

Original Article

Education and Counseling Pathways to Hospital Pharmacy Membership Adoption: A PLS-SEM and NCA Approach

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Abstract. Hospital outpatient pharmacies face intensifying competition from community drug outlets, yet evidence on scalable membership models that improve adherence and retention remains limited. This study evaluates a Pharmacy Services Membership Business Model (PSMBM) at The Medical City Iloilo Hospital Inc. (TMCIIH), quantifying how service attributes drive subscription intention and behavior. Using a cross-sectional survey ($n = 220$), Partial Least Squares Structural Equation Modeling (PLS-SEM) and Necessary Condition Analysis (NCA) were applied to four service domains: Medication Adherence Education (MAE), Medication Counseling (MC), Order & Delivery Services (OPD), and Pricing. The structural model explained 58% of the variance in Intention to Subscribe ($R^2 = 0.58$) and 41% in Actual Subscription ($R^2 = 0.41$). Pricing ($\beta = 0.801$, $p < 0.001$) and OPD ($\beta = 0.206$, $p = 0.020$) were significant sufficient predictors. NCA identified Pricing ($d = 0.444$, $p < 0.001$) and MAE ($d = 0.207$, $p = 0.021$) as necessary conditions. Non-parametric tests revealed significant demographic differences across sex, income, education, and payment mode. Findings support PSMBM viability and offer actionable guidance for tiered pricing, logistics enhancement, and educational content design. The model contributes to SDG 3 (Good Health and Well-Being) and SDG 10 (Reduced Inequalities).

Keywords: Medication adherence; Necessary Condition Analysis; Hospital pharmacy membership model; Partial Least Squares-Structural Equation Modeling; Subscription intention.

Medication adherence is the degree to which a patient's behavior corresponds with agreed health care provider recommendations (Jimmy & Jose, 2011). Non-adherence leads to disease worsening, preventable mortality, and substantial healthcare expenditure. Systematic evidence confirms that high out-of-pocket costs and limited prescription drug coverage significantly reduce adherence, and that reducing medication costs can improve uptake—though patients who receive subsidized medications may still struggle, particularly for non-severe conditions (Aziz et al., 2016).

Pharmacist-led interventions, including medication counseling, have demonstrated improved adherence outcomes; however, their effectiveness depends heavily on intervention frequency, medications involved, and individual patient characteristics (Elnaem et al., 2020). In the Philippines, hospital pharmacy counseling is

recognized as critical for rational drug use, yet constrained by resource limitations and fragmented service networks (Luib, 2022; FDA, 2024). Hospital pharmacies face increasing competitive pressure from approximately 25,000 registered retail drug outlets, many leveraging aggressive pricing and convenient delivery services (Gutierrez & Sakulbumrungsil, 2023).

A Membership Pharmacy Model addresses these challenges by bundling value-based services—education, counseling, and delivery—with transparent pricing aligned with actual acquisition costs (Hohmeier et al., 2023; Liu, 2020). Such models can improve patient engagement and adherence (Daly et al., 2020; Showande & Laniyan, 2022). Despite international evidence supporting comprehensive pharmacy programs (Torres-Robles et al., 2022; Lee et al., 2006), membership-based hospital pharmacy models remain largely untested in the Philippine setting.

This study addresses that gap by evaluating the acceptability of a Pharmacy Services Membership Business Model (PSMBM) at TMCIHl using a dual-method approach: PLS-SEM to identify sufficient predictors of subscription intention and behavior (Hsiao & Yang, 2011; Hair & Alamer, 2022), and NCA to identify minimum threshold conditions without which high subscription intention cannot manifest (Richter et al., 2020; Richter & Hauff, 2022; Richter et al., 2023). The study is grounded in the Technology Acceptance Model (TAM) (Ma & Liu, 2005) and the Theory of Planned Behavior (TPB) (Bosnjak et al., 2020). It examines the moderating and direct demographic effects of age, sex, income, education, brand preference, place of residence, preferred mode of payment, and health consciousness. Findings are framed within SDG 3 (Good Health and Well-Being) and SDG 10 (Reduced Inequalities), in support of Universal Health Coverage in the Philippines (Republic Act No. 11223, 2019; Wirtz et al., 2017).

Methodology

Research Design and Ethics

A quantitative, cross-sectional research design was employed. PLS-SEM was selected for its predictive strength in models with multiple latent constructs and non-normal data (Hair & Alamer, 2022), while NCA was integrated to detect non-compensatory necessary conditions (Richter et al., 2023). Ethics approval was obtained from the University of San Agustin Ethics Review Committee (Protocol No. 2024-91-STUDENT-COC-DUEÑAS-BUSINESS MODEL) and from the TMCIHl Institutional Review Board prior to data collection. All participants provided written informed consent, and data were anonymized and handled in compliance with the Philippine Data Privacy Act.

Participants and Sampling

The study was conducted at TMCIHl's outpatient department over one month (target population: ~320 patients/month). Purposive sampling targeted patients aged ≥18 years who were currently prescribed medications and had sufficient income and capacity to provide informed consent. Patients prescribed medications for sensitive conditions (e.g., HIV/AIDS, hepatitis, tuberculosis, sexually transmitted infections), those with severe cognitive impairment, acute psychiatric episodes, terminal illness, or recent major surgery were excluded (Chandra et al., 2021; Pompili et al., 2008; AlShehri et al., 2022; Booysen et al., 2020). Of 224 responses collected, 4 incomplete entries (1.79%) were removed, yielding a final sample of $n = 220$ —well within the 150–200 minimum recommended for robust NCA findings (Richter et al., 2023).

Research Instrument

A structured questionnaire was co-developed by the researcher in collaboration with TMCIHl's executive leadership and Health Informatics Management, Research, and Innovation Department. It was validated by three subject-matter experts using Oducado's (2020) instrument validation rating scale (mean scores: 4.00–5.00; $SD \leq 0.577$; perfect clarity score of 5.00). The instrument comprised: Part 1—demographic and behavioral profile; Part 2—5-point Likert scale ratings across MAE, MC, OPD, and Pricing (1 = Strongly Unacceptable to 5 = Strongly Acceptable); and Part 3—open-ended qualitative questions. A formative measurement approach was used for the service domains, while Intention to Subscribe was modeled reflectively. Pre-testing was conducted with $n = 30$ patients. Questionnaires were deployed via Microsoft Forms, distributed through concierge-assisted and QR-code-based voluntary submission.

Measurement Model Assessment

Reflective construct reliability and validity for Intention to Subscribe (IS1–IS3) were confirmed: outer loadings =

0.953–0.963 (all $p < 0.001$); Cronbach's $\alpha = 0.940$; composite reliability (ρ_C) = 0.961; AVE = 0.892. Formative constructs (MAE, MC, OPD, Pricing) were evaluated for multicollinearity ($VIF < 10$, acceptable per Hair & Alamer, 2022) and indicator relevance via bootstrapping with 5,000 subsamples. Indicators with non-significant weights but outer loadings > 0.70 were retained for theoretical consistency.

Data Analysis

Descriptive statistics (frequency, percentage, mean, SD) were computed in Jamovi 2.3.28. Non-parametric tests were used given significantly non-normal item distributions (Shapiro-Wilk $p < .001$): Mann-Whitney U for binary demographic variables; Kruskal-Wallis H for ordinal groups (age, income). PLS-SEM bootstrapping (10,000 samples) and NCA permutation testing (10,000 samples, CE-FDH ceiling technique) were conducted in SmartPLS 4. NCA effect size (d) interpretations followed Dul (2020): $d < 0.10$ trivial; 0.10–0.29 small; 0.30–0.49 medium; ≥ 0.50 large. Combined interpretation followed the Richter et al. (2022) dual-axis matrix, distinguishing necessary from sufficient conditions.

Results and Discussion

Respondent Profile

The sample ($n = 220$) had a mean age of 35.9 years ($SD = 10.4$; range: 19–69). Most respondents were in the 18–29 age group (36.4%), followed by 30–39 (29.5%), 40–54 (28.2%), and 55 and above (5.9%). The sample was predominantly female (69.5%). Most resided within Iloilo City (69.1%). Over half held a tertiary/bachelor's degree (50.5%). The majority fell within the low-income bracket per PSA (2024) classification (76.6%; mean income: ₱30,101, $SD = ₱31,054$). Brand loyalty was strong: 63.6% were brand-conscious, and 65.7% rated brand as 'very important.' Cash was the preferred payment mode for 66.8% of respondents. These characteristics are representative of a private secondary hospital outpatient population in Western Visayas.

Table 1. Demographic Profile ($n = 220$)

Category	n (%)
Age	
18–29	80 (36.4%)
30–39	65 (29.5%)
40–54	62 (28.2%)
≥ 55	13 (5.9%)
Sex	
Female	153 (69.5%)
Male	67 (30.5%)
Income	
Low	160 (76.6%)
Lower middle	19 (9.1%)
Below minimum threshold	36 (17.2%)
Education	
Bachelor's/Tertiary	111 (50.5%)
Post-graduate	14 (6.4%)
Secondary/Vocational	22 (10.0%)
Brand Preference	
Brand-conscious	140 (63.6%)
Generic-friendly	80 (36.4%)
Payment Mode	
Cash	147 (66.8%)
Cashless	73 (33.2%)
Residence	
Within Iloilo City	152 (69.1%)
Outside Iloilo City	68 (30.9%)

Level of Acceptability to the PSMBM

All four service dimensions were rated 'Acceptable' to 'Strongly Acceptable' on the Likert scale. Pricing received the highest acceptability rating overall, while MAE and MC were also rated favorably, reflecting patients' appreciation of clinical trust and health education. OPD was positively rated, especially among cashless payment users. These aggregate results indicate broad receptivity to the PSMBM concept, setting a favorable baseline for structural model testing.

Significant Demographic Differences in Acceptability

Mann-Whitney U tests revealed that female respondents rated three MAE items significantly higher than males (MAE2: $U = 4349$, $p = 0.045$; MAE3: $U = 4292$, $p = 0.032$; MAE6: $U = 4200$, $p = 0.018$), suggesting gender-based differences in valuing medication education. Respondents who preferred cashless payment showed significantly higher OPD acceptability, reflecting an alignment between digital lifestyle preferences and logistics-based service features. Brand-conscious respondents rated all four service domains and IS significantly higher, suggesting that trust and perceived value amplify receptivity to structured pharmacy services. Kruskal-Wallis tests indicated income and education-level differences in MAE, MC, OPD, and Pricing ratings, reinforcing the need for demographic tailoring in PSMBM rollout.

Measurement Model Results

Table 2. Reflective Construct Reliability and Validity (Intention to Subscribe)

Indicator	Outer Loading	Cronbach's α	CR (ρ C)	AVE
IS1	0.953***	0.940	0.961	0.892
IS2	0.956***			
IS3	0.963***			

Note. *** $p < 0.001$. All thresholds exceed recommended values (Hair & Alamer, 2022).

PLS-SEM Structural Results

Bootstrapping analysis (10,000 samples) identified Pricing as the strongest and only highly significant predictor of Intention to Subscribe ($\beta = 0.801$, $p < 0.001$), followed by OPD ($\beta = 0.206$, $p = 0.020$). MAE ($\beta = -0.141$, $p = 0.167$) and MC ($\beta = 0.014$, $p = 0.901$) were not significant. The model explained $R^2 = 0.58$ for IS and $R^2 = 0.41$ for Actual Subscription. These results indicate that perceived pricing value and delivery convenience are primary behavioral drivers within the PSMBM, whereas education and counseling, though valued, do not independently yield statistically significant effects. The strong influence of Pricing aligns with the Filipino healthcare context, where affordability is a primary determinant of service uptake (Gutierrez & Sakulbumrungsil, 2023). OPD significance is consistent with global evidence on enhanced pharmacy adherence performance (Urlick et al., 2020; Abu-Farha et al., 2022).

Necessary Condition Analysis Results

NCA (CE-FDH, 10,000 permutations) identified Pricing ($d = 0.444$, $p < 0.001$) as a statistically significant necessary condition with a medium-to-large effect, and MAE ($d = 0.207$, $p = 0.021$) as a small but significant necessary condition. MC approached significance ($d = 0.270$, $p = 0.096$), while OPD showed a non-significant necessity effect ($d = 0.221$, $p = 0.143$). These findings indicate that without a minimum acceptable Pricing level and baseline MAE, high subscription intention cannot occur—even when all other conditions are optimal. This represents a key theoretical contribution: necessity is distinct from sufficiency, and MAE functions as a credibility threshold that patients require before engaging with the membership concept.

Table 3. Combined PLS-SEM and NCA Results

Construct	PLS β	PLS p	NCA d	NCA p	Interpretation
MAE	-0.141	0.167	0.207	0.021*	Necessary, not sufficient
MC	0.014	0.901	0.270	0.096	Possibly necessary, not sufficient
OPD	0.206	0.020*	0.221	0.143	Sufficient, not necessary
Pricing	0.801	< 0.001***	0.444	< 0.001***	Both necessary and sufficient

Note. MAE = Medication Adherence Education; MC = Medication Counseling; OPD = Order, Payment & Delivery. * $p < 0.05$; *** $p < 0.001$.

Table 4. NCA Bottleneck Analysis – CE-FDH Percentile Thresholds

IS Level (%)	MAE (min %)	MC (min %)	OPD (min %)	Pricing (min %)
10–50	0.000	0.000	0.000	0.455
60	0.909	0.909	0.455	0.455
70	10.909	9.545	10.909	20.455
80	14.091	9.545	10.909	20.455
90	17.273	13.182	13.182	20.455

Note. Values represent minimum percentile thresholds required for each condition to enable the indicated IS level. IS = Intention to Subscribe.

Bottleneck analysis confirms that as IS targets increase, Pricing remains the most constraining factor (minimum threshold of 20.455th percentile for 90% IS). MAE must reach 17.273%, and MC must reach 13.182% at this level,

demonstrating that all four service components must meet a minimum standard to remove structural barriers to high adoption. At lower IS targets ($\leq 50\%$), most conditions were unconstrained. These findings have direct managerial implications: focusing exclusively on pricing strategy, while neglecting education or counseling baselines, risks creating structural bottlenecks that prevent achieving high adoption levels.

Theoretical and Practical Implications

This study makes two key theoretical contributions. First, it demonstrates that necessity and sufficiency are distinct analytical lenses: constructs such as MAE function as necessary preconditions without being statistical drivers, while OPD drives behavior without being a prerequisite. This distinction—invisible to sufficiency-only frameworks—has direct implications for healthcare service design and adoption modeling. Second, the study extends TAM and TPB into subscription-based pharmacy models by establishing Pricing not merely as an external variable but as a core construct with dual necessity and sufficiency roles, reframing affordability as a strategic signal of trustworthiness and value.

Practically, managers should: (1) design transparent, tiered pricing structures that communicate value through bundles and visible savings; (2) invest in multi-channel logistics—mobile apps, hotline ordering, cashless payment—to accelerate adoption among digital users; (3) maintain a minimum educational content standard as a credibility baseline, using scalable digital and gamified adherence tools; and (4) reposition medication counseling as a distinctly personal value-added service—such as one-on-one pharmacist consultations or a dedicated membership hotline—to differentiate it from general education and improve patient recall of its value.

SDG Alignment

The PSMBM directly supports SDG 3 (Good Health and Well-Being) by institutionalizing pharmacist-led education and counseling within a structured membership framework, which has been shown to produce sustained improvements in adherence, particularly for patients with complex medication regimens (Torres-Robles et al., 2022; Lee et al., 2006). SDG 10 (Reduced Inequalities) is addressed through tiered pricing and delivery structures that expand access for low-income patients—who comprised 76.6% of this sample—consistent with Universal Health Coverage principles (Republic Act No. 11223, 2019; Wirtz et al., 2017). By embedding affordability as a non-negotiable condition for adoption, the PSMBM translates equity goals into operational pharmacy strategy.

Conclusion

This study evaluated the acceptability of a Pharmacy Services Membership Business Model (PSMBM) at The Medical City Iloilo Hospital Inc. using an integrated PLS-SEM and NCA framework. Pricing emerged as both a statistically significant driver and a necessary condition for Intention to Subscribe, establishing it as the cornerstone of PSMBM success. OPD was a significant sufficient driver; MAE functioned as a necessary baseline condition; and MC showed limited independent influence in the current model.

Demographic analyses confirmed that sex, income, education, brand preference, and payment mode significantly differentiate patient acceptability, underscoring the need for tailored interventions. Together, these findings validate the PSMBM concept and offer evidence-based guidance: prioritize transparent tiered pricing, enhance digital logistics, maintain educational baselines, and distinguish counseling as a personalized premium feature.

This study contributes methodologically by demonstrating the value of combining necessity and sufficiency logic in health service research, and practically by providing a scalable model for hospital pharmacies in the Philippines and comparable low-to-middle-income contexts. Future research should examine multi-site PSMBM implementations, longitudinal subscription retention patterns, and the inclusion of clinical outcomes as downstream variables, to extend evidence-based pharmacy service innovation in pursuit of SDG 3 and SDG 10.

Contributions of Authors

Edric Ancel Pastrano Dueñas: Conceptualization, study design, data collection, statistical analysis (PLS-SEM, NCA, non-parametric testing), interpretation of results, manuscript drafting, revision, and submission.

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Conflict of Interest

The author declares no conflict of interest. The author serves as Chief Pharmacist at TMCIH, where data were collected; however, patient participation was entirely voluntary, and responses were fully anonymized.

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