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Management Accounting in Pharmacy Operations: Evaluating Costs, Efficiency, And Healthcare Outcomes

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ABSTRACT: The study evaluated the associations among management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance in selected healthcare institutions in Delhi-NCR, India. A quantitative, analytical cross-sectional study was conducted from April to September 2026 among 384 pharmacy and healthcare professionals. Data were collected using a structured questionnaire comprising five-point Likert-scale items. Descriptive statistics, reliability analysis, Pearson correlation, and multiple linear regression were performed using IBM SPSS Statistics version 29.0. Operational efficiency had the highest mean score (3.62 ± 0.65), followed by perceived healthcare-related pharmacy performance (3.58 ± 0.69), management-accounting practices (3.53 ± 0.68), and cost-management practices (3.48 ± 0.72). Management-accounting practices were positively correlated with operational efficiency ($r = .390$) and perceived healthcare-related pharmacy performance ($r = .295$). In the regression model for operational efficiency, both management-accounting practices ($B = 0.267$, $p < .001$) and cost-management practices ($B = 0.272$, $p < .001$) were significantly associated with operational efficiency ($R^2 = .232$). In the model for perceived healthcare-related pharmacy performance, management-accounting practices ($\beta = .188$, $p < .001$) and operational efficiency ($\beta = .240$, $p < .001$) were

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significant predictors, whereas cost-management practices were not independently associated with the outcome (β = .042, p = .404; R^2 = .142). Overall, management-accounting and cost-management practices were positively associated with operational efficiency, while management-accounting practices and operational efficiency were independently associated with perceived healthcare-related pharmacy performance. Given the cross-sectional design and perception-based outcome measure, these findings indicate statistical associations and should not be interpreted as evidence of causal effects or objectively measured improvements in patient health outcomes.

INTRODUCTION

Pharmacy operations represent a critical component of healthcare delivery because they connect the procurement, storage, distribution, dispensing, monitoring, and appropriate use of medicines with broader objectives of service quality, resource stewardship, and patient safety. Increasing pharmaceutical expenditure, complex medicine supply chains, expansion of clinical pharmacy services, and growing expectations for efficient and safe healthcare delivery have increased the need for systematic management of pharmacy resources. Consequently, pharmacy management extends beyond maintaining medicine availability and routine financial record-keeping. Pharmacy managers increasingly need to understand how financial resources are allocated, how costs are controlled, how operational processes perform, and whether resource-management practices are associated with favourable pharmacy and healthcare-related performance. Management accounting provides an internal decision-support framework through which financial information can be connected with planning, budgeting, resource allocation, cost control, and performance evaluation.

Management accounting differs from conventional financial accounting primarily in its orientation toward internal planning and managerial decision-making. In pharmacy operations, management-accounting information can support budgeting, expenditure monitoring, procurement decisions, inventory control, cost allocation, workforce utilisation, and evaluation of pharmacy services. This perspective is particularly relevant in healthcare institutions where pharmacy departments must operate within financial constraints while maintaining adequate medicine availability and supporting safe pharmaceutical care. Evidence from economic evaluations of clinical pharmacy services has demonstrated potential economic benefits associated with pharmacist-led services, although the quality, design, costing methods, and outcome measures of these evaluations have varied considerably (Gallagher et al., 2014; Perez et al., 2009; Touchette et al., 2014). Perez et al. (2009) reported positive economic benefits in a substantial proportion of full economic evaluations of clinical pharmacy services, while also identifying considerable variation in methodological quality. Similarly, Touchette et al. (2014) reported generally favourable economic findings for clinical pharmacy services but highlighted differences in service characteristics, study designs, costing approaches, and outcome measures. These findings support the importance of evaluating pharmacy resources in relation to both expenditure and the value generated by pharmacy activities rather than considering financial measures in isolation.

Cost management is an important component of this broader management-accounting perspective. Pharmaceutical expenditure can be influenced by procurement prices, purchasing practices, inventory levels, medicine wastage, expiry, emergency procurement, stock-outs, and the utilisation of pharmacy personnel and infrastructure. Inefficient resource allocation may increase operational costs without necessarily improving service performance, whereas excessive cost reduction may compromise medicine availability or other aspects of pharmacy service delivery. Therefore, effective pharmacy cost management should involve the optimisation of resource use rather than the simple minimisation of expenditure. This distinction is particularly important because the economic value of pharmacy services depends not only on their direct costs but also on the operational and healthcare-related value associated with the resources used. Economic evaluations of clinical pharmacy services have similarly emphasised the importance of considering costs alongside relevant outcomes rather than interpreting financial effects in isolation (Baudouin et al., 2021; Bullock et al., 2019; Dawoud et al., 2019).

Inventory management provides a practical area in which financial and clinical considerations can be integrated. Medicines vary considerably in acquisition cost, consumption frequency, and clinical importance; consequently, inventory-control decisions require consideration of both financial consumption and therapeutic criticality. ABC analysis classifies medicines according to their financial consumption, whereas VED analysis categorises medicines according to clinical criticality as vital,

essential, or desirable. The combined ABC-VED approach can therefore assist pharmacy managers in prioritising inventory-control activities according to both economic and clinical considerations. Studies conducted in Indian hospital and medical-store settings have demonstrated the usefulness of ABC-VED analysis for identifying high-value and clinically critical medicines and supporting more focused inventory-control decisions (Anand et al., 2013; Devnani et al., 2010; Gupta et al., 2007; Vaz et al., 2008). These approaches illustrate how financial and inventory information can be translated into operational decisions concerning procurement, stock control, and allocation of managerial attention.

Financial efficiency alone does not provide a comprehensive assessment of pharmacy performance. A pharmacy department may reduce expenditure while simultaneously experiencing medicine stock-outs, longer processing times, inefficient workflows, or inadequate medication-safety practices. Conversely, expenditure on additional pharmacists, medication review, reconciliation, information systems, or other pharmacy services may be justified when associated with improvements in service performance or reductions in healthcare-related resource use. Economic evaluations of clinical pharmacy services have therefore increasingly considered economic outcomes alongside clinical and humanistic outcomes. Gallagher et al. (2014) reported generally favourable economic findings for clinical pharmacist interventions among hospital inpatients, while also identifying methodological limitations across the available literature. Similarly, systematic reviews have indicated that clinical pharmacy services may be cost-effective in selected settings, although the strength of evidence has varied according to study design, costing methods, comparators, and outcome measurement (Dawoud et al., 2019; Touchette et al., 2014). Conversely, Baudouin et al. (2021) and Bullock et al. (2019) highlighted limitations in the economic evidence base, including reliance on cost-avoidance estimates, incomplete costing, limited full economic evaluations, and risk of bias. Thus, financial indicators should be interpreted alongside operational and healthcare-related measures rather than as standalone measures of pharmacy performance.

Operational efficiency represents another important dimension of pharmacy performance. Efficient pharmacy operations require appropriate utilisation of medicines, personnel, infrastructure, information systems, and technology. Relevant indicators may include inventory turnover, stock-out frequency, expiry and wastage, prescription-processing time, dispensing workload, resource utilisation, and pharmacy-service activity. Systematic measurement of such indicators can help managers identify operational variation and determine whether available resources are being used effectively. Measurement systems themselves require careful consideration of what constitutes meaningful performance. Magedanz et al. (2024), in a systematic review of key performance indicators for hospital clinical pharmacy services, identified 225 indicators across the literature, of which the large majority were process indicators and only a small proportion represented outcomes. The review also identified limitations in methodological quality and the absence of benchmarking reference values. These findings highlight the importance of linking operational measurement with meaningful economic, clinical, and patient-centred dimensions of pharmacy performance.

The relationship between pharmacy operations and healthcare performance is particularly important because medicines are directly connected with patient treatment while also representing a potential source of preventable harm when medication-use processes are unsafe. The World Health Organization (WHO, 2024) has identified medication-related harm as a major patient-safety concern and has emphasised the need to strengthen medication systems and practices across the healthcare continuum. The WHO policy brief further highlights the substantial burden of preventable harm associated with medicines and therapeutic practices. Accordingly, pharmacy performance should not be evaluated exclusively through expenditure or productivity indicators. Medication safety, medicine availability, pharmacist interventions, patient satisfaction, and other healthcare-related measures may provide additional information about the broader performance of pharmacy services.

Recent work further supports the need for multidimensional assessment. Magedanz et al. (2024) identified substantial variation in the development and methodological quality of clinical pharmacy performance indicators, while a subsequent global Delphi study established consensus around a smaller set of indicators spanning clinical, economic, and humanistic outcomes, including adverse drug-event rates, medication-related near misses, medication-goal achievement, treatment-cost differences, and patient satisfaction (Magedanz et al., 2026). These developments indicate a growing emphasis on evaluating pharmacy services through integrated performance frameworks rather than relying on isolated financial or process measures.

Despite this growing literature, management accounting, pharmaceutical inventory management, operational efficiency, and healthcare-related pharmacy performance have frequently been examined as separate areas. Inventory studies have primarily focused on expenditure classification and stock control (Anand et al., 2013; Devnani et al., 2010; Gupta et al., 2007; Vaz et al.,

2008), economic evaluations have concentrated on costs and cost-effectiveness (Baudouin et al., 2021; Bullock et al., 2019; Dawoud et al., 2019; Perez et al., 2009; Touchette et al., 2014), and clinical pharmacy performance studies have often focused on service processes or selected clinical, economic, and humanistic indicators (Magedanz et al., 2024, 2026). Consequently, there remains a need to examine how management-accounting practices relate to broader pharmacy operational performance while simultaneously considering cost management and perceived healthcare-related pharmacy performance. An integrated approach is relevant because financial information becomes more useful to pharmacy managers when it can be interpreted alongside operational indicators and service-related outcomes.

The present study therefore examined the associations among management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance in selected healthcare institutions in Delhi-NCR, India. Management-accounting practices included budgeting, expenditure monitoring, variance analysis, cost allocation, procurement-cost monitoring, and the use of accounting information for managerial decision-making. Cost-management practices included procurement expenditure, inventory-related costs, expiry and wastage control, and cost-containment activities, whereas operational efficiency encompassed inventory control, medicine availability, dispensing workflow, prescription-processing efficiency, and staff and resource utilisation. Perceived healthcare-related pharmacy performance reflected respondents' assessments of medicine availability, medication-safety practices, pharmacist interventions, patient satisfaction, and the perceived contribution of pharmacy services to patient care. By examining these dimensions together, the study aimed to provide an integrated assessment of the relationship between financial-management practices and pharmacy operational performance, while recognising that perceived healthcare-related pharmacy performance does not constitute independently verified clinical outcomes.

Research Objectives

- To assess management-accounting practices, cost management, operational efficiency, and perceived healthcare-related pharmacy performance.
- To examine the association of management-accounting and cost-management practices with operational efficiency.
- To examine the association of management-accounting practices, cost-management practices, and operational efficiency with perceived healthcare-related pharmacy performance.

METHODOLOGY

Study Design and Setting

A quantitative, analytical cross-sectional study was conducted to examine the associations among management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance. The study was conducted in selected healthcare institutions across the Delhi National Capital Region (Delhi-NCR), India, over six months from April to September 2026. The study framework comprised four principal domains: management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance. Management-accounting practices referred to the use of financial and accounting information for pharmacy-related planning, budgeting, expenditure monitoring, cost control, and managerial decision-making. Cost-management practices included procurement-cost monitoring, inventory-cost control, expiry and wastage management, and cost-containment activities. Operational efficiency referred to the perceived efficiency of pharmacy processes and resource utilisation. Perceived healthcare-related pharmacy performance reflected respondents' assessments of medicine availability, medication-safety practices, pharmacist interventions, patient satisfaction, and the contribution of pharmacy services to patient care.

Study Population and Eligibility Criteria

The study population comprised pharmacists, pharmacy managers, hospital pharmacy personnel, and other healthcare professionals directly involved in pharmacy operations or pharmacy-related resource-management activities. Participants were eligible if they were directly involved in activities such as medicine procurement, inventory management, budgeting, expenditure monitoring, dispensing, clinical pharmacy services, pharmacy administration, or resource allocation and were able to independently complete the questionnaire. Individuals without direct involvement in pharmacy operations, those unavailable during data collection, or those who declined informed consent were excluded.

Sample Size and Sampling Procedure

The minimum sample size was calculated using the single-population proportion formula:

$$n = Z^2p(1 - p)/d^2$$

A 95% confidence level, 5% margin of error, and assumed population proportion of 50% were used. The 50% assumption was selected in the absence of a sufficiently precise prior estimate and represents the most conservative estimate. The calculation yielded a minimum sample size of 384 participants.

As a comprehensive sampling frame was unavailable, non-probability sampling was employed. Healthcare institutions were purposively selected based on established pharmacy services and accessibility to relevant information. Within selected institutions, eligible professionals were recruited consecutively until the required sample size was achieved. A total of 384 complete and eligible questionnaires constituted the final analytical sample. Questionnaires with substantial missing information were excluded. Given the non-probability sampling approach, findings were interpreted as applicable to participating respondents and institutions rather than as population-representative estimates.

Study Instrument and Variable Measurement

Primary data were collected using a structured, researcher-developed questionnaire informed by literature concerning economic evaluation of clinical pharmacy services, pharmaceutical inventory management, cost-control practices, and pharmacy performance indicators. The questionnaire comprised five sections. Section A collected demographic and professional characteristics. Section B assessed management-accounting practices, including budgeting, expenditure monitoring, variance analysis, cost allocation, procurement-cost monitoring, and use of accounting information for managerial decisions. Section C assessed cost-management practices, including procurement and inventory costs, expiry and wastage control, and cost-containment activities. Section D assessed operational efficiency, including inventory control, medicine availability, dispensing workflow, prescription-processing efficiency, and staff and resource utilisation. Section E assessed perceived healthcare-related pharmacy performance, including medicine availability, medication safety, pharmacist interventions, patient satisfaction, and perceived contribution to patient care. Principal constructs were measured using five-point Likert-scale items ranging from 1 = strongly disagree to 5 = strongly agree. Composite scores were calculated for each domain, with higher scores indicating stronger management-accounting and cost-management practices and higher perceived operational efficiency and pharmacy performance.

Validity and Reliability

Content validity was assessed by five experts with relevant academic or professional experience in pharmacy practice, hospital pharmacy, healthcare management, and research methodology. Experts evaluated relevance, clarity, comprehensiveness, and alignment with study objectives, following which unclear or redundant items were revised or removed. The revised questionnaire was pilot-tested among 30 eligible pharmacy professionals who were not included in the final sample. The pilot assessment examined clarity, comprehensibility, response options, and completion time. Internal consistency was assessed using Cronbach's alpha, with coefficients ≥0.70 considered acceptable.

Secondary Data Collection

Where institutional access was granted, secondary pharmacy data were extracted using a standardised data-extraction format. Variables included pharmaceutical expenditure, procurement expenditure, inventory value, prescription volume, stock-out incidents, expired or wasted medicines, and documented medication-related interventions. Facility-level indicators, including inventory turnover, stock-out rate, expiry/wastage rate, and prescription-processing time, were calculated where appropriate denominator and source data were available. Secondary records were analysed separately from questionnaire responses. Facility-level observations were not treated as individual observations in respondent-level analyses.

Data Collection and Statistical Analysis

Data were collected using electronic and paper-based questionnaires according to institutional accessibility and participant preference. Institutional permission was obtained, and informed consent was secured before participation. Completed questionnaires were checked for completeness, coded, and processed separately from institutional-record data. Data were analysed using IBM SPSS Statistics version 29.0. Categorical variables were summarised using frequencies and percentages,

while continuous variables were presented using means and standard deviations or medians and interquartile ranges, as appropriate. Data distributions, missing observations, outliers, and statistical assumptions were assessed before inferential analyses.

Pearson's correlation coefficient was used for approximately normally distributed composite variables, while Spearman's rank correlation was applied where appropriate. Multiple linear regression was performed in two models. The first examined operational efficiency as the dependent variable with management-accounting and cost-management practices as predictors. The second examined perceived healthcare-related pharmacy performance as the dependent variable with management-accounting practices, cost-management practices, and operational efficiency as predictors. Regression results were reported using B, standard errors, standardised β coefficients, 95% confidence intervals, p-values, R^2, and adjusted R^2. Multicollinearity was assessed using variance inflation factors, while linearity, homoscedasticity, independence, and residual normality were evaluated. Facility-level expenditure and operational indicators were summarised descriptively and were not pooled with respondent-level data. All tests were two-tailed, with $p < .05$ considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the relevant Institutional Ethics Committee, and administrative permission was secured from participating institutions. Participation was voluntary and based on informed consent. No unnecessary personally identifiable information was collected, and responses were coded to maintain confidentiality. Electronic data were stored in password-protected files accessible only to authorised researchers. Institutional financial and operational information was reported only in aggregated form. Where secondary records contained patient-related information, only necessary non-identifiable information was extracted. The study did not alter routine pharmacy procedures or interfere with patient care.

RESULTS

Participant Characteristics

The final analytical sample comprised 384 complete and eligible respondents directly involved in pharmacy operations, including procurement, inventory management, expenditure monitoring, dispensing, clinical pharmacy activities, resource allocation, or pharmacy administration. The sociodemographic and professional characteristics of the respondents are presented in Table 1. The age distribution showed that 140 respondents (36.5%) were aged 21–30 years, 126 (32.8%) were aged 31–40 years, 79 (20.6%) were aged 41–50 years, and 39 (10.2%) were aged ≥51 years. The sample had an equal gender distribution, with 192 female (50.0%) and 192 male (50.0%) respondents.

Regarding educational qualification, B.Pharm-qualified respondents constituted the largest group (n = 226, 58.9%), followed by those with M.Pharm/PharmD qualifications (n = 134, 34.9%) and other qualifications (n = 24, 6.2%). In terms of professional experience, 129 respondents (33.6%) had <5 years of experience, 124 (32.3%) had 5–10 years, 77 (20.1%) had 11–15 years, and 54 (14.1%) had >15 years. Overall, 65.9% of respondents had ≤10 years of professional experience. Private hospitals represented the largest institutional category (n = 159, 41.4%), followed by government hospitals (n = 106, 27.6%), teaching hospitals (n = 76, 19.8%), and other healthcare facilities (n = 43, 11.2%). As non-probability sampling was used, these distributions describe the participating sample and should not be interpreted as population-representative estimates.

Table 1: Sociodemographic and Professional Characteristics of Respondents (N = 384)

Characteristic	Category	n	%
Age (years)	21–30	140	36.5
	31–40	126	32.8
	41–50	79	20.6
	≥51	39	10.2
Gender	Female	192	50.0
	Male	192	50.0

Qualification	B.Pharm	226	58.9
	M.Pharm/PharmD	134	34.9
	Other	24	6.2
Professional experience	<5 years	129	33.6
	5–10 years	124	32.3
	11–15 years	77	20.1
	>15 years	54	14.1
Institution type	Private hospital	159	41.4
	Government hospital	106	27.6
	Teaching hospital	76	19.8
	Other healthcare facility	43	11.2

Note. Percentages may not sum to exactly 100% because of rounding.

Internal Consistency and Descriptive Statistics

The four principal questionnaire domains demonstrated high internal consistency, with Cronbach's alpha coefficients ranging from 0.947 to 0.949, as presented in Table 2.

Operational efficiency had the highest mean score (3.62 ± 0.65), followed by perceived healthcare-related pharmacy performance (3.58 ± 0.69), management-accounting practices (3.53 ± 0.68), and cost-management practices (3.48 ± 0.72). The complete descriptive statistics and reliability estimate for all four domains are presented in Table 2.

All four domain scores were above the midpoint of the five-point Likert scale (3.0). The difference between the highest and lowest domain means was only 0.14 points, indicating relatively close clustering of perceived scores across the four domains.

Table 2: Descriptive Statistics and Internal Consistency of Principal Study Domains

Study domain	Mean	SD	Cronbach's α
Management-accounting practices	3.53	0.68	0.949
Cost-management practices	3.48	0.72	0.947
Operational efficiency	**3.62**	0.65	0.947
Perceived healthcare-related pharmacy performance	3.58	0.69	0.947

Note. Domain scores were measured using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

The high Cronbach's alpha coefficients indicate strong internal consistency of the multi-item domains. Because coefficients were close to 0.95, the possibility of some item redundancy should be considered during further psychometric evaluation.

Facility-Level Pharmaceutical Expenditure and Operational Indicators

Secondary pharmacy data were available from 24 participating healthcare facilities. These observations were analysed separately from the 384 respondent-level questionnaire observations because the facility was the unit of analysis for these indicators. The facility-level pharmaceutical expenditure and operational indicators are presented in Table 3.

The mean annualised pharmaceutical expenditure was ₹162.65 lakh (SD = ₹52.68 lakh). Mean inventory turnover was 7.51 times/year (SD = 0.95). The mean stock-out rate was 5.06% (SD = 1.39%), while the mean expiry/wastage rate was 2.76% (SD = 0.92%). The mean prescription-processing time was 15.39 minutes (SD = 2.40). Annualised pharmaceutical expenditure showed the greatest absolute dispersion among the reported facility-level indicators, whereas inventory turnover

demonstrated comparatively lower variability. The complete facility-level descriptive statistics are presented in Table 3.

Table 3: Facility-Level Pharmaceutical Expenditure and Operational Indicators (n = 24)

Indicator	Mean	SD
Annualised pharmaceutical expenditure (₹ lakh)	162.65	52.68
Inventory turnover (times/year)	7.51	0.95
Stock-out rate (%)	5.06	1.39
Expiry/wastage rate (%)	2.76	0.92
Prescription-processing time (minutes)	15.39	2.40

Note. Facility-level indicators were analysed descriptively and were not treated as individual respondent-level observations.

Correlation Analysis Among Principal Study Domains

Pearson correlation analysis demonstrated positive associations among all four principal questionnaire-derived domains, with the complete correlation matrix presented in Table 4.

Management-accounting practices were positively associated with cost-management practices (r = .358), operational efficiency (r = .390), and perceived healthcare-related pharmacy performance (r = .295). Cost-management practices were positively associated with operational efficiency (r = .358) and perceived healthcare-related pharmacy performance (r = .207). Similarly, operational efficiency was positively associated with perceived healthcare-related pharmacy performance (r = .328). The strongest observed association was between management-accounting practices and operational efficiency (r = .390), whereas the weakest association was between cost-management practices and perceived healthcare-related pharmacy performance (r = .207). Overall, the correlation pattern indicated that the four study domains were positively interconnected. Because the study employed a cross-sectional design, these findings represent statistical associations and do not establish causal or temporal relationships.

Table 4: Pearson Correlation Matrix of the Principal Study Domains

Variable	1	2	3	4
1. Management-accounting practices	1.000	.358	.390	.295
2. Cost-management practices	.358	1.000	.358	.207
3. Operational efficiency	.390	.358	1.000	.328
4. Perceived healthcare-related pharmacy performance	.295	.207	.328	1.000

Note. Values represent Pearson correlation coefficients. All reported associations were positive. Statistical significance levels for individual correlations were not included because the corresponding p-values were not provided.

The correlation pattern suggests that the four measured domains were positively interconnected, with the relationships generally falling within the small-to-moderate range. Because the study was cross-sectional, these associations do not establish causality, directionality, or temporal precedence.

Multiple Linear Regression Analysis of Operational Efficiency

A multiple linear regression model was conducted to examine the independent associations of management-accounting and cost-management practices with operational efficiency. The regression results are presented in Table 5. The overall model was statistically significant, $F(2,381) = 58.00$, $p < .001$, and explained 23.2% of the observed variance in operational efficiency ($R^2 = .232$; adjusted $R^2 = .228$).

Management-accounting practices demonstrated a statistically significant positive association with operational efficiency (B = 0.267, SE = 0.044, 95% CI [0.180, 0.354], $p < .001$). Similarly, cost-management practices demonstrated a statistically

significant positive association with operational efficiency (B = 0.272, SE = 0.042, 95% CI [0.190, 0.354], p < .001). After accounting for cost-management practices, a one-unit increase in the management-accounting score was associated with an estimated 0.267-unit higher operational-efficiency score. Likewise, holding management-accounting practices constant, a one-unit increase in the cost-management score was associated with an estimated 0.272-unit higher operational-efficiency score.

Table 5: Multiple Linear Regression Analysis of Operational Efficiency

Predictor	B	SE	95% CI	p-value
Constant	1.736	—	—	<.001
Management-accounting practices	**0.267**	0.044	0.180–0.354	**<.001**
Cost-management practices	**0.272**	0.042	0.190–0.354	**<.001**

Model statistics: *R^2 = .232; adjusted R^2 = .228; F(2,381) = 58.00; p < .001.*

Note. B = unstandardised regression coefficient; SE = standard error; CI = confidence interval.

Multiple Linear Regression Analysis of Perceived Healthcare-Related Pharmacy Performance

A second multiple linear regression model examined the independent associations of management-accounting practices, cost-management practices, and operational efficiency with perceived healthcare-related pharmacy performance. The regression results are presented in Table 6. The overall model was statistically significant, F(3,380) = 20.961, p < .001, and explained 14.2% of the observed variance in perceived healthcare-related pharmacy performance (R^2 = .142; adjusted R^2 = .135).

Management-accounting practices demonstrated a statistically significant positive association with perceived healthcare-related pharmacy performance (B = 0.189, SE = 0.054, β = .188, 95% CI [0.083, 0.295], p < .001). Operational efficiency also demonstrated a statistically significant positive association with the outcome (B = 0.255, SE = 0.058, β = .240, 95% CI [0.140, 0.369], p < .001).

Among the predictors included in the model, operational efficiency had the largest standardised coefficient (β = .240), followed by management-accounting practices (β = .188), indicating comparatively stronger statistical association of operational efficiency with perceived healthcare-related pharmacy performance within the fitted model. Cost-management practices did not demonstrate a statistically significant independent association with perceived healthcare-related pharmacy performance after simultaneous consideration of management-accounting practices and operational efficiency (B = 0.043, SE = 0.052, β = .042, 95% CI [−0.058, 0.144], p = .404). The confidence interval included zero, indicating that the independent association of cost-management practices was not statistically distinguishable from zero in the fitted model.

Table 6: Multiple Linear Regression Analysis of Perceived Healthcare-Related Pharmacy Performance

Predictor	B	SE	β	95% CI	t	p-value
Constant	1.839	0.227	—	1.393–2.285	8.113	<.001
Management-accounting practices	**0.189**	0.054	**.188**	0.083–0.295	3.499	**<.001**
Cost-management practices	0.043	0.052	.042	−0.058–0.144	0.835	.404
Operational efficiency	**0.255**	0.058	**.240**	0.140–0.369	4.384	**<.001**

Model statistics: *R^2 = .142; adjusted R^2 = .135; F(3,380) = 20.961; p < .001.*

Note. B = unstandardised regression coefficient; SE = standard error; β = standardised regression coefficient; CI = confidence interval.

Mean Scores of Management-Accounting Practices, Cost-Management Practices, Operational Efficiency, and Perceived Healthcare-Related Pharmacy Performance

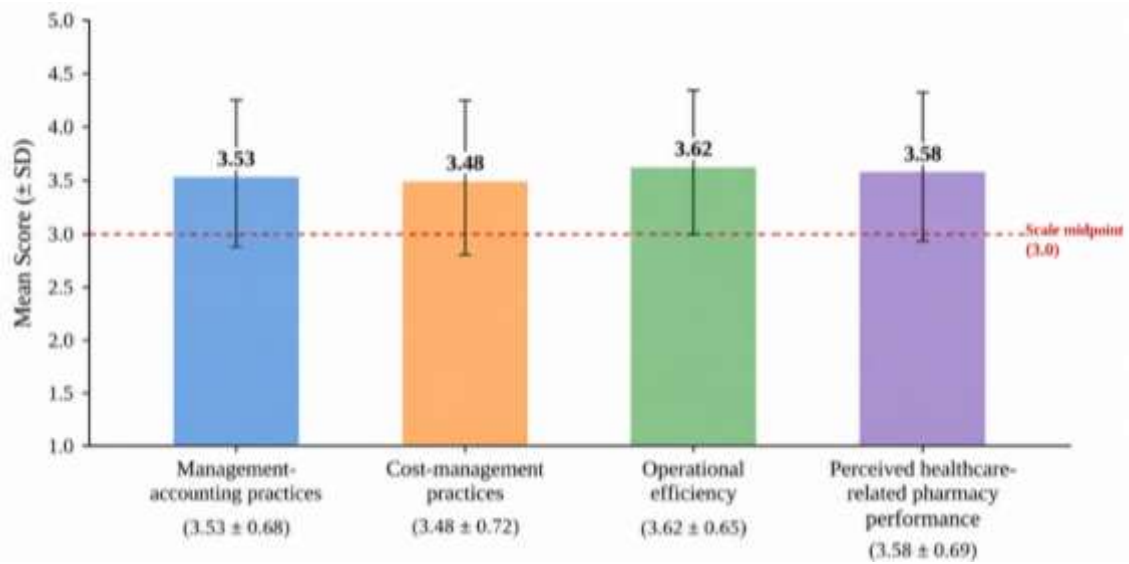

Figure 1: Mean Scores of the Principal Study Domains

Figure 1 presents the mean scores of the four principal study domains among the 384 respondents. All domain scores were above the midpoint (3.0) of the five-point Likert scale, indicating generally positive perceptions across the assessed dimensions. Operational efficiency recorded the highest mean score (3.62 ± 0.65), followed by perceived healthcare-related pharmacy performance (3.58 ± 0.69), management-accounting practices (3.53 ± 0.68), and cost-management practices (3.48 ± 0.72). The relatively small difference between the highest and lowest mean scores (0.14 points) indicates broadly similar perceived levels across the four domains.

Pearson correlation matrix showing the associations among management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance.

Figure 2: Correlation Matrix of Principal Study Domains

Figure 2 presents the Pearson correlation matrix illustrating the relationships among the four principal study domains. All observed correlations were positive, indicating that higher scores in one domain were generally associated with higher scores

in the others. The strongest association was observed between management-accounting practices and operational efficiency (r = .390). Operational efficiency also showed a positive association with perceived healthcare-related pharmacy performance (r = .328). Management-accounting practices were moderately associated with perceived healthcare-related pharmacy performance (r = .295), while the weakest association was observed between cost-management practices and perceived healthcare-related pharmacy performance (r = .207). Overall, the pattern indicates interconnected relationships among the study domains.

Unstandardised Regression Coefficients and 95% Confidence Intervals for Predictors of Perceived Healthcare-Related Pharmacy Performance

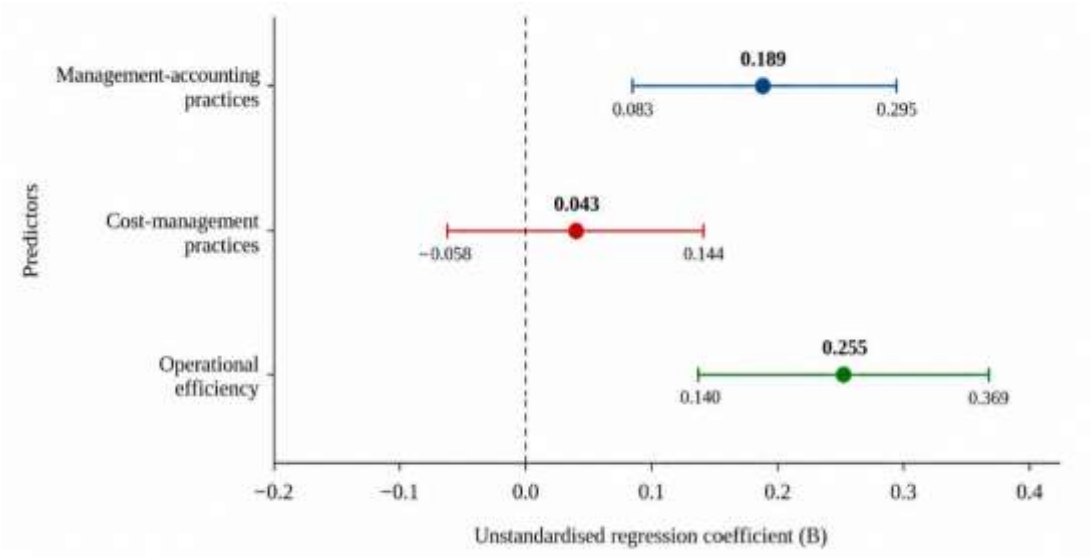

Figure 3: Regression Coefficients for Perceived Healthcare-Related Pharmacy Performance

Figure 3 presents the unstandardised regression coefficients (B) with 95% confidence intervals for the predictors of perceived healthcare-related pharmacy performance. Management-accounting practices showed a significant positive association with the outcome (B = 0.189; 95% CI: 0.083–0.295), while operational efficiency demonstrated the strongest positive association (B = 0.255; 95% CI: 0.140–0.369). In contrast, cost-management practices showed a comparatively small and statistically non-significant association (B = 0.043; 95% CI: −0.058–0.144). The confidence intervals for management-accounting practices and operational efficiency remain above zero, whereas that for cost-management practices crosses zero, visually supporting the regression findings.

DISCUSSION

The present study evaluated the relationships among management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance among pharmacy and healthcare professionals in selected healthcare institutions in Delhi-NCR. The findings demonstrate a consistent pattern of positive associations across the four principal study domains. Importantly, however, the cross-sectional design permits interpretation in terms of statistical association rather than causation.

The descriptive findings showed that operational efficiency had the highest mean score (3.62 ± 0.65), followed by perceived healthcare-related pharmacy performance (3.58 ± 0.69), management-accounting practices (3.53 ± 0.68), and cost-management practices (3.48 ± 0.72). All four mean scores were above the midpoint of the five-point scale, suggesting generally favourable perceptions of pharmacy management and operational practices. The relatively narrow difference of 0.14 points between the highest and lowest domain means further indicates that respondents perceived these dimensions as broadly interconnected rather than as distinctly separate aspects of pharmacy functioning. The high internal consistency of the domains (Cronbach's α = 0.947–0.949) also supports the reliability of the questionnaire measures within the study.

The correlation analysis provided further evidence of interrelationships among the study domains. Management-accounting

practices showed a positive association with operational efficiency (r = .390) and perceived healthcare-related pharmacy performance (r = .295). Cost-management practices were similarly associated with operational efficiency (r = .358), while operational efficiency was positively associated with perceived healthcare-related pharmacy performance (r = .328). These findings suggest that pharmacy professionals who reported stronger management-accounting and cost-management practices also tended to report better operational functioning. Such a pattern is conceptually consistent with the role of financial information, expenditure monitoring, inventory control, resource allocation, and performance monitoring in supporting pharmacy operations.

The regression analysis strengthened this interpretation by demonstrating that both management-accounting practices and cost-management practices were independently associated with operational efficiency. The first model explained 23.2% of the variance in operational efficiency (R^2 = .232). Management-accounting practices showed a significant positive association (B = 0.267, p < .001), while cost-management practices also showed a significant positive association (B = 0.272, p < .001). Thus, the findings suggest that operational efficiency is not related solely to financial control; rather, both the availability and use of management-accounting information and the implementation of cost-management practices appear to be relevant dimensions of pharmacy operational performance.

The second regression model provides an important additional finding. Management-accounting practices (β = .188, p < .001) and operational efficiency (β = .240, p < .001) were independently associated with perceived healthcare-related pharmacy performance, whereas cost-management practices were not statistically significant after adjustment for the other predictors (β = .042, p = .404). The finding indicates that the relationship between cost management and perceived pharmacy performance may be more indirect or may overlap with broader management-accounting and operational processes. Cost-management practices may contribute to performance through improved operational efficiency rather than producing a distinct independent association with the perceived performance measure.

The stronger standardised coefficient for operational efficiency (β = .240) compared with management-accounting practices (β = .188) further suggests that day-to-day operational functioning may have a comparatively closer statistical relationship with perceived pharmacy performance. This is plausible because pharmacy performance is ultimately expressed through processes such as timely dispensing, appropriate inventory availability, efficient resource utilisation, and effective coordination of pharmacy activities. Nevertheless, the R^2 of .142 indicates that most of the variation in perceived healthcare-related pharmacy performance remained unexplained by the three predictors. Consequently, factors such as staffing, workload, organisational structure, technology, procurement systems, leadership, clinical integration, and institutional policies may also contribute substantially to pharmacy performance.

The present findings are broadly consistent with previous literature demonstrating the importance of systematic financial and inventory-management approaches in pharmacy services. Indian studies using ABC-VED analysis have shown that a relatively small proportion of medicines can account for a substantial proportion of total pharmaceutical expenditure, highlighting the importance of prioritising resources according to both cost and clinical criticality (Gupta et al., 2007; Devnani et al., 2010; Anand et al., 2013). For example, Devnani et al. (2010) demonstrated that approximately 14% of pharmacy items accounted for approximately 70% of annual drug expenditure, while Anand et al. (2013) similarly demonstrated substantial concentration of expenditure among a limited proportion of medicines. These findings support the broader principle underlying the present study: systematic financial information and structured inventory-management practices can assist healthcare organisations in directing managerial attention toward high-cost and high-priority resources.

The facility-level findings of the present study further reinforce the importance of this issue. Across the 24 facilities for which secondary data were available, mean annualised pharmaceutical expenditure was ₹162.65 lakh, accompanied by measurable levels of stock-outs (5.06%) and expiry/wastage (2.76%). Although these facility-level indicators were descriptive and cannot be directly linked statistically to individual respondents' questionnaire scores, they illustrate the operational and financial consequences associated with pharmaceutical resource management. Previous Indian research has similarly emphasised the value of ABC-VED approaches for improving resource utilisation and reducing out-of-stock situations (Gupta et al., 2007; Devnani et al., 2010). Therefore, the current findings extend this literature by examining management-accounting and cost-management practices alongside broader perceived operational performance rather than focusing exclusively on medicine classification.

The positive relationship between management-accounting practices and pharmacy performance is also compatible with evidence from the clinical pharmacy economic-evaluation literature. Perez et al. (2009) reviewed 93 economic evaluations of clinical pharmacy services and reported evidence of economic benefit in a substantial proportion of studies, while Touchette et al. (2014) similarly identified economic and clinical benefits associated with clinical pharmacy services. These reviews nevertheless emphasised variability in study quality and the need for more methodologically rigorous economic evaluations. The present study contributes to this broader evidence base by showing that management-accounting practices were associated not only with perceived pharmacy performance but also with operational efficiency.

The finding that operational efficiency was independently associated with perceived pharmacy performance is also consistent with the wider literature on pharmacist services. Dawoud et al. (2019) reported evidence concerning the effectiveness and cost-effectiveness of pharmacist input at the ward level, while Bullock et al. (2019) highlighted the importance of evaluating the costs and cost-effectiveness of pharmacist participation in hospital ward rounds. Similarly, Baudouin et al. (2021) systematically reviewed the economic impact of clinical pharmaceutical activities in hospital wards. Collectively, this literature supports the proposition that pharmacy activities can have both operational and economic dimensions, although the magnitude and nature of benefits vary according to the service, setting, and evaluation methodology.

An important consideration when interpreting the present results is the distinction between process/operational performance and objectively measured patient outcomes. Magedanz et al. (2024) found that most clinical pharmacy key performance indicators identified in the literature were process indicators, whereas relatively few represented clinical, economic, or humanistic outcomes. The authors also identified limitations in methodological quality, validation, benchmarking, and outcome measurement. This observation closely aligns with the present study because the outcome measure was perception-based rather than an objective measure of patient morbidity, medication errors, readmission, mortality, or treatment effectiveness. Therefore, the current results should not be interpreted as demonstrating that management accounting directly improves patient health outcomes.

This distinction is particularly important in the context of medication safety. The World Health Organization (2024) emphasises that unsafe medication practices and medication-related harm remain major patient-safety concerns and require system-level interventions involving health workers, medicines, and medication-use processes. Consequently, improvements in accounting, cost control, and pharmacy efficiency should ultimately be evaluated according to whether they support safe, timely, and appropriate medication use rather than merely reducing expenditure.

The findings have several practical implications for healthcare administrators and pharmacy managers. First, management-accounting systems should be integrated into routine pharmacy decision-making rather than being viewed solely as financial reporting mechanisms. Regular monitoring of pharmaceutical expenditure, inventory value, procurement costs, stock movement, wastage, and service-performance indicators may provide managers with actionable information for resource allocation.

Second, cost-management strategies should be linked to operational objectives. The significant association between cost-management practices and operational efficiency suggests that expenditure control may be most useful when integrated with inventory planning, procurement, stock monitoring, and workflow optimisation. The absence of an independent association between cost management and perceived pharmacy performance indicates that cost reduction alone should not be treated as a sufficient indicator of pharmacy success.

Third, healthcare institutions could develop balanced pharmacy performance dashboards incorporating financial, operational, process, and where feasible patient-centred indicators. Such an approach would be consistent with the growing emphasis on structured clinical pharmacy performance measurement (Magedanz et al., 2024). Importantly, financial efficiency should be balanced against medicine availability and medication safety so that cost containment does not inadvertently compromise essential pharmaceutical services.

Several limitations should be considered. The cross-sectional design prevents determination of temporal sequence and causal relationships. The use of purposive institutional selection and consecutive participant recruitment limits generalisability beyond the participating healthcare institutions. Questionnaire responses were self-reported and therefore may be affected by response, recall, and social-desirability biases. The researcher-developed instrument demonstrated high internal consistency, but further external validation is required before wider application.

In addition, the principal outcome was perceived healthcare-related pharmacy performance rather than an objectively verified clinical outcome. Consequently, the findings cannot establish improvements in patient safety, medication adherence, morbidity, mortality, readmission, or other clinical outcomes. Facility-level operational data were available from only 24 facilities and represented a different unit of analysis from the individual-level questionnaire data; therefore, these indicators should not be interpreted as statistically linked to individual respondents' perceptions. Finally, multiple statistical associations were examined, and the possibility of residual confounding or common-method variance cannot be excluded.

Future research should use longitudinal and quasi-experimental designs to determine whether strengthening management-accounting and cost-management systems leads to measurable improvements in pharmacy operations over time. Multicentre studies using probability-based sampling would improve representativeness and external validity. Future studies should also integrate questionnaire data with routinely collected objective indicators such as stock-out frequency, inventory turnover, expiry and wastage, dispensing turnaround time, procurement lead time, medication-error rates, and pharmacy expenditure.

A particularly valuable direction would be the development of integrated pharmacy performance frameworks combining financial, operational, clinical, and patient-centred indicators. Economic evaluations should also assess whether investments in management-accounting systems generate measurable returns through reduced wastage, improved inventory utilisation, avoided medication-related problems, and enhanced service efficiency. Finally, future research should examine whether operational efficiency acts as a mediating pathway between management-accounting practices and broader pharmacy performance. Such studies could provide stronger evidence regarding the mechanisms through which financial and managerial practices may contribute to safer, more efficient, and more sustainable pharmacy services.

CONCLUSION

The present study evaluated the relationships among management-accounting practices, cost-management practices, operational efficiency, and perceived healthcare-related pharmacy performance in selected healthcare institutions in Delhi-NCR, India. The findings demonstrated positive associations among all four study domains. Operational efficiency recorded the highest mean score (3.62 ± 0.65), followed by perceived healthcare-related pharmacy performance (3.58 ± 0.69), management-accounting practices (3.53 ± 0.68), and cost-management practices (3.48 ± 0.72). Management-accounting practices and cost-management practices were both significantly associated with operational efficiency, with the regression model explaining 23.2% of its observed variance. Management-accounting practices and operational efficiency were independently associated with perceived healthcare-related pharmacy performance, whereas cost-management practices did not show a statistically significant independent association with the outcome after adjustment for the other predictors. The findings suggest that effective pharmacy management requires an integrated approach combining financial information, cost-management practices, and operational processes. Strengthening management-accounting systems may support pharmacy managers in monitoring pharmaceutical expenditure, allocating resources, managing inventories, and making informed operational decisions. Cost containment should not be pursued independently of medicine availability, service quality, and medication safety. Healthcare institutions should therefore consider integrating financial and operational indicators into routine pharmacy performance-monitoring systems. Future research should employ longitudinal and multicentre study designs, preferably with probability-based sampling, to improve generalisability and provide stronger evidence regarding temporal relationships. Further studies should incorporate objectively measured indicators such as stock-out frequency, inventory turnover, expiry and wastage, prescription-processing time, medication errors, and patient-safety outcomes. Research should also examine whether operational efficiency mediates the relationship between management-accounting practices and broader pharmacy performance. Such evidence would help clarify the mechanisms through which management-accounting and cost-management practices may contribute to efficient, sustainable, and safe pharmacy services.

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