Synergistic Effects of HRM Practices on Nurse Caring Behavior: A Multivariate Analysis in Private Hospitals

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Abstract

Nurse caring behavior is a crucial indicator of nursing service quality, which is influenced by Human Resource Management (HRM) practices in the healthcare sector. This study aimed to analyze the multivariate relationship between organizational commitment, effective communication, and work environment, and caring behavior among inpatient nurses at private hospitals in Bekasi Regency. A cross-sectional design was employed, with 94 nurses as respondents. Data were collected using structured questionnaires and analyzed using canonical correlation analysis. The findings revealed that the first canonical function was significant, with Rc= 0.822 and Rc²= 0.676, indicating that 67.6% of the variance in caring behavior was explained simultaneously by the three HRM factors. The work environment emerged as the most dominant contributor based on canonical loading, whereas organizational commitment demonstrated the largest relative contribution, based on canonical weight. Hospital managers should prioritize strengthening nurses' affective commitment through recognition and a supportive climate rather than relying solely on technical communication training. The study concludes that fostering a conducive work environment and enhancing nurses' organizational commitment are essential for promoting caring behavior and improving nursing service quality in private hospitals.

Keywords: *Caring Behavior, Effective Communication, Organizational Commitment, Work Environment*

1. INTRODUCTION

Nurse caring behavior serves as the foundation of nursing service quality, as it fundamentally reflects empathy, compassion, and patient safety orientation in clinical practice (Adarkwah & Hirsch, 2020; Karatas & Cinaroglu, 2024; Wang et al., 2022). However, maintaining consistent caring behavior becomes increasingly challenging when nurses work in high-pressure environments with demanding workloads. The private hospitals in Bekasi Regency, strategically located within Indonesia's prominent industrial zone, exemplify this tension, where healthcare professionals must balance efficiency demands with the imperative to deliver compassionate, patient-centered care (Kim & Shin, 2021; H.-Y. Liu et al., 2022; H. Y. Liu, 2022). In the post-pandemic era, this tension has intensified significantly as Bekasi's industrial workforce returns to full operational capacity while healthcare systems continue to face residual COVID-19-related mental fatigue, increased patient acuity, and staffing shortages. Moreover, the advent of Industry 4.0, characterized by automation, digital health records, and artificial intelligence-driven patient management, has paradoxically increased documentation burdens and reduced direct bedside interaction time, making it substantially more difficult for nurses to maintain genuine caring behaviors amidst technological demands (H.-Y. Liu et al., 2022; H. Y. Liu, 2022). In this context, the variation in nurses' caring behavior cannot be understood simply as an individual phenomenon but must be examined through the lens of Human Resource Management (HRM) practices that shape organizational behavior.

From an Human Resource Management (HRM) perspective, three organizational factors consistently emerge as critical determinants of employee behavior in healthcare settings: organizational commitment, effective communication, and the work environment (Shalahuddin, Aswan, Abdullah, Jimainal, & Yusof, 2025; Syarif, 2025). Organizational commitment reflects the psychological bond between nurses and their employing hospitals, influencing their willingness to exert effort and demonstrate caring behaviors beyond the minimum requirements (H.-Y. Liu et al., 2022). Effective communication enables accurate information exchange, reduces misunderstandings, and fosters interpersonal connections essential for caring interactions with patients. The work environment encompasses the physical, social, and psychological conditions that either support or hinder nurses' capacity to provide quality care. Despite the theoretical importance of these factors, most existing studies have examined their influence on caring behavior in isolation, treating each

factor as an independent predictor rather than recognizing their simultaneous, interconnected nature (Anselmann, Brouwer, & Mulder, 2023; Gong et al., 2025; H.-Y. Liu et al., 2020; Timmermans, Van Linge, Van Petegem, Elseviers, & Denekens, 2011).

The limitations of partial analytical approaches become particularly evident when considering the complex realities of hospital organizations. In practice, organizational commitment does not operate independently of work environment conditions, nor does communication effectiveness exist in isolation from commitment levels. These Human Resource Management (HRM) factors interact, combine, and mutually reinforce each other in shaping nurses' behavior. Consequently, research that examines only bivariate relationships or treats each factor as a separate predictor in multiple regression provides an incomplete picture of how Human Resource Management (HRM) practices collectively influence caring behavior (Kwan & Hung, 2025; H.-Y. Liu, 2021; H. Y. Liu, Wang, Huang, Hsu, & Han, 2020; Yi & Park, 2015). Hospital managers seeking evidence-based guidance for HRM policy design require a more comprehensive understanding of how combinations of organizational factors work together to produce the desired behavioral outcomes.

The urgency of this research is further amplified by the specific context of private hospitals in the Bekasi Regency. As healthcare facilities serving communities within a major industrial corridor, these hospitals face unique challenges, including high patient volumes, diverse patient populations, and pressure to maintain efficiency while meeting accreditation standards. The post-pandemic recovery period has exacerbated these challenges such as, nurses in Bekasi report higher levels of burnout and emotional exhaustion compared to pre-pandemic baselines, while simultaneously facing increased productivity targets from hospital administrators responding to financial pressures from reduced government healthcare subsidies. Furthermore, the rapid digitalization of hospital services under the industry 4.0 paradigm, including electronic medical records, telemedicine integration, and automated nurse scheduling systems, has created new sources of stress. Nurses must now master complex technological interfaces while preserving the empathic, human-centered interactions that define caring behavior (H.-Y. Liu et al., 2022; H. Y. Liu, 2022; Shalaby, Janbi, Mohammed, & Al-harthi, 2018). Nurses in this setting must navigate competing demands that can erode caring behaviors if the organizational support systems are inadequate. Hospital administrators require empirical evidence to design Human Resource Management (HRM) interventions that simultaneously strengthen commitment, enhance communication, and improve work environments in ways that collectively promote caring behaviors. Without such evidence, policy decisions risk being based on intuition rather than a rigorous analysis of how multiple factors interact in real organizational settings.

This study addresses these gaps by applying Canonical Correlation Analysis (CCA), a multivariate statistical technique specifically designed to examine relationships between two sets of variables. Unlike multiple regression, which examines how multiple predictors influence a single outcome, Canonical Correlation Analysis (CCA) enables researchers to analyze how a set of predictor variables (organizational commitment, effective communication, and work environment) relates to a set of criterion variables such as, multiple dimensions of caring behavior. This approach aligns with the theoretical understanding that both HRM practices and caring behavior are multidimensional constructs that should be examined in their full complexity (Karatas & Cinaroglu, 2024; Kim & Shin, 2021; Shalaby et al., 2018) (Bhimasta, Surya, & Pramudita, 2025; H.-Y. Liu et al., 2022). By identifying the linear combinations of variables from each set that achieve maximum correlation, Canonical Correlation Analysis (CCA) provides insights into the underlying structure of relationships that partial analytical methods cannot reveal.

This study is guided by three fundamental research questions. First, is there a significant multivariate relationship between the set of Human Resource Management (HRM) factors such as, organizational commitment, effective communication, and work environment and the set of caring behavior dimensions among inpatient nurses in private hospitals? Second, how strong is this multivariate relationship, and what proportion of the variance in caring behavior can be explained by the combination of Human Resource Management (HRM) factors? Third, what is the relative contribution of each Human Resource Management (HRM) factor to the multivariate relationship, and which factor emerges as the most dominant predictor of caring behavior?

To address these questions, this study introduces several novel aspects. Methodologically, it applies Canonical Correlation Analysis (CCA) within the context of nursing research in Indonesian private hospitals, an approach that is still relatively uncommon in local healthcare studies. The simultaneous examination of three Human Resource Management (HRM) factors as a predictor set, rather than treating them as isolated variables, represents a more theoretically appropriate approach to understanding organizational behavior. Contextually, this study focuses specifically on private hospitals in Bekasi Regency's industrial area, providing locally relevant evidence for healthcare managers in similar settings. Conceptually, this study contributes to the understanding of how organizational factors collectively shape professional nursing behavior, offering insights that extend beyond the specific research context.

This study is expected to provide multidimensional contributions to theory, practice, and policy. Theoretically, the findings will enrich the understanding of how Human Resource Management (HRM) factors operate as an integrated system in influencing employee behavior, contributing to the broader literature on organizational behavior in healthcare settings. The application of canonical correlation demonstrates the value of multivariate thinking in organizational studies. Practically, the results provide hospital managers with evidence-based guidance for designing integrated HRM interventions. Rather than recommending isolated improvements to single factors, this study suggests which combinations of organizational characteristics most strongly promote caring behavior. For healthcare regulators and professional associations, the findings may inform standards and guidelines that encourage hospitals to adopt comprehensive approaches to support nurses' caring behaviors.

Ultimately, the importance of this research lies in its potential to bridge the gap between the complex reality of organizational life and the analytical methods used to understand it. Nurses do not experience organizational commitment, communication practices, and work environments as separate, independent phenomena. These factors intertwine in their daily experiences, collectively shaping their capacity and motivation to provide caring and compassionate care. By employing analytical methods that respect this complexity, this study aims to generate insights that can truly inform the development of healthcare organizations capable of sustaining the caring behaviors that patients need and deserve.

2. LITERATURE REVIEW

This research is grounded in the integration of organizational behavior theory, social exchange theory, and caring theory. Nurse caring behavior represents the core of professional nursing practice that cannot be understood in isolation from the organizational context in which the nurses work. organizational behavior theory, as proposed by Ajzen (1991), explains how individual behavior within organizations is shaped by both personal characteristics and organizational factors. In the context of nursing, this theory provides a framework for understanding how organizational commitment, communication patterns, and work environment collectively influence nurses' professional behaviors. social exchange theory, developed by Blau (1964), posits that individuals reciprocate positive treatment from their organizations with positive attitudes and behaviors. When nurses perceive organizational support through fair treatment, effective communication, and conducive working conditions, they respond with increased commitment and enhanced caring behaviors toward their patients. Caring theory establishes caring as the moral ideal and foundational value of nursing practice, emphasizing the importance of human-to-human relationships, empathy, and holistic attention to patient needs. The integration of these three theoretical perspectives allows this study to examine how organizational factors such as, commitment, communication, and environment translate into the caring behaviors that define quality nursing practice.

A critical methodological implication emerges from this theoretical integration, particularly from the social exchange theory. According to Blau (1964), social exchanges within organizations do not occur as isolated, one-dimensional transactions, but rather as simultaneous, intertwined, and reciprocal processes. In the hospital setting, a nurse's perception of organizational support is never formed by a single factor alone, instead, commitment, communication quality, and work environment conditions are experienced and exchanged concurrently. For example, a supportive work

environment enhances the perceived value of organizational investment, which, in turn, strengthens commitment and motivates reciprocal caring behavior. Conversely, poor communication can negate the positive effects of physically adequate work environments. Therefore, testing Social Exchange Theory using only bivariate correlations or multiple regression, which assumes independent predictors, fundamentally misrepresents the theory's core premise of simultaneous, multidimensional exchange. Canonical Correlation Analysis (CCA) is not merely a statistical convenience but a theoretical necessity. Canonical Correlation Analysis (CCA) is the only multivariate technique that respects the simultaneous, interconnected nature of social exchange by examining how the entire set of organizational investments such as, commitment, communication, and environment jointly relates to the full spectrum of reciprocal behavioral outcomes. Therefore, Canonical Correlation Analysis (CCA) provides the only analytically rigorous test of Social Exchange Theory in complex organizational settings such as hospitals, where exchanges are inherently multivariate rather than bivariate.

Previous empirical studies have examined various determinants of nurses' caring behavior, which can be categorized into individual and organizational level factors. Individual-level factors include personal characteristics such as empathy, emotional intelligence, and professional values (Graham & McClain, 2019; Hamsal, Nurman, Hamzah, Arif, & Sukri, 2025; Kohler & Mathieu, 1993). Organizational-level factors encompass the work environment, leadership styles, and human resource management practices that either support or inhibit caring behaviors. However, a growing body of literature argues that for nurses working in hospital settings, organizational factors may be equally or even more critical than individual characteristics in shaping consistent caring behaviors. Several researchers have indicated that the drivers of professional behavior in high-stress healthcare environments may differ from those in less demanding settings, with organizational support playing a particularly crucial role (Wenang et al., 2021).

2.1 Organizational Commitment and Caring Behavior

Organizational commitment reflects the psychological attachment of individuals to their organization, which drives loyalty, dedication, and positive work behaviors, particularly in the form of affective commitment, which most strongly predicts performance and extra-role behaviors (Kim & Shin, 2021). Affective commitment refers to employees' emotional attachment to, identification with, and involvement in their organization. Employees with strong affective commitment remain with the organization because they want to, not because they need to stay. In the nursing context, high organizational commitment serves as a critical determinant of professional responsibility and the tendency to consistently demonstrate caring behaviors. Committed nurses internalize organizational values, including those related to patient-centered care, and exert discretionary effort to ensure that patients receive compassionate attention, even when facing workload pressures.

The relationship between organizational commitment and caring behavior can be explained by multiple mechanisms. First, committed nurses identify more strongly with their professional roles and organizational expectations, making caring behaviors congruent with their self-concepts. Second, commitment creates psychological investment in organizational outcomes, including patient satisfaction and quality indicators, motivating nurses to engage in behaviors that contribute to these outcomes. Third, commitment buffers against emotional exhaustion and burnout that can erode caring capacity over time, as nurses with strong organizational attachment maintain their motivation despite workplace stressors (Karatas & Cinaroglu, 2024; H.-Y. Liu et al., 2021; Shalaby et al., 2018). However, most existing studies have examined commitment as an isolated predictor of caring behavior, without considering how it operates in conjunction with other organizational factors.

2.2 Effective Communication and Caring Behavior

Effective communication plays a crucial role in team coordination, patient safety, and the formation of therapeutic relationships between nurses and patients (Popa, Soto-Acosta, & Palacios-Marqués, 2022). Communication in healthcare settings serves multiple functions such as, exchanging clinical information essential for accurate assessment and treatment, coordinating care activities among interdisciplinary team members, and establishing interpersonal connections that

form the foundation of caring relationships. Open and empathetic communication not only facilitates accurate clinical information exchange but also builds trust, which is fundamental to caring practices. When nurses communicate effectively with patients, they demonstrate respect, validate patient concerns, and create the psychological safety necessary for patients to express their needs and concerns.

The communication-caring relationship operates at multiple levels within healthcare organizations. The interpersonal level, nurse and patient communication directly manifests caring through attentive listening, empathetic responses, and information sharing that empowers patients. At the team level, communication among healthcare providers ensures coordinated care that prevents errors and meets patients' needs holistically. The organizational level, communication practices reflect institutional values and shape the climate within which caring occurs (Al Badi, Cherian, Farouk, & Al Nahyan, 2023; Brooks et al., 2017; Song & Kolb, 2013; Yang et al., 2024). Despite the recognized importance of communication, research examining its relationship with caring behavior has typically treated communication as an independent factor rather than as one element within an interconnected system of organizational influences.

2.3 Work Environment and Caring Behavior

A conducive work environment, both physically and psychosocially, has been demonstrated to influence nurse motivation, well-being, and performance (Alkorashy & Alanazi, 2023; Ghazawy, Mahfouz, Mohammed, & Refaei, 2021). The work environment encompasses the physical workspace, availability of resources, staffing adequacy, supervisory support, and collegial relationships that shape nurses' daily experiences. Supportive work environments provide the resources and support that enable nurses to manage work demands and maintain the emotional capacity to demonstrate caring behaviors in their work. When environments are characterized by adequate staffing, supportive management, positive collegial relationships, and access to necessary supplies and equipment, nurses can focus their energy on patient care rather than struggling with organizational obstacles.

The concept of a healthy work environment has received considerable attention in the nursing literature, with research consistently demonstrating its impact on both nurse outcomes such as, job satisfaction, burnout, retention, and patient outcomes such as, satisfaction, quality of care, adverse events. Magnet hospitals, recognized for their exemplary nursing environments, demonstrate how organizational characteristics can support professional nursing practices and quality patient care. Key elements of supportive work environments include nursing leadership that values and supports staff, collaborative relationships among healthcare providers, professional development opportunities, and organizational policies that prioritize patient care quality (Al-Hamdan & Bani Issa, 2022; Othman & Nasurdin, 2019; Wan, Zhou, Li, & Shang, 2018; Wan, Zhou, Li, Shang, & Yu, 2018). However, research has rarely examined how the work environment interacts with commitment and communication to shape caring behavioral patterns.

2.4 Caring Behavior as Core Nursing Practice

Caring behavior constitutes the core of nursing practice based on humanistic values that emphasize empathy, presence, and concern for patients' holistic needs (Bhatti, Hussain, & Al Doghan, 2018). Caring is a crucial indicator of service quality and patient satisfaction in hospitals. Watson's Theory of Human Caring positions caring as the moral ideal of nursing, emphasizing the importance of authentic presence, transpersonal relationships, and attention to the subjective meaning of health experiences for patients. Caring behaviors include physical presence, attentive listening, empathetic responses, competent technical care delivered with compassion, and advocacy for patients' needs.

Multiple dimensions of caring behavior have been identified in the nursing literature. Assurance of presence refers to nurses' physical and emotional availability to patients, demonstrating that patients matter as individuals. Knowledge and skill encompass the competent application of technical expertise delivered in a manner that respects patient dignity and promotes comfort. Respectful communication involves interacting with patients in a manner that honors their values,

preferences, and autonomy. Together, these dimensions constitute holistic care, which distinguishes professional nursing from merely technical task completion (Bhatti, Mat, & Juhari, 2018; El-Gazar, Abdelhafez, & Zoromba, 2022; Opoku & Boateng, 2024; Patience, De Braine, & Dhanpat, 2020). Despite the recognition of the multidimensional nature of caring, research has often measured caring as a unidimensional construct or examined only selected aspects.

3. METHODOLOGY

3.1 Research Design and Approach

This study aims to analyse the multivariate relationship between organizational factors and inpatient nurses' caring behavior within the Human Resource Management (HRM) context of private hospitals. The organizational factors examined include organizational commitment, effective communication, and work environment as representations of the psychological, relational, and contextual aspects that shape nurses' work attitudes and behaviors. Caring behavior is a form of service-oriented performance that reflects the quality of nurse-patient interactions and serves as a crucial indicator of healthcare service quality.

This study employed a cross-sectional design involving 94 inpatient nurses from five private hospitals in Bekasi Regency. The cross-sectional approach was selected because it allows data collection at a single point in time, providing a snapshot of the relationships between organizational factors and caring behavior as they naturally occur in hospital settings. This design is appropriate for examining the simultaneous associations between multiple variables without manipulating the research context, thereby preserving ecological validity of the findings (Sugiyono, 2022).

3.2 Population and Sample

The target population of this study comprised all inpatient nurses working in private hospitals in Bekasi Regency. Bekasi Regency was selected as the research setting due to its strategic position as an industrial area with a high concentration of private healthcare facilities serving diverse patient populations. The industrial context presents unique challenges for nursing practice, including high patient volumes, demanding workloads, and efficiency pressures that may affect nurses' capacity to maintain caring behaviors (Ghozali, 2021).

Sample selection was conducted using a consecutive sampling technique to recruit respondents who met the inclusion criteria during the data collection period. Consecutive sampling involved including every eligible participant who presented during the study timeframe until the desired sample size was achieved. This approach was chosen for its practicality in clinical research settings, while maintaining systematic participant selection. The inclusion criteria for this study were registered nurses with active practice licenses, a minimum of one year of work experience in the current hospital, direct involvement in inpatient care provision, and willingness to participate in the study by providing informed consent.

A total of 94 nurses participated in this study, representing five private hospitals in the Bekasi Regency. While some multivariate guidelines recommend sample sizes exceeding 150 observations for canonical correlation analysis, the achieved sample size of 94 is justified by the high homogeneity of the target population. All participating nurses worked within a geographically contiguous industrial corridor in Bekasi Regency, shared similar sociodemographic characteristics, operated under comparable private hospital accreditation standards (minimum type C hospitals), and faced identical regional healthcare policies. This population homogeneity reduced extraneous variance and enhanced the stability of multivariate estimates, making the sample size adequate for detecting the strong canonical effects expected in this study ($Rc > 0.80$). Furthermore, the sample meets the minimum requirement of at least 10 observations per variable ($7 \text{ variables} \times 10 = 70$), and the achieved subject-to-variable ratio of 13.4:1 provides sufficient statistical power for the primary canonical analysis.

3.3 Instrument Validity and Reliability

The questionnaire underwent rigorous validity and reliability testing prior to data collection. Content validity was established through an expert review by two nursing academics and one Human

Resource Management (HRM) researcher who evaluated the relevance and representativeness of the items for each construct. Construct validity was assessed using confirmatory factor analysis to ensure that the items loaded appropriately on their intended factors. All items demonstrated factor loadings exceeding the minimum threshold of 0.50, indicating acceptable construct validity (Creswell, 2024).

Reliability was assessed using Cronbach's alpha coefficient for each construct. The results showed satisfactory internal consistency: organizational commitment (α= 0.87), effective communication (α = 0.84), work environment (α = 0.89), and caring behavior (α= 0.91). These values exceeded the generally accepted threshold of 0.70, indicating that the instruments reliably measured their respective constructs.

3.4 Data Collection Procedures

Data collection will be conducted over a three-month period from March to May 2024. The researcher obtained formal permission from the management of each participating private hospital before initiating the data collection. After receiving institutional approval, the researcher coordinated with nursing directors or head nurses to identify potential participants who met the inclusion criteria.

Questionnaires were distributed to eligible nurses during shift changes or scheduled break times to minimize disruption to the patient care. The researcher explained the study's purpose, procedures, and ethical considerations to potential participants before distributing the questionnaires. Nurses who agreed to participate provided written informed consent and completed a self-administered questionnaire, which took approximately 20-25 minutes to complete. Completed questionnaires were collected in sealed envelopes to ensure confidentiality.

3.5 Common Method Bias Assessment

As all variables were self-reported by the same nurses at a single time point, Common Method Bias (CMB) could potentially inflate the observed relationships. To address this concern, procedural and statistical remedies were implemented. The questionnaire was designed with distinct response formats and scale anchors for predictor and criterion variables to reduce consistency artifacts. Items were arranged in a randomized order, and the purpose of each section was presented separately to create a psychological separation between the variable sets. Harman's single-factor test was conducted, which revealed that a single factor accounted for only 28.4% of the total variance, which was well below the recommended threshold of 50% (Creswell, 2024). This indicates that common method bias does not pose a serious threat to the validity of these findings.

3.6 Data Analysis

Data analysis was conducted using the IBM SPSS Statistics software. The analysis was conducted in several stages. First, a descriptive analysis was performed to describe the respondents' characteristics and the distribution of the research variables. Descriptive statistics included frequencies, percentages, means, and standard deviations. Assumption Testing was conducted to ensure the appropriateness of the canonical correlation analysis. The tests included assessments of multivariate normality, linearity, and multicollinearity. Multicollinearity was assessed using Variance Inflation Factor (VIF) values, with a VIF< 10 indicating acceptable levels.

Canonical Correlation Analysis (CCA) was employed as the primary analytical technique to examine the simultaneous relationships between organizational factors namely organizational commitment, effective communication, and work environment and the dimensions of caring behavior, including assurance of presence, knowledge and skill, and respectful communication. CCA was chosen because it is specifically designed to explore the relationships between two sets of variables, making it particularly suitable for the research objectives of this study. Unlike multiple regression, which assesses the influence of multiple predictors on a single outcome, CCA enables the analysis of how an entire set of predictor variables relates to an entire set of criterion variables simultaneously. This approach aligns with the theoretical understanding that both organizational factors and caring behavior are multidimensional constructs that should be examined in their entirety.

Canonical correlation analysis produces multiple canonical functions, with each function representing a distinct pattern of relationship between linear combinations of the predictor and

criterion variable sets. The analysis focused on the first canonical function if it demonstrated statistical significance, as this function represented the strongest relationship between the two variable sets. The statistical significance of canonical functions was assessed using Wilks' lambda and associated F-tests, with a significance level set at $p< 0.05$. The strength of the multivariate relationship was evaluated using the canonical correlation coefficient (*Rc*) and its square (Rc^2). The canonical correlation coefficient indicates the magnitude of the relationship between the two canonical variates, whereas Rc^2 represents the proportion of variance shared by the linear combinations of the two variable sets.

4. RESULT AND DISCUSSION

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for the sample data, providing an overview of the data in terms of sample size, mean, standard deviation, and minimum and maximum values for the research variables.

Table 1. Descriptive statistics of research variables

Variables	N	Mean	Std. Dev.	Min	Max
Organizational Commitment	94	3.95	0.82	1.00	5.00
Effective Communication	94	4.45	0.96	1.00	5.00
Work Environment	94	4.04	0.83	1.10	5.00
Caring Behavior	94	3.56	0.83	1.00	4.00

The sample size for this study was 94 respondents, consisting of inpatient nurses from five private hospitals in Bekasi Regency. The descriptive statistics show that the mean scores for all variables fall within the moderate to high categories. Effective communication had the highest mean (4.45), followed by the work environment (4.04) and organizational commitment (3.95). This indicates that respondents perceive the communication climate and working conditions as relatively favourable. The mean caring behavior score of 3.56 suggests that nurses have implemented caring practices in their service. The moderate standard deviations across all variables (ranging from 0.82 to 0.96) indicate a relatively homogeneous data distribution, making the dataset appropriate for multivariate analysis.

4.2 Canonical Correlation Analysis Summary

Table 2 presents a summary of the canonical correlation analysis, including eigenvalues, canonical correlation coefficients (*Rc*), and squared canonical correlations (Rc^2) for the first canonical function.

Table 2. Canonical correlation summary

Root	Eigenvalue	*Rc*	Rc^2
1	2.084	0.822	0.676

Canonical correlation analysis yielded one significant canonical function. Table 2 displays a canonical correlation coefficient of $Rc= 0.822$, with a squared canonical correlation of $Rc^2= 0.676$. This indicates a very strong multivariate relationship between the set of Human Resource Management (HRM) factors and caring behavior, where 67.6% of the shared variance in caring behavior is simultaneously explained by organizational commitment, effective communication, and the work environment. The eigenvalue of 2.084 confirms the strength of the first canonical function. Only one canonical function was found to be significant, with $Rc= 0.822$, explaining 67.6% of the shared variance between the two variable sets.

4.3 Multivariate Significance Tests

Table 3 presents the results of the multivariate significance tests, including Pillai's Trace, Hotelling's Trace, Wilks' Lambda, and Roy's Largest Root, along with their significance levels.

Table 3. Multivariate significance tests

Test Statistic	Value	Sig.
Pillai's Trace	0.676	< 0.001
Hotelling's Trace	2.084	< 0.001
Wilks' Lambda	0.324	< 0.001
Roy's Largest Root	2.084	< 0.001

Table 3 shows that all multivariate tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) were significant at $p < 0.001$. These findings confirm that the first canonical function is statistically meaningful, indicating that the identified multivariate relationship is not due to chance. All tests consistently demonstrated the statistical significance of the first canonical function.

4.4 Canonical Loadings for Predictor Variables

Table 4 presents the canonical loadings (structure coefficients) for the predictor variable set, representing the correlation between each original variable and its respective canonical variate.

Table 4. Canonical loadings for predictor variables (set *X*)

Variables	Loading
Organizational Commitment	0.934
Effective Communication	0.901
Work Environment	0.938

Table 4 shows that all Human Resource Management (HRM) variables have very high canonical loadings: work environment (0.938), organizational commitment (0.934), and effective communication (0.901). These values indicate that all three variables have very strong correlations with the Human Resource Management (HRM) canonical variates. The work environment emerged as the factor with the most dominant correlation, confirming that safe, supportive, and conducive working conditions are a primary prerequisite for the formation of nurse caring behavior. However, the high loadings of organizational commitment and effective communication demonstrate that affective and interactional factors also play important roles in shaping caring practices in hospitals.

4.5 Canonical Loadings for Criterion Variables

Table 5 presents the canonical loadings for the criterion variable set, representing the correlation between the caring behavior variable and its canonical variates.

Table 5. Canonical loadings for criterion variables (set *Y*)

Variable	Loading
Caring Behavior	1.000

Table 5 shows that the canonical loading for caring behavior is 1.000, which means that this variable fully represents the dependent canonical variate. This finding confirms that the combination of Human Resource Management (HRM) factors formed in the predictor variate is directly reflected in the nurse caring behavior as the primary indicator of nursing service quality. Consequently, any change in Human Resource Management (HRM) practices has the potential to directly impact the improvement or decline in NC.

4.6 Standardized Canonical Coefficients

Table 6 presents the standardized canonical coefficients (canonical weights), which reflect the relative contribution of each variable in forming the canonical variate for the first function.

Table 6. Standardized canonical coefficients

Variable	Coefficient
Organizational Commitment	0.672
Effective Communication	0.461
Work Environment	0.579
Caring Behavior	1.000

Table 6 displays the canonical weights, reflecting the relative contribution of each variable in forming the canonical variate for the first function. In the predictor variable set, organizational commitment (X_1) had the largest weight (0.672), followed by work environment (X_3) at 0.579 and effective communication (X_2) at 0.461. This pattern indicates that organizational commitment is the most important factor in the HRM combination associated with nurses caring behavior. In the criterion set, the weight for caring behavior (Y) = 1.000, demonstrating that the dependent variate is fully represented by this variable.

This finding confirms that nurses' psychological attachment to their organization plays a key role in encouraging the emergence of caring behavior, as nurses with high commitment tend to demonstrate greater dedication and responsibility in service delivery. Nevertheless, the substantial contributions of the work environment and effective communication indicate that caring is formed through the synergy between affective factors (commitment) and contextual-operational factors (environment and communication). Therefore, efforts to enhance caring behavior in hospitals should be directed toward strengthening nurses' organizational commitment, accompanied by the creation of a conducive work environment and effective communication. Organizational commitment made the largest relative contribution to the multivariate relationship.

4.7 Discussion

4.7.1 The Dominant Role of Organizational Commitment in Shaping Caring Behavior

The finding that organizational commitment has the largest canonical weight (0.672) among the predictor variables strengthens Bakertzis and Myloni (2021) organizational commitment theory, which states that employees' affective attachment to their organization encourages the emergence of extra-role behavior. In the nursing context, caring behavior can be understood as a form of extra-role behavior that goes beyond the formal task demands. The high canonical loading of organizational commitment (0.934) further confirms that nurses with strong commitment tend to demonstrate greater concern and responsibility in caring for patients. This finding aligns with previous research indicating that committed nurses internalize organizational values, including the value placed on patient-centered care, and exert discretionary effort to ensure that patients receive compassionate attention even when facing workload pressures (Falatah & Conway, 2019; Kato, Chiba, & Shimazu, 2021; Wei et al., 2023).

The relationship between organizational commitment and caring behavior can be explained through social exchange theory Blau (1964) When nurses perceive that their organization values them, provides adequate support, and treats them fairly, they reciprocate with positive attitudes and behaviors, including enhanced patient care. This reciprocal relationship creates a virtuous cycle in which organizational investment in employee well-being returns through improved service quality. The finding that organizational commitment contributes most strongly to the multivariate relationship suggests that affective bonds between nurses and their hospitals form the psychological foundation upon which care practices are built.

From the perspective of organizational behavior theory by Ajzen (1991), commitment represents the internalization of organizational values and goals. Nurses who are strongly committed incorporate patient-centered care as a personal value, making caring behaviors congruent with their self-concept. This internalization ensures that caring is not merely performed because of external demands or supervision but emerges authentically from within the nurse herself. Such authentic caring is likely to be more consistent, resilient to workplace stressors, and genuinely experienced by patients as compassionate attention.

4.7.2 Work Environment as the Most Correlated Factor

The finding that the work environment has the highest canonical loading (0.938) among the predictor variables aligns with Ajzen (1991) perspective that the physical and psychosocial work environment constitutes a primary determinant of employee motivation and performance. A safe, comfortable, and supportive environment creates positive psychological conditions that enable nurses to devote their full attention to patients. Thus, the work environment functions as an enabling factor that facilitates the actualization of caring values in nursing. This finding is consistent with Popa et al. (2022) and Song and Kolb (2013) research on healthy work environments, which demonstrated that supportive working conditions significantly influence nurse motivation, well-being, and performance.

The strong correlation between the work environment and caring behavior can be understood through multiple mechanisms. First, adequate staffing and resource availability reduce time pressure and workload, which can force nurses to prioritize efficiency over compassionate interaction. Second, supportive supervisory relationships provide nurses with the emotional resources required to cope with the demands of patient care. Third, positive collegial relationships create a climate in which caring is modelled, valued, and reinforced among team members. Fourth, organizational policies that prioritize quality of care signal to nurses that patient well-being is genuinely valued, encouraging them to invest in caring behaviors (Aung Po, Wichaikhum, Abhicharttibutra, & Suthakorn, 2024; Kato et al., 2021; Wei et al., 2023).

Magnet hospital research has consistently demonstrated that organizational characteristics that support professional nursing practice are associated with better patient outcomes. This study's findings extend the literature by showing that work environment quality is the single most correlated factor with caring behavior among the Human Resource Management (HRM) variables examined. This suggests that interventions to improve work environment conditions may have the most direct impact on enhancing caring practices, as environmental factors either enable or constrain nurses' capacity to translate their commitment and communication skills into actual caring behaviors.

4.7.3 The Synergistic Role of Effective Communication

Effective communication, with a canonical loading of 0.901 and canonical weight of 0.461, plays a crucial role in building a supportive work climate and facilitating caring interactions. Communication in healthcare settings serves multiple functions essential for caring practice, including exchanging clinical information necessary for accurate assessment and treatment, coordinating care activities among interdisciplinary team members, and establishing interpersonal connections that form the foundation of caring relationships. Open and empathetic communication not only facilitates accurate clinical information exchange but also builds trust, which is fundamental to caring practices (BowenXue et al., 2024; Pohl, Battistelli, Djediat, & Andela, 2022; Tomietto et al., 2019).

The communication-caring relationship operates at multiple levels within healthcare organizations. At the interpersonal level, nurse-patient communication directly manifests caring through attentive listening, empathetic responses, and information sharing that empowers patients. When nurses communicate effectively with patients, they demonstrate respect, validate patient concerns, and create the psychological safety necessary for patients to express their needs and concerns. At the team level, communication among healthcare providers ensures coordinated care that prevents errors and meets patients' needs holistically. At the organizational level, communication practices reflect institutional values and shape the climate in which caring occurs.

This study's finding that communication contributes meaningfully to the multivariate relationship, albeit with a smaller weight than commitment and environment, suggests that communication functions as a reinforcing factor that amplifies the effects of commitment and environment. In organizations with strong commitment and supportive environments, effective communication enables positive conditions to translate into actual caring behaviors. Conversely, even in organizations with committed nurses and adequate environments, poor communication can undermine care by creating coordination failures, misunderstandings, and interpersonal tensions that distract from patient-centered attention.

4.7.4 Caring Behavior as the Core of Nursing Practice

The finding that caring behavior has a canonical loading of 1,000 confirms that the dependent variate is fully represented by this construct, consistent with Mohd Nasurdin, Tan, and Naseer Khan (2020) caring theory, which positions caring as the core of nursing practice based on humanistic values. Caring behavior encompasses multiple dimensions, including assurance of presence, knowledge and skill, and respectful communication. Assurance of presence refers to nurses' physical and emotional availability to patients, demonstrating that patients matter as individuals. Knowledge and skill encompass the competent application of technical expertise delivered in a manner that respects patient dignity and promotes comfort. Respectful communication involves interacting with patients in a manner that honors their values, preferences, and autonomy.

The complete representation of caring behavior in the dependent variate indicates that this construct successfully captures the essence of what patients experience as quality care. This finding validates the multidimensional measurement approach used in this study and confirms that caring behavior is an appropriate criterion for examining the impact of Human Resource Management (HRM) practices on service quality. Any change in the combination of Human Resource Management (HRM) factors is directly reflected in caring behavior, making it a sensitive indicator of organizational effectiveness in supporting professional nursing practice (Akinyemi, George, & Ogundele, 2022; Brefo-Manuh & Anlesinya, 2023; Szilvassy & Širok, 2022).

From a theoretical perspective, this finding reinforces the integration of organizational behavior and caring theories. Organizational commitment provides the motivational foundation, the work environment provides the enabling conditions, and effective communication provides the behavioral mechanisms through which caring is expressed. These three factors work together as an integrated system, not as independent influences, to shape the caring behaviors that define quality of nursing practice. The strong multivariate relationship (Rc= 0.822 and Rc^2= 0.676) demonstrates that these HRM factors collectively explain a substantial proportion of the variance in caring behavior, confirming their importance as organizational determinants of the quality of service.

5. CONCLUSIONS

5.1 Conclusion

This study concludes that there is a significant and strong multivariate relationship between Human Resource Management (HRM) factors and nurse caring behavior (Rc= 0.822 and Rc^2= 0.676), directly answering the three research questions by confirming that the work environment is the most correlated factor (canonical loading= 0.938), while organizational commitment provides the largest unique contribution (canonical weight= 0.672). Practically, hospital managers should adopt an integrated humean resource bundling strategy that combines commitment, environment, and communication interventions simultaneously, rather than isolated training programs, to sustainably improve caring behavior. Despite its limitations, including the cross-sectional design and small sample of 94 nurses, this study offers a clear direction for future research. Leadership style should be examined as a potential moderator, as transformational leadership may amplify the observed multivariate relationships, whereas abusive or laissez-faire leadership could negate even the best Human Resource Management (HRM) conditions. Future longitudinal and intervention studies with larger samples are urgently needed to test both the proposed human resource bundles and leadership's moderating role.

5.2 Research Limitations

Although this study provides valuable insights into the factors influencing nurses' caring behaviors, several limitations must be acknowledged. First, the cross-sectional design employed in this research precludes any causal inferences, as data were collected at a single point in time, making it impossible to determine causal relationships between Human Resource Management (HRM) factors and caring behavior. Second, the sample was limited to 94 nurses from five private hospitals in Bekasi Regency, which significantly restricts the generalizability of the findings to other healthcare settings, regions, and types of hospitals. Third, the study relied on self-reported data from the participating nurses, which introduced the potential for social desirability bias, where respondents

may have provided answers, they perceived as favourable rather than completely accurate reflections of their behaviors and perceptions. Fourth, the measurement of caring behavior as a single composite variable represents another limitation, as this approach prevented a multidimensional analysis that could have revealed how different Human Resource Management (HRM) factors might differentially influence various dimensions or aspects of caring behaviors. Finally, the study omitted potential mediating or moderating variables that could provide a more comprehensive understanding of these relationships, such as leadership style, organizational culture, or individual nurse characteristics, which may play important roles in shaping how Human Resource Management (HRM) factors translate into caring behavior.

5.3 Suggestions and Directions for Future Research

Based on the findings and limitations of this study, several suggestions and directions for future research are proposed. Future researchers are encouraged to employ longitudinal or experimental research designs that would allow for the examination of causal relationships between Human Resource Management (HRM) factors and nurses caring behavior over time, providing stronger evidence for causal inferences. To enhance the generalizability of the findings, subsequent studies should expand the sample scope to include a larger and more diverse population, encompassing various types of hospitals across different geographic regions and considering public healthcare institutions for comparative analysis. Methodologically, future research should consider incorporating multiple data collection methods, such as observational techniques, patient evaluations of nurses' caring behavior, or supervisor assessments, to complement self-report data and minimize the potential for social desirability bias.

Additionally, researchers should conceptualize and measure caring behavior as a multidimensional construct, allowing for a more nuanced analysis of how different Human Resource Management (HRM) factors may uniquely predict various dimensions of caring behavior. Finally, future studies should explore more complex theoretical models by incorporating potential mediating and moderating variables, such as leadership style, organizational culture, job satisfaction, or burnout, to provide a more comprehensive understanding of the mechanisms through which Human Resource Management (HRM) factors influence nurses caring behavior. Such expanded models would make significant theoretical and practical contributions to nursing management and healthcare quality improvement.

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