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Understanding pharmacy customer retention through service quality: A SERVQUAL and regression study

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Abstract
Customer retention has become vital for pharmacies' profitability and operational stability as the healthcare sector evolves. This study investigates the impact of service quality on customer retention in pharmacies using the Service Quality (SERVQUAL) model and Ordinary Least Squares (OLS) Regression model. The SERVQUAL dimensions—tangibles, reliability, responsiveness, assurance, and empathy—were mapped to specific dataset features for a comprehensive evaluation. The analysis revealed a mean service quality score of 0.358650 with a standard deviation of 0.078922, indicating moderate service quality with notable variability. Regression analysis demonstrated a strong relationship between service quality and customer retention rates, with an R-squared value of 0.785, explaining 78.5% of the variability in customer retention. Consultation services substantially positively impacted customer retention, with a significant coefficient of 0.6900, underscoring the importance of professional and empathetic interactions in retaining customers. While factors such as Customer Satisfaction Score, Prescription Volume, and Medication Adherence Rate showed less significant individual impacts, overall service quality remains crucial for customer retention.

Keywords: Customer retention, service quality, community pharmacies

1. Introduction
The healthcare landscape is rapidly evolving, and pharmacies are pivotal in providing accessible healthcare services. Customer retention is a critical metric in the pharmacy sector, directly influencing profitability and operational stability. With increasing competition, pharmacies must prioritize service quality to maintain and grow their customer base. This article explores how various dimensions of service quality impact customer retention rates in pharmacies. Understanding the factors contributing to customer retention can help pharmacies develop strategies to enhance service quality, improving patient outcomes and business performance.

Service quality in pharmacies is critical to patient satisfaction, medication adherence, and overall health outcomes. This study explores the key dimensions of service quality in pharmacies, the methodologies used to assess service quality, and the impact of service quality on customer satisfaction and loyalty. Service quality in pharmacies encompasses several dimensions, including reliability, responsiveness, assurance, empathy, and tangibles. Research indicates that these dimensions collectively influence customer satisfaction and loyalty (Chan *et al*., 2016; Castaldo *et al*., 2016; Nitadpakorn *et al*., 2017) [1, 2, 4]. For instance, Parasuraman, Zeithaml, and Berry's SERVQUAL model have been extensively used to measure service quality in various industries, including healthcare. In the context of pharmacies, service quality involves accurately dispensing medications, providing professional advice, ensuring medication availability, and maintaining a pleasant environment (Alsamydai *et al*., 2015; Moullin *et al*., 2013; Rabbanee *et al*., 2015) [5, 7, 8].

Customer retention refers to the ability of a company to retain its customers over time. It is a critical metric that reflects the health of a business and its ability to maintain a loyal customer base. High retention rates indicate customer satisfaction, loyalty, and the effectiveness of customer relationship management strategies. In the context of pharmacies, retention is particularly important due to the competitive nature of the industry and the personalized service required in healthcare. Retention in pharmacies is often linked to the quality of healthcare advice provided by pharmacists, the efficiency and accuracy of prescription filling and refilling processes, and the overall customer experience, which includes factors such as wait times, staff friendliness, and the availability of medical products (Kanyan *et al*., 2015; Bonnal *et al*., 2014; Touchette *et al*., 2014) [6, 10, 12].

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Effective retention strategies in pharmacies can lead to numerous benefits. Increased lifetime value is one of the primary advantages, as long-term customers tend to spend more over time and are more likely to purchase additional products and services (Khoso *et al.*, 2014; Mosadeghrad, 2014) [3, 9]. Moreover, satisfied and loyal customers are more likely to provide positive word-of-mouth referrals, which can attract new customers without the high costs associated with advertising and marketing. A stable customer base contributes to a more predictable and stable revenue stream. This stability allows pharmacies to manage better inventory, forecast demand, and plan for future growth (Alhusein *et al.*, 2019; Bhowmik *et al.*, 2013) [11, 13].

2. Materials and Methods
Datasets with 100,010 examples were synthetically generated using Python programming, which is ensured to closely relate to the realistic data for 274 community pharmacy operations during a one-year period. The study utilized a mixed-method approach, combining quantitative data from customer retention rates and qualitative data from customer satisfaction from the 274 community pharmacies. This comprehensive approach ensures a thorough understanding of how service quality impacts customer retention (Chan *et al.*, 2016; Castaldo *et al.*, 2016; Khoso, *et al.*, 2014; Nitadpakorn, *et al.*, 2017) [1, 2, 3, 4].

Service quality in pharmacies can be evaluated through several dimensions. The most widely used model is SERVQUAL, developed by Parasuraman, Zeithaml, and Berry, which includes five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The SERVQUAL model evaluates service quality, Eq.1 and Eq.2, based on the above-mentioned five key dimensions with the dataset features.

$$\text{SERVQUAL Score} = \sum_{i=1}^{n}(P_i - E_i) \tag{1}$$

Where P_i represents the perceived performance of the service, and E_i represents the expected level of service for the $i-th$ attribute of n number of service attributes being evaluated.

$$\text{Overall SERVQUAL Score} = \sum_{j=1}^{m}\left(\sum_{i=1}^{n}\left(P_{ij} - E_{ij}\right)\right) \tag{2}$$

Where P_{ij} represents the perceived performance of the service, and E_{ij} represents the expected performance, for the $i-th$ attribute of $j-th$ dimension, for m number of dimensions (5 in the case of SERVQUAL)

For tangibles, we include features such as pharmacy size (sq.ft), cleanliness and organization, use of technology, and accessibility. Reliability encompasses features like sales revenue (INR), prescription volume, prescription fill rate (%), medication adherence rate (%), medication error rate (%), profit margin (%), ROI (%), inventory turnover, and ADE reporting rate (%). Responsiveness is mapped to patient wait times (min), customer satisfaction score, customer retention rate (%), consultation services, online services, and MTM utilization (%). Assurance involves features like staff professionalism and communication, labor costs (INR) as a proxy for investment in quality staff, consultation services, and GDR (%) for informed decisions. Empathy includes customer satisfaction score, customer retention rate (%), community engagement, and consultation services (Chan *et al.*, 2016; Rabbanee, *et al.*, 2015; Kanyan *et al.*, 2015; Alsamydai *et al.*, 2015) [1, 5, 6, 7].

The Ordinary Least Squares (OLS) regression model is used to analyze the impact of service quality on customer retention in community pharmacies. By applying OLS regression Eq. (3) and Eq. (4), the relationship between various dimensions of service quality and the rates at which customers continue to patronize the pharmacy are analyzed (Moullin *et al.*, 2013; Mosadeghrad *et al.*, 2014; Touchette *et al.*, 2014; Alhusein *et al.*, 2019) [8-11].

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \epsilon \tag{3}$$

$$\hat{\beta} = (X^T X)^{-1} X^T Y \tag{4}$$

Where Y is the dependent variable, β_0 is the intercept, $\beta_1, \beta_2, \dots \beta_k$ are the coefficients for the independent variables, $X_1, X_2, \dots, X_k$ are the independent variables, X is the matrix of independent variables (including a column of ones for the intercept), Y is the vector of observed values of the dependent variable, X^T is the transpose of the matrix X, and $(X^T X)^{-1}$ is the inverse of the matrix product $X^T X$.

This approach allows for a comprehensive assessment of how different aspects of service quality contribute to customer retention in community pharmacies (Bonnal *et al.*, 2014; Bhowmik *et al.*, 2013) [12, 13].

3. Results and Discussion
Applying the SERVQUAL model to our dataset revealed the following results for service quality scores: the mean score was 0.358650 with a standard deviation of 0.078922. The minimum score was 0.124620, and the maximum score was 0.720106. The 25th, 50th, and 75th percentiles were 0.303222, 0.350909, and 0.404355, respectively, indicating moderate service quality across the pharmacies with some variability.
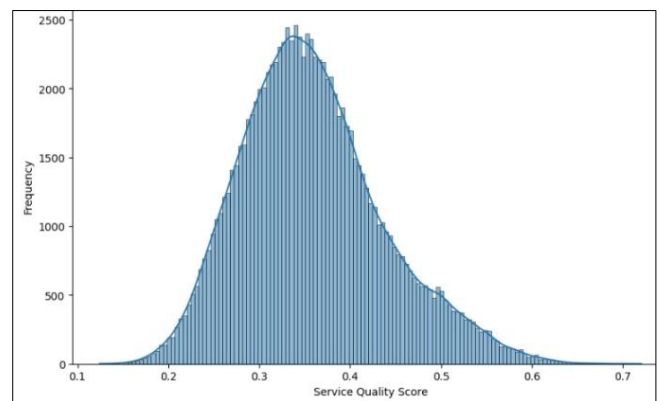
Fig 1: Distribution of Service Quality Scores

The distribution of overall service quality scores as shown in Fig 1, reveals an approximately normal (bell-shaped) distribution, with the majority of scores concentrated around the mean. The peak indicates that the most common service quality scores are around 0.3, extending from approximately 0.1 to 0.7. This spread highlights the variability in perceived service quality, suggesting differences in customer experiences and the effectiveness of service delivery across the dataset. These findings provide a baseline for understanding the overall service quality landscape and underscore the need for targeted improvements in specific areas to enhance customer satisfaction and retention.
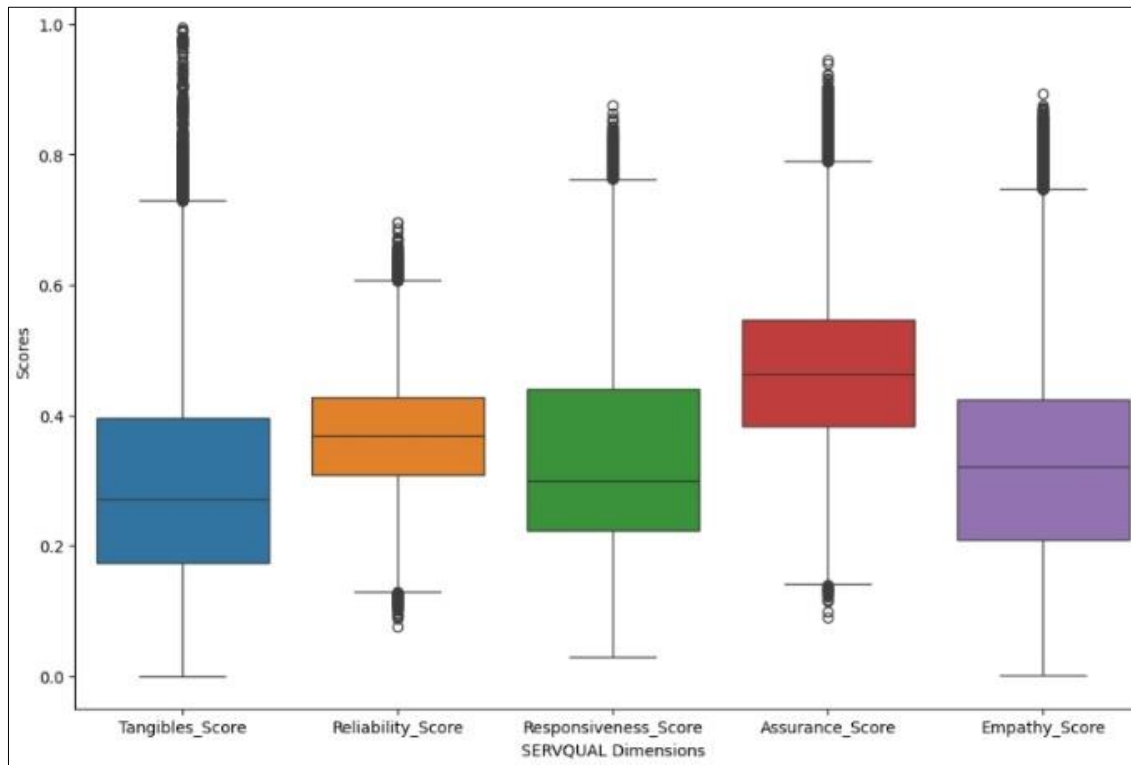
Fig 2: SERVQUAL Dimension Scores

The boxplot in Fig 2 depicts scores for various service quality dimensions assessed by the SERVQUAL model, typically including tangibles, reliability, responsiveness, assurance, and empathy, although specific labels. Each box represents one dimension, summarizing the distribution of scores through the median (middle line), interquartile range (box), and potential outliers (points outside the whiskers). The red boxplot, with the highest median score, indicates this dimension was rated most favourably on average, while the orange boxplot, with the lowest median score, suggests it was rated less favourably. The regression model demonstrated a high R-squared value of 0.785 as shown in Table 1, indicating that the model can explain approximately 78.5% of the variability in customer retention rates. This suggests a strong overall relationship between the independent variables included in the model and customer retention rates.

The regression results provide further insights. The coefficient for Consultation Services was notably high (0.6900), and it was highly significant ($p<0.001$) as shown in Table 2. This indicates that consultation services substantially positively impact customer retention rates, reinforcing the importance of professional and empathetic customer interactions in retaining customers.

However, other variables such as Customer Satisfaction Score, Prescription Volume, Medication Adherence Rate (%), Inventory Turnover, Patient Wait Times (min), Medication Error Rate (%), Staff Professionalism and Communication, Use of Technology, Online Services, Cleanliness and Organization, Accessibility, and Community Engagement did not show significant coefficients. This suggests that, individually, these factors might not have a strong direct

impact on customer retention rates when considered alongside Consultation Services.

The t-value (or t-statistic) measures the size of the difference relative to the variation in the sample data and helps determine whether to reject the null hypothesis; a higher absolute t-value indicates that the coefficient is significantly different from zero. The p-value indicates the probability of observing the results when the null hypothesis is true, with a small p-value (typically less than 0.05) suggesting strong evidence against the null hypothesis, making the coefficient statistically significant. The p>|t| column in the results table provides the p-values for each coefficient's t-test. The 95% confidence interval [0.025, 0.975] indicates the range within which the true value of the coefficient likely lies, with a 95% probability; if this interval includes zero, the coefficient might not be significantly different from zero.

Table 1: Regression Analysis Summary

Metric	Value
Model	OLS
Dep. Variable	Customer Retention Rate (%)
R-squared	0.785
Adj. R-squared	0.785
Method	Least Squares
F-statistic	28130
Prob (F-statistic)	0
No. Observations	100010
AIC	-170100
Df Residuals	99996
BIC	-169900
Df Model	13
Covariance Type	nonrobust

Table 2: Regression Analysis

Variable	Coef	Std err	t	p>|t|	[0.025	0.975]
constant	0.1102	0.002	49.87	0	0.106	0.114
Customer Satisfaction Score	-0.0032	0.003	-1.08	0.276	-0.009	0.003
Prescription Volume	0.0027	0.002	1.15	0.249	-0.002	0.007
Medication Adherence Rate (%)	0.0002	0.001	0.21	0.83	-0.002	0.002
Inventory Turnover	-0.0028	0.004	-0.74	0.454	-0.01	0.005
Patient Wait Times (min)	0.0005	0.002	0.32	0.749	-0.003	0.004
Medication Error Rate (%)	0.0015	0.002	0.6	0.548	-0.003	0.006
Staff Professionalism and Communication	0.0006	0.001	0.393	0.695	-0.002	0.003
Consultation Services	0.69	0.001	604.65	0	0.688	0.692
Use of Technology	-0.0004	0.001	-0.265	0.791	-0.003	0.002
Online Services	0.001	0.001	1.215	0.224	-0.001	0.003
Cleanliness and Organization	-0.0002	0.002	-0.151	0.88	-0.003	0.003
Accessibility	0.0037	0.003	1.131	0.258	-0.003	0.01
Community Engagement	-0.0011	0.002	-0.659	0.51	-0.004	0.002

Interestingly, the constant term was significant, indicating that even in the absence of the variables considered, there is a base level of customer retention that might be influenced by other factors not included in the model.

In summary, the results highlight the crucial role of consultation services in driving customer retention in pharmacies. While other factors might contribute to overall service quality, their individual impact on retention rates appears to be less pronounced. These findings suggest that pharmacies should prioritize enhancing consultation services as a key strategy for improving customer retention, while also considering a holistic approach to service quality improvements.

4. Conclusions
This study underscores the critical role of service quality in driving customer retention within the pharmacy sector. Using the SERVQUAL model and Ordinary Least Squares (OLS) regression analysis, we assessed the impact of tangibles, reliability, responsiveness, assurance, and empathy on customer loyalty. Our findings reveal a moderate overall service quality score with significant variability among pharmacies. The regression analysis demonstrated a strong relationship between service quality and customer retention rates, explaining 78.5% of the variability. Notably, consultation services had the most substantial impact on retention, highlighting the importance of professional and empathetic customer interactions. While other factors like Customer Satisfaction Score, Prescription Volume, and Medication Adherence Rate had less significant individual effects, the overall quality of service remains crucial for maintaining customer loyalty. These insights suggest that pharmacies should prioritize enhancing consultation services and adopt a holistic approach to improving all service quality dimensions to achieve better patient outcomes and business performance. Future research should explore additional factors influencing customer retention in pharmacies.

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