothesis was rejected, and it was confirmed that despite a non-significant influence of PEwP on HRQoL, PEwP indirectly influenced PMU and consequently impacted respondents' HRQoL.

Table 5
Mediation analysis between HRQoL and PEwP through PMU.

Direct effect model between HRQoL, PEwP, and PMU					
Variable	Coeff	SE	t	p *value*	95% CI
Constant	12.64	0.48	26.52	<0.001	11.70, 13.57
PEwP	0.003	0.04	0.07	0.94	−0.08, 0.09
PMU	−0.03	0.008	−3.93	<0.001*	−0.05, −0.02

Indirect effect of PEwP on HRQoL			
Variable	Effect	BootSE	95% BootCI
PMU	−0.045	0.013	−0.07, −0.02[a]

* Significant at 0.05 level; [a]Bootstrap CIs that do not include zero indicate mediation; SE = standard error; CI – Confidence interval; Coeff = Coefficient; BootSE = Bootstrap standard error; BootCI = Bootstrap confidence interval. HRQoL = Health-related quality of life; PEwP = Prior experience with pharmacists; PMU = Perceptions of disease management resource utilization.

4. Discussion

The study aimed to assess the perception of disease management resource utilization (PMU) and experience with pharmacy services among people with MetS and investigate the influence of these perceptions and experiences on health outcomes. Findings revealed that less than one-third of the respondents had a good perception of MetS management resource utilization. Previously, studies have shown that medication utilization has been relatively low,[75–77] while pharmacy service has also been considered inadequate.[27,78–81] One critical concern common to the poor utilization of these resources is patients' perceptions of these resources,[79,80,82–84] as highlighted in the current study. Therefore, patients' perceptions may be the most influential psychological factors affecting the utilization of healthcare, medication, and pharmacy services. Although MetS management resources are available, their utilization depends on patients' perceptions and trust in the available services, which impacts decision-making on their utilization pattern. Thus, patients with poor perceptions of these resources may be prone to exhibit negative interpretations of them, impacting their utilization. Therefore, pharmacists and other healthcare providers must prioritize and address patients' perceptions while implementing interventions to achieve optimal management utilization to promote patients' health status.

Furthermore, social and economic factors such as unstable or low household income and a lack of supportive social networks have been revealed to be associated with underutilized disease management resources,[85] the current study has shown that patients' experience significantly predicts patients' perceptions of disease management resource utilization. Although most respondents had good experience with pharmacy services, higher odds of having good perceptions of disease management resource utilization suggested that they might have been highly driven by their experience, leading to greater adherence to the therapy plans to maintain optimal health status. This finding aligns with

previous research indicating that patients' satisfaction with healthcare services significantly shapes their perceptions of disease management resources.[86] Patient experience encompasses interactions within the healthcare system, including care from health plans and personnel.[87] These interactions may significantly influence patient perceptions throughout their care journey, as positive experiences correlate with improved satisfaction with the services received.[88] Consequently, the heightened satisfaction can, in turn, shape patients' perceptions of disease management resources, subsequently influencing their utilization. This perspective aligns with the constructivist approach, which argues that prior experience organizes cognitive content, resulting in changes in perceptions and health behavior.[89] Consequently, patients with negative experiences may develop wrong perceptions about resource adequacy within the healthcare system, ultimately affecting resource utilization.

Only 40% of the respondents had good HRQoL, which aligns with expectations for PwO suffering from multiple comorbidities having poorer HRQoL outcomes.[90–93] Research supports this assumption, revealing that as the number and severity of health conditions increased among PwO, the negative impact on HRQoL intensifies.[94] Aside from the impact of comorbidities, the study explored the influence of patients' PMU on their HRQoL. Findings revealed a positive association, with respondents having good PMU exhibiting a significantly higher likelihood of achieving better HRQoL. This suggests that positive perceptions of disease management resource utilization may inspire patients to utilize resources effectively, potentially improving HRQoL. While previous research has not directly linked patients' perceptions with HRQoL, similar associations have been observed in patients with respiratory diseases, where low HRQoL was associated with low healthcare resource utilization.[95] Consequently, individuals with good perceptions may be more inclined to utilize healthcare and pharmacy services, enhancing their HRQoL.

Despite the higher probabilities of good HRQoL among those with good experience with pharmacists, the study found no direct relationship between patients' experience and HRQoL. One could hypothesize that positive experiences may motivate patients to consistently adhere to healthcare provider recommendations, promoting optimal health outcomes because of changes in health behavior.[96,97] Therefore, positive experiences may stimulate good health behaviors, including adequate utilization of disease management resources, eventually promoting an improved quality of life. Furthermore, one focus of the study was to investigate how patients' perceptions, influenced by their experience, indirectly impact their HRQoL. The analysis revealed that patients' experience with pharmacists indirectly impacts HRQoL through their perceptions of disease management resource utilization. Consequently, positive healthcare experiences may foster favorable perceptions of disease management resource utilization, and thus promote adequate resource utilization. However, effective disease management resource utilization may promote adequate quality of life. These findings reiterate the importance of healthcare providers in promoting patient experience and satisfaction, as they play critical roles in encouraging good perceptions, which improves health behavioral states.[96,97] Consequently, through these health behavioral states, patients may utilize disease management resources adequately, thus reflecting positively on their health status.

The study encountered some limitations. Firstly, BMI derived from self-reported heights and weights was used instead of waist circumference to identify PwO, given the lack of access to the respondents. Nonetheless, BMI remains a valuable index for identifying individuals at risk for comorbidities among PwO. Secondly, the study was focused on individuals in the Southern states. Also, there was an uneven distribution of the study sample size in each state in the region. For example, higher proportions of the respondents came from Texas (18.3%) and Florida (16.9%), while only 1.3% and 1.8% were from Delaware and Mississippi, respectively. Therefore, the uneven distribution across states might limit the extrapolation of the findings to the general population of MetS in the country. Demographically, the study sample overrepresented females, white individuals, and those with health insurance, potentially biasing interpretations of study findings. This underscores existing disparities in healthcare access and emphasizes the need for interventions targeting underrepresented groups. Another limitation is the lack of assessment of the utilization of MetS management resources, as the current study focused on perceptions. Incorporating utilization assessment could provide deeper insights into the resource utilization patterns and their impact on HRQoL. Lastly, the study utilized a panel database from Qualtrics for data collection; there remains the possibility of response bias, even though the panel reflects patient-care settings and the overall census numbers for the states of residence, geographic area (rural and urban), age, and gender in the US. Despite these limitations, the study has provided a solid foundation for understanding how individuals with multiple chronic diseases perceive disease management resources and how these perceptions influence their HRQoL.

5. Conclusion

The overarching finding from this study revealed that only one-third of the respondents had good perceptions of disease state management resource utilization and that these perceptions were influenced mainly by prior experiences with pharmacists and other healthcare providers. Approximately 41% of people with MetS in the country's Southern states had good HRQoL. Perceptions of disease management resource utilization among people with MetS were significantly associated with their HRQoL. Lastly, PEwP through the PMU indirectly influenced respondents' HRQoL. This finding confirms that achieving good HRQoL among patients may also depend on how patients perceive the utilization of disease management resources and their experience with healthcare providers. Therefore, all healthcare providers must always consider utilization perceptions from patients to achieve adequate HRQoL. Also, pharmacists and other healthcare providers must improve their professional ways of providing services to create a favorable impression on their patients, promote perceptions of healthcare resource utilization, and improve the actual utilization of these resources to positively impact health outcomes.

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Ethical approval and consent to participate

Ethical approval was obtained from Chapman University's Institutional Review Board (IRB) with an approval number of IRB-23-248. Informed consent was obtained from the respondents. Also, privacy was ensured through information confidentiality, as data did not have an identifier. We also received approval to use proprietary questionnaires from the NCSME&PR, CARE, HPQ, BMQ, SEAMS, and EUROQoL managements.

CRediT authorship contribution statement

Olajide A. Adekunle: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – original draft, Writing – review & editing. **Jon C. Schommer:** Methodology, Validation, Writing – review & editing. **Yun S. Wang:** Supervision, Validation, Writing – review & editing. **Ismaeel Yunusa:** Supervision, Validation, Writing – review & editing. **Marc L. Fleming:** Supervision, Validation, Writing – review & editing. **Enrique Seoane-Vazquez:** Supervision, Validation, Writing – review & editing. **Lawrence M. Brown:** Funding acquisition, Methodology, Project administration, Supervision, Validation, Writing – review & editing.

Declaration of competing interest

The authors declare no competing interest.

Data availability

The datasets and the studying findings are available with the corresponding author and are accessible on request.

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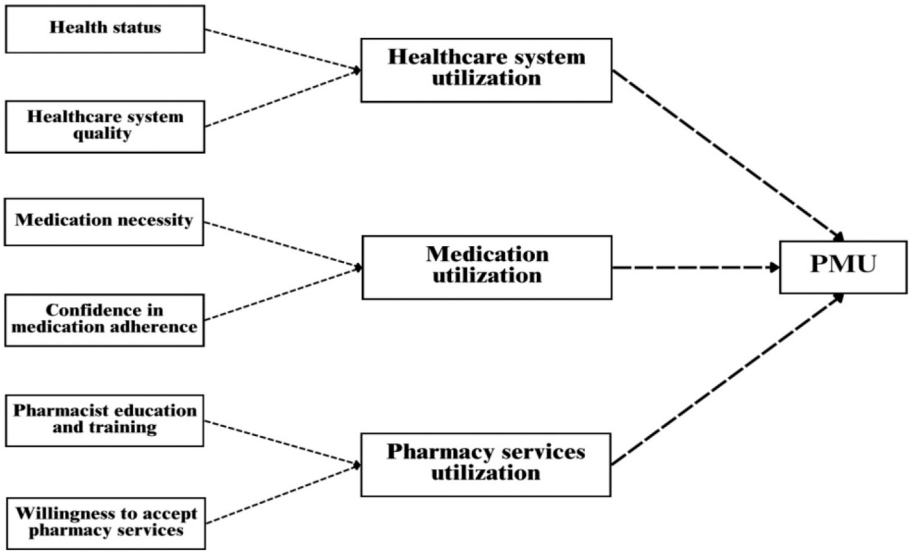
Appendix 1. Study areas comprising the states in the southern region and Washington, DC.

Geographical zones	States and their abbreviations
Southern region	Delaware (DE), Maryland (MD), Virginia (VA), West Virginia (WV), Kentucky (KY), North Carolina (NC), South Carolina (SC), Tennessee (TN), Georgia (GA), Florida (FL), Alabama (AL), Mississippi (MS), Arkansas (AR), Louisiana (LA), Texas (TX), Oklahoma (OK) and Washington, DC

Appendix 2. Conceptualization of PMU



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